cuadernos de Nuestra América

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CIPI
CENTRO DE INVESTIGACIONES DE POLITICA INTERNACIONAL

Science and Diplomacy

Possibilities for scientific Exchange Cuba-USA

Scientific achievements for humanity.

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ADDRESS

3ra. Ave., No. 1805 entre 18 y 20,
Miramar, Playa,
Zona postal 13, La Habana, Cuba.
Teléfono: 7206 3098
revcuaderamerica@cipi.cu
Sitio web: www.cna.cipi.cu

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The International Politics Research Center (CIPI in spanish) is an academic institution attached to the Ministry of Foreign Affairs of the Republic of Cuba, founded in 2010.

It comprises more than 40 researcher-teachers and maintains close relationships of exchange and scientific collaboration with research centers, universities, and academic organizations both in Cuba and abroad.

The CIPI's mission is to contribute to the periodic updating of strategic planning and the implementation of Cuban foreign policy by conducting medium- and long-term research and studies in the fields of international politics and international relations. The institution's main areas of work include scientific research, the development of international policy scenarios, the organization of events, and the publication of relevant materials.

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Diplomatic Space

Articles

Note from the Editorial Board

This issue 013 is dedicated to Science and Diplomacy. The Editorial Board thanks all the authors for their interest and dedication.

In the section *Diplomatic Space*, researcher Charles Arthur refers to what he calls the pharmaceutical revolution. He states that Fidel Castro dedicated special attention to the research of vaccines and treatments to fight cancer.

In the *Articles* section, Sergio Jorge Pastrana and José Ramón Cabañas Rodríguez PhD analyze the role of science in the priorities of national interest for Cuba and the United States, and how to ensure that its results have a significant impact on the real priorities of the respective development processes, taking into account the asymmetries between the two nations and Washington's centuries-old interest in dominating Havana.

Cooperation and its performance in Health between Cuba and the United States, is the subject of the authors Néstor Marimón Torres PhD and Dr. Grisel Torres Amaro.

Tania Crombet PhD. and Ernesto Chico and Agustin Lage Ph.Ds. state that regardless of decades of political and economic hostility between the U.S. government and Cuba, scientific collaboration actions have taken place and are still occurring, involving not only academic institutions but also companies from both countries. It is a concrete experience that illustrates the uniqueness of scientific collaboration and knowledge-based industries and may hold keys to how to move forward in the future.

In the article "From Science to Hope: Cuba-United States Exchanges and Heberprot-P", Denysse Fundora M.Sc., together with a group of collaborators, describe how the evolution of scientific knowledge in the United States allowed Cuban researchers to have a significant amount of information at the time of the founding of institutions such as the Center for Genetic Engineering and Biotechnology. Subsequent exchanges between scientists from both countries were indispensable for the creation of the only effective pharmacological treatment to date of severe diabetic foot ulcers, and that the policy revisions that occurred during the Barack Obama administration opened spaces to try to introduce Heberprot-P in the U.S. market.

Professor David G. Armstrong posits that the restoration of diplomatic relations between Cuba and the U.S. in 2014 brought about a new era of medical collaboration. Limb preservation, particularly in patients with diabetes, represents a crucial area where bilateral efforts have produced significant advances which contributed to the preservation of diabetic limbs. This illustrates how scientific diplomacy for the sake of human health can eradicate geopolitical differences.

In the Article "U.S.-Cuba Environmental and Scientific Cooperation: a Bridge Over Troubled Waters", Researcher Daniel Whittle, Program Director of the NGO Environmental Defense Fund, emphasizes that U.S. and Cuban scientists, plus other experts, have a long and rich history of collaboration, and that cooperation on environmental issues has been especially productive, helping to create political space for dialogue on sensitive issues.

Cooperation in Marine Protected Areas Management between Cuba and the United States is analyzed by researcher Fernando Bretos Trelles, in the sense that ocean science diplomacy refers to the pursuit of science and its ability to transcend politics. He highlights some of the science diplomacy efforts made between the United States and Cuba in the last three decades.

Professor Luis Enrique Ramos Guadalupe details the first attempts to establish an effective collaboration between Cuban and U.S. scientists and institutions in the field of tropical meteorology and the subsequent efforts to expand and consolidate them. The study focuses on the most transcendental actions in three periods that correspond to the Colonial times, the first decades after the establishment of the Republic, and the new context defined by World War II and the post-war period, up to the severance of diplomatic and commercial relations between the United States and Cuba.

Rita Sibello Hernández PhD. and Maikel Hernández Núñez BA. point out that since the revolutionary

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triumph, relations between Cuba and the United States have been very tense, making it difficult for scientists of both nations to collaborate. However, in 2018 researchers from the U.S. universities of Vermont and Oberlin and the Center for Environmental Studies of Cienfuegos, Cuba, projected to carry out an academic exchange based on the completion of a research project.

Náyade Caridad González González M.Sc., Professor at the Higher Institute of International Relations "Raúl Roa García" (ISRI), considers that Cuban foreign policy faced a complex and unfavorable international scenario as of 2020, especially in our region. Influenced by external factors that have a negative impact on its internal situation, it is necessary to mention the covid-19 pandemic and the intensification of economic and political coercive measures imposed by the US government during the Trump administration.

In "Building Bilateral Health Solutions: an Academic-Governmental Partnership to Improve Community Health", Katherine Y. Tossas PhD., and several collaborators, emphasize the process of developing an innovative academic-government partnership between the University of Illinois Cancer Center (UICCC) and the Cuban Ministry of Public Health (MINSAP). This first-of-its-kind collaboration aimed to address Maternal and Child Health (MCH) inequities in Englewood, a predominantly black and structurally underserved neighborhood in Chicago.

We hope our readers will also enjoy this issue of *Cuadernos de Nuestra América* No. 013 in English and Spanish.

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With or Without You: Cuba's Pharma Revolution Couldn't Wait

Charles Arthur

Writer, editor and Researcher. Former editor at the UN Industrial Development Agency, and worked on UN development Programs in Haiti and Palestine

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In the late 1970s, in order to minimize the impact of the US embargo, the Cuban government began its first investments in pharmaceutical production plants. A UNIDO project, beginning in 1978, enlisted the expertise of an Indian company, Sarabhai Chemicals, to help Cuba establish its first chemical synthesis plant for the production of generic pharmaceutical products. At that time, Cuba's leader Fidel Castro was determined to develop the country's pharmaceutical sector, and deliver healthcare to the population.

Castro paid special attention to research into vaccines and treatments for fighting various cancers, and, in 1981, he set up six Cuban researchers in a small laboratory in a house in Havana. "He used to visit the scientists almost every day. He would often come by very late at night," Merardo Pujol Ferrer, business development director for Heber Biotec, the marketing company for Cuban biotech products, told The Miami Herald.

In May 1981, the scientists harvested the first batch of leukocyte interferon, marking the beginning of Cuba's efforts to develop its own biotechnology industry. Interferon didn't turn out to be a cure for cancer as doctors had hoped, but did prove beneficial against dengue fever which broke out in Cuba in the 1980s. The small Havana lab was upgraded and became the Center for Biological Research.

Biotech's potential

At the beginning of the 1980s, across the world there was increasing recognition of the potential of biotechnology. A group of scientists, concerned about the wide gap in know-how between the developed and developing countries, recommended that UNIDO establish an international center in a developing country to help close that gap.

At a meeting in Belgrade, in December 1982, interested countries enthusiastically endorsed UNIDO's initiative to offer grant funding via a competitive application process to facilitate the creation of a biotechnology development center. A committee of experts, coordinated by UNIDO, was tasked with visiting and assessing the suitability of the countries proposing to host the international center: Belgium, Cuba, India, Italy, Pakistan and Thailand, spending 7-10 days in each country between March and May 1983.

A UNIDO-led delegation travelled to Havana in April. Sergio Jorge Pastrana was, at that time, head of the department of international cooperation at the Cuban Academy of Sciences, an institution with the rank of a Ministry, dealing with all of the country's scientific and technological activities. He was tasked with accompanying the delegation on site visits and was asked to translate when the delegation met President Castro.

What Castro told UNIDO

Pastrana recalls that during the meeting Castro said, "We have just started to build and, as we speak, the site is being prepared by heavy machinery..." He was interrupted by a UNIDO member of the delegation who said, "*Comandante*, the analysis is yet to be made. We will report soon and, in a month or so, the Board will decide about the site... Please, do not hurry."

As Pastrana tells it, Castro answered, "It is OK, do not worry. If you decide that Havana will be your site, we will share the Center with UNIDO. If not, it will be ours. Why hesitate and wait, when it is so urgently needed? The more centers we can have, as soon as possible, the better."

Cuba goes ahead

A UNIDO meeting in Madrid in September 1983 agreed on setting up an International Center for Genetic Engineering and Biotechnology but could not reach agreement on its location. At that meeting, Cuba withdrew its application to host the center and instead backed India's bid. At the same time, it announced it was opening its own center, which would doubtless cooperate with the UNIDO center when it materialized.

Cuba's Center for Genetic Engineering and Biotechnology (CIGB), which absorbed the earlier-established Center for Biological Research, opened on 1 July 1986, with around 300 employees. "This center is big, but I hope the scientific results that are obtained will also be great," said Castro at the opening ceremony.

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Today, the CIGB, which now employs around 1,700 workers, is known for its innovative work in developing vaccines, therapeutic molecules, and other biotechnological products. It has played a crucial role in Cuba's response to various health challenges, including the COVID-19 pandemic. (*COVID-19: Long-term Support for Biotech Yields Vaccine Promise in Cuba*, n.d.) Cuba's biotech and pharmaceutical industrial sector is now comprised of 21 research centers and 70 factories, under the umbrella of BioCubaFarma.

The mooted international center – the International Center for Genetic Engineering and Biotechnology (ICGEB) – was eventually co-hosted by Italy and India, with locations in Trieste and New Delhi. Matangkasombut (1984) writing in the Asian Pacific Journal of Allergy and Immunology, provides the details of how the decision was made. It finally started operations as a special program of UNIDO in 1987. In 1994, it became an independent, international organization.

References:

Burki T. (2021). Behind Cuba's successful pandemic response. The Lancet. Infectious diseases, 21(4), 465–466. https://doi.org/10.1016/S1473-3099(21)00159-6

Cárdenas O'Farrill, A. (2018). *How Cuba Became a Biopharma Juggernaut*. https://www.ineteconomics.org/perspectives/blog/how-cuba-became-a-biopharma-juggernaut#:~:text=In%20the%201960s%2C%20the%20government,investments%20in%20pharmaceutical%20production%20plants

Jiménez, Marguerite R. (2011). *Cuba's Pharmaceutical Advantage*. https://nacla.org/article/cuba%E2%80%99s-pharmaceutical-advantage

Larsen, J. (2021). *Covid-19: Long-term support for biotech yields vaccine promise in Cuba*. https://www.unido.org/stories/covid-19-long-term-support-biotech-yields-vaccine-promise-cuba

Matangkasombut, P. (1984). Unido's ICGEB: a case of petty politics prevailing over scientific peer-reviews. Asian Pacific Journal of Allergy and Immunology,154–155.

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Science, Diplomacy and Sustainability in Bilateral Relations Between Cuba and the United States

Sergio de Jesús Jorge Pastrana, BA

ORCID ID: 0009-0008-9385-1774

e-mail: pastrana@ceniai.inf.cu

sergiojorgepastrana@gmail.com

José Ramón Cabañas PhD

ORCID: 0000-0001-7778-3566

director@cipi.cu

joser.cabanas50@gmail.com

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Abstract

Starting from existing global agreements and scientific certainties that establish the foundations for further global human social and economic development, the role of science within priorities of national interests of both Cuba and the United States is discussed. Likewise, the way that relations between scientists of said countries have evolved along history, and how their results of research can show significant impact on real priorities of their respective national developments. Taking into account asymmetries between both nations and the century-old urge of Washington to exert domination over Havana.

Keywords: *science, diplomacy, development, sustainability*

Introduction

In September 2024, the United Nations launched a so-called Pact for the Future to guide the achievement of humanity's global development goals. Just about the same time, mid-October 2024, marked the 25th anniversary of the Budapest World Science Conference. This event, held under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council for Science (ISC), was the greatest effort of the world's scientific community to alert society and governments of the world over the opportunity of opting for a collective will and the priority to promote ways to achieve sustainable development and provide the world with a code of conduct and a framework for action that could lead to the creation and consolidation of a global knowledge society, which in turn could build a future of sustainability (UNESCO, 2000).

Despite the unprecedented global mobilization and more than seven years of preparation to produce a movement that could change the then very negative trends in the world's economic and social development, the conference failed to overcome the pitfalls of collective hypnosis in the face of the advance of neoliberal capitalism and the lack of attention by the governments of developed countries to the urgent need for collective rational political leadership to provide an opportunity for the construction of a society that would seek global human, economic and social development based on knowledge.

The evolution of the world economy under the laws of the so-called "Washington Consensus", the declaration of the unipolar world according to the thesis of F. Fukuyama (1992) and the roadmap of Z. Brzesinsky (1997), all of them under the growing influence of digital technologies, defined the evolution of human societies towards the information society, rather than towards the knowledge society promoted by the global scientific community.

The digital enabling technologies and biotechnology that promised so much in terms of education, culture, new therapies and formulas for a better and more widespread human development, were very quickly oriented towards the promotion of the market, entertainment, distraction and addiction. The dizzying technological development in a society permeated by its influence and convinced of the "trickle down" theory whereby "the market ethic" would grow the economy and benefit all societies by creating more jobs, which would also immeasurably increase the wealth of nations, took the existing world system by storm.

From their very origins, both Cuba and the United States have seen their respective developments as nations closely intertwined as immediate neighbors, and in this process the declaratory discourses of the great power of the North have been conditioned by internal political forces, which in the debate on hypothetical national interests (which are rarely clearly defined), privilege one or another extreme of different types, according to the immediate political situation.

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> “[...] the development of the national capacities for science in Cuba and the United States had a common, parallel and coincident origin [...]”

Several authors have recently coincided in dividing the discourse of U.S. political elites, defining, on the one hand, the dissemination of an uncritical idealized narrative, and on the other, the execution of real policy, which is always conditioned by the interests of large corporations. The objective of this article is to explore the role of science and its applications to the sustainability of human societies in general, and specifically within the framework of bilateral relations between Cuba and the United States. Likewise, to observe how science plays an important role in the definition of political relations according to the real interests of both nations, regardless of the political discourse in force in the short term and the manipulation of the long-term strategy of the imperial corporate power.

Development

In order to comprehend the true dimension of these challenges and alerts, it is necessary to refer to the background, in order to define the evolution of the following components:

- The evolution of national science systems, especially in Cuba and the United States.
- The process of depletion of the planet's capabilities to guarantee human habitat caused by the distortions of the world economy imposed by imperialism.
- The evolution and radical changes in the organizational forms of energy use, productive processes and the recent advent of enabling technologies and their contribution or not to the objectives of sustainable human development.

Origin and evolution of the national systems of science, technology and innovation in Cuba and the United States.

Although the development of the national capacities for science in Cuba and the United States had a common, parallel and coincident origin in the historical horizon, its subsequent evolution was conditioned by the unequal development of the national economies with respect to the corresponding European metropolises.

At the end of the 18th century, the ideas of the European Enlightenment reached the evening soirees of high society in important urban centers of the New World. In Boston, Philadelphia and New York in the nascent United States of America and in Havana, Cuba, groups of intellectuals oriented to philosophical, geographical, naturalistic and medical studies began to organize. Pioneers were the American Philosophical Society in Philadelphia, in the United States, and in Cuba the Patriotic Society, later known as the Economic Society of Friends of the Country (Sociedad Económica de Amigos del País). The diaries of the German academic traveler Alexander von Humboldt, who visited both countries in 1800 and 1804, record his exchange with research circles in social meetings such as those organized at that time in Berlin, Paris, London and other European cities.

The first four national Academies of Sciences had emerged in Europe much earlier, in the 17th century, in Italy, England, France and Germany. It was not until the 1860s that academies of science emerged in the Americas. After long processes of integration, the first national academies of science in the Americas appeared in Cuba (1861) and the United States (1863), and in the 19th century academies of science outside Europe were only established in New Zealand (1867), Argentina (1874) and Canada (1883). There were not so many in Europe either after three centuries. Only five were founded in the 17th century, four in the 18th and four in the 19th century. Until the beginning of the 20th century, science was only practiced in very few capitals and almost always as an individual activity of

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some professors with their students or apprentices in university cloisters, museums, or in very few laboratories existing at that time.

In both countries that decade would witness, in turn, bloody and fratricidal armed conflicts, linked to the emergence and definition of the very survival of the respective national states. In the case of the United States, the conflict was between two different modes of production and two different visions of future economic development. In the case of Cuba, in addition to a similar change in the mode of production, the struggle was essentially over its emerging identity as an independent nation. These two oppositions to the two largest European empires, Spain and Great Britain, which had been disputing global hegemony for centuries, marked in both countries the character of the creation of the main scientific organizations of each.

The United States was born as a federated state of adjoining territories of different levels of development, economy and state organization. This origin was, therefore, a long political process that still continues today to compensate for differences and establish balances. From very early on, once Great Britain was defeated in the war to define the feasibility of the United States as a nation, the ruling caste of European origin dictated the Monroe Doctrine, the result of the elaboration of the geopolitics of the American world under the aegis of the nascent United States of America, which claimed the right to declare sovereignty over the entire group of nations of the Americas.

Two factors would come to define the future after the military conflict that engulfed the country in the mid-19th century and threatened to divide it forever. First, industrial development, and second, the depredation of neighboring colonial territories at the expense of France, Mexico and Spain.

For its part, within the framework of these processes of national consolidation, the Academy of Sciences of Havana emerged as an element of higher social organization that was an integral part of the first efforts to recognize a national identity in Cuba, while in the case of the Academy of Sciences of the United States, the institution was created by decree of President Abraham Lincoln to support the nation as an advisory body in the Civil War, so that from its origins it was conceived as an element of specialized advice to the military effort of the country, and this was recorded in its founding documents.1

It should be noted that at the time of the establishment of both Academies of Sciences there were already long-standing contacts between their scientists. This is the case of Felipe Poey and his long epistolary exchange with the founding researchers of the Washington Academy, Joseph Henry and Spencer Baird, with whom he had been collaborating for two decades in the classification and promotion of the original collections of the Smithsonian Institution, as well as with other colleagues in institutions in Philadelphia, New York and Harvard, or of his son, also founder of the Cuban Academy, meteorologist Andrés Poey, with his American colleagues.

These exchanges were between fellow researchers who respected each other as equals, and it should be noted that it was precisely in the United States during the V International Sanitary Conference, held in Washington, D.C. in 1880, that Carlos J. Finlay presented for the first time his hypothesis of the mosquito as the transmitting agent of Yellow Fever, which he would reiterate later that same year, a few months later, before the plenary of the Cuban Academy of Sciences in Havana. Twenty years later, Finlay himself, in collaboration with the American physician Jesse Lazear, from the School of Public Health of the Johns Hopkins University in Baltimore, was able to experimentally confirm the certainty of his hypothesis as opposed to others of the

1 The Act of Incorporation of the National Academy of Sciences of the United States signed by President Lincoln on March 3, 1863, in the middle of the Civil War, established that the Academy would have the obligation to provide scientific and technical advice free of charge to any government department when requested to do so. It is recorded that during the remainder of the 19th century and up to 1916 the Academy was consulted on only a dozen occasions. On that date in 1916, by Executive Order of President Woodrow Wilson, the National Research Council was created, a new contingency executive body in charge of coordinating the scientific and technological research of the entire nation in the service of the preparations for the war in which the country was involved in Europe. After the end of that conflict, the National Research Council remained in operation as a permanent operating body of the National Academy of Sciences, performing the organization and service of the specialized advisory function in science and technology matters for all entities of the U.S. government. "Governing Documents" www.nasonline.org. Accessed 10/15/24.

team of researchers working in Cuba during the turn of the century, and then, in collaboration with Doctors Leonard Wood and Walter Reed in Cuba and William C. Gorgas in Panama, to undertake sanitation campaigns to eradicate the so-called "Scourge of the Tropics". Thus, the highest achievement of world virology in the 19th century was reached by an original scientific hypothesis of a Cuban researcher and its final demonstration and introduction into practice in both countries, the whole region and the world through bilateral collaboration with American scientists.

The history and details of the exchanges in various disciplines can be found in the works listed in the references and in others published together with this one. Suffice it to say that since then to date, collaboration between researchers from both countries has been almost uninterrupted for more than a century and a half and has been of great importance for their contributions in various fields of science for Cuba, the United States, the Caribbean region and the world in general.

During the rest of the 19th century and the first half of the 20th century, scientific activities continued to be the work of societies and institutions of the scientists themselves under the protection of large universities and other educational centers or of the nascent industries. It would not be until the middle of the 20th century that governmental efforts would emerge in both countries for the development of science.

In the United States, the main research and development centers were organized by the large industrial monopolies. When the United States was attacked at Pearl Harbor on December 7, 1941 and President Franklin D. Roosevelt called for the war effort, ad-hoc research activities were organized through the creation of commissions. It was not until the end of the war, in the post-war period between 1945 and 1950, that the governmental structures in charge of the sciences were established and linked to permanent advice to the defense agencies of that country. After the report presented by a commission headed by Engineer Vannevar Bush entitled Science, the Endless Frontier, and successive organizational processes in 1950 established the National Science Foundation, the first governmental institution for the promotion of science.

In Cuba, for its part, after the U.S. occupation the Academy of Sciences continued as an independent non-governmental collective organization of scientists, but the development of the Cuban economy according to the extractive interests of the main investors did not promote local research activities, so that the Academy remained essentially a primarily medical entity. When in 1950 the Government of President Carlos Prío Socarrás requested a loan from the International Bank for Reconstruction and Development (origin of the World Bank), the Commission in charge under the direction of Francis A. Truslow proposed the need to straightaway promote applied research and consequently recommended the immediate establishment of a Cuban Foundation for Technological Research. The truth is that this idea was not taken up and at the time of the triumph of the Revolution, Cuba only had a few medical laboratories and four experimental stations (three agricultural and one industrial).

On January 15, 1960, a few days after the first anniversary of the revolutionary triumph, Fidel was invited to close the meeting for the Twentieth Anniversary of the Speleological Society of Cuba at the headquarters of the Academy of Sciences in Havana. It is there where he delivers the speech in which he states that

> [...] The future of Cuba must necessarily be a future of men of science, of men of thought, because that is precisely what we are sowing the most. What we are sowing the most are opportunities for intelligence.

“[...] at the time of the triumph of the Revolution, Cuba only had a few medical laboratories [...]”

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Said and done, the Literacy Campaign was launched, and once it was concluded, the Academy and the University Reform were re-founded, with the expansion of technical and basic science careers together with a broad system of scholarships for young people from all over the country so that they could access high school and university.

The main research centers created from the development needs, based on the scarce existing laboratory facilities and the qualified force of the national universities, first undertook the task of studying, describing and characterizing Cuba's natural conditions and resources. From this, state plans for economic and social development were designed and in a period of three decades the system of R&D centers created by the Revolution in the country was able not only to have a scientific vision of the natural environment, the economy and Cuban society, but also to apply that knowledge to national development, achieving human advancement objectives characterized in indexes that in many ways compete with those of developed countries. In addition to the above, research centers in various branches were able to advance in the creation of new productive technologies and finished products applied to health - human and animal - agriculture and various productive processes, which led the RAND Corporation to comment in a report prepared for the World Bank in March 2001 that "... Brazil and Cuba are the only two Latin American countries developed above the world average in their scientific and technological capacity".

It is thus demonstrated that the scientific and technological development that has been internationally recognized in Cuba is a genuine result of the Revolution in compliance with the development strategy outlined since the revolutionary triumph itself, as recorded in two specialized reports prepared at the request of the World Bank in 1950 and 2000, respectively.

Science and the limits of development.

In 1992, the Earth Summit in Rio de Janeiro succeeded in producing two conventions of transcendental scope: the Framework Convention on Climate Change and the Convention on Biodiversity. These undoubtedly addressed the need for concerted action on the two most urgent problems threatening the global environment and there is no doubt that the most notable warning on that occasion about both problems was given in his brief five-minute speech by our Commander-in-Chief Fidel Castro when he said: "An important species is in danger of disappearing: mankind". But to reach an understanding of the reasons that sought a settlement on the legal bases that could then reconcile the collective interests of humanity in order to promote sustainable development, we would have to travel a long road that began even much earlier.

A good time to set a global alert in this respect was the energy crisis of 1972. The preceding decade had marked several extremes for human societies. The process of decolonization, the wars in Southeast Asia, especially the Vietnam War and related conflicts, the struggle for civil rights in the United States, the generational clash of the counterculture and the initial steps in the conquest of outer space, just to mention the main movements, had shaken the foundations of global governance. The social cataclysm did not respect borders or horizons. Led by youth, 1968 was a year of turbulent social and political clashes in Washington, Mexico and Paris, and of revolutionary effervescence in Asia, Africa and Latin America.

The 1960s, on the other hand, had already brought us the first widely publicized warning about environmental pollution caused by indiscriminate pesticides in the development of extensive agricultural practices with the work "Silent Spring" by the writer Rachel Carson (Carson, 1962), while the emergence of a growing number of independent nations as a result of decolonization led the World Bank to create a high-level commission, chaired by the Canadian Chancellor, to argue the requirements of international development, which produced the report entitled "Counterparts to Development" (Pearson et al., 1969), and, towards the end of that decade, a team from the Massachusetts Institute of Technology (MIT) was commissioned by the Club of Rome to conduct a prospective statistical study on the global limits to the impact of forms of commercial and economic industrial development based on the practices of the existing capitalist economy. The result of this request was the publication in 1972 of "The Limits to Growth" (Meadows et al, 1972), which already warned that the maximum thresholds of exhaustion of the regenerative capacity of various resources of the planet as a habitat for the human species were about to be crossed.

Although the statistics showed that these growth limits were clearly defined on the basis of the current

production and consumption patterns of the economy of the existing world system, the main variables used were neither conclusive nor absolute, although they already warned of the need to achieve a possible and desirable sustainable balance, which immediately became the obvious corollary for the solution of the conflict defined by the report.

The following decade brought the results from the hands of atmospheric chemists who discovered in the reading of sequential observations of atmospheric ozone the growing hole in the concentration of this gas over the polar cap, which eliminated an important filter of excess ultraviolet solar radiation, the cause of skin cancer. As an evolution of all these alarms, the UN World Commission on Environment and Development, known as the Brundtland Commission, after its Chair, former Prime Minister of the Netherlands, produced the report "Our Common Future" (UN, 1987).

Since then, there has been a dichotomy between the stated objectives of achieving a sustainable balance in the long term for the use of the planet's resources to adequately meet the needs of the global population (UN, Millennium Development Goals - MDGs, Sustainable Development Goals - SDGs); and, in contrast to these goals, commercial and social economic practices in which unsustainable patterns of production and consumption promoted by monopoly capitalism are maintained, which on the other hand, based on permanent financial manipulation, only favor a smaller and smaller percentage of human societies (Piketty, 2014).

> "[...]
> **An important species is in danger of disappearing: mankind**
> [...]"

The possibility of a sustainable permanence of the human species on the planet and the way to achieve it is debated between these dilemmas, which unfortunately is manipulated by the media between the extreme narratives that it is either an unsolvable problem, or that it is a false mirage not as serious as it is said to be. Nevertheless, the world scientific community, analyzing in depth each of the situations that have brought to limits the possibility of an equitable sustainable development, has systematically demonstrated the conclusion that the conflict is permanently maintained and aggravated by arbitrarily imposed practices in order to continue privileging the minorities that hold power in the developed capitalist countries.

First of all, we must take into consideration the opposing elements in this dilemma.

On the one hand, as the entire planet has become a global community of production, consumption and services, the market is regulated according to supply and demand, but the mechanisms for regulating the market have been conditioned by the domination by the world's leading power of international trade, financial and political organizations and their increasing use as instruments of force for geopolitical domination.

In the debates on the U.S. presidential elections, the antagonism of these visions has become evident, which will ultimately be modulated by the vested interests of the U.S. bipartisan political system in terms of supporting the maintenance of unipolar hegemonies in the midst of a global geopolitical situation that, in addition to maintaining it in permanent instability, has demonstrated the impossibility of keeping it unalterable.

It is absurd to privilege and prioritize the maintenance of an unsustainable hegemony over the pursuit of the global sustainability of human societies. The corollary elaborated by Yuval Noah Harari in Sapiens (Harari, 2014), inspired by the works of Drs. Jared Diamond, "Guns, Germs and Steel" of 1997, and Ian Morris, "Why the West Dominates and for How Much Longer" of 2010, both from the University of California, is that the destabilization caused by neoliberalism since the Washington Consensus, which, in order to guarantee the short-term profits of the richest, wrecked the foundations that gave stability to any of the national economies, including those of the most developed countries themselves. That corollary has left us on the

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edge of the endless war declared in October 2001 by U.S. President George W. Bush. This war is being conducted by the US military apparatus and its allies, who have become the leaders of the tools of global domination nurtured by the Military Industrial Complex.

To summarize, the reality we have faced in the last fifty years is that there is a global international effort that fosters a consensus aimed at promoting the collective development of human societies and establishes global agreements in this regard that have gone through the statements of the highest multilateral forums of supposedly binding commitments. However, despite evidence, consensus and purposes, the squandering of fossil fuels, the growing marginalization and exploitation of the Global South, military chaos and humanitarian catastrophes are systematically imposed.

The following is a partial list of the main milestones in the definition of the objectives to be pursued in long-term sustainable human development according to the best knowledge of world science.

Main Steps in the Process of Building Consensus on the Requirements of Sustainable Development

- Report of the Pearson Commission for International Development. Washington. 1969.
- MIT Report to the Club of Rome on Limits to Growth. 1972.
- Human Environment Summit. Stockholm. Stockholm, Sweden, 1972.
- UN Conference on Human Settlements HABITAT I. Vancouver, Canada 1976.
- United Nations Conference on Health for All. Alma-Ata, USSR, 1978.
- United Nations Conference on Science and Technology for Development. Vienna, Austria. 1979.
- Report of the Commission on Environment and Development "Our Common Future". UN. New York, 1987.
- Earth Summit. Rio de Janeiro, Brazil, 1992.
- UN Habitat Conference on Human Settlements II. Istanbul, Turkey, 1996.
- World Conference on Science. Budapest, Hungary, 1999.
- World Conference of Academies of Sciences. Tokyo, Japan, 2000.
- World Summit on the Information Society, Geneva, 2003 and Tunis, Tunisia, 2005.
- Millennium Development Goals 2000-2015. UN.
- UN Conference on Human Settlements Habitat III. New York, UN, 2016.
- Sustainable Development Goals 2015-2030. UN.
- Summit of the Future. UN 2024.

All these efforts have been systematically developed by building agreements and action programs (negotiated within multilateral international organizations and based on the best available scientific knowledge) that are practicable and achievable, starting with the optimal use of the same original contribution requested to developed countries by the World Bank and the United Nations since 1967 in the report of the UN Commission for International Development, consisting of 0.7 of the GDP of developed countries to be devoted to international sustainable development in a stable and long term manner. Unfortunately, all reports from that time to date show that this pledge has been broken, in the best years, by no less than half of the commitment, which in turn, in more than 80 percent of the contribution finally made, has been invested within the donor countries. In addition, since the end of the 20th century, international development has hardly been recognized as a partial objective and the UN programs mentioned above no longer quantify it in absolute terms, but only in gradual percentage increases.

However, all the agreements and decisions of these conferences, fittingly based on the best available scientific knowledge, have not been fulfilled in due time and form over the last half century due to the systematic failure of developed countries to fulfill their commitments to international development. The growing impossibility of fulfilling official development assistance (ODA) commitments has had two main reasons: firstly, the application of ODA for geopolitical objectives of domination and, secondly, the exaggerated expenditure of the military budgets of the developed countries.

In the half century elapsed since the identification of unrecoverable thresholds in the abuse of the planet's habitability conditions, the global economy has continued to invest and squander more resources in fratricidal wars than in ordering the long-term sustainable development of human societies on the planet, dominated by the mirage of imperial superiority.

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Science, Information and Knowledge

In one of his most recent essays (Beyond Hegemony, 2024) and in various conferences, Dr. Jeffrey Sachs, Director of the School of Development at Columbia University in New York, argues that the current geopolitical juncture is characterized by the convergence of the decline of Western hegemony, the global ecological crisis (composed of climate change, the destruction of biodiversity and massive pollution, all phenomena induced by human societies) and the rapid advance of technologies (especially artificial intelligence, information technology, biotechnology and geo-engineering). In this context, a process of instability and adjustment is taking place in which the poles of development are being reconfigured, modifying the patterns of exploitation, production and consumption that have been shaped for centuries in what he characterizes as a change of phase in history, which is currently undergoing a process characterized by uncertainty and the growing danger of a nuclear hecatomb.

For his part, in his address to the 16th BRICS Summit in Kazan in October 2024, the UN Secretary General thanked this group of countries for their support for multilateralism and described the current situation as a

> [....] proliferation of wars, the devastation of climate change, pollution and biodiversity loss, growing inequality and stubborn poverty and hunger; a deep crisis that threatens plans for a better future for many vulnerable countries; the fact that less than a fifth of the Millennium Development Goals are on track to be met; the growing digital divide and the lack of safeguards for artificial intelligence and other digital technologies [...] and finally, [...] the lack of representation of developing countries at global decision-making tables. All this has to change [...]

To this end, he said, the recently agreed September 2024 Summit of the Future defined the course of action to strengthen multilateralism, defend peace and human rights and promote sustainable development. Four areas of action are outlined in the Pact for the Future: 1. The reform of the global financial architecture, which is obsolete, useless and unjust. 2. Climate. The goal of maintaining a limit of 1.5 degrees for global warming and objective financial commitments to that end. 3. Technologies. Every country must have the possibility of accessing the benefits of new technologies, and 4. Peace. Strengthen and update the tools to guarantee peace, including the reform of the United Nations Security Council.

> “[...]
> **The future of Cuba must necessarily be a future of men of science**
> [...]”

In view of these scenarios, bilateral relations between Cuba and the United States remain sequestered in a limbo inherited from the Cold War of the last century, harassed by power groups in various levels of the U.S. government structures with an endless web of laws, administrative provisions, unilateral coercive measures and designation in exclusive lists that continue to this day to constitute the most comprehensive and oldest complex of economic, commercial and financial aggressions ever wielded in history by a great power against another nation. This aggressive spawn has gone through all possible alternatives and - always under a set of pretexts- has sought to continue applying the policy defined by the hostile and illegal memorandum of the Assistant Secretary of State for Inter-American Affairs, Lester Mallory, dated April 6, 1960.

However, despite this climate of constant aggression under any pretext, scientists from both countries continue to communicate, exchange experiences, explore new possibilities and promote ways to share the process of creating new knowledge. In the more than half a century of this always aggravated dispute, Cuba was able to build a national system of science, technology and innovation that has obtained achievements, technologies and products at the state-of-the-art of the world scientific level. On the other hand, the

research carried out by the scientific communities of both countries offer multiple spaces for sharing work and objectives, but can only advance in leaps and bounds between the various ways in which different U.S. political interests hinder any constructive initiative, until it becomes of interest again and contacts and collaboration are reborn.

In this sense, several institutions of both countries, the region and the world have served as bridges to maintain contacts regardless of the ups and downs of the political confrontation and this has allowed researchers to show different results of joint work of benefit to both countries and to others in the region and the world. Among the institutions that have facilitated these relations, it is worth mentioning, in the first place, both Academies of Sciences, which in the case of the Cuban scientific academy has been the main entity channeling relations in its capacity as an official institution of the Cuban State, which is not part of the government or the administration, although it has national institutional representativeness.

On the U.S. side, in addition to the National Academies of Sciences (NASEM), the efforts over the years of the Smithsonian Institution and the American Association for the Advancement of Science (AAAS), both of which are among the world's leading non-governmental organizations in promoting international research and collaboration, are noteworthy. Likewise, the International Social Science Council (SSRC), the Latin American Studies Society (LASA) and various non-governmental entities such as the Environmental Defense Fund (EDF), The Nature Conservancy (TNC), and countless university and local organizations, research centers and many other R and D centers and bodies that have appreciated with respect and consideration the work of the Cuban scientific community and share its goals and objectives.

The initiatives that have been realized in bilateral scientific and technical collaboration can show an ever-growing array of successful and very promising results. In the medical care sector, there is the joint confrontation of the Ebola fever epidemic in Sierra Leone, Africa in 2014, as well as an exchange project on primary health care in low-income areas for three months with the City of Chicago in 2017. Both in preventive medicine and in confronting epidemics Cuba can show results far superior to those achieved in the United States thanks to the vision of a comprehensive health system that can provide holistic solutions that are very effective both in prevention and in crises and has been of interest to several cities in the United States. This became evident in the impossibility of a swift and effective response to the emergence of the COVID-19 pandemic, when the lack of integration between public strategies and private care systems failed to immediately contain the spread of the virus and the excessive mortality among the weakest patients.

In the training of medical personnel, U.S. graduates from low-income, disadvantaged families after studying at the Latin American School of Medicine have also demonstrated another aspect in which, despite the enormous difference in size and resources, the Cuban experience can make a positive contribution to U.S. health care.

The possible application of new drugs developed in Cuba after clinical studies, both in vaccines against cancer and in treatments for diabetic foot ulcers in collaboration with important scientific centers in the United States could contribute greatly to improve the morbidity and mortality of diseases that cause considerable havoc in large sectors of U.S. society.

In biodiversity conservation activities and coping with the effects of Climate Change, both in terms of shared natural resources and experiences in research, monitoring, adaptation and resilience projects, the communities of scientists learn a lot from each other and have been able to exchange information, techniques and research resources for bilateral benefit.

Faced with the scourge of natural disasters, from their prevention to the confrontation of extreme events, the experience of decades in the protection of populations and settlements through monitoring and education regarding hurricanes and other climatological events can also help in the design and application of equivalent strategies for other types of crises such as oil spills and all types of emergencies. The hurricane cooperation resulting from the joint work of meteorologists and respective authorities of both countries is a model example of how, despite political differences at any time and through multilateral collaboration within the regional association IV of the World Meteorological Organization, scientists from both countries have maintai-

> “[...] the current geopolitical juncture is characterized by the convergence of the decline of Western hegemony [...]”

ned a work of excellence not only for joint benefit but also for the entire Caribbean region.

These and other equally satisfactory examples are reported in other articles in this publication and in those cited and listed in the reference section of this article. They serve as examples to reflect on how both countries can best contribute to the achievement of global sustainable development goals and the future of human societies.

Conclusions

Political relations between Cuba and the United States have been in almost permanent conflict since the 19th century; but they have been escalating and intensifying since 1960 to date, with only a short episode of attempted relaxation at the end of Barack Obama's presidential term. The fact that Cuba was the culmination of the wars of independence of Spanish America and that the thirty years of that last war ended up bleeding Spaniards and Cubans “to the last man and the last peseta”, allowed the United States to enter the conflict and in the short space of three months manage to dominate the remains of the Spanish empire and convert the few colonies that Spain still retained in protectorates under its aegis.

In the case of Cuba, which had been the motivating element of its communications campaign to justify the war against Spain, the intervening power had no choice but to grant independence, but not before, under blackmailing pressure, imposing on the constitution of the nascent republic a set of amendments that in fact turned it into a neo-colony under the premises of the aforementioned Monroe Doctrine.

That neocolonial condition allowed the overwhelming entry of U.S. investors who bought the land and the local economy at bargain prices and enthroned a corrupt and delinquent local oligarchy that would end up turning Cuba into the recreational den of the mafias and the excesses of the northern power. The victory of the Cuban Revolution in 1959 radically changed the panorama and an economic and social project of national development prevailed over the neocolonial surrender of the governments of the first half of the century. Since then the bilateral relationship has been subject to the assumptions of the two hundred year old Monroe Doctrine, to the precepts of the Platt Amendment of one hundred and twenty years, to the dictates of the Lester Mallory Memorandum of sixty years and to the delusions of an absurd extraterritorial law of the United States of thirty years ago, which has been futilely trying to turn Cuba back into the protectorate it was with the military boot of the United States on its territory in 1898.

In the face of all this abuse, the Republic of Cuba, under the process of the Cuban Revolution since 1959, laid the foundations for an economic and social development of national independence that led to the creation of a more just, equitable, educated and healthy society that has come to compete in human development indexes with the most highly developed countries in the world and that in the scientific field has managed to establish centers and schools of thought at the highest world level in various disciplines.

These centers have established relationships and contacts with counterparts around the world and especially in the United States, which can contribute to the advancement of global sustainable development objectives.

If leaders in the United States could realize the advantages of a constructive bilateral relationship with Cuba that could end the policy of confrontation aimed at imposing neocolonial conditions, renouncing its

traditional objective of promoting regime change and instead be dedicated to fostering neighborly relations equivalent to those that exist with the other Caribbean countries, they would find that Cuba would not only be one of their major trading partners in the Caribbean, but would also be a counterpart to achieving greater welfare and development objectives throughout the region.

At least in science, researchers have highlighted the advantages of a constructive bilateral relationship. It would be worthwhile to create the conditions to foster its better development and promotion aimed at achieving higher goals of sustainable development. It should therefore be a priority for both countries to foster a climate of cooperation and exchange in the fields of science as opposed to confrontation and confrontation. This would necessarily result in concrete advantages of national interest for all.

In the intervening years of this century, the policy of endless war declared by the then President of the United States in 2001 has succeeded only in killing millions of citizens of the countries of the Global South and tens of thousands of Americans. Destroying the economies of dozens of countries, increasing the US public debt by several billion dollars and enriching a handful of investors. The world has become more violent and insecure, and the objectives of global development are vanishing, wrecking the social fabric of nations for the benefit of far less than one percent of the world's citizens who amass useless absurd fortunes and further defer the possibilities of a harmonious development of human societies.

References

Boom, B. (2012, September) Biodiversity without borders: Advancing U.S.-Cuba cooperation through environmental research. Science and Diplomacy. 1(3). https://www.sciencediplomacy.org/sites/default/files/biodiversity-without-borders_science__diplomacy.pdf

Brundtland, GH (1987) Nuestro futuro común Informe de la Comisión Mundial sobre el Medio Ambiente y el Desarrollo. Ginebra, Documento de las Naciones Unidas A/42/427.

Brzezinski, Z. (1997) El gran tablero mundial. ISBN 0465-02726-1. https://geopoltica.yolasite.com/resources/Textos_Geopolitica/Brzezinski,%20El%20gran%20tablero%20mundial.pdf

Bush, V. (1945) Science, the endless frontier. USGPO, Washington. https://www.nsf.gov/about/history/vbush1945.htm

Carson, R. (1962). Silent Spring. Penguin Classics. https://www.fao.org/fileadmin/templates/library/pdf/Silent_spring.pdf

Diamond, J. (2016) Armas, gérmenes y acero: breve historia de la humanidad en los últimos trece mil años. ISBN: 9788483463260.

Harari, Y. N. (2015). Sapiens: A brief history of humankind. New York: Harper Publisher. ISBN 9780 0995 90088.

Meadows, D. (1972). Limits to growth. Chelsea Green Publishing. https://www.donellameadows.org/wp-content/userfiles/Limits-to-Growth-digital-scan-version.pdf

Pastrana, S. (2015, March) Building a lasting Cuba-U.S. bridge through. Science and Diplomacy. 4(1). https://www.sciencediplomacy.org/perspective/2015/ building-lasting-cuba-us-bridge-through-science

Pastrana, S., Gual Soler, M., Wang, T. (May, 2018) Promoting Scientific cooperation in time of diplomatic challenges: MEDICC, 20(2),23-26. https://www.doi.org/10.37757/MR2018.V20.N2.5

Pearson, LB. (1969). Partners in Development: Report of the Commission on International Development. London: Pall Mall Press.

Rogers, C. (1999) World Conference on Science Report. UNESCO 2000. https://journals.sagepub.com/doi/abs/10.1177/1075547099021002006

Sachs, J. (2024) Beyond hegemony. https://www.cirsd.org/en/horizons/horizons-summer-2024--issue-no-27/beyond-hegemony

Smith, I. (2010) Why the West rules--for now: the patterns of history, and what they reveal about the future. New York, Farrar, Straus and Giroux.

Truslow, F. (1951) Resumen del Informe sobre Cuba. Banco Internacional de Reconstrucción y Fomento. https://documents1.worldbank.org/curated/ru/353411468245994932/pdf/UNN16000Cuba0000economico000Spanish.pdf

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Wagner, C. et al. (2001, March) Science and Technology Collaboration: building capacity in developing countries. RAND. https://www.rand.org/pubs/monograph_reports/MR1357z0.html

Williamson, J. (2004, January) The Washington consensus as policy prescription for development. PractinionersPractitioners of Development. World Bank. https://www.piie.com/sites/default/files/publications/papers/williamson0204.pdf

Bilateral Cooperation in Health between Cuba and the United States: Scope and Limitations

Dr. Néstor Marimón Torres PhD

Ministerio de Salud Pública de Cuba
ORCID:0000-0003-1449-5270
e-mail: dirdri@infomed.sld.cu

Dr. Grisel Torres Amaro PhD

Ministerio de Salud Pública de Cuba
ORCID: 0009-0008-8937-2404
e-mail: africa@msp.sld.cu

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Abstract

Health cooperation relations between the United States and Cuba were conducted at the level of non-governmental organizations, scientific societies, universities, friendship associations, solidarity groups, etc., but were nonexistent at the governmental level. We had to wait for the Obama administration to materialize some cooperation actions between specialists in the fight against the Ebola epidemic in Central Africa in 2014 and during the earthquake in Haiti. It was not until after December 17, 2014 with the announcement by the presidents of both countries of their willingness to begin negotiations to restore diplomatic relations that a political and health rapprochement began, producing in 2016 important actions and exchanges never before achieved. Starting in 2017, with the beginning of the Trump administration, a sharp decrease occurs, until it disappears completely. The main cooperation actions carried out and the most significant examples are mentioned, including the drive of scientists and researchers from both countries to materialize them. A chronological retrospective description of the main activities and their results is included, something historic, never before achieved. The change of administration affected the level of cooperation, paralyzing a promising and beneficial future for both parties.

Keywords: *cooperation, exchanges, memorandums of understanding*

Chronological development of cooperative relations

Relations prior to December 17, 2014.

In the governmental area, they focused on the visits of officials from the Center for Disease Control and Prevention (CDC) in Atlanta to Cuban health institutions as part of the medical checkup program for Cuban travelers to the United States.

The non-governmental area was characterized by exchanges with some universities and institutions, private hospitals, the development of specialized medical exchanges through non-governmental organizations (NGOs), such as MEDICC (Medical Education Cooperation with Cuba) (Sanchez, 2015) and medical associations, such as the American Public Health Association and the Cuban counterpart (Ochoa Alonso, 2020), among others.

Also, NGOs that obtained special permits to make specific donations to the National Health System (SNS), such as: Caribbean Medical, Disarm Education Fund, Global Link, Lions Club and others. Scholarships were granted to low-income Americans to study medicine in Cuba, as part of the program proposed by the Commander in Chief, Fidel Castro, to the U.S. Congressional Black Caucus and the NGO Pastors for Peace (Oncubanews, 2022), which sent the first students to the Latin American School of Medicine (ELAM).

Relations after December 17, 2014

When the presidents of Cuba, Army General Raul Castro Ruz and the United States, Barack Obama, announced the results of bilateral talks and the willingness to begin negotiations to restore diplomatic relations between the two countries (Cubadebate, 2014), relations between the Ministry of Public Health (Minsap) and the U.S. Department of Health and Human Services (HHS), experienced significant growth both quantitatively and qualitatively, in the development of scientific and academic exchanges between professionals and experts from both countries.

Relations during 2015: The beginning

An official from the U.S. Department of Health and Human Services (HHS) visited us and participated for the first time in the International Convention "Cuba Health 2015", then Head of the Office for the Americas

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of the HHS Global Office, responding to the invitation extended to the Ministry of Health by the Cuban Minister of Health.

In June 2015, Minsap received the visit of the Deputy Advisor for Science and Technology to the Secretary of State, leading a delegation of HHS and CDC officials from Atlanta, with the aim of exploring possibilities for cooperation, holding visits to health centers and conducting fruitful exchanges with officials and scientists.

In October 2015, Cuban experts were invited to participate in the 64th Annual Meeting of the American Association of Tropical Medicine and Hygiene (ASTMH) and the Pan American Health Organization/World Health Organization (PAHO/WHO). A Symposium was devoted to discussing the prospects for collaboration between Cuba and the U.S., under the theme, "Building Bridges through Health". This visit had a great impact due to the high level exchanges held and the very good acceptance of the American scientists Ameijeiras (HHA). First official Cuban visit to this renowned institution

In November 2015, Minsap executives visited the CDC in Atlanta, responding to an invitation from the U.S. side. The Cuban delegation was headed by the National Director of Epidemiology, accompanied by other specialists from the "Pedro Kouri" Institute of Tropical Medicine (IPK) and the head of the Imaging Department of the "Hermanos Ameijeiras" Hospital (HHA). First official Cuban visit to this prestigious institution.

Relations during 2016: Historical development of bilateral actions

A delegation headed by the First Deputy Minister of Health and made up by managers and specialists from different health centers such as: IPK, National Institute of Hygiene, Epidemiology and Nutrition (INHEN), Oncology and National School of Public Health (ENSAP), visited the USA in March 2016, responding to an invitation from the HHS. They were received at the Department of Health headquarters by the Under Secretary and other senior officials. They toured the National Institutes of Health (NIH) and visited CDC Atlanta, being attended by the top executives.

For the first time, two Cuban professionals, Presidents of the Commissions of Medical Checkups participate, invited by the organizers of the US CDC, in the Intergovernmental Summit of the International Training Association for Panel Doctors, held in March 2016, in Prague, Czech Republic.

A delegation of cancer specialists from the CDC and the NIH also visited Cuba to participate in the Cancer Workshop held between the Cuban Academy of Sciences and the American Association for the Advancement of Science (AAAS) in May 2016.

In the month of June, a historic visit takes place, when the United States Secretary of Health invites the Cuban minister, who is received on the first day by his counterpart. He fulfilled a program of meetings and exchanges with the Secretary of Health and other officials. He visited the NIH and other health centers. (Morales, 2016) A framework Memorandum of Understanding was signed for the first time in history for collaboration between MINSAP and HHS, on issues such as arboviruses, chronic diseases, aging and others (Calvo, 2016).

But furthermore, in the month of October, the U.S. Secretary of Health and Human Services makes a bilateral visit to Cuba where he toured health centers. A new Memorandum of Understanding was signed with the Minister of Public Health, specifically for cancer,

> "[...]
> **Starting in 2017, with the beginning of the Trump administration, a sharp decrease occurs, until it disappears completely**
> [...]"

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due to the interest of both countries in cooperation in such a prioritized issue (Fariñas Acosta, 2016).

In addition, the Secretary participated in the Regional Meeting on Arboviruses Cuba-USA-PAHO/WHO, with a large delegation of North American specialists. The Secretary of Health and Human Services, the Director of PAHO, together with the Cuban Minister presided over that event, where delegations from more than 20 countries of the region were present, including six ministers (Domínguez Cruz, 2016).

Another significant moment was the holding in Havana of a meeting on tropical diseases between the "Pedro Kouri" Institute of Tropical Medicine and American institutions (NIH, CDH, HHS and others), with the presence of Dr. Anthony Fauci, Director of the US National Institute of Allergy and Infectious Diseases, from November 28 to 30, 2016, which meant the first visit to Cuba of this prestigious scientist.

Almost closing the year, in mid-December, we were visited by the Assistant Secretary of the Department of Health and Human Services along with other officials. She participated in the event on biotechnology and the use of Hebertprot-P, in Varadero, and toured the Medical University of Matanzas, a polyclinic, a medical office and held talks with executives of the Ministry of Health.

That year, work also began on a project proposal presented by the University of Illinois entitled, "Intercultural Alliance to evaluate the effectiveness of two models of health care delivery in low-income populations". It had its origin in the visit and participation of Dr. Robert Winn, Associate Vice Chancellor for Community Health Practices and Director of the Cancer Center of the University of Illinois, in the 2015 Health Convention and its exchanges in polyclinics and health centers. (To be expanded later).

Relationships in 2017: Total decline in activities

The year coincides with the beginning of the Trump administration, there are changes of officials and policies, almost from the start the exchanges that had been taking place are stopped and governmental relations in health are paralyzed. No exchange actions at the level of ministries of health are materialized, despite the full validity of the memoranda of understanding signed and the commitments reached in 2016.

In the non-governmental sphere, exchanges continued to take place, although in smaller numbers, between universities, associations, researchers, scientists, as a sign of the interest of this sector of the population in maintaining and promoting relations in this field, despite political obstacles. Some examples are:

- Visit of professionals from Johns Hopkins University to the "Pedro Kouri" Institute of Tropical Medicine, to exchange on issues of sexually transmitted diseases, from January 16 to 20.
- Participation of North American professionals, in the International Course on Dengue carried out by the "Pedro Kouri" Institute of Tropical Medicine, from August 7 to 25, 2017.
- International Workshop on Laparoscopic Surgery of Morbid Obesity and Metabolic Diseases and meeting with the American Society of Endoscopic Surgeons in cancer treatment and novel techniques.
- Academic and professional exchange visit from Indiana John-Hopkins University, North Carolina, American Society of Northwest, Anesthesia Seminaries and Minnesota among others.
- Scientific exchange workshop between professionals from the National Center for Minimal Access Surgery and the Institute of Robotic Surgery and Transplantology of Miami, USA.
- Training with international experts from Sparrow Hospital, Michigan, on topics of gynecological laparoscopic surgery, robotic surgery and advances in the use of new techniques.
- Visit of the Rotary Club, Florida, in which surgeries were performed on children with malformations (cleft lip), as well as participation in the National Workshop on Pediatric Maxillofacial Surgery.
- Exchange in the area of craniofacial surgery at the Cincinnati School of Medicine, performing surgeries on children with craniofacial malformations at the Calixto García Hospital.
- The Project "Intercultural Alliance between Minsap and the University of Illinois", agreed upon during the previous year, materialized with the stay of Cuban advisors for three months in Chicago. It was the first time that a group of Cuban specialists, in the health care area, collaborated with the U.S., in this case linked to the community, based on Cuba's experiences in Primary Health Care and the Maternal and Infant Program (*Granma*, 2017).

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Relations during 2018, 2019 and 2020

During all these years there were no contacts at the governmental level, in spite of some proposals from our side to materialize actions, based on the two Memorandums of Understanding signed. These have not been repealed or denounced by any of the parties, so they remain in force.

This period was characterized by few but valuable exchanges at the non-governmental level, such as visits from universities, associations and solidarity movements, NGOs and others, with important donations and cooperation. The aggressive policy of the U.S. administration against our country prevailed, in addition to the Covid 19 epidemic, when no kind of cooperation was carried out either; on the contrary, the blockade and economic asphyxia against Cuba intensified, with serious effects on health at such a sensitive moment in need. (Puig Meneses & Perera Robbio, 2023).

Most significant examples of cooperation in health care between the two countries

The cooperation actions with the "Pedro Kouri" Institute of Tropical Medicine (IPK) have always been and are of great interest to the U.S. government, because they recognize the strengths of this institution, its scientists and researchers, who can contribute with their experiences to strengthen the structures and containment programs to prevent the entry of tropical diseases such as Dengue, Zika and Chikungunya, among other arboviruses, to that country, especially to the Southern States. In the last few years, the interests among scientists and researchers have remained related to Covid-19 and even more in the preparation of our countries to face new epidemics.

> "[...] with the beginning of the Trump administration, there are changes of officials and policies [...]"

The exchange relations and mutual recognition and identification between scientists and researchers, and the interest in promoting cooperation between both parties, in the face of common health hazards, have prompted policy makers to develop concrete actions, demonstrating the value of health in the interest of our peoples, as well as validating that global health and health and scientific diplomacy are decisive tools to achieve common goals (Pastrana et al. 2018). North American scientists repeatedly highlight and praise the level reached by Cuban medical science (Johnson, 2021).

Collaborative actions with the IPK, the most important example

Among the main actions carried out by this institution are technical missions of Cuban professionals to the United States such as: meetings on Tuberculosis (TB/PAHO), visits of Cuban professors and scientists to the University of Texas, at different moments during the year.

Numerous visits were received from professionals from the United States such as the editors of Nursing Journals and Science Magazine, a delegation from the CDC of Atlanta for the Gonococcus and Tuberculosis Laboratory, from the Medical College of the University of Florida Also different groups of students and professors from universities such as Indiana University, Colorado School of Public Health, Tulane University, University of San Francisco, University of Minnesota, North Western University and Michigan State University.

In addition, courses and events where delegations of American professionals participated such as: the BSL2/BSL3 (Biosafety) theoretical and practical course, the 15th International Dengue Course, which is held every two years, (Fariñas Acosta, 2017) the Symposium "New advances in our knowledge of the biology of Aedes Aegypti and its control", organized by the American Association for the Advancement of Science (AAAS), Johns Hopkins University and the IPK and with the presence of Prof. Peter Agre, Nobel Prize in Chemistry, 2003, the 80th Anniversary Congress of the Institute of Tropical Medicine, IX Cuban Congress of Microbiology and

Parasitology, VI National Congress of Tropical Medicine, VI International Seminar on HIV Infection and AIDS in Cuba, 5th International Symposium. Chromoblastomycosis: A neglected disease.

Work began on a proposal for several specific cooperation projects "U.S.-Cuba Collaborative Arbovirus Research Initiative, in 2017" between the IPK and different institutions of the United States, including topics of virology, immunology and vectors.

In 2018 exchanges continued, although in smaller numbers, notably the "Course on the importance of institutional committees for the care and use of laboratory animals" (CICUAL), with the development of a research protocol involving experimental animals for studies of infectious diseases, and the Workshop "The impact of CICUAL in research with laboratory animals"; participation of a renowned professor as a lecturer in the "XVII Meeting of the "Ibero American-Cuba Cochrane network 2018"; participation of a prestigious professional in the "Scientific Exchange on the implementation of Wolbachia, as a promising tool in the control of the A. Aegypti mosquito in Cuba"; and the participation of U.S. professors from the University of Ohio in the Symposium on Infectious Diseases: 'Immunology and New Therapies'.

In 2019 the Qualitative Research Course of the Master's Degree in Epidemiology was held, and the scientific exchange and collaboration for the thematic research on HIV/AIDS continued, where a professor from the University of North Carolina participated as an expert on these topics. IICA again received participants for the "16th International Course on Dengue, Zika and other Arboviruses" and held the workshop Frontiers in the Application of Ozone, with the participation of a large number of U.S. professionals. That year, a paper was published in cooperation between both parties on research related to the transmission and evolution of Zika. (Gutierrez-Bugallo, G. *et al*. 2019).

In 2020 the actions continued to show the downward tendency. However, the XIII Course on Travel Medicine and Tropical Medicine and the Technical Workshop on biosciences in research and treatment of the Covid-19 pandemic, carried out between experts from Cuba and the United States on coronavirus issues, were held.

In 2021, as a new modality, virtual exchanges (Virtual Forums) were held between the IPK-NIAID, which we consider to be the action that had the greatest impact after the decrease in actions due to Covid-19. It was the only one of a bilateral nature between governmental institutions, a space where experiences in the management and control of Covid-19 and the development of vaccines in both countries were exchanged. This action was inserted in the objectives proposed in the health memoranda signed in 2016.

During 2022, at the request of the US side, an important Cuba-US virtual meeting was held with the participation of the State Department, HHS, NIH, and Cuban officials from Minrex, Minsap, IPK and other experts were present. Cuban specialists made brief presentations on the main arboviruses. The interest of the U.S. side to exchange and learn about these topics was evident. It was agreed to continue with other similar activities.

2023 it was a more active year in the field of exchanges and virtual conferences between the National Institute of Allergy and Infectious Diseases (NIAID) and the IPK, together with other specialists from Minsap and BioCubaFarma, according to the topics they addressed: arboviruses, anti-pandemic preparedness and neurological diseases among others, aimed at achieving greater knowledge and updating among scientists from both countries.

In March, Minsap authorities and IPK specialists held a working meeting with HHS and NIAID officials. As a result of this scientific meeting, the parties agreed to continue working on the implementation of the Memorandum and to promote technical exchanges related to research on arboviruses, COVID-19 experiences and other topics (*Cubadebate*, 2023).

Days before that, a delegation of American scientists from different institutions like the Association for the Advancement of Science (AAAS), research institutes (NIH), universities and others held a fruitful meeting with Cuban counterparts from the Academy of Science, the Ministry of Public Health, BioCubaFarma, IPK and others to discuss science, innovations, biomedical research and the challenges for both parties (*Granma*, 2023).

It should be noted that joint research and publications did not stop despite the absence of face-to-face meetings. That is why, based on what was agreed in 2016 - 17 and the interest of the parties, especially with universities, several of them were realized, notably one on dengue and another on aedes. Two groups of IPK

authors and North American specialists materialized both publications (Piedra *et al*. 2023).

The year 2024, from February 14 to 16, marked a resumption of face-to-face actions, with the II Joint Cuba-United States Scientific Conference on Health, "Addressing global health challenges through innovation and scientific research" (*Prensa Latina*, 2024).

This event, which was being organized since 2023, had several previous videoconferences on specific topics of interest to the parties such as arboviruses, pandemic preparedness, neurological diseases, aging, among others, as well as for the preparation and selection of scientists and researchers who would be the speakers. There was support from other institutions such as PAHO, MEDICC, Academy of Sciences of Cuba, BioCubaFarma and several centers and universities in the USA and Cuba, although the central organizational core was the IPK and NIAID. There was ample participation with some 150 delegates, including 37 North American specialists and scientists.

The three days of the event were dedicated to the topics of arboviruses, anti-pandemic preparedness, advanced health technology (omics and genomics) and chronic diseases (cancer, ataxia, cardio-metabolic diseases, aging, neurological diseases and COVID-19). Fifty-two lectures were presented and one session was dedicated to identifying new topics for collaboration. In the week following the meeting, two press releases were issued by each side, referring to the meeting.

The U.S. delegation included Dr. Maria Cristina Cassetti, Deputy Director of the Division of Microbiology and Infectious Diseases at NIAID/NIH, Joyelle Dominique, Director of the Global Office of Research at NIAID/NIH, Mackenzie Klein, Senior Officer for Global Health at the Department of Health and Human Services (HHS), and Dr. Steve Whitehead, Microbiologist and Principal Researcher in the Arbovirus Vaccine Research Section, Laboratory of Viral Diseases at NIAID/NIH.

The four projects preliminarily approved in 2017, related to arboviruses topics, were ratified and finally it was agreed to carry out joint publications for high impact journals and to continue the collaboration with new virtual sessions on the topics identified during the conference, to advance in the development of new projects with the IPK and to organize a similar scientific activity in the USA. Since then, two virtual sessions have already been held, one on the topic of Tuberculosis and the other on Antimicrobial Resistance. The event was also an opportunity to stimulate and encourage the completion in 2024 of a publication on research related to the immune response to dengue virus (Granela *et al*. 2024).

> "[...] In 2020 the actions continued to show the downward tendency [...]"

"Cross-Cultural Partnership to Evaluate Effectiveness of Two Models of Health Care Delivery in Underserved Populations in Chicago" project. Another significant example of collaboration

The development of this project was based on the Cuban experience in Primary Health Care, where specialists of General Comprehensive Medicine of Cuba, responding to a request made by the University of Chicago to the Ministry of Health, visited the city to evaluate the possibilities of cooperation with the clinics served by that university, to apply the Cuban experience in community care and thus contribute to improve the health indicators of low-income populations of African American and Latino origin, mainly related to the Maternal and Child Care and Cancer Prevention Program. (Carey J. 2017).

The proposal arose after a visit to Cuba in 2015 to participate in the Health Convention of a delegation led by Dr. Robert Winn, associate vice director of community health practices and director of the University of Illinois Cancer Center. They visited first level institutions, i.e. polyclinics and doctor's offices, among others, where they appreciated the attention focused mainly on

health promotion and prevention. When comparing the health indicators between Cuba and Chicago, they found that Cubans are better off than those in Chicago, especially the indicators related to the less favored and developed areas of the city.

They then came up with the idea of collaboration and proposed a project so that Cuban doctors could advise on community care in the neediest areas. Dr. Winn, pointed out that the Cuban Health System undertakes preventive health care very satisfactorily and with few financial resources (*UIC Today*, 2017).

After two more visits to Cuba, he presented his proposal which was approved, with the first three doctors traveling in early January 2017. They did an initial preliminary survey of the health situation for just over a week. Subsequently, at the end of October, four advisors traveled to work in the Englewood area, with a population of about 25,000 inhabitants and a life expectancy of 72 years.

To carry out this activity, the Health Situation Analysis used in the Family Medicine Program in Cuba was used as a working tool to diagnose the health status of these communities and expectations and actions for the future continuity of the intervention were outlined. It was demonstrated that this tool - used by our professionals- could be applied in a different environment and context to know the diagnosis of the health status of the Englewood community, projecting future actions to improve the results of the evaluated programs: Maternal and Child Care Program and Cancer Prevention.

With this project, for the first time in the history of U.S.-Cuba relations, a cooperation in health was officially established, with medical advisors working in the community together with U.S. professionals in their own territory. Again, this project could not continue beyond 2017 for the same restrictive political reasons of the Trump administration, despite the interest it created in other cities such as Detroit.

Results achieved

The main cooperation actions for years are highlighted, especially those in the governmental field, since the announcement by the President of Cuba and the United States, on December 17, 2024, of the will to re-establish diplomatic relations.

This allowed the Cuban Ministry of Public Health and the U.S. Department of Health and Human Services to have a rapprochement in their relations, which materialized in various actions such as exchanges, visits, scientific meetings, development of research projects and other activities that were visible for years. Sadly, very little time was available to pursue that course, which was practically only the year 2016. Although the commitments reached, such as the signing of the two Memoranda of Understanding, remain in force and with full legal validity by both countries, will allow - provided there is political will - to once more develop cooperation actions of interest and benefit for both parties. All of the above illustrate what is sought in the relations between the peoples and governments of the United States and Cuba (Martínez, 2023).

In the body of the work, the importance of two examples of collaboration stands out for their scope and projection. The first is everything that the IPK carried out with different North American institutions, and the second is the first project of technical consultancy in health developed with the University of Illinois.

The background in the first case includes several collaborations with universities and non-governmental institutions, but above all the level and priority attained after 2016 with the relations established with the NIH, fundamentally with the NIAID, with full identification of interests and objectives, which were guided and driven by the ministries of health of both countries and by the current issues involved in such cooperation. The number of actions carried out over the years, also expresses a common spontaneous desire to collaborate, driven by the full awareness and knowledge of scientists, researchers and officials, of the importance of the joint confrontation of diseases for Cuba and the U.S., and even for the globalized and interdependent world in which we live today.

The other outstanding example was the collaboration project with the University of Illinois for consultancy in primary care and maternal and child health activities in low-income African-American areas with unfavorable health indicators.

It was the first time that Cuban advisors went to work as health collaborators in U.S. institutions, and even in the community. It was of great impact and ended in 2017 with the development of the initial stage, which lasted

several months, but then the new U.S. administration did not allow its continuation.

Conclusions

The work here presented demonstrates the potential and the wide field of cooperation existing between Cuba and the U.S. in health, with a great future for the development of scientific, academic, research, training and experience exchange activities, including in the field of health care.

A remarkable fact is that, despite the steely economic, commercial and financial blockade of the U.S. against Cuba and the many obstacles, limitations, prohibitions and sanctions, over the years, different health institutions and/or organizations such as universities, medical associations, NGOs, research centers have managed to carry forward various cooperation actions between both countries. These are the cases of MEDICC, Pastors for Peace (American students at ELAM), universities such as the University of Florida, Indiana University, Colorado School of Public Health, Tulane University, University of San Francisco, University of Minnesota, North Western University, Michigan State University, among others.

In that sense, when in 2014 the process of diplomatic rapprochement and cooperation relations began, health was precisely one of the sectors that advanced most rapidly with specific actions and activities that included visits of the Cuban Minister to the U.S. and of the Secretary of Health of that country to Cuba. The signing of two Memorandums of Understanding on that occasion was considered historic, as it had never been achieved before. This facilitated the realization of projects and exchanges of great value and interest for both countries, as described in this work. It was as if the repressed or forbidden desire or need of scientists and researchers were released all at once with great drive and energy.

We believe that the interest in relations that always existed in spite of the blockade, together with the official authorization of the government, with activities at the governmental level, made possible the progress achieved in cooperation in just over a year. The change of administration again imposed limits, but what was achieved demonstrated all that can be done between the two countries for the good of health for all. The paths are already known and the conditions exist to continue advancing in the non-governmental field, with the drive of scientists and friends. In the governmental field, we are ready to take an enormous leap forward based on the experience of what was achieved in the Obama Administration, if the required political will exists.

References

Berlanga Acosta, J., Savigne, W., Valdez, C., Franco, N., Alba, J., del Rio, A., . . . Fernández-Montequín, J. (2006). Epidermal growth factor intralesional infiltrations can prevent amputation in patients with advanced diabetic foot wounds. *International Wound Journal*, 3(3). pgs 130-160.

Calvo, M. (2016, June 15). "Firman Cuba y Estados Unidos acuerdo de cooperación en Salud" periódico *Granma*, https://www.radiohc.cu/noticias/nacionales/96888-firman-cuba-y-estados-unidos-acuerdo-de-cooperacion-en-salud

Cubadebate (2023). Científicos de EEUU visitan el Instituto de Medicina Tropical "Pedro Kourí." http://www.cubadebate.cu/noticias/2023/03/23/cientificos-de-eeuu-visitan-el-instituto-de-medicina-tropical-pedro-kouri/

Cubadebate, (2014). Intervención del Presidente Barack Obama anunciando cambios en la política hacia Cuba – Cubadebate. http://www.cubadebate.cu/noticias/2014/12/17/intervencion-del-presidente-barack-obama-anunciando-cambios-en-la-politica-hacia-cuba/

Domínguez Cruz, A.M. (2016, October 20). "Cuba y Estados Unidos inician cooperación institucional en salud". Periódico *Juventud Rebelde*. https://www.juventudrebelde.cu/Cuba/2016-10-20/Cuba-y-Estados-Unidos-inicios-cooperación-institucional-en-salud

Fariñas Acosta, L. (2017, August 16) "Trabajar juntos en busca de soluciones precisas", colaboración científica Cuba-Estados Unidos, periódico *Granma* https://www.granma.cu/cuba/2017-08-16/trabajar-juntos-enbusca-de-soluciones-precisas16-08-16-2017

Fariñas Acosta, L. (2016, October 21). Acuerdan Cuba y Estados Unidos trabajar juntos en el control del cáncer. *Granma* - https://www.granma.cu/

García Ojalvo, A., Berlanga Acosta, J., Mendoza Marí, Y., Fernández Mayola, M., Valdés Pérez, C., Savigne

Gutiérrez , W., . . . Armstrong, D. (2017). Healing enhancement of diabetic wounds by locally infiltrated epidermal growth factor is associated with systemic oxidative stress reduction. *International Wound Journal*, 214-225. 2017. 03 PubMed.

Granela, H., Perez, A., Morier, L., Alvarez. M., Guzman, MG., Sierra, B. (2024) Possible effects of ancestry-related oxysterol-binding protein-like 10 genetic polymorphisms on dengue virus replication and anti-dengue immune response 1-s2.0-S2405844024135669-main.pdf

Granma (2017, January 11). Cuba y Chicago inician colaboración en materia de salud. https://www.granma.cu/mundo/2017-01-11/cuba-y-chicago-inician-colaboracion-en-materia-de-salud-11-01-2017-22-01-0 9

Granma (2023, March 23) Evalúan científicos de EE. UU. y Cuba vínculos de cooperación. https://www.granma.cu/mundo/2023-03-23/evaluan-cientificos-de-ee-uu-y-cuba-vinculos-de-cooperacion.

Gutierrez-Bugallo, G et al. (2019) Vector-borne transmission and evolution of Zika virus-PubMed https://pubmed.ncbi.nlm.nih.gov/30886369

Jackie Carey (2017, November 13). Cuban delegation, UIC work toward better women's health in Englewood. *UIC News* Release https://today.uic.edu/cuban-delagation-uic-work-toward-better-womens-health-in- englewood/

Johnson. C (2021, March 2). "La ciencia médica de Cuba es brillante, innovadora y trabaja en bien de la humanidad": presidenta del Roswell Park Cancer Center, en CNN. (C. Amanpour, Entrevistador) *CNN*. Obtenido de https:// edition.cnn.com/videos/tv/2021/03/02/amanpour-candece-johnson-cuba-covid-lung-cancer-vaccine.cnn

Martínez Hernández. (2023, December 19). Una muestra de lo que aspira en las relaciones entre los pueblos de Estados Unidos y Cuba. Periódico Granma. https://www.granma.cu/mundo/2023-12-19/una-muestra-de-lo-que-se-aspira-en-las-relaciones-entre-los-pueblos-de-estados -unidos-y-cuba-19-12-2023-oo-12-11

Morales, R. (2015, July 2). Cuba espera mayor intercambio científico con Estados Unidos, asegura Ministro de Salud. http://www.cubadebate.cu/noticias/2015/07/02/cuba-espera-mayor-intercambio-cientifico-con-estados-unidos-asegura-ministro-de-salud/

Ochoa Alonso, A. (2020, October-December). La asociación americana de salud pública y la salud pública cubana. Cincuenta años de relación fructífera. Revista cubana salud pública, 46(4), e2768. https://www.scielosp.org/pdf/rcsp/2020.v46n4/e2768/es

Oncubanews (2022) Médicos estadounidenses graduados en Cuba https://oncubanew.com/cuba-ee-uu/medicos-estadounidenses-graduados-en-cuba/?amp=1

Pastrana, S., Gual Soler, M., Wang, T. (2018, May) Promoting Scientific cooperation in time of diplomatic challenges: MEDICC, 20(2) ,23-26. https://doi.org/10.37757/MR2018.V20.N2.5

Piedra LA, Martínez LC, Ruiz A, Vázquez JR, Guzmán MG, Rey J, Bisset JA. (2022). First Record of Natural Transovarial Transmission of Dengue Virus in Aedesalbopictus from Cuba. Am J Trop Med Hyg.2022, 106(2): 582–584. doi: https://doi.org/10.4269/ajtmh.21-0710..

Piedra LA, Rodriguez MM, Lopez I, Martinez LC, Ruiz A, Garcia I, Rey J, Bisset JA. (2023). Insecticide Resistance Status of Aedesalbopictus (Diptera: Culicidae) Populations from Cuba. J Med Entomol. 2023. DOI: https://doi.org/10.1093/jme/tjac189

Prensa Latina (2024, February 23). Dialogan Cuba y Estados Unidos sobre Salud global e investigación biomédica. https://www.prensa-latina.cu/2024/02/23/dialogan-cuba-y-eeuu-sobre-salud- global-e-investigación-biomédica/

Puig Meneses Y, Perera Robbio A. (2023, September 22) Cooperación en Salud de Cuba con Estados Unidos: tender puentes para defender la vida. http://www.cubadebate.cu/noticias/2023/09/22/cooperacion-en-salud-de-cuba-con-estados-unidos-tender-puentes-para-defender-la-vida/

Sánchez A. (2015, June 3). Una cuestión de perspectivas examinando los sistemas de salud de Cuba y Estados Unidos a través de un prisma cultural. https://instituciones.sld.cu/sucusap/una-en-cuestion-de-perspectivas-examen

Sullivan, P., Brueton, M., Tabara, Z., Goodlad, R., Lee, C., & Wright, N. (1991). Epidermal growth factor

in necrotising enteritis. Lancet, 53-54. 1991. Jul.6; 338(8758): 53-4. doi: 10.1016 /0140-6736 (91). National Institutes of Health (NIH). https:// pubmed.ncbi.nlm.nih.gov

UIC Today (2017, January 9). UIC welcomes Cuban health officials to Chicago. https://today.uic.edu/uic-welcomes-cuban-heath-officials-to-chicago

The Cuba-United States Collaboration in Biotechnology and Cancer: The Art of the Possible

Tania Crombet

Centro de Inmunología Molecular
ORCID: 0000-0002-2550-7292
e-mail: taniac@cim.sld.cu

Ernesto Chico

Innovative Immunotherapy Alliance
ORCID: 0009-0008-6717-7288
e-mail: chico@i2alliance.com

Agustín Lage

Centro de Inmunología Molecular
ORCID: 0000-0001-9472-9158
e-mail: lage@cim.sld.cu

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Abstract

Despite decades of political and economic hostility between the government of the United States of America and Cuba, scientific collaboration actions have occurred and continue to occur involving not only academic institutions but companies from both countries. It is a concrete experience that illustrates the uniqueness of scientific collaboration and knowledge-based industries and may contain clues on how to move forward in the future.

In this article we review the actions of scientific collaboration in cancer control, which led first to joint clinical trials with innovative Cuban products, with joint publications in scientific journals of international circulation, and then to the emergence of a joint venture, the first in the history of both countries. These actions take place in a context of respect and cordial and frank relations between Cuban and U.S. research teams.

The setting up for the first time ever of a business with shared ownership between U.S. and Cuban organizations represented a major challenge. Beyond the considerations expected in any venture with commercial purposes, and the high uncertainty associated with the development of biotechnological drugs, the creation of this company required the solution of important legal obstacles, especially because it is not a classic academic collaboration project, nor a conventional contract between companies, but a collaboration project precisely in that border zone where science becomes business development.

Despite the complexities, both the joint scientific research and the operation of the joint venture have been maintained for more than 5 years. The building of collaborative scientific relations between Cuba and the United States, after half a century of separate evolution, may be a unique historical opportunity.

American and Cuban scientists know each other and have always been enthusiastic about collaboration. In decades of political confrontation between the two countries there has always been closeness between the U.S. scientific community and Cuban scientists. Of course, this has been tempered or limited by the blockade and the hostility of U.S. policy towards Cuba. The "Art of the Possible" lies precisely in knowing how to manage this contradiction. The characteristic of the human activity that we do, Science, helps a lot in the approach. Science is not the only intelligent activity of man, of course, but the essential characteristic of Science is its objectivity, its attachment to verifiable data.

The science and technology systems of both countries must now rebuild academic and business exchange relations. This exchange could be born, as is science itself in today's world, with a solid institutional framework, oriented to explicit objectives, integrated in programs that group several projects, and connected from the beginning to what we manage to build in terms of economic and cultural relations.

Keywords: *scientific collaboration, joint ventures, cancer, biotechnology*

Introduction

Historians do not agree on who is the author of the phrase "Politics is the art of the possible". They attribute it to Clausewitz, to Bismark, to Churchill, others to Machiavelli, or even to Aristotle.

Whoever the real author of the phrase is, the truth is that it serves us very well to describe the space of collaboration between Cuba and the United States in the field of Biotechnology and specifically its applications

for the control of Cancer, in the more than 6 decades of hostility since the imposition of the economic, commercial and financial blockade on Cuba in 1960. It would be difficult to imagine more difficult conditions for scientific and even business collaboration between both countries, in a high technology field considered by many as "strategic". And yet, several collaborative actions have taken place, and are still taking place and can be projected further into the future.

Let us first review what has happened, and then try to explore what experiences we can gather and what connections this history has to the uniqueness of scientific collaboration and knowledge-based industries.

I. Scientific collaboration in cancer control

Academic collaboration between CIM and RPCCC

Scientific collaboration between the Center for Molecular Immunology (CIM) in Havana, Cuba and the Roswell Park Comprehensive Cancer Center in Buffalo (RPCCC), NY, began more than a decade ago, following the active participation of scientists from the institute in the meetings "Immunotherapy in the new century", which the CIM organizes every two years, practically since its inauguration.

Following the interest of the Roswell experts, a visit of CIM researchers to the institute took place which involved the presentation of pre-clinical and clinical results of innovative Cuban molecules, as well as discussions with the main experimental groups. As a result of these meetings, working stays of several young CIM scientists in Buffalo are organized. In 2015, the Roswell Park Center obtains a license from the Office of Foreign Assets Control (OFAC) to begin preclinical and clinical studies of products from the Center for Molecular Immunology in the United States. After hard work by the clinical and regulatory teams of both institutions, in 2017, the FDA authorizes the first clinical trial of a Cuban biotechnology product in the United States: the CIMAvax-EGF vaccine.

The CIMAvax-EGF vaccine involves a specific active immunotherapy designed to induce antibodies against an important tumor growth factor: Epidermal Growth Factor (EGF). The vaccine consists of recombinant human EGF conjugated to a recombinant protein derived from Neisseriameningitidis (P64k). The antibodies achieved after vaccination block the interaction of Epidermal Growth Factor Receptor (EGFR) with one of its most important ligands (EGF). At the time of OFAC licensing, the CIMAvax-EGF vaccine was registered in Cuba as a maintenance treatment for patients with advanced non-small cell lung cancer. A randomized Phase III study in patients with advanced lung cancer, where CIMAvax-EGF vaccine was used after first-line chemotherapy, demonstrated an overall survival advantage compared to best supportive care, particularly in patients with high baseline serum EGF levels. (Rodriguez PC, 2016).

At the time of the clinical trial design in the United States, a major milestone in cancer research had been achieved: the registration of immune checkpoint inhibitory antibodies. In particular, anti-PD1 antibodies represented the new standard of treatment for patients with advanced lung cancer in progression. These therapies were not available in Cuba.

Despite being registered in Cuba, the first clinical trial of CIMAvax-EGF in the United States consisted of a Phase I trial, where the vaccine was combined with the anti-PD1 antibody nivolumab. The research was designed to primarily evaluate the safety and immunogenicity of the new combination (Evans R, 2022).

The study enrolled 13 patients with progressing lung cancer. The combination proved to be safe, while the

> "[...]
> **There are currently 3 clinical trials underway in the United States, with the CIMAvax-EGF vaccine.**
> [...]"

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immunogenicity of the vaccine was higher after co-administration with nivolumab. The median survival of subjects who completed the CIMAvax-EGF induction regimen was 18.3 months, which was higher than the expected survival for patients treated with nivolumab-monotherapy (less than one year).

At the end of the research, a joint manuscript between RPCCC and CIM was published describing for the first time the treatment of patients in the United States with a molecule from Cuban biotechnology. (Evans R, 2022).

In 2018, the constitution of the joint venture between Cuba and the United States (Innovative Immunotherapy Alliance) was approved for the co-development of 4 new cancer therapies. Among the 4 molecules, there are 2 vaccines (CIMAvax-EGF and Glycovax) and 2 novel immune modulators (interleukin 2 mutein and VSSP), to reverse cancer-associated immune suppression. As of this year, all pre-clinical and clinical research at RPCC is conducted under the aegis of this first joint venture, incorporated in Cuba.

There are currently 3 clinical trials underway in the United States, with the CIMAvax-EGF vaccine.

The first trial, conducted in patients with advanced lung and head and neck cancer, is a Phase 2, open-label, non-randomized, multicenter study. The trial explores the combination of CIMAvax-EGF with an anti-PD1 antibody (pembrolizumab or nivolumab) in different treatment settings. The primary objective is to evaluate objective response rate, progression-free survival and overall survival. Exploratory objectives include characterization of anti-EGF antibody levels, serum EGF levels and other blood biomarkers in relation to clinical outcomes. Preliminary data from this investigation are favorable. Very encouraging survival data are obtained, particularly in patients who do not respond to anti-PD1 therapies, including those patients whose tumor has low PDL1 expression or who lack mutations in the KRAS oncogene (Frascati R, 2023).

The second study evaluates the safety and immunogenicity of the CIMAvax-EGF vaccine in patients with metastatic colorectal cancer, when administered in combination with standard therapies for advanced stage disease.

The last trial evaluates the effect of CIMAvax-EGF in preventing the occurrence of lung cancer in high-risk patients. It also includes patients who have undergone lung cancer surgery and are at risk of relapse. As part of the research, an in-depth pharmaco- dynamic characterization of the impact of the use of the vaccine on the lung epithelium will be performed.

In summary, after almost 15 years of relations with the Roswell Park Comprehensive Cancer Center, we can affirm that academic collaboration takes place in the context of deep respect and cordial and frank relations between the Cuban and U.S. research teams. Systematic virtual or face-to-face scientific discussions are held on the design and results of pre-clinical experiments and clinical trials. Experts from the Buffalo hospital have visited Cuba on numerous occasions, in order to hold exchanges with physicians and researchers, bring donations of equipment and consumables and organize joint training sessions on the procedures of research protocols. The work stays have not only been concentrated in Havana or in secondary or tertiary health care, but the Roswell doctors have been able to visit other provinces of the country and interact with specialists in primary health care, as well as with relatives and patients treated with CIM drugs.

Trials in the United States have allowed the evaluation of new Cuban drugs in the context of state-of-the-art cancer diagnosis and treatment, as well as access to advanced analytical technologies. As part of the collaboration, several samples from Cuban patients have been characterized at the Roswell Institute. Molecular and cellular studies have been transcendental in the elucidation of the mechanisms of action and in the identification of biomarkers predictive of greater efficacy of the new therapies. The incorporation of new drugs to the joint venture's portfolio and the initiation of clinical trials with interleukin 2 mutein are anticipated.

II. The science-industry connection

Biotechnology applied to health is one of the branches of science where collaboration between Cuba and the United States can result in an important benefit for the populations of both countries, especially in fields such as the development of novel drugs for cancer and other chronic diseases that afflict our populations.

However, scientific collaboration without the business component does not allow the greatest benefits of this collaboration to be achieved. The development of drugs for use on a population scale

involves very high costs, which in practice cannot be financed by the traditional mechanisms of scientific collaboration. This means that the development cycle of novel drugs must involve a business sector that can extract, from the expectations of future market profits, the substantial resources for the advanced phases of clinical research.

Business collaboration in the development of biotechnological medicines between Cuban companies and companies from other countries has been a reality for 30 years, with notable examples in countries such as China, India, Japan and others. Since the reestablishment of diplomatic relations in 2014, the possibility of collaboration with Cuban companies in the biotechnology sector began to be valued more seriously by companies in the pharmaceutical sector in the United States.

As of that date, executives of the main U.S. companies, responsible for evaluating opportunities for business alliances, began to visit Cuba to evaluate the portfolio of research projects of the Cuban biotechnological sector in search of new drugs to enrich their commercial offer to U.S. patients. Leading companies in this sector in the United States, such as Genentech and Biogen sent high-level delegations to Cuba to evaluate these opportunities, even in the midst of a panorama of legal uncertainty as to how the U.S. government blockade would regulate this potential collaboration. Cuban companies responded to this rapprochement by transparently showing their lines of research, and also their consolidated experience in establishing lasting alliances with companies from many countries in the joint development and exploitation of their intellectual property.

> “[…] academic collaboration takes place in the context of deep respect and cordial and frank relations […]”

This period of business rapprochement reached a point of maximum activity when the Obama administration issued a general license authorizing any U.S. company to start collaborating with Cuban companies in the research of biomedical products, including their importation and commercialization in the U.S.

Unfortunately, this step, undoubtedly positive, occurred at the end of 2016, a few months before the election of Donald Trump president, which again generated a climate of legal uncertainty about the collaborations between the two countries.

The collaboration between the Roswell Park Comprehensive Cancer Center in Buffalo, New York, and the Center for Molecular Immunology in Havana, Cuba, stands out as an exception in this panorama of rapprochement between the biotechnological sectors of these countries. It began before 2014 as an academic collaboration motivated by the desire to offer American oncology patients other treatment alternatives to those already available in that country, especially in the emerging field of immunotherapy. When in 2015 the visits of delegations from the various states of the Union to Cuba began to take place, RPCCC and CIM already had a scientific collaboration consolidated by the scientific rigor of both parties and the shared vocation to benefit cancer patients in both countries.

The opportunity arose, therefore, with the relaxation of the aforementioned regulations of the U.S. administration, to transform this collaboration into a business alliance that would allow access to the necessary funds for the development in the United States of Cuban products for cancer immunotherapy.

The business modality chosen to make this opportunity come true was the creation of a joint venture between RPCCC and CIM, based on Cuban soil, but aimed at commercializing novel drugs in the United States and other countries. Which in fact turned the joint venture Innovative Immunotherapy Alliance (IIA), constituted in September 2018, into the first joint

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business venture between the two countries in the biomedical sector.

The setting up for the first time ever of a business with shared ownership between U.S. and Cuban organizations represented a major challenge. Beyond the commercial considerations expected in any commercial venture, and the high uncertainty associated with the development of biotechnology drugs, the creation of this company required the solution of important legal obstacles.

The first legal challenge, as was to be expected, was to find a way to deal with the possible consequences of the blockade on a business with operations in both countries, seeking not only the adequate defense of the parties against hostile actions by the U.S. government, but also thinking of the protection of patients, whose survival in the future could depend on a continuous supply of medicines.

Another no less important challenge was to familiarize the U.S. partner with the system of laws governing companies in Cuba, and to find within these the adequate protection of the investment and the autonomous operation of a mixed capital organization. The fact that the company is legally domiciled in Cuba, even though it implied the need for a more flexible position of the U.S. partner, turned out to be an undoubted advantage in the long run, since the legal regime in Cuba is much more stable than in the U.S., as demonstrated by the measures that were soon implemented by the Trump administration.

Paradoxically, the challenge of managing a joint business, the element that could be expected to be the most complicated, given the decades of isolation in the commercial relations between the two countries and the important differences in the business cultures between the two countries, has ended up working in an organic and natural way. For more than five years, the company has been strategically directed and operationally managed in a completely joint manner, with managers from both countries coordinating all activities on a daily basis. This shared operation did not stop either during the closure of the U.S. Embassy in Havana or during the COVID19 pandemic.

After more than five years, the Innovative Immunotherapy Alliance exhibits significant results in business collaboration. In addition to the scientific and medical results outlined earlier in this paper, the company has been able to advance the development of its drug portfolio. Its intellectual property base has grown by 50% and significantly increased its value, which has been certified by international agencies specialized in this industry. The company has led to greater international visibility for both the Center for Molecular Immunology and Roswell Park, making it a benchmark example in any analysis of the practical possibility of long-term collaboration in the biomedical business sector.

The very existence of the joint venture, more than five years after its creation, ten years after the opening of diplomatic relations and after several very complex years in the health, economic and geopolitical panorama of the world, should lead us to reflect and draw lessons.

Without pretending to cover all of them, we highlight the following:

- Good science, particularly biomedicine, as a common interest between the scientific and business communities of both countries.
- The possibility of creating, and strengthening, a stable business environment in which innovation-oriented businesses can be developed with shared and protected intellectual property.
- The existence of a business work culture that is not very distant, and that can guarantee an environment of transparent administration, respect for legality and that turns the creativity of our two peoples into an engine for development.

These lessons and many others to be derived from this experience should lead us to imagine a future of new possibilities.

III. Possible futures

The previous sections illustrate a continuity (albeit intermittent and complex) of scientific collaboration actions whose reasons and roots we must try to understand. Both countries, obviously different in size and economic possibilities, have for decades placed science at the center of their national projects. The first Cuban Academy of Sciences was founded in 1861, and the United States Academy of Sciences in 1863. They were the first two outside Europe.

Then, in the first half of the 20th century in Cuba, the dependent capitalism of the neocolonial republic

hampered scientific development; but the Socialist Revolution accelerated it in the second half of the century and that take-off was supported in the 70's and 80's by an extensive scientific collaboration with the Soviet Union and the countries of the European socialist camp.

In the United States also, although for different reasons, an analogous dynamic was imposed: the economic depression of the 1930s affected investment in science; the military effort of the World War and the post-war American world economic leading role accelerated it in the second half of the century.

Simultaneously, in the second half of the 20th century, there were processes of direct connection of science with production and with the life of companies, which were evident in various sectors (chemistry, microelectronics, informatics) but especially in the nascent biotechnology industry. Parallels can also be found in this process between what was happening in the United States and in Cuba.

Very soon after recombinant DNA technology was established in the 1970s, the first biotech company (Genentech) was founded in California in 1976, the first recombinant product for broad medical use (rec insulin) was registered in the United States in 1982, followed by rec interferon in 1986 and the first therapeutic monoclonal antibody in 1997. Many new biotechnology companies were founded in the 80's until they became a high-tech industrial sector with more than 2500 companies. In Cuba, the first institution for the research and production of biotechnological products was founded in 1981, Interferon rec was registered in 1987 and the first therapeutic monoclonal antibody was obtained in 1982. New biotechnology companies also emerged in the 1980s and 1990s, which were grouped in the Scientific Hub in 1992 and in the business organization BioCubaFarma in 2012. BioCubaFarma today groups 47 companies, 13 of them abroad.

Both in Cuba and in the United States, the scientific and productive potential that was emerging in biotechnology was oriented in a privileged way to obtain products for cancer control.

In the field of Oncology, a framework of strengths and weaknesses with complementarities was being formed, making it a fertile ground for collaboration.

> “[…] **Business collaboration in the development of biotechnological medicines between Cuban companies and companies from other countries has been a reality** […]”

Malignant neoplasms are currently the second leading cause of death in both the United States and Cuba. Since the 1970s, both countries have implemented, with different approaches, comprehensive actions for the reduction of cancer mortality.

Cuba and the United States have a very special combination of differences and similarities, the comparative analysis of which can generate useful insights. The first difference is obviously the size of the economies and the volumes of resources that can be dedicated to cancer control. But in contrast to this enormous difference, the incidence and mortality patterns of both countries are close, characterized by long life expectancy, low infant mortality and a minimal fraction of mortality attributable to infectious diseases, with non-communicable chronic diseases prevailing as the leading cause of death, mainly heart disease and cancer.

In contrast, the organization of the Health System and the patterns of medical care, which fundamentally

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connect scientific developments with patients, differ greatly in both countries.

This polarization of similarities and differences does not occur to this extent with other North-South "country pairs". Its analysis may uncover very interesting facets of the process of transforming scientific research results into public health impact.

The prominence of science in society for more than 100 years, the intentional effort to connect science with the economy, the priority given to the biotechnology sector - and within it to products for cancer control - and the emergence of research and production companies created the objective bases for collaboration between the two countries, not only in science but also in the connection of science with industry.

That explains the stories of collaboration that we have described in the preceding sections of this article, and their resistance to the unfavorable context created by the climate of political hostility and its codification in U.S. laws.

American and Cuban scientists know each other and have always been enthusiastic about collaboration. In decades of political confrontation between the two countries, there has always been closeness between the U.S. scientific community and Cuban scientists. That has not ceased to exist. Of course, it has been tampered with or limited by the blockade and the hostility of U.S. policy towards Cuba. For example, for the last 20 years, in our own Center of Molecular Immunology we have been organizing an international scientific event on cancer immunotherapy every two years. The foreign country that sends the most scientists to that event is the USA.

The characteristic of the human activity that we perform, Science, helps a lot in the approach. Science is not the only intelligent activity of man, of course, but the essential peculiarity of Science is objectivity, the attachment to verifiable data.

A scientist is very attached to the objective value of the data, to prove what he says. When you argue with people who are mentally trained to look for the facts and interpret them, many things are simplified. That scientist comes here and sees the facts in Cuba, the results of the achievements of the Revolution, also the problems we have, but he analyzes them, studies them, and that element of objectivity allows a dialogue between the scientific communities of different countries, with a common basis of connection. You can have scientists of different nationalities and different cultural roots in the same room, and you will find that they understand each other perfectly, because they speak the same language. In the early years of Cuban biotechnology, academic exchanges between Cuba and the United States, although severely limited by the blockade, had a certain level of activity. In the first venture of the nascent Cuban biotechnology, the production of interferon, those relations were present.

Also, in 1981 the organization NACSEX (US-Cuba Scientific Exchange) was created, which obtained authorizations for visits to Cuba by US scientists. In 1986 the U.S. Treasury Department ordered the suspension of the trips because it suspected "possible commercial implications". The Treasury letter to Dr. Halvorson stated that "...nothing of value will be provided to Cuba in return...". NACSEX ceased operations in 1993 but was able to contribute to more than 50 high-level scientists in molecular biology visiting Cuba and contributing to the Cuban effort.

In the field of neurosciences and since the 1970s, collaboration with American scientists had contributed to studies on brain electrical activity in Cuba and to the development of computing, including the manufacture of the first Cuban computers.

But for the most part (there are more than 1.5 million researchers in the United States), American scientists also saw "from afar" the development of science and biotechnology in Cuba and, although some individual academic visits in both directions and meetings in third countries continued to occur, there were no institutionalized actions of collaboration for several decades, neither in the academic field, much less in the business field. Many visa requests for Cuban scientists to participate in events in the United States were denied in those years.

Those were the same decades in which science was consolidated in the world as an institutionalized human activity, rather than as a sum of individual undertakings, and as a task of the States and, increasingly, of the companies.

Projecting these trends into the future, it becomes clear that it will not be possible to separate academic relations from economic relations. It was possible in the

> “[...]
> **Malignant neoplasms are currently the second leading cause of death in both the United States and Cuba**
> [...]”

19th century, but not in the 21st century. The future will not be an extrapolation of the past, but will contain discontinuities in trends. In which direction these trends will take us, we do not know. But we do know that it is something to be built consciously.

Such different historical roots will be projected into the future in many fields of social life. Also, in the field of scientific collaboration. At present and even in the context of the complexities of the relationship between the two countries, multiple contacts are taking place in different sectors of science and projects are being discussed, several of which involve the access of patients in the United States to biotechnological products emerging from Cuban science, the evaluation and joint development of new products, and even the establishment of joint ventures, with research and production capabilities. We do not yet know how many and which ones will crystallize, and how many and which obstacles will have to be overcome, but the process is underway.

If we handle it poorly, the ideology of a science of elitist individualities could prevail, oriented towards the interests of those who already have today much more material resources, and amplifying national and social inequalities, and we will run the risks of the fragmentation of the Cuban scientific project into disconnected collaborative operations, the dismantling of integral programs (such as biotechnology and others), the theft of brains and finally the absorption of the capacities built by the “mass effect” of the much larger, more diverse and economically powerful North American institutional system.

But if we manage it well, the building of collaborative scientific relations between Cuba and the United States, after half a century of separate evolution, may be a unique historic opportunity. It will be decided in the next ten years, maybe less. That is “the art of the possible”.

In other countries of the South, incipient scientific development efforts in the second half of the 20th century could hardly mature, deformed by the influence of U.S. scientific and economic power, and interrupted by military coups and dictatorships. In Cuba, the scientific effort of the last 6 decades occurred in the context of a revolutionary project of national sovereignty and social justice, and matured as a “country program” integrated to the other components of the social project, and in certain sectors, such as biotechnology, connected to the productive and economic projects. In recent years, we scientists have been the protagonists of the heroic resistance of the Cuban people.

This is the science and technology system that must now rebuild academic exchange relations with the United States. This exchange could be born, as is science itself in today's world, with a solid institutional framework, oriented towards explicit objectives, integrated into programs that group together various projects, and connected from the beginning to what we manage to build in terms of economic and cultural relations.

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References

Evans, R., Lee, K., Wallace, P. K., Reid, M., Muhitch, J., Dozier, A., ... & Dy, G. K. (2022). Augmenting antibody response to EGF-depleting immunotherapy: Findings from a phase I trial of CIMAvax-EGF in combination with nivolumab in advanced stage NSCLC. Frontiers in Oncology, 12, 958043.

Frascati R et al. Final results from a phase II trial of CIMAvax-EGF and nivolumab as second-line (2L) therapy after platinum-based chemotherapy in advanced non-small cell lung cancer (NSCLC). JCO 41, 9135-9135(2023).

Rodriguez, P. C., Popa, X., Martínez, O., Mendoza, S., Santiesteban, E., Crespo, T., ... & Neninger, E. (2016). A phase III clinical trial of the epidermal growth factor vaccine CIMAvax-EGF as switch maintenance therapy in advanced non–small cell lung cancer patients. ClinicalCancerResearch, 22(15), 3782-3790.

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From Science to Hope: U.S.-Cuba Exchanges and Heberprot-P

Denysse F. Fundora Agrelo MSc[1]

Researcher. International Policy Research Center

ORCID: 0000-0002-0976-3368

e-mail: denyssefundora@gmail.com

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Abstract

The evolution of scientific knowledge in the United States allowed Cuban researchers to have a significant amount of information at the time of the creation of institutions such as the Center for Genetic Engineering and Biotechnology. Subsequent exchanges between scientists from both countries were essential in the development of the only effective pharmacological treatment to date for severe diabetic foot ulcers. Policy revisions during the Barack Obama administration opened up opportunities to try to bring Heberprot-P to the U.S. market, which is closer to fruition with the Food and Drug Administration's approval of a Phase 3 clinical trial for this product.

Keywords: *scientific exchange, Heberprot-P, biotechnology, diabetes*

Introduction

On April 30, 2024, phase 3 clinical research for Heberprot-P was authorized in the United States. This fact is relevant since, in more than 25 years, no pharmacological treatment for the healing of complex ulcers has been approved by the regulatory agency of that country, the Food and Drug Administration (FDA)2 (Chen *et al*., 2023). However, beyond technical details, the announcement of that day stands out for being the most recent manifestation of how the evolution of scientific knowledge generated from Cuba and the United States has been able to translate into hope for hundreds of thousands of patients.

The purpose of the present article is to further elaborate this last statement. It is the first effort to record the main events and exchanges that led to the creation of the only option available in the world to date to treat the most severe stages of diabetic foot ulcer.[3]

This effort has combined both the skill and interest of researchers in both countries, as well as the action of various unofficial entities -some created for the purpose of registering the product- that found a space for their cooperative action in the context of the official exchange that took place between Cuban and U.S. health authorities in the period between 2015 and 2017.

These actions also have as a background the more than 150 years of permanent communications that have taken place between the respective academies of sciences and other research entities, which have constituted a unique link in the type of relationship that has been built between the two nations, even in those moments of greatest political tension.

Diabetes, lesions and cost

According to the World Health Organization, diabetes is a chronic disease in which there is insufficient insulin production or response to insulin, resulting in a concentration of glucose in the bloodstream (World Health Organization, 2023). This condition can lead to serious health problems, including heart disease, loss of eyesight, kidney diseases and diabetic foot ulcers.

For decades, effective treatment for severe diabetic foot ulcers has been a major debit in the world of medicine. In the vast majority of cases, the solution to this ailment involves amputation of the affected limb, which starts a countdown that sets the survival of about 50% of patients for a period of no more than five years. Therefore, the search for a solution to diabetic foot ulcers involves a deeper debate than the patient's possibility of preserving a limb or not, or of suffering discrimination or psychological damage associated with his new condition. These realities, aside from being true, omit a greater repercussion: the action of amputating not only has the potential to minimize the patient's quality of life, but can ostensibly decrease his or her life expectancy.

1 Collaborators: DrC. Jorge Berlanga (CIGB), DrC. José R. Cabañas (CIPI), DrC. Marta Ayala (CIGB), DrC. Miladys Limonta (CIGB), DrC. Liz Alvarez Lajonchere (CIGB), MSc. Merardo Pujol (CIGB) y BS. Raimundo Ubieta (CIGB).

2 Federal agency of the U.S. government, subordinate to the Department of Health.

3 Diabetic foot is a syndrome manifested at the skin, nerve, circulatory and osteopathic levels. Ulceration is the preterminal stage, prior to amputation.

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Alarmingly, nearly half of the patients who suffer a lower limb amputation caused by a diabetic foot ulcer do not survive beyond five years. Among U.S. veterans, the prognosis is even grimmer, as survival beyond two years is uncommon in patients that develop gangrene. Of particular concern is the disproportionate impact in African-American communities, where Medicare beneficiaries are nearly twice as likely to suffer a lower limb amputation within one year of DFU diagnosis compared to their non-Hispanic white counterparts. Innovative therapeutic options for severe diabetic foot ulcers are not only needed, but long overdue for patients (Zelen, 2024).

Currently, this debt has been settled with the appearance of Heberprot-P, a product that allows the healing of severe lesions caused by diabetes. However, this has not eliminated amputation as a recurrent global response. One of the causes lies in the difficulties associated with the regulations that hinder the entry into national markets of a promising product, but made in a country subject to sanctions by the United States and isolated from the dynamics of the large pharmaceutical corporations of the first world.

Diabetes is the eighth leading cause of death in the United States, and the number of adults diagnosed with diabetes is currently more than twice as high as it was two decades ago. It is also the leading cause of lower limb amputation, kidney failure, and blindness in adults (Centers for Disease Control and Prevention, 2024).

According to the Centers for Disease Control and Prevention, more than 38 million Americans of all ages have diabetes, 97 million adults have pre-diabetes - 1 in 3 adults - and there has been an increase in its incidence in children, both type 1 and type 2. According to the institution's statistics, in 2020 there were nearly 8 million hospital discharges associated with diabetes, of which 160 000 resulted in amputation of a lower limb, a figure similar to that of the previous year (Centers for Disease Control and Prevention, 2024).

The average annual expenditure for the treatment of diabetes is $12 022 per patient, so medical costs for people with diabetes are approximately 2.6 times higher than for people without the disease (Parker et al., 2024). The options available in the United States for patients with diabetic foot ulcers range from topical dressings and medications, from saline solutions to growth factors. However, the capacity for action of these resources is usually limited to less severe ulcers, i.e., those corresponding to grades 1 and 2 on the Wagner scale.[4] Therefore, patients with lesions corresponding to grades 3 and 4 see their options largely limited to amputation of the limb where the ulcer occurs.

The appearance of the article "Epidermal growth factor intralesional infiltrations can prevent amputation in patients with advanced diabetic foot wounds" (Berlanga Acosta et al., 2006) opened a new window in the global science for the treatment of severe diabetic foot ulcers. The text documents the results of a pilot study conducted on a heterogeneous group of 29 patients with grade 3 and 4 ulcers —severe and at high risk of amputation—, with no additional therapeutic options. The treatment was applied between April 2001 and September 2002, with the aim of testing the effectiveness of this novel procedure in preventing amputation, and in the 17 cases that completed the 24 programmed sessions it was possible to prevent amputation. This was the first clinical evaluation of growth factor infiltration in critical and extensive diabetic lesions in the lower limbs.

The great contribution of Cuban science, as will be explained henceforth, was to observe the favorable effect of the topical use of the Epidermal Growth Factor in the healing process and to achieve greater effectiveness when administered in deeper layers of

4 A classification system widely accepted by the scientific community to evaluate diabetic foot ulcers. It covers 6 stages ranging from grade 0 —no skin damage— to grade 5 —extensive gangrene—.

> "[...] more than 38 million Americans of all ages have diabetes [...]"

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the wounds. Therefore, by injecting the Epidermal Growth Factor directly into the lesion, the active agent can penetrate into the desired areas, without the upper layers of the wound impeding its action (Berlanga Acosta *et al*., 2006).

From EGF to Heberprot-P

One of the strongest lines of research in the United States, fundamentally in basic science, is related to healing, tissue repair and regeneration of tissues and organs. To cite an outstanding example, the discovery and development of most of the growth factors5 has occurred in that country, which led among other milestones, to the Nobel Prize in Medicine or Physiology in 1986, shared between Stanley Cohen and Rita Levi-Montalcini for the discovery of Epidermal Growth Factor and Nerve Growth Factor, respectively.

Cohen and Levi-Montalcini had worked together under the tutelage of Professor Viktor Hamburger at the University of Washington. Hamburger was the first to somehow predict the existence of proteins that dictated to cells what their spatial distribution would be and what they should specialize in. Altogether, these scientists discovered a factor that made neurons grow in culture, which was associated with an ingredient present in saliva.

While researching this ingredient, Cohen had the idea of injecting a crude extract of salivary glands from adult mice into newborn mice, looking for nervous system development. The injected mice had an opening of the eyelids and a budding of the dentition 5 to 7 days earlier than the natural occurrence, so that the crude extract had triggered an accelerated maturation of epithelial structures. Consequently, the first name given to Epidermal Growth Factor was Eyelid-Tooth Factor.

This sequence of studies led to the discovery of a large family of growth factors, Platelet-derived growth factors (PDGF), discovered by a pathologist named Russell Ross. These PDGFs were found in conditioned media of transformed cells, i.e. malignant cells, because they constitute endocrine mechanisms of defense and, at the same time, of proliferation of malignant cells. In other words, these PDGFs, although they contribute to tissue repair, unfortunately also allow resistance to chemotherapy or radiotherapy.

When in the 1960s Cohen first noticed this effect on the skin, he prepared an eye drop with a saturate of mouse salivary glands, to which he added the aforementioned crude extract, to treat burns on the cornea of rabbits. As a result, he showed that these ulcers healed much faster, a conclusion that became the cornerstone of future research. The first clinical trial based on this discovery occurred in 1989, in burn patients, for which a semi-solid cream was prepared with the aim of accelerating the repair of the skin in the affected areas.

In the 1970s, intensive work began on smart dressings, first developed by Massachusetts General Hospital burn ward Principal, John Burke, from bovine collagen. This was probably the first dressing of biological origin to be used on burn patients. In addition, when the stem cell phenomenon was discovered, several institutes dedicated to regenerative medicine were created in the United States, where intensive work has been done on the reprogramming of these cells to achieve a prospective phenotype desired by the researcher for different structures of the organism, be they bone, adipose tissue, cartilage or other

This summary allows us to affirm that when the Center for Genetic Engineering and Biotechnology (CIGB) was created in Cuba in 1986 for research, development, production and commercialization of innovative products, there was an extraordinary amount of information from the United States on growth and healing factors, which allowed Cuba to become the second country in the world to obtain a recombinant human epidermal growth factor (rhEGF)6 in 1989.

After joining the CIGB in 1991, Professor Jorge Berlanga was entrusted with the study of Epidermal Growth Factor and scarring, at the request of Dr. Pedro Lopez-Saura, who was influenced by Irwin Kelman Cohen and Gregory "Greg" Schultz. Kelman Cohen was a reconstructive surgeon, founder of the American Wound Healing Society. Schultz was a biochemist, president of that institution, who anticipated that chronic wounds secrete chemicals -proteases- that

5 Growth factors set the guidelines for cellular and spatial repair of damaged peripheral or internal tissues in a given space and time.

6 The term recombinant refers to the fact that it is obtained in a laboratory by genetic engineering methods, and not by natural means, which allows the product to be developed on an industrial scale.

degrade growth factors, both those produced by the organism and those applied exogenously. He was the person who first spoke of biofilm, a layer of bacteria and pathogens that create a symbiotic community among themselves and lead to the wound becoming chronic, which can lead to stagnation of healing.

A fortunate reaction to all this accumulation of knowledge that had been generated in the last decades was Dr. Berlanga's decision to establish contact, via manuscript messages, with several researchers based in the United States. An important impulse to this effort, which combines, without ignoring the institutional and the individual, was the scholarship granted to the Cuban researcher in the scarring laboratory attached to the Burn Unit of the University Hospital of Alberta, Canada, between 1994 and 1995. This experience brought him in contact with advanced research on the biochemistry of the skin and scar in a profound way. It also set the stage for his participation in the 57th North American Plastic Surgeons Meeting and increased his connections, with the valuable support of his mentor, Edward Tredget.

Tredget, in turn, was close to Anita Roberts, one of the discoverers of the Transforming Growth Factor-β (TGF-β) in the 1980s, who also actively sponsored the laboratory where the Cuban scientist fulfilled his scholarship.

Subsequently, with new knowledge and inputs, Cuban scientists initiated a series of experiments that led to the demonstration that controlled and sterile acute wound fluid was capable of degrading a chemical sequence analogous to Epidermal Growth Factor. In successive studies, a repeated finding was associated with the occurrence of topical adversities. To this was added an article published by the scientists of the University of Queensland, Sheree E. Cross and Michael S. Roberts, according to which, when applying a growth factor on the surface of a wound, the diffusion of the product in the deep parts of the wound is practically nil. In the eyes of the Cuban scientist, such conclusions weakened the prospects of achieving an effective topical treatment for deep lesions (Cross & Roberts, 1999).

For his part, Kelman Cohen published in Plastic Reconstructive Surgery a clinical study he had performed on 17 healthy human volunteers, young people with two groin wounds, one of which was treated with silver sulfadiazine and the other with a combination of silver sulfadiazine and epidermal growth factor. The result was that there was no difference (Cohen *et al.*, 1995).

The concerns from Cuba about the topical application of epidermal growth factor and Kelman Cohen's discovery, which were relatively close in time, had important and disparate consequences for research on diabetic foot ulcer healing in both countries.

On the other hand, Cuban scientists accessed a study by researchers in England based on injections of Epidermal Growth Factor to patients with necrotizing enterocolitis (Sullivan *et al.*, 1991). This disease occurs in preterm newborns and manifests as necrosis of the intestine. To preserve the life of the infant in the most severe cases, an extensive portion of this organ may be removed. The risk of mortality is high for people with short bowel syndrome, as it is known in medicine, because they are deprived of the larger part of an organ that performs four functions at the same time and is characterized by a complex cellular specialization.

The article focused on the case of an eight-month-old infant with severe necrotizing enterocolitis, in whom a recombinant human epidermal growth factor was tested intravenously with parental consent. The procedure restored the patient's intestinal function and constituted a remarkable contribution to the application of epidermal growth factor, apart from topical, burn and healing applications.

> “[…]
> **The average annual expenditure for the treatment of diabetes is $12 022 per patient**
> […]”

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Motivated by this discovery, Cuban scientists created a parenteral Epidermal Growth Factor[7] project in the then Division of Clinical and Preclinical Trials of the CIGB. This gave rise to the idea of replacing the topical application of Epidermal Growth Factor with an injectable variant.

While the English scientists had restricted their studies to the digestive tract, a series of experiments at CIGB focused on the sciatic nerve of rats demonstrated the protective anti-necrogenic effect of Epidermal Growth Factor injection outside the gastrointestinal system. The Cuban scientists had ventured for the first time into the peripheral soft tissues of a limb.

The experiments that followed this finding sought to prove whether the injection of Epidermal Growth Factor was really capable of preventing tissue death. Initially, they focused on ischemia in several organs and accumulated evidence. Subsequently, Dr. Berlanga was awarded a fellowship at what is now the Institute of Cancer Research in London, an experience that gave a definitive boost to the understanding of the biological potency of Epidermal Growth Factor injection and the fact that its pharmacological properties were much broader than when applied superficially.

Promising results led CIGB's director, Dr. Luis Herrera, to create a task force and begin clinical studies. In 2003, Stanley and Kelman Cohen were invited to Cuba to participate in the Cuban symposium on healing named Biotechnology Havana. Curiously, a letter of request had to be sent to U.S. President George W. Bush to authorize the scientists' participation in the event. On that occasion, the researchers were able to exchange on the particularities of Stanley Cohen's discovery, information that is not usually published and that appears in this article.

Two years later, in 2005, Dr. Berlanga was invited by Professors Kelman Cohen and Greg Schultz, at that time president of the American Healing Society, to present in the United States the first results of Cytoprot-P, the first name under which Heberprot-P was known. The conference was attended by Stanley Cohen and was introduced by Schultz, who praised the results achieved by Cuban scientists.

After the event, Dr. Berlanga went to Richmond, Virginia, where Professor Kelman Cohen resided. On that occasion he was able to meet Dr. Peter Sheehan, diabetes expert and director of New York Foot and Ankle Hospital, who unfortunately passed away unexpectedly in 2014 and important shared aspirations were cut short.

The first International Congress for the Control of Diabetes and its Complications was held in Cuba in 2010. It was attended by six U.S. scientists. Only six years later, the number had risen to 51, a sign of the interest in research in Cuba and the facilities resulting from the re-establishment of diplomatic relations between the two countries (Whitefield, 2018).

Kelman Cohen had mentioned the virtues and potential of Cuban research to Dr. David Armstrong, a world leader in the treatment of diabetic foot ulcers. Armstrong visited Cuba in 2012 to participate in an event organized by the CIGB, as part of a delegation, which was a remarkable endorsement of the project. In Armstrong's own words:

> The cost of treating severe diabetic wounds is more expensive than that of the five major cancers in the United States. There is a huge disconnect between the public health need and the pharmacological approach in the United States. Our ability to partner with colleagues in Cuba and bring this drug into clinical trials in our country is potentially important in our ability to heal wounds and improve lives, worldwide (Ruiz-McGill, 2016).

The bases on which the success of Injectable Growth Factor to treat diabetic foot ulcers has been built are, firstly, to avoid degradation; secondly, to overcome the biofilm discovered by Schultz; and thirdly, to take the treatment to the wound planes where the responder cells are really located. In other words, the evolution of studies at a global level, but fundamentally in the United States and Cuba, added to the expertise of researchers on the Island, made it possible to delve deeper into the lesion until finding a greater density of receptors for the growth factor. This contribution has not been fortuitous and is extensively documented.

The novelty is not the product to be applied, since growth factors were already widespread in the global market. In the words of Kelman Cohen: "What the

7 Term that refers to that which is introduced into the organism by a route other than the digestive tract, such as intravenous, subcutaneous or intramuscular.

Cubans have done now is very clever. Instead of simply pouring it into the wound, they have injected it into the healthy margins of the wound, thus allowing it to initiate the healing of the wound before it is destroyed" (Murray, 2006), to which he added 'Cuba has very advanced ideas and we are not taking advantage of them', in reference to the impediment posed by political issues to the bilateral development of science.

A decade later, Professor Armstrong insisted on this topic, "It shatters me to know that there may be something out there that has the potential to save limbs and we don't have the opportunity to test it thoroughly because of political rather than public health issues" (Lenzer, 2016).

To mention an example, Cuban scientists face limitations to publish the results of their studies in specialized U.S. journals, which prevents their insertion in certain platforms that constitute global references for the study of diabetes. Fortunately, there are articles in which renowned Cuban and American scientists have jointly participated, such as "Glucose toxic effects on granulation tissue productive cells: the diabetics' impaired healing" (Berlanga-Acosta *et al*., 2013) and "Chronic Wounds with Emphasis in Diabetic Foot Ulcers", both in BioMed Research International (Berlanga-Acosta, *et al*., 2014); as well as "Expression of cell proliferation cycle negative regulators in fibroblasts of an ischemic diabetic foot ulcer. A clinical case report" (Berlanga-Acosta *et al*., 2012) and "Healing enhancement of diabetic wounds by locally infiltrated epidermal growth factor is associated with systemic oxidative stress reduction" (García Ojalvo *et al*., 2017), in the International Wound Journal.

Heberprot-P in the United States

For more than 60 almost uninterrupted years, the hostile nature of bilateral relations between the United States and Cuba has imposed limitations on cooperation in areas of common interest, from which the field of biotechnology has not been exempt. Nevertheless, there have been exceptions that continue to motivate the potential for collaboration between the two countries.

One of them was the signing of the Memorandum of Understanding between the Ministry of Public Health of Cuba and the Department of Health and Human Services of the United States in health matters, on June 13, 2016 (Minsap-HHS, 2016). The text declares the intention of both institutions, in line with the expressed will of then Presidents Raúl Castro and Barack Obama, to strengthen collaboration in scientific and health areas. Among these were listed non-communicable diseases such as diabetes, as well as biomedical research and development, clinical trials and regulation of medical products.

> "[...] **The cost of treating severe diabetic wounds is more expensive than that of the five major cancers in the United States** [...]"

Related to this milestone, mention should also be made of the visit to Washington D.C. that same year of the then Cuban Minister of Public Health, Dr. Roberto Morales Ojeda, who headed a delegation of specialists in areas such as cancer, tropical diseases, neurology and cardiovascular diseases, who held productive conversations with senior executives of the U.S. National Institutes of Health. As part of the program, officials from the FDA and the Cuban counterpart CECMED initiated a dialogue that was to favor mutual knowledge of their respective work systems. On that occasion, Dr. Morales received recognition from the Pan American Health Organization as the first country on the continent capable of preventing mother-to-child transmission of HIV and syphilis.

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Four months later, on October 17, the Presidential Policy Directive on Relations with Cuba (DPP-43) went into effect. This document authorized, on the basis of a general license from the Office of Foreign Assets Control (OFAC)8, joint commercial and non-commercial medical research between individuals and entities of both countries, as well as research, clinical trials, marketing and distribution of Cuban biopharmaceutical products, which were previously approved by the FDA. Additionally, the Treasury Department granted licenses for clinical trials of specific Cuban drugs (González Gómez, 2023).

Thus, in addition to the interest in exchanging knowledge that existed within the scientific community in Cuba and the United States, there was also the political will of the government to channel it.

After three years of negotiations, in 2018 the Cuban company Heber Biotec, belonging to BioCubaFarma, and the U.S. company Mercurio Biotec agreed to work together to introduce Heberprot-P in the U.S. market (Alcalde & Barsotti, n.d.). Likewise, OFAC authorized Mercurio Biotec to enter into agreements with CIGB to secure the necessary procedures to import Heberprot-P for the purpose of conducting clinical trials (Granma, 2018).

This effort was cut short, but was an important precedent to what is now CIGB's agreement with U.S.-based Discovery Therapeutics Caribe (DTC), based in Cleveland, Ohio. In early 2024, DTC submitted an Investigational New Drug (IND) application to the FDA, which included a Phase 3 protocol for a randomized, double-blind, placebo-controlled trial of Heberprot-P for Wagner scale grade 3 and 4 diabetic foot ulcers. On April 10, the company received a clearance letter from the FDA to proceed with the proposal. This would be the first time that the Cuban product will be studied for use in U.S. patients with diabetic foot ulcers. According to David Armstrong: "This trial represents an encouraging potential to change the current paradigm and provide new hope to those who desperately need it" (Armstrong, 2024).

With this step, hope has resurfaced among scientists, patients, relatives and specialists on both sides of the Straits of Florida, that new avenues will open up to achieve the goal that we should all be striving for: the improvement of the quality of life of human beings. It remains in the hands of officials and politicians the possibility of turning the project into reality.

Conclusions

The experience of the long road travelled between the discovery of Epidermal Growth Factor and the authorization for clinical trials of Heberprot-P in the United States reinforces the need to promote and preserve scientific exchanges between the two countries regardless of the dynamics associated with bilateral political relations.

It is not possible to write the history of Heberprot-P without mentioning the remarkable contributions of scientists in the United States and the exchanges between researchers based in both countries, as well as the fluent personal and institutional communication that has been maintained over the years, expressed in visits, participation in events and joint publications.

The existing connections between the scientific communities of both countries for the treatment of diabetic foot ulcers got a remarkable boost with the policy revisions that occurred in the last years of the Barack Obama administration. Without them, efforts such as those of Mercurio Biotec and Discovery Therapeutics Caribe would not have been possible.

The commercial vision associated with the biopharmaceutical industry in the United States was a brake on the development of effective products for the treatment of advanced diabetic foot ulcers. This reality, added to the high and growing rates of diabetes in that country, creates a propitious space for bilateral collaboration, which would be greatly favored with the lifting of restrictions that affect the free exchange of knowledge. In this sense, the approval of the Phase 3 clinical trial for Heberprot-P shortens the gap that currently exists between serious patients and their hopes of not resorting to amputation.

The present text may be useful for the purpose of transmitting accurate information that will enable both specialists and decision-makers to have the most appropriate alternatives available, both for dealing with this disease and for establishing more stable exchange mechanisms that will make joint progress possible in

8 Unit of the U.S. Department of the Treasury. It is in charge of the Cuban Assets Control Regulations (CACR).

the fight against other diseases. The analysis of the potential impact that this possible bilateral cooperation would have in relation to third countries, which are not even in a position to propose the appropriation of this knowledge, remains the objective of another publication.

References

Alcalde, L. M., & Barsotti, S. (s.f.). Historic Agreement between U.S. and Cuba Pharmaceutical Companies. Kegler Brown Hill+Ritter. https://www.kegler-brown.com/case-studies/historic-agreement-between-u-s-and-cuba-pharmaceutical-companies/

Armstrong, D. (April 30, 2024). DTC Receives FDA SMP Letter for Phase 3 Clinical Trial of rhEGF. https://discothera.com/news/f/dtc-receives-fda-smp-letter-for-phase-3-clinical-trial-of-rhegf

Berlanga Acosta, J., Savigne, W., Valdez, C., Franco, N., Alba, J., del Rio, A., . . . Fernández-Montequín, J. (2006). Epidermal growth factor intralesional infiltrations can prevent amputation in patients with advanced diabetic foot wounds. International Wound Journal, 3(3).

Berlanga-Acosta, J., Mendoza-Mari, Y., Martínez, M., Valdés-Perez, C., Ojalvo, A., & Armstrong, D. (2012). Expression of cell proliferation cycle negative regulators in fibroblasts of an ischemic diabetic foot ulcer. A clinical case report. International Wound Journal, 232-236.

Berlanga-Acosta, J., Armstrong, D. G., Schultz, G., & Herrera-Martinez, L. (2014). Chronic Wounds with Emphasis in Diabetic Foot Ulcers. BioMed Research International.

Berlanga-Acosta, J., Schultz, G., López-Mola, E., Guillen-Nieto, G., García-Siverio, M., & Herrera-Martínez, L. (2013). Glucose toxic effects on granulation tissue productive cells: the diabetics' impaired healing. BioMed Research International.

Centers for Disease Control and Prevention. (May 15, 2024). Diabetes Basics. Obtenido de https://www.cdc.gov/diabetes/about/index.html

Centers for Disease Control and Prevention. (May 15, 2024). National Diabetes Statistics Report. Obtenido de https://www.cdc.gov/diabetes/php/data-research/

Chen, M., Chang, C., Levian, B., Woodley, D., & Li, W. (2023). Why Are There So Few FDA-Approved Therapeutics for Wound Healing? International Journal of Molecular Science, 24. doi:https://doi.org/10.3390/ijms242015109

Cohen, I. K., Crossland, M. C., Garrett, A., & Diegelmann, R. F. (1995). Topical Application of Epidermal Growth Factor onto Partial-Thickness Wounds in Human Volunteers Does Not Enhance Reepithelialization. Plastic and Reconstructive Surgery, 96(2), 251-254.

Cross, S. E., & Roberts, M. S. (1999). Defining a Model to Predict the Distribution of Topically Applied Growth Factors and Other Solutes in Excisional Full-Thickness Wounds. Journal of Investigative Dermatology, 112(1), 36–41., 112(1), 36-41.

García Ojalvo, A., Berlanga Acosta, J., Mendoza Marí, Y., Fernández Mayola, M., Valdés Pérez, C., Savigne Gutiérrez, W., . . . Armstrong, D. (2017). Healing enhancement of diabetic wounds by locally infiltrated epidermal growth factor is associated with systemic oxidative stress reduction. International Wound Journal, 214-225.

González Gómez, T. (2023). Oportunidades para avanzar hacia el mejoramiento de las relaciones bilaterales entre Cuba y Estados Unidos a través del sector biofarmacéutico, a partir de la pandemia de COVID-19. La Habana: Trabajo de Diploma en Relaciones Internacionales. ISRI.

Granma. (March 21, 2018). U.S. and Cuban companies reach agreement on Heberprot-p. https://en.granma.cu/cuba/2018-03-21/us-and-cuban-companies-reach-agreement-on-heberprot-p

Lenzer, J. (March 21, 2016). US researchers blocked from testing Cuban drug. BMJ. 10.1136/bmj.i1642

McLaughlin, P. J., Cain, J., Titunick, M., Sassani, J., & Zagon, I. (2017). Topical Naltrexone Is a Safe and Effective Alternative to Standard Treatment of Diabetic Wounds. Advances in Wound Care. doi:10.1089/wound.2016.0725

MinSap-HHS. (June 13, 2016). Memorando de Entendimiento entre el Departamento de Salud y Servicios Humanos de Estados Unidos en materia de salud y el Ministerio de Salud Pública de la República de Cuba. https://www.hhs.gov/sites/default/files/hhs-minsap-mou.pdf

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Murray, M. (January 11, 2006). Cubans developing therapy for diabetic ulcers. NBC News. https://www.nbcnews.com/id/wbna10777359

Organización Mundial de la Salud. (April 5, 2023). Diabetes. Obtenido de https://www.who.int/es/news-room/fact-sheets/detail/diabetes

Parker, E., Lin, J., Mahoney, T., Ume, N., Yang, G., Gabbay, R., . . . Bannuru, R. (January, 2024). Economic Costs of Diabetes in the U.S. in 2022. Diabetes Care, 47(1). doi:https://doi.org/10.2337/dci23-0085

Ruiz-McGill, R. (March 2, 2016). UA Health Sciences Researchers Look to Collaborate With Cuba on Diabetic Wound Therapy. https://deptmedicine.arizona.edu/news/2016/ua-health-sciences-researchers-look-collaborate-cuba-diabetic-wound-therapy

Sullivan, P., Brueton, M., Tabara, Z., Goodlad, R., Lee, C., & Wright, N. (1991). Epidermal growth factor in necrotising enteritis. Lancet, 53-54.

Whitefield, M. (January 1, 2018). Cuba exports medicine to dozens of countries. It would like the U.S. to be one of them. Miami Herald. https://www.miamiherald.com/news/nation-world/world/americas/cuba/article189830809.html

Zelen, C. (April 30, 2024). DTC Receives FDA SMP Letter for Phase 3 Clinical Trial of rhEGF. https://discothera.com/news/f/dtc-receives-fda-smp-letter-for-phase-3-clinical-trial-of-rhegf

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Bridging Borders Through Science: Collaborative Efforts in Diabetic Limb Preservation between Cuba and the USA

David G. Armstrong, DPM, MD, PhD

Professor of Surgery and Neurological Surgery. Director, Southwestern Academic Limb Salvage Alliance (SALSA) Keck School of Medicine of University of Southern California

ORCID: 0000-0003-1887-9175

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Abstract

The re-establishment of diplomatic relations between Cuba and the USA in 2014 has brought about a new era of medical collaboration. Limb preservation, particularly in patients with diabetes, represents a crucial area where bilateral efforts have yielded significant advances. This manuscript explores the historical and scientific collaboration between Cuban and American researchers in diabetic foot care, focusing on marrying interdisciplinary teams with technology, cell biology, and enhancing wound healing. These efforts have not only advanced diabetic limb preservation but also illustrate how scientific diplomacy can bridge geopolitical divides for the greater good of human health.

Keywords: *limb preservation, diabetic foot ulcers, egf therapy, international collaboration, scientific diplomacy*

Context

On December 17, 2014, the Presidents of the United States and Cuba announced the reestablishment of diplomatic relations, opening new doors for cooperation in multiple fields, including healthcare. Diabetes and its complications have emerged as one of the most urgent public health crises, affecting millions worldwide. Among the most devastating complications are diabetic foot ulcers (DFUs), which precede 80% of lower extremity amputations globally. With more than 18.6 million people affected annually, DFUs present a significant healthcare challenge, particularly in underserved populations.

Limb preservation, a field aimed at reducing preventable amputations, has been a focal point for collaboration between Cuban and American researchers. The unique strengths of each nation—Cuba's emphasis on preventive, community-based care, and the USA's technological advances—have enabled the development of new therapies and protocols that address the multifaceted nature of diabetic foot disease. This manuscript explores the collaborative journey between researchers from both countries, focusing on key innovations in EGF therapy, oxidative stress management, and cellular mechanisms that underpin successful wound healing.

Scope of the problem

DFUs represent not only a clinical challenge but a profound socioeconomic burden. Approximately 50% of ulcers become infected, with up to 20% of those cases leading to lower extremity amputations. The 5-year mortality rate for patients with DFUs is staggering, exceeding 30%, and rising to more than 70% in patients who undergo major amputations. The direct costs associated with treating DFUs in the USA alone are estimated to range between $9 billion and $13 billion annually. This significant burden highlights the urgent need for innovative, effective, and affordable interventions, a need that has driven the US-Cuba collaboration in diabetic limb preservation research.

History and Initiation of the Collaboration

The US-Cuba partnership in limb preservation began long before the normalization of diplomatic relations in 2014. Discussions with colleagues at the Center for Genetic Engineering and Biotechnology (CIGB) in Cuba, where groundbreaking work in epidermal growth factor (EGF) therapy had already shown promise in accelerating wound healing led to an acknowledgement of the scope of the problem and the promise of collaboration.

Our initial meetings focused on the shared public health burden of diabetes and its complications. Cuba's well-established healthcare infrastructure, with its focus on community engagement and preventive medicine, was a natural complement to the USA's technological prowess in medical devices and wound care innovations. This partnership has since led to numerous joint publications and the exchange of scientific expertise across borders, laying the foundation for our ongoing research efforts. It has also led to

> “[…] scientific diplomacy can bridge geopolitical divides for the greater good of human health […]”

numerous collaborative clinical visits between nations (Figures 1-4).

Key Advances in Limb Preservation Research

1. Epidermal Growth Factor Therapy: The use of EGF in diabetic wound healing has been one of the most promising contributions from Cuba to this collaborative effort. EGF promotes cell proliferation, migration, and differentiation—critical processes in tissue repair. Collaborative work, including “Healing enhancement of diabetic wounds by locally infiltrated epidermal growth factor,” demonstrated that regional infiltration of EGF in diabetic foot ulcers not only accelerates healing but also reduces systemic oxidative stress, a key contributor to chronic wounds in diabetes. This therapy has since been integrated into clinical protocols for wound care in both Cuba and the USA, offering a new avenue for improving outcomes in high-risk diabetic populations.
2. Reduction of Oxidative Stress: Oxidative stress is a well-known driver of cellular damage in chronic wounds, particularly in patients with diabetes. Through our collaborative research, we identified that locally administered EGF not only facilitated wound healing but also modulated systemic oxidative stress markers. This systemic benefit was a groundbreaking discovery, indicating that therapies targeting local wound environments could also positively impact overall metabolic health. Such findings are of significant importance in resource-limited settings, where reducing hospitalizations and long-term complications is critical.
3. Cellular Mechanisms in Wound Healing: One of the most challenging aspects of DFUs is the cellular dysfunction associated with diabetic tissue. Our work, including the study “Expression of cell proliferation cycle negative regulators in fibroblasts of an ischemic diabetic foot ulcer,” explored the cellular dynamics within diabetic wounds. Work led by my colleague Jorge Berlanga at CIGB found that fibroblasts from DFUs exhibit premature senescence and increased expression of cell cycle inhibitors such as p53 and p21. These molecular roadblocks prevent adequate tissue regeneration, resulting in chronic, non-healing wounds. This discovery has since influenced treatment approaches that target these molecular pathways to promote more effective healing.
4. Integration of Multidisciplinary Care: Multidisciplinary care is essential for reducing the risk of major amputations in patients with DFUs. Drawing on our experience from both nations, we have emphasized the importance of integrated care teams consisting of podiatrists, vascular surgeons, infectious disease specialists, and primary care clinicians. Our recent JAMA publication reinforces that this multidisciplinary approach reduces the risk of amputation and improves overall patient outcomes . The collaboration has also fostered training programs, where Cuban clinicians are exposed to the latest technological advancements in offloading devices, thermal imaging, and wound assessment tools developed in the USA.

Challenges and Lessons Learned

While the collaboration between Cuban and American researchers has yielded significant results, it has not been without challenges. Geopolitical tensions, trade restrictions, and limited access to advanced medical technologies in Cuba have occa-

sionally hampered the full realization of our research goals. However, these challenges have underscored the importance of scientific diplomacy as a tool for overcoming barriers. The perseverance of researchers on both sides has demonstrated that healthcare transcends borders, and that shared knowledge can bring about limb and life-saving innovations.

The COVID-19 pandemic, in particular, has highlighted the fragility of global scientific collaborations. Travel restrictions and resource reallocations disrupted some of our ongoing studies, particularly those involving in-person clinical trials. Nonetheless, the pandemic also reinforced the value of international partnerships in healthcare research, as virtual collaborations and data-sharing platforms emerged to sustain momentum in our work.

Conclusion

The Future of US-Cuba Medical Cooperation:

The collaborative efforts between Cuba and the USA in diabetic limb preservation have set the stage for further medical partnerships. As we look to the future, there are opportunities to expand this collaboration into other areas of chronic disease management, such as cardiovascular health, renal disease, and neurodegenerative conditions. The success of EGF therapy and our joint research on oxidative stress and cellular dynamics in wound healing provide a template for future breakthroughs. Moreover, as the global burden of diabetes continues to rise, expanding access to these innovations in underserved regions will be critical.

Cuba's preventive healthcare system, which emphasizes community-based interventions and early detection of chronic diseases, could greatly benefit from integration with technological advancements from the USA. Collaborations could focus on population health management, leveraging health data analytics, telemedicine, and mobile health platforms to improve the detection, monitoring, and treatment of chronic diseases such as diabetes and cardiovascular diseases. This would also facilitate the development of cost-effective health strategies that could be implemented not only between Cuba and the USA but also in low- and middle-income countries (LMICs) facing similar challenges.

The Role of Scientific Diplomacy

The US-Cuba partnership in limb preservation illustrates the power of scientific diplomacy. Despite the political challenges that have historically divided our nations, the collaboration has advanced not only healthcare outcomes but also diplomatic relations. The work we have done in limb preservation is not just a triumph of science; it is a demonstration of how two nations can come together for the shared goal of improving human health. This partnership serves as a model for other nations grappling with the dual burdens of chronic disease and limited healthcare resources.

As we continue to build on the foundation of this collaboration, it is imperative that we expand our efforts to include more stakeholders —government agencies, private sector companies, and international organizations— so that the innovations developed through this partnership can reach the people who need them most.

Reference

Armstrong, D. G., Tan, T-W., Boulton, A. J. M., Bus, S. A. (2023). Diabetic Foot Ulcers A Review. JAMA. http://dx.doi.org/10.1001/jama.2023.10578

Armstrong, D. G., Boulton, A. J. M., Bus, S. A. (2017). Diabetic Foot Ulcers and Their Recurrence. *N Engl J Med, 376*(24), 2367-2375.

Armstrong, D. G., Swerdlow, M. A., Armstrong, A. A., Conte, M. S., Padula, W. V., Bus, S. A. (2020). Five year mortality and direct costs of care for people with diabetic foot complications are comparable to cancer. *J Foot Ankle Res, 13*(1), 16.

Berlanga Acosta, J., Mendoza Mari, Y., Martínez, M. D., Valdés Pérez, C., Ojalvo, A. G., Armstrong, D. G. (2013). Expression of cell proliferation cycle negative regulators in fibroblasts of an ischemic diabetic foot ulcer. A clinical case report. *International Wound Journal, 10*(2), 232-236.

Berlanga Acosta, J., Armstrong, D. G., Schultz, G. S., Herrera Martínez, L. (2014). *Chronic wounds with emphasis in diabetic foot ulcers*. Biomed Res Int, 2014:890352.

Cabal Mirabal, C. A., Berlanga Acosta, J., Fernández Montequín, J. *et al.* Quantitative Studies of Diabetic Foot Ulcer Evolution Under Treatment by Digital Stereotactic Photography. *J Diabetes SciTechnol* 2019;1932296819853843.

Du, C., Li, Y., Xie P. *et al.* (2019). The amputation and mortality of inpatients with diabetic foot ulceration in the covid-19 pandemic and post pandemic era: A machine learning study. *International Wound Journal, 19*(6), 1289-1297.

Rodríguez Rodríguez, N., Martínez Jiménez, I., García Ojalvo, A. *et al.* (2021). Wound chronicity, impaired immunity and infection in diabetic patients. *MEDICC Review* https://mediccreview.org/wound-chronicity-impaired-immunity-infection-diabetic-patients/

Rogers, L. C., Lavery, L. A., Joseph, W. S., Armstrong, D. G. (2023). All feet on deck: The role of podiatry during the covid-19 pandemic: Preventing hospitalizations in an overburdened health-care system, reducing amputation and death in people with diabetes. *J Am Podiatr Med Assoc, 113*(2), 20-51.

Shin, L., Bowling, F. L., Armstrong, D. G., Boulton, A. J. M. (2020). Saving the Diabetic Foot During the covid-19 Pandemic: A Tale of Two Cities. *Diabetes Care 43*(8),1704-1709.

Prof. Armstrong making rounds in Hospital Dermatológico Guillermo Fernández Hernández Baquero, Cuba, December 2012.

CIGB's Prof. Jorge Berlanga with Profs Marvin J. Slepian (middle) and David G. Armstrong following Cuban wound healing symposium, 2016.

David G. Armstrong (right) being interviewed by Cuban National TV's Niurka Damarys following keynote at Cuban International Symposium on Diabetes and its Complications, 2016.

Prof. Armstrong in Limb Preservation Clinic at University of Arizona with nurse Katherine Broze and Ambassador Jose Ramon Cabañas, 2016.

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Environmental and scientific cooperation between Cuba and the United States: A Bridge over Troubled Waters[1]

Daniel Whittle[2]

Program Director of the NGO Environmental Defense Fund.
ResearchGate: Daniel Whittle Environmental Defense Fund

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Abstract

Scientists and other experts from the United States and Cuba have a long and rich history of working together, through good times and bad. The fruits of their labors have been many — discoveries of new species on land and in the water, advances in restoring and conserving soils impacted from decades of overuse, new approaches for managing pests and invasive species that threaten agricultural yields and biodiversity, improved methodologies for tracking hurricanes, reductions in overfishing, conservation and restoration of corals, and new protections for endangered species. Cooperation on environmental matters has been especially productive and has helped create political space for dialogue on more sensitive issues. Following the restoration of diplomatic relations in 2014, the two countries signed 22 bi-lateral agreements, the first two of which promised government-to-government cooperation on shared environmental and natural resource issues.

Though US-Cuba relations worsened during the Trump Administration and have only slightly improved in the Biden era, cooperation on science and the environment remains strong, particularly between non-governmental organizations in the United States and governmental and non-governmental actors in Cuba. Looking ahead, there are many opportunities to expand cooperation on issues such as climate change and clean energy that would be beneficial to people in both countries.

Keywords: *US-Cuba relations, science diplomacy, environmental cooperation*

Introduction

On April 20, 2010, an explosion on a British Petroleum (BP) oil rig off the coast of Louisiana resulted in the deaths of 11 people and the largest marine oil spill in history. For nearly three months, more than 200 million gallons of oil spilled freely into the Gulf of Mexico, wreaking havoc to marine life, ecosystems, and coastal communities far and wide. The spill spread out over 4,000 square miles and polluted roughly 200 miles of Gulf waters along the edge of the Cuban exclusive economic zone (EEZ), and posed a threat to beaches, reefs, mangrove swamps and towns along Cuba's northwestern coast. An international incident was prevented by the chance timing of the central Gulf Loop Current gyre formation, which interrupted the delivery of oil down current as far as Cuba and the Florida Keys.

The BP oil spill exposed major flaws in the oil industry's safety practices, the government's oversight of offshore drilling, and the emergency response plans for spills. It also revealed how utterly unprepared the US government was in addressing the threats posed to neighboring countries down current of the spill. Though Cuba has some of the best environmental laws on the books, its hands were tied when it came to protecting itself from pollution originating across the border. What made Cuba especially vulnerable was the lack of formal contact and coordination with the United States on pollution in shared waters, or on virtually any environmental matter. At that time, Cuban officials had no effective or efficient way to communicate with US counterparts about the spill's movement or to coordinate in responding and curbing its impacts. They couldn't simply call the US Coast Guard and ask for information or help. Likewise, in the event oil were to enter its waters, Cuba couldn't count on help from US government or from private sector resources in the states to help it contain the oil--US law prohibited response teams from entering Cuban waters.

Fortunately, a few US-based environmental groups with experience working in Cuba, including Environmental Defense Fund, were monitoring the spill and could act as

1 This article includes excerpts from Crahan, M., editor, US-Cuba Working Together Again: Lessons from Environmental Cooperation, Columbia University, 2021, with the permission of the editors.

2 The author thanks Valeries Miller, director of the Cuba Program at EDF, and Eduardo Boné-Morón, Senior Manager of the Cuba Program at EDF, for their contributions to this article.

> “[…] Cuba has some of the best environmental laws on the books […]”

unofficial channels of information between government officials in both countries throughout the crisis. It took more than 18 months until the two governments found a way to talk directly to each other about how to deal with future oil spills. And those talks, which ultimately produced a bi-lateral agreement on oil spill prevention and response in January 2017, might have never happened had people in Florida not woken up to the fact that Cuba had its own plans to drill for oil off its northern coast. They realized that an offshore spill in Cuba could have devastating impacts on Florida's Keys and much of the state's southeastern shorelines and cities. Cooperation to prevent future oil spills in Cuban waters was seen as essential to protect economic, social and environmental interests in south Florida and the east coast of the United States.

We're connected

It's never been any secret to Cuban and American scientists that our two countries are connected and that shared environmental problems require shared solutions. Scientists on both sides of the Florida straits have been finding ways to study and work together literally for centuries, through good times and bad. The fruits of their labors have been many — discoveries of new species on land and in the water, advances in restoring and conserving soils impacted from decades of overuse, new approaches for managing pests and invasive species that threaten agricultural yields and biodiversity, improved methodologies for tracking hurricanes, reductions in overfishing, conservation and restoration of corals and new protections for endangered species.

The list goes on and many are captured in the 2021 book Cuba-US Working Together Again: Lessons from Environmental Cooperation, published by Columbia University's Institute for Latin American Studies, with support from the Havana-based Fundación Antonio Núñez Jiménez, the American College of Environmental Lawyers, and the Environmental Defense Fund (EDF). The authors in that collection, released shortly after President Biden took office, made a strong case that the United States and Cuba should resume dialogue and cooperation on environmental matters and provided a proposed road map for doing so. Before providing a summary of more recent examples of collaboration below, it is worthwhile to recap some of the areas of cooperation explored in that 2021 volume.

A long history of environmental and scientific cooperation

Cuban historian Reinaldo Funes, in his *A Brief Historical Overview of Environmental Exchanges between the United States and Cuba*, explores the genesis of scientific and environmental collaborations over the years and what propelled them, the diversity of scientists, academics, government officials and businesspeople involved in them, and why such partnerships have proven to be so mutually beneficial. For example, Dr. Funes notes that in the late 19th and early 20th centuries, numerous American companies owned sugar plantations and mills in Cuba. With support from Tropical Plant Research Foundation and the United States Department of Agriculture, and with financial support from the Sugar Club of Cuba, Cuban and American scientists teamed up in the 1920s to classify Cuban soils and to better understand the role of soils in the cultivation of sugar. American scientist Hugh Hammond Bennett, who led the study and who is widely regarded as the father of soil conservation in the US, wrote in his book *The Soils of Cuba,* "There is probably nowhere else in the world where the influence of the soil is more important than in the sugar plantations of Cuba." At a meeting of the Cuban Society of Soil Science in Havana a few years back, a Cuban scientist told me that they still regarded Dr. Bennett (a fellow North Carolinian of mine) as a hero and that his work remains an important resource in Cuba to this day.

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ARTICLES

Margarita Fernandez, president of the Caribbean Agro-ecology Institute, writes about more recent collaborations between academic scientists, farmers and conservationists around the intersection of agriculture and the environment. In her piece, *Grassroots Learning: Cuba-US Solidarity and Cooperation in Agroe-ecology and Climate Change,* Dr. Fernandez notes that a diversity of new collaborations started in the early 1990s and has continued since then. "Over the past three decades, there have been hundreds of exchanges between Cuban and US farmers, alternative agriculture advocates, policy makers, and academics engaging in a variety of workshops and meetings on issues related to agriculture, food and more recently the climate crisis." As a result of the collapse of the Soviet Union in 1991, and the ensuing economic crisis in Cuba, the country began to move away from industrialized farming, dominated by sugar monoculture, toward agro-ecological and organic production systems and smaller farms that produced a broader range of crops. Collaborations since then have looked at the social, economic, and environmental benefits of Cuba's shift toward small-scale farming and agro-ecology and how those benefits can be sustained in the future. Partners from the United States also have been keenly interested in learning from Cuba's experience and in adapting lessons learned there to advance more environmentally sustainable farming practices in the U.S. For example, the Federation of Southern Cooperatives, a non-profit cooperative association of black farmers, landowners, and cooperatives in the United States, has longed worked with Cuba's National Small Farmers' Association (ANAP) to compare notes and share ideas on sustainable farming practices.

Immediately following the normalization in relations between the US and Cuba in December 2014, agricultural exchanges and collaborations became a top priority, both for NGOs and farmer organizations and for both governments. In 2015 the Cuba-US Agro-ecology Network (CUSAN) was established and since then has brought hundreds of US farmers to Cuba for trainings and learning exchanges around strategies for climate resilience, climate justice, agro ecology and food sovereignty. In 2016, the Cuban Ministry of Agriculture and US Department of Agriculture signed two memoranda of understanding aimed at expanding trade and increasing opportunities for collaborative research.

Liliana Nuñez, Patricia Gonzalez and Valerie Miller also focus their articles on productive environmental and scientific bi-lateral and multi-lateral collaborations since the 1990s. In her piece, *The Sea: a bridge that unites us*, Dr. Gonzalez, professor and former director of the Center for Marine Research at the University of Havana, argues that good policy and sustainable management depend upon sound science that is not artificially constrained to political borders. She examines collaborative research that has been critical to better understanding and addressing shared environmental problems, particularly around degradation to marine and coastal resources and the impacts of climate change. She observes that collaborations are especially effective when premised upon transparency, shared interests and mutual respect. Dr. Gonzalez is one of the leaders of the Tri-National Initiative on Marine Science and Conservation in the Gulf of Mexico, a research collaborative between Cuba, the US and Mexico that was established in 2007 and continues to the present day. This initiative, which includes six thematic areas, has been particularly effective in producing joint research to improve the management of migratory marine species and has led to tri-lateral efforts to establish a network of marine sanctuaries throughout the Gulf of Mexico. Dr. Gonzalez also cites the successful efforts of Cubans and Americans to convince the University of Miami's prestigious *Bulletin of Marine Sciences* to end its long-standing policy of not publishing Cuban authors. In 2018 the Bulletin published a special issue on Cuba, featuring articles jointly written by Cuban, American and Mexican experts, prompting the Miami Herald to run an article entitled, *U.S., Cuban marine biologists put an end to 'academic embargo'.*

Liliana Nuñez, president of the Cuban NGO Fundación Antonio Nuñez Jiménez, addresses the important role that her group and other civil society organizations play in collaborative research and education on a wide variety of topics. She emphasizes the social and cultural aspects of environmental protection, natural resources conservation and sustainable development and stresses the importance of stakeholder and community participation in policy making and management at the local, national and international levels. With the Environmental Defense Fund, Ms. Nuñez' group was one of the founding organizations in 2016 of the *Research Initiative for the Sustainable Development of Cuba*

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(RISDoC), an international initiative focused on sustainability in several sectors of Cuba's economy, including energy, agriculture, tourism and others. That initiative has provided a forum for academics, civil society and governmental officials to come together to discuss how economic development can be achieved without compromising the country's commitment to environmental protection and sustainability.

In *Oceans of opportunity: Recent Cuba – U.S. marine collaboration and future possibilities,* Valerie Miller, director of the Cuba Program at Environmental Defense Fund (EDF), writes that past collaborations on overfishing and conservation of marine and coastal habitats have resulted in new working relationships among resource agencies, research centers, business enterprises and coastal communities around common interests and objectives. For example, Ms. Miller and Dr. Gonzalez both discuss the partnership between EDF, University of Havana's Center for Marine Research and the Cuban Center for Fisheries Research to develop a new training program for professionals from across the island working in fisheries-related fields. Training from this program has already resulted in tangible actions and policies, including new fishery management plans and a nation-wide ban on goliath grouper, a species that is especially vulnerable to overfishing. She also highlights Cuba's progressive plan to prioritize the conservation and management of sharks, developed with assistance from American and Mexican scientists, and *SOS Pesca*, a four-year community-based project to address overfishing, protect marine habitats, and provide alternative livelihoods in remote communities. These past partnerships provide a pathway for new cross-sector initiatives on marine conservation and climate change mitigation and adaptation.

Orlando Rey and Daimar Canovas also speak about the past as a foundation for the future. In *Back on the road: Cuba, US and environmental cooperation*, Mr. Rey, a former government lawyer at the Cuban Ministry of Science, Technology and Environment, draws upon his experiences in collaborating with US environmental lawyers and policy experts in the late 1990s and early 2000s. At that time the Cuban government had just recently established the first ever cabinet-level ministry for the environment and was in the process of developing a suite of new environmental laws and policies. Cuba invited legal and policy experts from the United States to work with them on crafting new measures on coastal zone management, environmental impact assessments, and biodiversity conservation, among others. He says that "at that time, the potential of the environment as a space for cooperation was already very clear, as an area of mutual interest to both the United States and Cuba." Mr. Rey goes on to say that it was no coincidence that in President Obama's speech on December 7, 2014, he chose environmental cooperation as one of the four areas of mutual interest between the US and Cuba. In fact, of the 22 bilateral agreements signed between November 2015 and January 2017, the first two dealt with environmental protection and resource conservation, and environmental matters were addressed in no fewer than 10 of the 22 pacts. Mr. Rey notes that *now* is the perfect time to broaden and deepen Cuba-US environmental cooperation, but rightly reminds us that the level of cooperation seen during the last two years of the Obama administration was short-lived and virtually vanished during the Trump administration. He cautions that for such cooperation to become more "resilient" and durable, it will take a more lasting change in US policy (e.g., a lifting of the US embargo) and strong commitment from both governments.

University of Havana Law School professor Daimar Canovas writes in *Conservation of biodiversity: a space for Cuba-US cooperation*, that global environmental challenges such as climate change and loss of biodiver-

> "[…]
> **Scientists on both sides of the Florida straits have been finding ways to study and work together**
> […]"

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sity cannot be addressed unilaterally. He describes how both are included in the first two bi-lateral agreements signed between the two governments in November 2015. He notes that Cuba has made protecting the environment a top policy priority, even under extremely difficult economic circumstances, and that Cuban citizens now have a constitutional right to a clean environment. In 2017 the Cuban government adopted *Tarea Vida (or Project Life),* a sweeping long-term plan climate change adaptation and mitigation. Professor Canovas maintains that cooperation between the US and Cuba is an "ethical imperative" and that cooperation must go beyond government-to-government accords and include the participation of NGOs, academics and other non-governmental actors. "The future," he says, "is in our hands."

Yordanka Castillo, a Cuban lawyer then associated with the Fundación Antonio Núñez Jiménez, writes about the usefulness of the memorandum of understanding (MOU) as a tool to guide cooperation between US and Cuban entities (governmental and nongovernmental alike). Though non-binding in nature, MOUs provide a measure of formality to collaborations and have proven to be efficient and effective instruments through which partnering organizations can align priorities and provide a pathway for carrying out joint activities in service of common or shared objectives.

Yociel Marrero, of the Fundación Antonio Núñez Jiménez, suggests that the 17 Sustainable Development Goals (SDGs) established by the United Nations in its 2030 Agenda could provide a "safe and diverse platform" for bi-lateral cooperation between Cuba and the United States at a time when all nations draw up plans and partnerships for achieving the goals. He recommends that dialogue take place right away between actors in both countries (governmental and non-governmental) to determine which of the SDGs should be prioritized for collaboration. To this end, he sets forth several specific actions to get the ball rolling. These include forming a regional network of academic institutions and research centers from the United States, Cuba and wider Caribbean around priority SDGs. Mr. Marrero also emphasizes the need for international financial institutions (including those that do not currently fund Cuba) to provide funding to multi-lateral projects associated with SDGs.

In his article, *Cuba-US: Strategies on Furthering Environmental Cooperation,* David Farer, a fellow and former president of the American College of Environmental Lawyers, discusses the work of the College's International Pro Bono Committee and its partnership with Cuba's Fundación Antonio Núñez Jiménez. He notes that COVID-19 resulted in a delay of planned activities in Cuba in 2020, but that partners on both sides of the Florida Straits have found ways to adapt and to continue dialogue and joint activities while waiting for travel to open up again. Mr. Farer also provides a summary of specific ideas for future collaborations suggested by several contributors to this book and by others who presented at the series of webinars on February 21, 2021 hosted by Columbia University. Key areas for collaboration include climate change adaptation and mitigation, clean and resilient energy, sustainable small-scale fisheries, and coastal resilience, just to name a few.

The authors concluded that it is undeniable that the United States and Cuba have a shared interest in environmental protection and sustainability and that suspending dialogue and cooperation until political differences are fully resolved undermines our national interests and is costly to both countries. In a December 11, 2020 letter to President-elect Biden, 15 leaders of US-based NGOs and academic institutions urged the new President to "set a new course, one firmly based on constructive engagement and the centuries old tradition of science diplomacy." the letter's authors argued that "[a] renewed policy of scientific engagement on environmental matters will advance the interests of the United States and those of the Cuban people in a way that ensures a clean and healthy environment and sustains the natural resources upon which our societies and economies depend. Engagement will also be fundamental to carrying out your agenda on promoting clean energy and addressing climate change in Latin America and the Caribbean."

Cooperation in the Biden Era

Most of those who advocate for a US foreign policy of constructive engagement with Cuba have been disappointed with the Biden Administration's timid record on Cuba and express regret at the missed opportunities. While President Biden never promised to fully restore the policies and approaches of the Obama

era, he did indicate an intention to reverse President Trump's most restrictive policies, to reengage diplomatically, and to make support for the Cuban people a priority. The Biden Administration has taken some steps to fulfill those pledges, but those steps have not led to the kind of meaningful reforms many had hoped for and expected. The Administration's unwillingness to remove Cuba from the list of state sponsors of terrorism remains, perhaps, the single biggest obstacle to meaningful improvements in US-Cuba relations.

Nonetheless, President Biden maintained the bi-lateral agreements put in place by President Obama and left intact by Trump; in several instances, the Biden Administration reinitiated a dialogue and cooperation that had languished during the Trump years. Discussions on environmental matters have resumed and, in 2023, the two governments renewed a memorandum of understanding on terrestrial protected areas that had expired. Furthermore, the State Department began issuing some non-immigration visas to Cuban scientists once again, enabling two-way professional and academic exchanges on a variety of issues, from climate change to coral reef conservation, to sustainable agriculture. These exchanges are vital to experts on both sides of the Florida Straits and help keep the door open for more cooperation in the future.

Below are some specific examples of recent cooperative research and other activities that illustrate the mutual benefits of continued collaboration and the potential for deepening scientific and environmental cooperation in the future.

Cuba's Historic Coral Reef Expedition

Cuba is home to four of the world's most climate-resilient coral reefs, making it an ideal location to study and collect data as we seek to preserve other reefs worldwide. Over the last few years, EDF and other US-based NGOs have continued to support Cuban experts and institutions in making important progress to protect these vital habitats, promote marine stewardship, and address overfishing.

In 2023, EDF and the New York-based Wildlife Conservation Society collaborated with Cuban scientists and 30 Cuban institutions to complete Cuba's Historic Coral Reef Expedition[3] (Bojeo a Cuba) on-board the Oceans for Youth vessel, successfully circumnavigating the country to conduct critical research on the health of coastal coral reefs, fish and other marine life. The leading organizations from Cuba included Avalon-Marinas Marlin (Ministry of Tourism), the Center for Marine Research of the University of Havana, Naturaleza Secreta, and the Agency for the Environment within the Ministry of Science, Technology, and Environment. Initial data analysis from the groundbreaking expedition demonstrates both the resilience and fragility of Cuba's coral reefs.

> "[…] it is undeniable that the United States and Cuba have a shared interest in environmental protection and sustainability […]"

Key findings indicate a high biomass of medium fish in 60 % of the areas sampled and a large presence of herbivorous fish across most sites, offering hope for how these fish species may withstand a changing climate. However, researchers also found coral bleaching, disease, and an invasive coral species. Now, Cuban and US partners are working to publish, share, and apply these results, which will help build new pathways forward for healthy oceans in Cuba and strengthen marine protected areas to help reach the global goal of 30 % of marine areas protected by 2030. Additionally, many young Cuban researchers are now using the data for thesis projects, highlighting how this historic expedition will continue to shape the

3 https://vitalsigns.edf.org/story/historic-cuban-voyage-searches-clues-coral-reef-survival

future of marine resource management through its influence on up-and-coming ocean leaders.

El Bojeo became a powerful communications tool to reconnect Cuban communities across the island with their unique natural and cultural heritage. The research vessel stopped in coastal communities to connect residents to science and the marvels of Cuban waters. The expedition has become even more critical as ongoing marine heat waves unfold around the globe. This knowledge can lead to new management and conservation techniques to preserve and slow the degradation of reefs around the world.

Advancing Cuban Coral Reefs' nomination for UNESCO World Heritage Site, EDF and other US-based NGOs (Wildlife Conservation Society, The Oceans Foundation, Cresta Coastal Network) are working with Cuban partners to establish the "Cuban Caribbean Reef System" as a UNESCO World Heritage Site. Sites include Gardens of the Queen and Guanahacabibes National Parks, known as the crown jewels of the Caribbean for their healthy, resilient coral reefs. If selected, this recognition would elevate these parks to the global stage to support their ongoing protection, increase park visitation and recreation (e.g., fly-fishing, SCUBA diving, bird watching), and create more jobs for nearby coastal communities. Partners submitted a pre-proposal at the end of 2023, and, in July 2024 a team from the International Union for Conservation of Nature (IUCN) designated the pre-proposal as "very strong," allowing the nomination to move forward.

Fostering resilience through ecosystems-based adaptation

In December 2022, EDF, Wildlife Conservation Society and Cuban institutions launched a new ecosystems-based adaption project, primarily funded by the Caribbean Biodiversity Fund. This community-centered project focused on promoting community climate resilience in four coastal protected areas connected to Cuba's most important reef systems. Cuba's National Center for Protected Areas (CNAP) serves as the coordinating institution and identified the focus protected areas, where the project is engaging nine coastal communities and ten institutions on climate-resilient strategies to support fisheries, ecosystems, and livelihoods. Over the course of the project, partners have implemented initiatives for coral reef, sand dune and mangrove restoration and climate adaptation planning. EDF and Cuba's Center for Fisheries Research (CIP) co-led a series of trainings on Climate Resilient Fisheries and aquaculture for project participants to learn about marine resource management strategies and examine creative opportunities for alternative livelihoods. During the trainings, EDF and Cuban fisheries scientists have worked with fishermen and conservationists to interpret fisheries assessments and propose new management measures and cultivation options for oysters, fish, and seaweed for three of Cuba's four fishing zones. The success of this project is a result of a community-centered approach: Cuban scientists, fishermen, and protected area staff are now the ones leading the participatory trainings and have the technical and leadership skills needed to further scale sustainable fisheries management. Project partners are also creating community climate adaptation and resilience plans, restoring coastal and marine habitats, developing sustainable fishing plans, and identifying economic alternatives that support conservation.

The Ocean Foundation (TOF) is a US-based NGO that has collaborated with Cuban marine the University of Havana and other science-based institutions since 1999. In 2021, TOF also received a grant from Caribbean Biodiversity Fund Ecosystem based Adaptation Program. The three-year project focused on coastal enhancement activities in Cuba and the Dominican Republic, the two largest island countries of the Caribbean. The highly successful exchange was intended as a south-south collaboration whereby two developing countries shared experiences and technology collaboratively with the goal of assisting coastal communities to adapt to climate change.

In both countries, TOF and partners SECORE International and the *Fundación Dominicana de Estudios del Mar* (FUNDEMAR) worked with the University of Havana and CITMA to replant corals at three sites in both countries using new sexual propagation techniques that provide the genetic diversity needed to withstand bleaching and disease. Coral seeding, or larval propagation, refers to the collection of coral spawn (coral eggs and sperm, or gametes) that can fertilize in a laboratory. These larvae are then settled on special substrates that are later dispersed on the reef without need for mechanical attachment. Over 1.46 hectares of coral habitat was restored through the planting of 46,485 coral substrates.

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> “[…] President Biden maintained the bi-lateral agreements put in place by President Obama and left intact by Trump […]”

The project also worked in both countries to transform nuisance *sargassum* into compost for use by agricultural communities -- removing the need for expensive petroleum-based fertilizers that contribute to nutrient pollution and degrade coastal ecosystems. Finally, the project, though the Cuban Agency for Environment (within CITMA) improved over 1,400 hectares of mangrove habitat in the Cuban provinces of Artemisa and Mayabeque and created the Caribbean School for Mangrove Ecology. Over 5,000 Cuban and Dominican nationals were engaged in the project.

Building a network of resilient coastal communities

In April 2022, Environmental Defense Fund (EDF), the Caribbean Agroecology Institute (CAI)(formerly VCI), and the Foundation of Antonio Nuñez Jiménez (FANJ) hosted the 4th Research Initiative for the Sustainable Development of Cuba (RISDoC) symposium. The 3-day symposium, *Sustainable Livelihoods and Resilience in Cuba's Coastal Communities,* brought together more than 70 participants from across Cuba with international specialists to develop new alliances and share best practices on policies, projects and strategies for climate adaptation and sustainable development in the coastal zone. In the year leading up to the symposium, we adapted to COVID-restrictions and forged new cross-sector partnerships by producing special report, *Sustainable livelihoods for coastal communities: Building climate resilience for energy, fisheries, agriculture, tourism, and communities*, co-authored by 48 Cuban and international experts across diverse sectors which curates for the first time a vast compilation of experiences and visions for a more sustainable and resilient Cuba. Most co-authors participated in the 4th RISDoC symposium, and many presented on their activities and perspectives on coastal adaptation. This integrated approach is helping Cuba address its environmental, economic and food security goals.

In May 2023, EDF, the Caribbean Agro-ecology Institute and the Foundation of Antonio Nuñez Jiménez (FANJ) held the 5th International Seminar of our Research Initiative for the Sustainable Development of Cuba (RISDoC) focused on Urban Coastal Zone Resilience. More than 100 entrepreneurs, community leaders, and municipal government officials from across Cuba joined with coastal experts to advance equitable and just economic growth that builds climate resilience. Participants shared best practices from across the country as well as case studies from New Orleans, Puerto Rico, and Mexico that showcased how these coastal regions are navigating similar effects of climate change. The event amplified the voices of entrepreneurs who talked about the progress and challenges of innovative food production and included field visits to an aquaponics business and a coastal farm that restored mangroves and hosts learning exchanges. Since EDF and FANJ first started RISDoC in 2016, we have observed the myriad ways this event helps transform the country. Partners say they continue to hear “the echoes of RISDoC” in efforts to promote participatory processes across sectors — from local development planning to oyster production to clean energy. Participants share that the event serves as a growing force for optimism and possibility for partners across disciplines and throughout the country, recognizing it as a unique space to learn and build connections with people who would not otherwise come together. National institutions, NGOs, municipal government, and private sector stakeholders now collaborate in new ways, view each other as partners in local development, and openly discuss how to activate and engage with local communities.

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Knowledge sharing and building capacity

Cuban scientists are highly trained and accomplish so much with relatively few resources. For example, Cuban climate scientists have designed sophisticated models to estimate sea level rise and project how climate change may impact coastal communities and ecosystems in the future. They are also experts on using nature-based infrastructure (like mangrove forests, sea grass beds and coral reefs) to mitigate the impacts of climate change. This expertise is central to the country's efforts to adapt to climate change and has positioned Cuba to play an effective role in international climate change negotiations and agreements. Cuban botanists, marine ecologists, wildlife scientists and other experts are widely respected throughout Latin America and the Caribbean for their research, expertise, and an impressive track record in protecting natural areas and biodiversity; Cuban experts often provide technical assistance to other countries in the region.

EDF staff and other US-experts frequently collaborate with Cuban partners on peer-reviewed scientific and policy articles published in journals in the United States and other countries. In 2018, EDF and scholars from the Gund Institute in Vermont and the Center for Marine Research at the University of Havana collaborated on a special issue of the University of Miami's Bulletin of Marine Sciences[4] that featured 17 scholarly articles from teams of Cuban and American scientists, ending the journal's policy to not publish work by Cuban authors.[5] In 2025, the Bulletin of Marine Sciences will publish a second special issue on Cuba with at least 13 peer-reviewed articles, focusing on the results from *el Bojeo* (discussed above). EDF and Cuban scientists will serve as co-editors of that issue.

US-based NGOs have also secured visas and provided support for scientists, fishermen, community leaders, resource managers and officials to present their work and participate in conferences and exchanges around the world. This helps ensure that Cuba's impressive progress informs the global community and that Cuban partners have opportunities to learn from projects in other countries, particularly Mexico, Belize, The Bahamas Chile, Puerto Rico, and the United States.

The Harte Research Institute (HRI) for Gulf of Mexico Studies at Texas A&M University-Corpus Christi has been particularly active in organizing capacity building opportunities around the Gulf of Mexico large marine ecosystem. Since 2010, HRI's *Gulf of Mexico Student Workshop on International Coastal and Marine Management (SWIMM)* has brought together graduate students from Mexico, Cuba, and the United States for peer-to-peer exchanges, shared learning, and intensive interactions with scientists, managers, and practitioners[6].

Science Diplomacy

The American Association for the Advancement of Science (AAAS) has long pursued exchanges and collaborative activities on a wide range of topics with counterparts in Cuba. In 2014, AAAS and the Cuban Academy of Sciences signed an initial memorandum of understanding (MOU) that resulted in three workshops in Havana on neurosciences, cancer immunotherapy and mosquito-borne illnesses. In 2022, AAAS and the Cuban Academy signed a second MOU committing to scientific cooperation on environmental conservation, ocean and marine studies, health, public policy on science and other issues of mutual interest. In March 2023 AAAS organized a delegation of 15 government, academic and NGO experts to travel to Havana for a symposium on environmental and public health issues.[7] In March 2024, AAAS organized a 20-person delegation to Havana for an exchange on aging and disaster management. That event included high level US government officials from the US National Oceanic and Atmospheric Administration (NOAA) in charge of marine conservation, fisheries management, and hurricane preparedness and response.[8] Finally, in September 2024, AAAS organized meetings in Mexico with public health experts from Cuba, the United States and Mexico. AAAS' Center for Science Diplomacy has signaled its intent to continue making cooperation with Cuba a priority in the future.

4 https://joeroman.com/wp-content/uploads/2018/04/roman-intro.pdf

5 https://www.miamiherald.com/news/nation-world/world/americas/cuba/article219965430.html

6 https://www.harteresearch.org/project/gulf-mexico-student-workshop-international-marine-management-swimm

7 https://www.aaas.org/news/aaas-and-cuban-academy-sciences-reflect-future-us-cuba-scientific-cooperation?utm_label=AAASNews

8 https://www.aaas.org/news/aaas-and-cuban-academy-sciences-brainstorm-us-cuba-shared-challenges-and-opportunities-aging.

Clean Energy and Climate Resilience

Shortly after taking office, President Biden made clear that fighting climate change would be a top priority. Upon signing an executive order on climate change on January 27, 2021, Biden said his was a "whole-of-government approach to put climate change at the center of our domestic, national security, and foreign policy." At the COP 26 in Glasgow, Scotland later in the year, the Biden Administration reasserted the United States' leadership on climate and, together with leaders from the European Union, launched the Global Methane Pledge, which aims to reduce global methane emissions by at least 30 percent from 2020 levels by 2030. Cuba signed the pledge shortly after the COP.

In April 2022, Vice President Harris announced the new U.S.-Caribbean Partnership to Address the Climate Crisis 2030 (PACC 2030) as the principal initiative for supporting Caribbean countries in climate adaptation and energy security.[9] The PACC 2030 initiative has four pillars: 1) improving access to development financing, 2) facilitating clean energy project development and investment, 3) enhancing local capacity building, and 4) deepening collaboration between the U.S. and Caribbean partners. These pillars aim to address key concerns of Caribbean nations, and commitments and projects are outlined within the framework of these pillars.

Cuba's energy sector is at a crossroads. The country's mostly fossil fuel-fired energy system faces a number of longstanding and serious challenges, including breakdowns at aging power plants, decreasing fuel imports and fuel shortages, and the growing threat of climate change-related disruptions. In recent years, Cuba has seen frequent electric blackouts and brownouts that have affected residents, businesses, and government institutions island-wide. Like the rest of the Caribbean, Cuba is overly dependent upon expensive, imported fossil fuels, which seriously compromises the country's energy security and economic development, and its citizens well-being. Aging power plants and transmission lines are in serious need of repair, are not capable of providing reliable electricity to citizens, and are extremely vulnerable to hurricanes. The Cuban government has adopted ambitious clean/renewable energy goals: 37% by 2030; and increasingly there is a discussion around an "energy transition" in Cuba and setting a 100% goal for the future, in line with the direction many Caribbean Island nations are taking. This makes perfect sense—the cost of solar, wind and other renewable energy technologies has been decreasing, making transition the economically smart and sensible thing to do.

As pointed out in EDF's 2017 report on Cuba's electric grid,[10] Cuba has more distributed energy generation than every other country in the world, except Denmark. The decentralized system provides resilience in the face of hurricanes. Though these "microgrids" are not mostly diesel generators, they can be converted to low carbon microgrids, powered by solar and other renewables. In 2024, EDF and Columbia University's Sabin Center for Climate Change Law published an update report on Cuba's energy situation.[11] The report provides detailed information on the current state of Cuba's electricity sector and recommends reforms to advance the transition to a lower emission, reliable, and more climate resilient system. The recommendations include possible changes to Cuban domestic policies to, among other things, encourage greater public and private investment in the country's energy transition. The report also explores how a bilateral dialogue between the U.S. and Cuban governments could help to drive renewable

9 https://www.state.gov/pacc2030/

10 https://www.edf.org/sites/default/files/cuban-electric-grid.pdf

11 https://scholarship.law.columbia.edu/sabin_climate_change/220/

> "[…]
> **Cuban scientists are highly trained and accomplish so much with relatively few resources**
> […]"

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energy development in the island nation, in a manner that benefits the Cuban people as well as the interests of people throughout the region.

Looking ahead

At the time of this writing, the outcome of presidential election in the United States is still unknown. Unlike in 2008 and 2016, the issue of Cuba has barely registered in the campaigns of the two major candidates, and it seems unlikely that Cuba will be a foreign policy priority at the outset of the new administration in Washington, regardless of who wins. That said, conventional wisdom suggests that a President Harris would follow the Biden Administration's approach to Cuba, at least in the short run, while a President Trump would gradually chip away at the modest progress in policy and diplomatic relations made since 2021.

Over the longer term, there is some promise that a President Harris would craft her own, constructive approach to Cuba, within a broader Caribbean initiative.[12] As noted above, Harris led the U.S.-Caribbean Partnership to Address the Climate Crisis 2030 (PACC 2030) as the principal mechanism for supporting Caribbean countries in climate adaptation and energy security. A Harris Administration could build upon PACC 2030 by giving it a greater sense of urgency and more financial support and by explicitly including Cuba within the initiative. Such a move would be a logical next step, reflecting Harris' particular interest in the region, and would be an extremely positive one that could open the door to constructive engagement on other issues.

In either scenario, we can expect that some measure of dialogue and cooperation on science and the environment will continue because, as history has shown us, science and the environment know no borders.

References

Crahan, M., ed. (2021). US-Cuba Working Together Again: Lessons from Environmental Cooperation. Columbia University.

Harter Research Institute for Gulf of Mexico Studies. The Gulf of Mexico Student Workshop on International Marine Management (SWIMM). https://www.harteresearch.org/project/gulf-mexico-student-workshop-international-marine-management-swimm

Marczak, J. (2024). What Kamala Harris's record in Central America and the Caribbean reveals about her foreign policy approach. Atlantic Council. https://www.atlanticcouncil.org/blogs/new-atlanticist/what-kamala-harriss-record-in-central-america-and-the-caribbean-reveals-about-her-foreign-policy-approach/

Miami Herald (2018). U.S., Cuban marine biologists put an end to 'academic embargo'. https://www.miamiherald.com/news/nation-world/world/americas/cuba/article219965430.html

Ortiz Calva, E. (2023). AAAS and Cuban Academy of Sciences Reflect on the Future of U.S.-Cuba Scientific Cooperation. https://www.aaas.org/news/aaas-and-cuban-academy-sciences-reflect-future-us-cuba-scientific-cooperation?utm_label=AAASNews

Ortiz Calva, E. (2024). Sciences Brainstorm on U.S.-Cuba Shared Challenges and Opportunities in Aging and Disaster Management. https://www.aaas.org/news/aaas-and-cuban-academy-sciences-brainstorm-us-cuba-shared-challenges-and-opportunities-aging

Panfil, M., Whittle, D., Silverman-Roati, K. (2017). The Cuban Electric Grid. Lessons and Recommendations for Cuba's Electric Sector. https://www.edf.org/sites/default/files/cuban-electric-grid.pdf

Silverman-Roati, K. et al. (2024). Building a Cleaner, More Resilient Energy System in Cuba: Opportunities and Challenges, Sabin Center for Climate Change Law and Environmental Defense Fund. https://scholarship.law.columbia.edu/sabin_climate_change/220/

The ecology and conservation of Cuba's coastal and marine ecosystems (2018). Bull Mar Sci. 94(2): 149-169. https://doi.org/10.5343/bms.2017.1164

U.S. Departament of State. U.S.-Caribbean Partnership to Address the Climate Crisis 2030. https://www.state.gov/pacc2030/

Vital Signs (2023). Historic Cuban voyage searches for clues to coral reef survival. https://vitalsigns.edf.org/story/historic-cuban-voyage-searches-clues-coral-reef-survival

12 See e.g., https://www.atlanticcouncil.org/blogs/new-atlanticist/what-kamala-harriss-record-in-central-america-and-the-caribbean-reveals-about-her-foreign-policy-approach/

Cooperation on Marine Protected Areas Management between Cuba and the United States

Fernando Bretos Trelles

Cresta Coastal Network, a Project of The Ocean Foundation
ORCID: 0000-0002-7547-4820
e-mail: fernando@crestacoasts.org

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Abstract

Ocean science diplomacy refers the pursuit of science and its ability to transcend politics. In the context of this article, it refers to cooperation among countries with adversarial political relationships to conceive solutions to common threats to the ocean. This paper highlights some of the science diplomacy efforts between the United States and Cuba over the past three decades. These same efforts catalyzed the political détente between US President Barrack Obama and Cuban President Raul Castro that was announced on December 17th, 2014. This paper focuses on a marine protected area network that came about because of this rapprochement and which has been expanded by a group of scientists despite a return to political restrictions in 2017. The Gulf of Mexico MPA Network is a network of 11 marine protected areas (MPAs) in Mexico, Cuba, and the United States that continues to serve the shared interests of the three countries.

Keywords: *Cuba, United States, US embargo, marine protected area, ocean science diplomacy, gulf of mexico*

Introduction

Cuba and the United States have maintained diplomatic tension for seven decades resulting mainly from the US economic embargo against Cuba. The embargo was initially enacted by President Dwight D. Eisenhower in 1960 as an extension of an arms embargo originally executed in 1958. The policy was a means of blocking imports to and exports from Cuba in response the Cuban Revolution. Later in 1962, President John F. Kenney extended the policy as a complete economic embargo of the country. This policy has been maintained by 12 US presidential administrations since Eisenhower. It has restricted all manner of socioeconomic exchange between the countries for generations.

One exception to the political isolation has been scientific research. Cuba and the US have a long history of collaboration in the natural sciences going back to the 19th century. Scientific cooperation has perdured the political isolation through groups of intrepid scientists between the US and Cuba who believe studying and conserving shared marine and coastal resources trumps politics. This article outlines a collaborative platform initiated in 2007 that led to the announcement of a sister sanctuary program between the US and Cuba in November 2015. This sister sanctuary program paved the way in 2017 to the creation of a trans-boundary and regional marine protected area (MPA) network between Cuba, US and Mexico, the three countries that share the Gulf of Mexico. Called the Gulf of Mexico, or RedGolfo, this network brings together MPA managers from 11 MPAs in the region to address shared threats such as climate change, oil spills, mass tourism, overfishing and others by working together on joint solutions.

Trinational Initiative for Marine Science and Research in the Gulf of Mexico and Western Caribbean

In 2007, scientists and governments from the United States and Cuba came together in Cancun, Mexico to discuss the creation of a platform to formalize and normalize cooperation in marine science. The result was the creation of the Trinational Initiative for Marine Science and Conservation in the Gulf of Mexico and Western Caribbean (3NI) (www.trinationalinitiative.org). 3NI is a collaborative framework that overcomes political barriers to promote ongoing joint scientific research to preserve and protect the shared waters and marine habitats of this dynamic and highly connected marine and coastal region. Scientists and agency representatives from the three countries, representing six working groups, one of which concentrates on MPAs, meet regularly to plan marine research and policy outcomes that address the needs of coastal stakeholders and improve coastal and marine habitat quality in each country. The other working groups beside MPAs are coral reefs, fisheries, marine mammals, sea turtles and sharks and rays. Since its beginnings, 3NI has facilitated research and conservation collaboration through eight

workshops in each of the three countries. Countless scientific publications and conservation tools, such as the Gulf of Mexico Coral Reef Report card (2019) have resulted from this trinational cooperation.

The 3NI platform has contributed to numerous regional collaborations including a sister sanctuary program that was conceived cooperatively by the National Oceanic and Atmospheric Administration and Centro Nacional de Áreas Protegidas (Cuba) during a 2013 3NI meeting in Corpus Christi, Texas. During the rapprochement between Presidents Barack Obama and Raúl Castro, initiated on December 17th, 2014, scientists recommended the creation of this sister sanctuary program to both administrations understanding that the leaders of the two countries saw environmental cooperation as the basis for bilateral cooperation that would transcend 55 years of political deadlock. This sister sanctuary program named Guanahacabibes National Park and Banco de San Antonio in Cuba and Florida Keys National Marine Sanctuary in Florida and Flower Gardens NMS in Texas as the four MPAs contributing to the agreement. Both the sister sanctuary agreement and a separate agreement between the US State Department and Cuba's Ministry of Foreign Relations (MINREX) were announced and signed in November 2015. The latter, entitled the Memorandum of Understanding on Cooperation in the Conservation and Management of Marine Protected Areas, created a unique bilateral network that facilitated joint efforts concerning the science, stewardship, and management between Cuba and the US. Despite the return of political restrictions by President Donald Trump in 2016, both agreements remain active.

Two years later, RedGolfo was founded in at a workshop Cozumel in December 2017 when the Mexican Ministry for Environment (SEMARNAT) recommended adding seven MPAs to the network making it a truly Gulf wide effort. This was instigated by the recent approval of a Gulf of Mexico Large Marine Ecosystem projected, funded by the Global Environment Facility, which stipulated the creation of a broad regional MPA network to manage fisheries and habitat conservation. RedGolfo brought together 11 MPA managers from the three countries to informally create a new Gulf of Mexico Marine Protected Area Network. At a follow up meeting in Merida, Mexico in April 2018, The Ocean Foundation,

> "[…]
> **Cuba and the US have a long history of collaboration in the natural sciences**
> […]"

a US based nonprofit overseeing the network, oversaw the signing of MOUs between Mexico's Protected Area Commission (CONANP) and Cuba's National Protected Area Center (CNAP). At that same meeting, a broader guiding document conceived by the 11 MPA network managers to continue advancing the goals and stakeholders of this fledgling MPA network was drafted.

Gulf of Mexico MPA Network (RedGolfo)

The newly created Gulf of Mexico MPA Network (RedGolfo) is an example of how, despite decades of stalemate caused by the US embargo against Cuba, government officials, scientists, and practitioners from US, Cuba, as well as Mexico came together in 2017 to find common ground.

The network's goal is to share results and lessons learned in building resilience to shared threats such as climate change, overfishing, tourism and oil spills. Its work is far from over with political changes in the US and Mexico and the pandemic pausing many of RedGolfo's operations. However, RedGolfo was taken a step further at the International Marine Protected Area conference in Vancouver in February 2023 where The Ocean Foundation helped leverage an historic meeting between NOAA and CNAP to continue working on bilateral cooperation between Cuba and the US on MPA related issues despite the political impasse between the countries.

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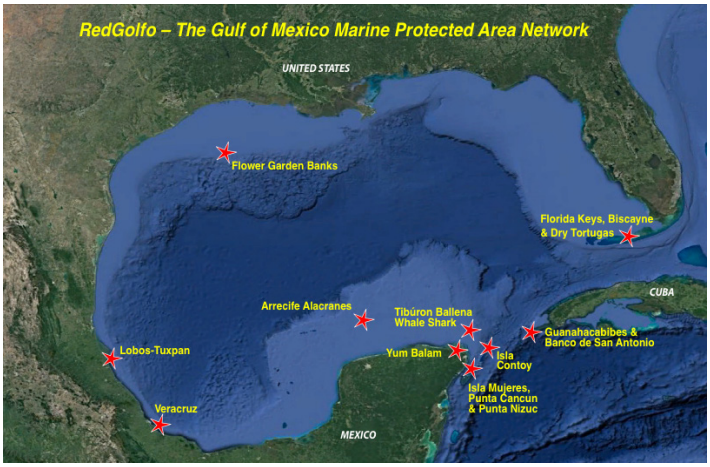

Map of the marine protected areas in RedGolfo: The Gulf of Mexico Marine Protected Area Network.

Conclusions

The Trinational Initiative and the resulting RedGolfo has served as a catalyst for international cooperation in the Gulf of Mexico. RedGolfo, despite political tension, remains a strong tool to expand research and cooperation on shared marine resources in the Gulf of Mexico, the largest enclosed body of water in the Atlantic Ocean and home to over 60 million residents in each of the three countries. Ocean science diplomacy continues to bring together scientists to transcend political tensions in the spirt of scientific discovery. RedGolfo and the Trinational Initiative are effective platforms that provide a safe space for scientific progress.

References

A. Polejack, L.F. Coelho, Ocean Science Diplomacy can Be a Game Changer to Promote the Access to Marine Technology in Latin America and the Caribbean, Front. Res. Metr. Anal. 6 (2021) 637127. https://doi.org/10.3389/frma.2021.637127.

A. Polejack, S. Gruber, M.S. Wisz, Atlantic Ocean science diplomacy in action: the pole-to-pole All Atlantic Ocean Research Alliance, Humanit Soc Sci Commun. 8 (2021) 52. https://doi.org/10.1057/s41599-021-00729-6.

A. Polejack, The Importance of Ocean Science Diplomacy for Ocean Affairs, Global Sustainability, and the UN Decade of Ocean Science, Front. Mar. Sci. 8 (2021) 664066. https://doi.org/10.3389/fmars.2021.664066.

C. Besancon, T. Mudford, Evaluation Framework for Marine Protected Area Manager Networks, OCEAN GOVERNANCE Protecting and Restoring Marine Ecosystems, Catalysts for Building Peace and Security and Fostering Sustainable Economies, South Asia and Atlantic Ocean Basin. (2023).

C.M. Fieseler, N. Al-Mudaffar Fawzi, B. Helmuth, A. Leitão, M. Al Ainsi, M. Al Mukaimi, M. Al-Saidi, F. Al Senafi, I. Bejarano, R. Ben-Hamadou, J. D'Addario, A. Mujthaba Dheen Mohamed, B.W. Giraldes, L. Glowka, M.D. Johnson, B.P. Lyons, D. Mateos-Molina, C.D. Marshall, S. Mohammed, P. Range, M. Reza Shokri, J.M.K. Wong, N.D. Pyenson, Expanding ocean protection and peace: a window for science diplomacy in the Gulf, R. Soc. Open Sci. 10 (2023) 230392. https://doi.org/10.1098/rsos.230392.

H. Harden-Davies, The next wave of science diplomacy: marine biodiversity beyond national jurisdiction, ICES Journal of Marine Science. 75 (2018) 426–434. https://doi.org/10.1093/icesjms/fsx165.

T. Mudford, C. Besancon, Guidelines and Best Practices for MPA Manager Networks, (2022).

Cuba–USA cooperation in Meteorology (1850-1961)

Prof. Luis Enrique Ramos Guadalupe

Professor and researcher

Coordinator of the History Commission, Cuban Meteorological Society; Secretary for scientific activity, Union of Historians of Cuba, Havana

ORCID: 0009-0008-6550-7917

e-mail: luisenrique.meteor@gmail.com

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Abstract

The initial attempts to establish effective cooperation between scientists and institutions in the field of tropical meteorology of both, Cuba and the USA, are described and analyzed, as well as further efforts to widen and consolidate those first steps. This study focuses on the more relevant actions during three periods that correspond broadly with the colonial era, the first decades after the establishment of the Cuban Republic, and the new context that is defined by World War II and its aftermath, until the moment when diplomatic and commercial relations between both countries were severed. Significant factors that promote this cooperation in each stage, like the geographic situation of the Cuban archipelago, Cuban proximity to the US, the proficiency of Cuban meteorologists; tropical hurricanes and the need to increase the efficacy of both, forecasts and early warning systems, for natural events that affect both countries were taken into account.

Keywords: *cooperation, meteorology, forecasts, hurricanes*

Introduction

Beyond the human interest in sharing knowledge for mutual benefit and the common good that the generalization of advances in science and technology brings to nations, the primary reason and starting point for Cuban-US collaboration in meteorology arises from their geographic proximity. Their natural and political-administrative borders converge at the northern limit of the tropical belt, where both states share a marine sector between the Old Bahamas Channel and the Yucatan Channel, just at the entrance to the Gulf of Mexico.

The ports of southern North America and those of northern Cuba have the Straits of Florida as a route, where the Gulf Stream stimulates the development of thunderstorms and tropical cyclones that often intensify into hurricanes. In their different spatial-temporal scales, the effects of Ian, Idalia and Milton, all in the 2020-2024 quadrennial, exemplify these phenomena that equally impact the society and economy of both countries, and reach the entire region.

In order to focus on the subject that motivates this article —always from a Cuban perspective—, we will refer to three stages delimited by relevant events in the political context. The first two intervals in our periodization cover, respectively, from 1850 to 1898, and from 1899 to 1941; while the third and last one is developed over nineteen years, from 1942 to 1961.

In the initial stage, framed in the final years of the colonial regime in Cuba, the first links between Cuban and American meteorologists were established, generally at the initiative of the Creoles, without any agreements or legal instruments. This is explained, among other reasons, by the opposition of the Spanish Crown to promote the development of an autochthonous science and its application to the territory of "the Island of Cuba", since it was understood that any intellectual freedom could mean an expression of independence and sovereignty. In addition, Spain foresaw among other threats the one represented by "the Americans", and placed certain limits to its objectives and interests in Cuba.

In keeping with its political status, the representation of the "Island" in the nascent international forums on weather and climate was in charge of the officials from Madrid, as it happened in the Maritime Meteorological Conference held in London from September 10 to 16, 1874 (WMO/WMO, 1973), where Spain and its overseas territories were represented by the mariner, astronomer and meteorologist from Cadiz, Cecilio Pujazón García (Mohn, 1878).

As alternatives, the Sociedad Económica de Amigos del País (1793-present) and the Real Academia de Ciencias Médicas, Físicas y Naturales de La Habana (1861-1961) were exceptions in the promotion and application of a science with indigenous roots; however, they were limited to the capital and lacked the authority to establish lines of collaboration with foreign countries.

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> “[...] the primary reason and starting point for Cuban-US collaboration in meteorology arises from their geographic proximity [...]”

In the second stage, at the beginning of the Republic, the interest of the North Americans in Cuba was reinforced, including the incentive of the tropical nature. The end of the war against Spain and the relationship of political and economic dependence that gravitated towards the United States, opened the possibility of seeking new knowledge in a nearby and easily accessible country.

In the third stage, a new context arose which required the United States to seek from science a better knowledge and forecast of the tropical systems that affected the economic activity and the operability of its military forces, oriented to a broad spectrum of interests in the continent.

Once this methodological framework has been defined, we will characterize each interval, under the premise of not considering the scientific collaboration or cooperation at that time, in the manner and form that these terms currently acquire with respect to international programs and projects. The following is a synthesis of how this interaction was expressed in the three moments already mentioned.

Development

Havana Observatories, the Smithsonian Institution and the Signal Service

The first Cuban who had exchanges in meteorological matters with an American colleague was Andrés Poey Aguirre (1825-1919), who established ties with Joseph Henry (1797-1878), secretary of the famous Smithsonian Institution in Washington, D.C. These ties were created in 1850, when Poey learned that since the previous year Henry had been promoting a network of volunteer weather observers in North America, Central America and the Caribbean (Smithsonian Institution Archives, 2024). The relationship was channeled from the epistolary exchange that Henry and Felipe Poey Aloy —Andres' father— had previously had on topics of mutual interest in the natural sciences (Pruna, 2006, pp. 122-123).

Relations between Andrés and Henry acquired a more formal character in January 1861, when the Spanish authorities created the Physical-Meteorological Observatory of Havana and elevated the young Cuban to the position of director (Cuban National Archives, 1856- 1862). This led to the exchange of serial publications, observations and special works, such as the one related to the intense geomagnetic storm that occurred in August 1859, which produced aurora borealis and extreme phenomena in North America. The auroras were observed in Havana at lower latitudes and Poey made a study of them which is today among the most complete on this event (Kimbal, 1960).

The first comparative study based on meteorological data from Cuba and the United States appears in a monograph by Poey focused on thunderstorms and their effects in both territories (Poey, 1856).

In the early 2000s, Cuban researcher Pedro M. Pruna Goodgall visited the Smitsonian Institution, and in the documentation related to Cuba he found evidence of the epistolary exchange between the two scientists. The links were interrupted in 1869, when the colonial government removed Poey from the direction of the Observatory. After his dismissal, Andrés left Cuba for the United States, where “he got in touch with Joseph Henry and Luis Agassiz” (Pruna, 2006). He stayed two years in North America, before settling definitively in France (Ortiz, 1979).

The most important institution in terms of meteorological research in Cuba in the 19th century was

the Observatory of the Royal College of Belen, run by Spanish Jesuit priests. As a private educational institution, and under the protection of the Church, it enjoyed a certain independence from the Government. In the field of Earth and atmospheric sciences, its authority was almost unquestionable. The Jesuits had 33 observatories spread throughout the world (Udías, 2003), and the one in Havana was undoubtedly the largest and best equipped in the tropical zone.

For the daily operational work, its director, Father Benito Viñes Martorell, S.J. (1837-1893) collected data and oral or written reports from the pilots and captains of ships docked or anchored in Havana harbor, including U.S. ships traveling between Central America, the Caribbean, and the Gulf and Atlantic ports. Most of these ships were consigned to Galveston, New Orleans, or New York, and whenever he could, he took notes from the binnacle of ships bordering the Atlantic in the months of the hurricane season, and compared the storm reports with his own observations in Havana (Ramos, 2023).

Since September 1867, Cuba had an international telegraphic link by submarine cable (Altshuler, 2014, p. 20), and the data folders of the Belen Observatory show the method of meteorological surveillance based on the reports received by the cable between Havana and Key West. In the months of greatest danger during the hurricane season, Viñes took into account the telegrams sent from Washington by the old Signal Service (Gutiérrez-Lanza, 1904), and later by the Weather Bureau (now the National Weather Service). The exchange of serial publications, mainly the Yearbooks with the tables of variables measured at the Havana observatory, deserves a special mention. Thanks to the sending of these volumes, it is now possible to recover and access these data, available in the digitized collections of the National Oceanic and Atmospheric Administration of the United States (NOAA), and accessible on Google platforms (NOAA, 2023). The Bethlehem College observation series spans nearly a century and is a valuable reference in climate change research.

A problem linked to hurricane forecasts was the weather reports in the Caribbean, which required paying for the telegrams that were sent daily from the Lesser Antilles, using the submarine cable. Regarding this antecedent of the current early warning systems, Father Mariano Gutiérrez-Lanza, S. J. (1865-1943), Viñes' successor at the Belen Observatory, points out:

> It was indeed a precious help and an extraordinary deference on the part of the Signal Service in Washington to allow Fr. Viñes to copy the telegrams sent to that central office by his observers in the West Indies [...] however, the assignment to send warnings whenever Fr. Viñes of any cyclone that was dangerous for the Great Republic [United States] continued until 1898, both during the life of Fr. Viñes and in the time of Fr. Gangoiti, his immediate successor. (Gutiérrez-Lanza, 1904, p. 20).

In 1886, when several shipping and marine insurance companies decided to jointly pay for the payment of messages to and from Havana, limiting them to the months of greatest frequency in the formation of hurricanes. Among these insurers, the New York Board of Underwriters stood out, which adjusted the value of the policies to the months of the hurricane season (*El León Español*, 1886, p. 2). On occasions, the officers of the American ships came to compare their chronometers with the instruments of the Belen Observatory; and even, before setting sail, they went to inquire about the potential hurricane danger in the Caribbean, the Gulf or the Atlantic (Gutiérrez-Lanza, 1904, p. 29).

At the end of the 19th century, important scientists visited the Belen Observatory; among them Louis Agricola Bauer (1865-1932), Chief of the Division of Terrestrial Magnetism of the United States; and Edward Everett Hayden (1858-1932), Chief of the Division of Marine Meteorology of the Hydrographic Office of that country, who came to Havana in October 1888 to exchange data and reports on the intense hurricane that the previous month had crossed over the Strait of Florida (Gutiérrez-Lanza, 1904, p. 103). Both visits presuppose a discussion of criteria, methods, observational data and the exchange of publications.

When Spanish sovereignty in Cuba ceased and U.S. intervention and occupation began, the U.S. government ordered the Weather Bureau to create a district section in Havana, mainly oriented to the forecast of hurricanes and the study of the weather (Stockman, 1899). The bureau had meteorological stations in the Cuban territory; and its chief, William B. Stockman, held the position of "Weather Bureau Official in the Havana

Forecast District". Stockman occupied this responsibility until the end of the Interventory Government.

The Republic and the North. Meteorological information and competing interests

After the Intervention, one of the first decisions of the Cuban government was to create the National Meteorological Service. For this purpose, it reproduced the structure of the former Weather Bureau Office. The new entity adopted the name of Central Meteorological, Climatological and Crop Station, and in tune with the U.S. Weather Service, it was subordinated to the Secretariat of Agriculture, Industry and Commerce (Republic of Cuba, 1902). Its first director was the Cuban sailor Luis García Carbonell (1840-1921), chosen not only for his proven knowledge of nautical meteorology, but also to mark a line of continuity with the American office, since Stockman had incorporated Carbonell to the Weather Bureau, to be in charge of the computation of climatological data.

With the influx of U.S. capital and its large investments in the sugar industry and other sectors, studies on Cuba's climate came to the forefront. In the weekly reports elaborated and published by the Station, we find reports on rainfall, temperatures and humidity sent by Americans living in the country; almost always administrators, technicians and assistants of the sugar mills, mines and estates. They acted, in fact, as volunteer meteorological observers.

In 1908, the Central Station adopted the name of National Observatory and established its headquarters on the heights of Casa Blanca, where today the buildings of the Institute of Meteorology are located. In 1921, after Carbonell's death, the young José Carlos Millás Hernández took over the direction of the Observatory. Millás had attended high school in New York, and after graduating in civil engineering and architecture from the University of Havana, he obtained a postgraduate degree in Celestial Mechanics from the University of Chicago (Millás, 1917-1961). With such a background, his relationship with his North American colleagues was evident.

Among the first Cuban-US links in the 1902-1941 period was the process of agreement, design and manufacture of a telescope for the astronomical section of the National Observatory. The idea arose in 1915, when a large official Cuban delegation participated in the Second Pan-American Scientific Congress (Republic of Cuba, 1915), held in Washington and aimed at promoting alliances and shaping relations between the United States and the republics of the Hemisphere.

In the process of building the instrument, Millás had as his technical counterpart Professor John Brashear, in charge of machining the optical elements that were assembled by The Warner & Swasey Company, in charge of the manufacture (Rodríguez, 2001). It was a long and arduous process, delayed by the First World War; but once the conflict was over, the 508 mm diameter refractor was installed in Havana and is now in the safekeeping of the Cuban Institute of Geophysics and Astronomy, awaiting its future restoration.

Later, in 1925, the meteorological section of the Observatory introduced the pinball technique, aimed at improving forecasts by incorporating data from the "upper air", i.e., conditions in the middle and upper troposphere (Millás, 1926).

The Secretary of Agriculture financed part of the technical infrastructure, but the money was only enough to buy the balloons, the gas to charge them, the reticulated planchettes to set the balloon positions during the ascent, and some other equipment. In view of this, Millas sought support from meteorologist Charles Frederick Marvin, of the Weather Bureau, and obtained the shipment of an aerological scale to measure the

> "[...]
> **Since September 1867, Cuba had an international telegraphic link by submarine cable**
> [...]"

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volume of gas in the filled balloons, and a drawing board to work with the charts where the ascent of the balloon was plotted (Millás, 1926). In reciprocity, since January, 1926, Cuba began to send to Washington the upper air data, adding them to the cablegram with the general state of the local weather.

At the stage we are analyzing, the relations between the National Observatory and the Weather Bureau were developed at the behest of the meteorologists, and not by the political will of the respective governments. Finally, the Cubans were trying to fulfill their mission in a country lacking state programs for the science sector.

An example of such inconveniences is provided by history in the 1927-1928 biennium, when it was learned that transmissions from the radiotelegraph station located in the small archipelago of Swan or Santanilla Islands, would cease definitively. The observations on those islands, carried out by U.S. personnel, were of paramount importance for monitoring the weather in the Caribbean Sea, mainly in its western region, cradle and path of dangerous hurricanes.

The radio transmitter installed there was owned by Tropical Radio, an affiliate of the United Fruit Company, which used it to manage refrigerated merchant ships carrying agricultural products and cargo between Central America and the United States. However, in view of the boom and expansion of radio telegraphy, United Fruit installed radio equipment on all its ships, and the Swan station became unnecessary; it was no longer profitable, and they opted to close it. The collateral effect was the loss of meteorological data, which left a vacuum of sensitive information for the National Observatory (*Diario de la Marina*, 1928, p. 1).

The eventual solution to the problem seemed to lie in an agreement between the United States Department of Agriculture and Tropical Radio Corporation. Miguel Angel de la Campa y Caraveda, Undersecretary of State of the Republic of Cuba, made arrangements with the State Department to resume sending data as soon as possible (Millás, 1932), and both agreed that the Cuban side could provide transmitting equipment and, if necessary, send a radiotelegraph operator qualified as a meteorological observer.

The disclosure of the news prompted a reaction from the Consul of the Republic of Honduras in Havana, who in a diplomatic note addressed to the Cuban Foreign Ministry made it known that, although some U.S. citizens were de facto occupying part of Swan, the sovereignty of the islands corresponded to the Honduran state, by virtue of which it would assert its jurisdiction (Pavlidis, 2011). This was equivalent to saying that the Cuban government was obliged to conduct any negotiations related to Swan through the Honduran government and not with the United States; and that as long as the dispute was not settled, the Cuban Meteorological Service could not place equipment or send its technical personnel, under the risk of becoming involved in an international diplomatic conflict.

Months earlier, in 1927, Millás had taken advantage of an event held at the Academy of Sciences to ask the U.S. Ambassador, Noble Brandon Judah, for his intercession to keep that station active, which was as important for Cuban meteorology as it was for the United States. References indicate that Brandon Judah included the matter in the agenda he took to President Herbert Hoover, on the occasion of a trip to Washington for consultations in mid-1928 (*El Mundo*, 1928, p. 1).

On August 16 of that year, the diplomat returned to Havana, and reporters came to wait for him to listen to his statements or comments. It should be remembered that, at that time, any statement made by the U.S. ambassador had a special political connotation that the newspapers were eager to pick up and interpret. Questioned by the reporters, Judah said first of all: "There already exists, at the expense of the United States government, a Radiotelegraph Station and Meteorological Observatory on Swan Island. This is the best news I have" (*El Mundo*, 1928, p. 1). He then explained that an official of the Department of Agriculture of his country had traveled to Swan, in order to reach an agreement on the telegraphic transmissions with the directors of Tropical Radio Corporation.

It is in keeping with historical truth to point out that the Ambassador kept his word to the Cuban Meteorological Service, acting proactively, as befitted his duties in a matter of interest to Cuba. In spite of everything, communications from Swan continued to experience interruptions; and sometimes, when it was most needed, the air was off the air. Four years later, it was business as usual, as hurricane season was upon us and Brandon Judah had been replaced in his position (*Diario de la Marina*, 1932).

This was the situation on June 11, 1932, when Professor Charles Marvin, Chief of the Weather Bureau, announced that due to the economic crisis hitting the United States, they were forced to withdraw the telegrapher and observer in Swan (*El Mundo*, 1932), thus, the hopes of the Cuban Meteorological Service were abandoned.

During the stage we are analyzing, hurricane forecasters in the United States were part of the general structure of the Weather Bureau, which prioritized inland weather systems, typical of subtropical and temperate zones; while hurricanes were considered transitory phenomena with an impact limited to the Atlantic and Gulf coasts. It was the deadly Labor Day Storm or Florida Keys hurricane that led to change this vision and to design a specific forecasting and warning system for tropical systems. On September 2, 1935, the intense hurricane swept through the island chain and southern Florida, with a death toll of half a thousand (McDonald, 1935). In response to the impact, hurricane forecasts were decentralized in four areas with their respective offices; one of them in Jacksonville, Florida.

The eyes of U.S. cyclonologists turned to focus on Cuba, faced with the need for more information from the country's observatories, equipped with instruments and personnel that, although not numerous, were competent and experienced in the field of hurricanes. All this was happening at a time when relations between Cuba and the United States were being resized after the longed-for elimination of the Platt Amendment (1934) and the signing and enforcement of the controversial Trade Reciprocity Treaty. In this context, the National Observatory increased the volume of time it dedicated to surface weather and upper air.

> Three daily cablegrams are sent by the National Observatory to Washington; four from June to November 15. A radiogram is sent to Mexico every day, including upper atmosphere data; and in case of bad weather, additional cables and telegrams are transmitted to both Mexico and Washington (Millás, 1930, pp. 186-191).

For all these reasons, it became necessary to strengthen and consolidate the data exchange system, and Professor Willis Ray Gregg, Chief of the National Weather Service of the United States, came to Havana. The U.S. Embassy made the official announcement, and the Associated Press confirmed the news:

> Miami, Florida. December 7, AP. Dr. Willis Gregg, chief of the Washington Weather Bureau, said today that on Thursday he will confer in Havana with Cuban meteorologists on the means by which specialists of both countries can assist each other in charting the course of a storm (*Diario de la Marina*, 1936a, p. 1).

The Chief of the Weather Bureau arrived in Havana on December 8, 1936, with the main objective of obtaining and systematizing the data from the Cuban meteorological and radiotelegraphic stations in the Caribbean Sea. Likewise, the United States would increase the volume of data transmitted daily. Undoubtedly, the Americans knew that Cuba operated a weather station of its own in Grand Cayman, and had others in the pipeline for the Caribbean area. Gregg offered to do what he could to keep the Swan Islands station operational, to reorganize the system for broadcasting weather messages from ships en route in the Caribbean, and to structure a "complete circuit of meteorological information" to be activated in the next hurricane season (*Diario de la Marina*, 1936b, p. 9).

At the time of the visit, the Belen College Observatory continued to focus on tropical cyclone studies and forecasting. Given the make-up of its faculty with priests and professors of Spanish origin, it was not considered an institution close to the United States. However, Father Gutiérrez-Lanza had a degree in Science from

> "[...] **World War II transformed global dynamics in every sense** [...]"

Georgetown University; and the young priest Eulogio Vázquez Vales, S.J., who then directed the meteorological observatory of the Jesuit school in Cienfuegos, had arrived in Cuba with a master's degree in Meteorology obtained at the Massachusetts Institute of Technology (MIT) (Vázquez, 1939).

Vázquez's relationship with the high scientific center led him to invite to Cuba a team of specialists, attracted by the objective of testing the new techniques of atmospheric sounding with radio-meteorographs raised by free balloons. This technique, known as radiosondes, surpassed the pilot balloons, since they were capable of transmitting from great heights and in real time, data on temperature, atmospheric pressure, and wind direction and speed. The tests were carried out between September 19 and 20, 1938, taking the terraces of the College in Buena Vista, Marianao, as the experimental site. The experts from Belen and the North Americans from MIT participated in them, and the event goes down in history as the first time that this novel technique was applied and tested jointly in Cuba (*Diario de la Marina*, 1938, p. 12).

From War to Crisis

As is well known, World War II transformed global dynamics in every sense. When the United States entered the world conflict, Cuba was immersed in its vicissitudes, and this configured a new scenario of cooperation between the respective meteorological services. With the increase of war operations, and the commitments made by the country with respect to the doctrine of "continental defense", it became necessary to transfer the direction and personnel of the Cuban Meteorological Service to the Navy Reserve, as ordered by a presidential decree signed on May 13, 1942 (Republic of Cuba, 1942). The National Observatory and its facilities were detached from the Ministry of Agriculture, and part of its personnel enlisted in the Navy. With this, the Observatory became subject to the Cuban-US military cooperation agreements, resulting from the bilateral negotiations carried out between 1942 and February 1943 (Camacho, 1954, pp. 107-109).

With the arrival of the troops, ships and planes of the U.S. Army and Navy, the work of the observers and radio operators of the Meteorological Service multiplied under the war regime, and they now had to be permanently in tune with the radiotelegraphic stations of the Cuban Navy and the Weather Bureau centers, at preset transmission schedules.

As the war activity around Cuba was focused on the fight against German submarines, the first recipients of meteorological information were the air bases and naval posts that Cuba ceded for the training of U.S. pilots and sailors, and for the surveillance and protection missions of the coastal naval routes and towards the Panama Canal. Meanwhile, the Weather Bureau was determined to complete its network of atmospheric sounding stations on the North American continent (Weather Bureau, 1946).

During the course of these events, the now Lieutenant Commander José Carlos Millás, director of the National Observatory of the Cuban Navy, and Francis Wilton Reichelderfer (1895-1983), Chief of the Weather Bureau, maintained frequent communication focused on the exchange of meteorological information between the respective institutions. It is obvious that Millás identified the opportunity to expand the capabilities of the Cuban Service, something that the senior U.S. executive wholeheartedly supported. Among the actions planned was the transfer to Cuba of the radio probes technique and the training of Cubans in it; talks to that effect began at the end of 1943 (Higgs, 1950).

The basis of the agreement is set forth in a memorandum signed by Ambassador Spruille Braden, addressed to Jorge Mañach Robato (1898-1961), Secretary of State of the Republic of Cuba. The two diplomatic notes are dated July 17 and August 2, 1944. Let us see an excerpt from the first one:

> The American Ambassador to the Cuban Secretary of State.
>
> Embassy of United States of America.
>
> No. 632. Habana, July 17, 1944.
>
> Excellency:
>
> I have the honor to inform Your Excellency that preliminary discussions have taken place between representatives of the United States Weather Bureau, Department of Commerce, and the Cuban Meteorological Service regarding the cooperative establishment and operation of a radiosonde station in Cuba, to be located in the vicinity of Habana.

> Since that time, Dr. F. W. Reichelderfer, Chief of the Weather Bureau, has corresponded with Dr. José Carlos Millás, Director of the Cuban Meteorological Service, on the subject, and my Government is informed that as result the Weather Bureau and the Cuban Meteorological Service had agree in principle that it would be desirable for their respective governments to cooperate in the establishment and operation of the station… (U. S. Department of State, 1944, pp. 1225-1226).

In this connection, the U.S. Congress authorized the $18,240.00 required to finance the project, channeling it into the programs of the Interdepartmental Committee for Cooperation with the Republics of America. This amount would be included in the expenditures for fiscal year 1944-1945, and would finance the station and its initial logistics. In another paragraph of the document, Braden notes:

> My Government has already established a network of radiosonde observations stations in United States, the West Indies, México and the Canal Zone, y feels that establishment of a station in Cuba would fill a gap in the network. Radio probes observations are needed for the protection of military and commercial aircrafts operating in this area, and also provide advance information on destructive hurricanes that threaten civilian and military installations located in the region of the Caribbean Sea and Gulf of Mexico. (U. S. Department of State., 1944).

In response, Cuba sent an engineer to Washington for training in radio probes operation, and the Cuban Navy appointed an ad hoc representative to the Weather Bureau (Navy, 1945, pp. 5-9).

In the third quarter of 1944, the equipment for the station and the means to receive and transmit data arrived in Havana: a hundred or so radio-meteorographs, balloons, parachutes, as well as the charts and printed models for the upper air reports. In addition, the Weather Bureau undertook to make any necessary repairs and adjustments. The agreement established that the data and copies of the graphs obtained in each sounding would be sent to the offices in Miami and Washington D. C., for which purpose modern teletype machines were installed to link the National Observatory with the offices in Miami, Washington, and some

> “[…] the war activity around Cuba was focused on the fight against German submarines […]”

meteorological centers in the continent (Higgs, 1950). Cuba and the United States would pay in equal parts the cost of the transmissions, which were carried out by the American Telegraph and Telephone Company (ATT), owner of the cables. Two specialists from the Weather Bureau traveled to Havana to prepare and advice on the installation of the station.

When this equipment was already in service, the Navy reached another agreement with the Weather Bureau, for an amount of $75,000.00, destined to set up seven “first order” meteorological stations in Cuba, equipping them with radio transmitters to link them with the National Observatory (Roselló, 1944).

After the end of the war, the Observatory received in mid-1946 new means to improve the link with the Weather Bureau headquarters, by means of a much more modern teletype circuit (Masdeu, 1946). At that stage, another station for atmospheric sounding was installed, with the new “rawin” (acronym of radio-wind) technology, which substantially improved the knowledge of the upper air; and in 1947 a similar equipment was sent to the airport of the city of Camagüey (American Embassy, Havana, 1948).

Later, in the 1950s, a WSR-1A (Weather Surveillance Radar) was transferred to Cuba, designed to operate at a wavelength of 10 centimeters, 3 gigahertz, and give a theoretical range of 150 to 240 kilometers (Millas, 1952). According to the scanty documentation available, the radar was in operational condition by the end of July 1952, but the equipment functioned more

as an experimental means than as a truly useful radar for daily forecasting.

Finally, the three years between 1959 —the year of the triumph of the Revolution— and 1961, when relations between the two countries were severed, sum up this overview at the Cuba-United States links in the field of meteorology.

At the beginning of that year, exchanges between the National Observatory and the Weather Bureau continued to focus on inputs to keep the measuring equipment and aerological soundings running.

In April 1959, Clarence La Rue traveled to Cuba, the official in charge of advising on the installation of the new "rawin", model SCR-658 (Signal Corps Radiodirection-finder), previously contracted to improve the Casa Blanca meteorological station and the Camagüey airport. The SCR-658 would come to replace the old Metox, similar, but already obsolete. On that occasion, Captain Millás, now an officer of the Revolutionary War Navy, told La Rue that "cooperation [with the United States] was 100% open" (Millas, 1959).

By that date, most of the expenditures for the Weather Bureau's cooperative programs continued to go to the radio probe service, pilot balloons, and the Havana-Miami teletypewriter circuit. The sum amounted to $ 29 198.70 (Reichelderfer, 1959a). We have before us the letter where Reichelderfer confirms to Millás having received the check for $ 16 000.00 destined to the payment of the supplies for the radio probes (Reichelderfer, 1959b).

However, the most senior official in the U.S. Weather Service who visited Cuba after the triumph of the Revolution was Dr. Gordon Dunn, Chief of the Weather Bureau Office in Miami, then called the Hurricane Warning Center (Millás, 1960), the forerunner of today's National Hurricane Center. Dunn arrived in Cuba on August 10, 1959, and stayed 48 hours in Havana. The topics of work were oriented to the exchange of data and communications, in particular the regularity and content of the information during the night hours. He worked with the Belen Observatory and the aeronautical meteorology office of the International Airport of Rancho Boyeros (today José Martí) (Millas, 1959).

It is apparent that the cooperation between the National Observatory and the Weather Bureau was not completely interrupted during the first years of the Revolution, although little by little limitations began to appear. At the beginning of 1960, the new "rawins" acquired in the United States arrived in Havana (Millas, 1960). They were the last technical means that the Cuban Meteorological Service received from the United States.

Although the blockade/embargo had not reached its extreme rigor, the strained relations between Cuba and the United States determined the cessation of all technological transfer; shipments of helium gas, radio probes and other replacement instruments and components ceased. Notwithstanding, scientists from both countries hoped to maintain cooperation based on the principle of placing science and knowledge above all else, even political reasons, but only correspondence and the exchange of meteorological data continued to flow. Trying to prioritize supplies for the radio probe service, Millás made the necessary arrangements with the Cuban Navy command, but a serious problem put an end to his intentions, when in October 1960 the U.S. Government banned exports to Cuba.

The last climatological report sent to the United States contains the accumulated rainfall in the Cuban meteorological stations in December 1960 (Ministry of the FAR, Revolutionary Navy, 1960). It is recorded that the document arrived at the Weather Bureau offices on March 6, 1961, three months after relations with Cuba were severed.

Conclusions

Meteorologists who in the 19th century and the first half of the 20th century promoted in Cuba the knowledge and development of tropical meteorology, identified the importance of cooperation with their American colleagues, and not only in terms of instruments methods and technologies, but in favor of sharing knowledge and structuring a joint way of acting in the face of phenomena potentially dangerous for society and the economy in both countries.

After the triumph of the Revolution and the emergence of a long-standing dispute between the two governments, collaboration did not stop completely. In a timely manner, scientists from the two nations have found ways to exchange results, and cooperate mainly in tropical cyclone forecasting, climate change studies, and forecasting the impacts of other phenomena of mutual interest in the environmental field.

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> “[...] the cooperation between the National Observatory and the Weather Bureau was not completely interrupted during the first years of the Revolution [...]”

In this regard, collaboration scenarios have been designed in international congresses, multilateral meetings at a high technical or governmental level and in the programs sponsored by the entities of the United Nations System, particularly the Intergovernmental Panel on Climate Change (IPCC).

The Cuban National Meteorological Service uses online resources hosted in U.S. sites, mainly satellites, despite the fact that some of them are forbidden or limited by the restrictions imposed by the blockade/embargo. In addition, there are many publications jointly signed by specialists from both countries; and to this must be added the participation of Cuban and U.S. academics in congresses held in the respective countries.

When the harmful economic, commercial and financial blockade ends and normalcy is restored in the Cuban-US relations, the products of collective intelligence will emerge with all their potential in order to cooperate in favor of the common knowledge and mutual benefit of our peoples.

Before concluding, the author thanks the Editorial Board of Cuadernos de Nuestra América for the initiative of this issue, dedicated to focus with multiple perspectives on the dimensions and dynamics of relations between Cuba and the United States, a topic a controversial as it is indispensable.

References

Altshuler, J., (2014). Las comunicaciones internacionales de Cuba. La Habana: Científico-Técnica.

American Embassy, Havana (1948, 10 de marzo). Carta de F. W. Reichelderfer a J. C. Millás. Reg. Opr-A; Radisonde Station. Nota no. 561. The American Embassy to the Cuban Minister of State, 62 Stats 3134, Treaties and Others International Acts Series 1947.

Archivo Nacional de Cuba (1856-1862). Fondo Instrucción Pública; Leg. 115, No. 7342, documento 1, “Expediente sobre creación de un observatorio meteorolójico en La Habana”; 1.ª pieza.

Camacho, P. (1954). Segunda Etapa Republicana. Libro de Cuba.

Diario de la Marina (1928, 20 de julio). En opinión del P. Gutiérrez- Lanza y el Sr. José Carlos Millás, es imprescindible tener una estación meteorológica en la Isla de Swan.

Diario de la Marina (1932, 13 de julio). Cuba está amenazada de quedarse dentro de poco tiempo sin observaciones del Caribe.

Diario de la Marina (1936a, 8 de diciembre). Hoy llegará el Jefe del Weather Bureau de los Estados Unidos Mr. Gregg.

Diario de la Marina (1936b, 11 de diciembre). Cuba montará una estación meteorológica en el Cabo Gracias a Dios para observar ciclones. Los Estados Unidos tendrán una en Isla Swan.

Diario de la Marina (1938, 6 de octubre). Interesante ensayo científico en el Observatorio del Colegio de Belén.

El León Español (1886, 10 de octubre). Trascendental acuerdo.

El Mundo (1928, 17 de agosto). Ya hay observatorio en la Isla de Swan, nos dice el embajador de los Estados Unidos.

El Mundo (1932, 15 de junio). Sin recibir datos de la Isla Swan, puede llegar el ciclón devastador, inesperadamente.

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Gutiérrez-Lanza, M. (1904). Apuntes históricos acerca del Observatorio del Colegio de Belén. La Habana: Avisador Comercial.

Kimbal, D. S. (1960, April). Study of the Aurora of 1859. Geophysical Institute of the University of Alaska. Scientific Report no. 6.

Marina de Guerra (1945). Radiosonda. Discurso del capitán de corbeta ingeniero José Carlos Millás, director del Observatorio Nacional. La Habana: Marina de Guerra.

Masdeu, J. (1946, 21 de julio). *Bohemia, 38*(29), 72.

McDonald, W. F. (1935). The hurricane of August 31 to September 6. *Mon. Wea. Rev.*, 63, 269-271.

Millás, J. C. (1926). Iniciación de los estudios aerológicos en Cuba. *Bol. del Obs. Nac. 22*(1), 3-12. La Habana: Secret. de Agric. Comercio y Trabajo.

Millás, J. C. (1930). Lo que representa el Observatorio Nacional. Libro de Cuba. La Habana: Federación de la Prensa Latina de América.

Millás, J. C. (1932, 18 de septiembre). Gran Caimán y Swan deben ser centinelas que avisen a Cuba la proximidad de los huracanes procedentes del Mar Caribe. *Diario de la Marina*.

Millás, J. C. (1952, 5 de agosto). Transcripción de la entrevista realizada a José Carlos Millás por la emisora Radio Álvarez [mecanog.]. Fondo documentos del Observatorio Nacional. Biblioteca y archivo del Instituto de Meteorología.

Millás, J. C. (1959, April 28). Cuban visit. Clarence La Rue, Chef Instrumental Engineering Division, Miami. Fondo documentos del Observatorio Nacional. Biblioteca y archivo del Instituto de Meteorología.

Millás, J. C. (1960, 27 de enero). Carta a Francis Reichelderfer, La Habana. Fondo documentos del Observatorio Nacional. Biblioteca y archivo del Instituto de Meteorología.

Millás, J. C. (1917-1961). Expediente académico. Fondo Academia de Ciencias Médicas, Físicas y Naturales de La Habana (actualmente depositado en el Archivo Nacional de la República de Cuba).

Ministerio de las FAR. Marina de Guerra Revolucionaria (1960). Observatorio Nacional. Relación de los totales de lluvia caída en algunos lugares de Cuba durante el año 1960 [mecanuscrito]. Fondo documentos del Observatorio Nacional. Biblioteca y archivo del Instituto de Meteorología.

Mohn H. (1878). *Principios de Meteorología. Exposición elemental de la doctrina del viento y del tiempo.* [C. Pujazón, trad.] Establ. Tipog. de don José Gay, San Fernando.

NOAA (2023). Central Library and the Climate Database Modernization Program, National Climate Data Center (NCDC). https://icoads.noaa.gov/climar3/c3poster-pdfs/S2P1

Ortiz, R. (1979). *Andrés Poey y Aguirre, precursor de la meteorología científica en Cuba. Conferencias y Estudios de Historia y Organización de la Ciencia*, (13), 20.

Pavlidis, S. J. (2011). *A Brief History of Las Islas Santanilla-Swan Islands*. The Northwest Caribbean Guide.

Poey, A. (1856). Sobre las tempestades eléctricas y la cantidad de víctimas anuales del rayo en los Estados Unidos de América y en la Isla de Cuba. *Memorias de la Real Sociedad*, (26), 29-48, La Habana.

Pruna, P. (2006). *Historia de la Ciencia y la Tecnología en Cuba*, La Habana: Científico Técnica.

Ralph Higgs (1950) (comp.). *Cooperation with Cuba*. U. S. Weather Bureau.

Ramos, L. (2023). *De Meteorología y Huracanes. Benito Viñes, un científico español en Cuba*. Madrid: Instituto Juan Andrés, de Comparatística y Globalización.

Reichelderfer, F. W. (1959a, 12 de mayo). Carta a J. C. Millás. Washington. Fondo documentos del Observatorio Nacional. Biblioteca y archivo del Instituto de Meteorología.

Reichelderfer, F. W. (1959b, 20 de octubre). Carta a J. C. Millás. Washington. Fondo documentos del Observatorio Nacional. Biblioteca y archivo del Instituto de Meteorología.

República de Cuba (1902). Decreto no. 105. *Gaceta Oficial de la República de Cuba, 1*(4)51, 1621. Secretaría de Agricultura, Industria y Comercio.

República de Cuba (1915). Decreto 1059. *Leyes y Decretos de la República de Cuba*, (16), 1026-1027.

República de Cuba (1942, 15 de mayo). Decreto 1359. *Gaceta Oficial de la República de Cuba, 40*(9)293, 8602.

Rodríguez, E. (2001). *Nuestro telescopio refractor de 10 pulgadas. Datos Astronómicos para Cuba. Revista Cubana de Astronomía. Instituto de Geofísica y Astro-*

nomía. La Habana: Ministerio de Ciencia, Tecnología y Medio Ambiente.

Roselló, A. (1944, 29 de octubre). *Carteles,* 44, 32-33.

Smithsonian Institution Archives (2024). https://siarchives.si.edu/history/joseph-henry.

Stockman, W. (1899). *Cuba Section. Climate and Crop Service of the U. S. Weather Bureau, 1*(1), 1-8.

U. S. Department of State (1944). Radiosonde Station, Memorandum Agreement. 61 Stat. 4084, Treaties and Other International Acts Series 1842. Cuba, Treaties and Other International Acts Series (TIAS).

Udías, A. (2003). *Searching the Heavens and the Earth. The History of Jesuits Observatories*. Dordrecht: Kluwer Academic Publishers.

Vázquez, E. (1939). *Nueva orientación en los estudios ciclónicos*. La Habana: Hermes.

Weather Bureau (1946). Administrative Report of the Chief of Weather Bureau for Fiscal. Reprint from Thirty-Fourth Annual Report of the Secretary of Commerce, 19461.

WMO/OMM. (1973). Cien años de cooperación internacional en meteorología. Organización Meteorológica Mundial (1873-1973). Ginebra.

Academic exchange between the University of Vermont and Oberlin College, USA, and the Center for Environmental Studies of Cienfuegos (CEAC), Cuba

Dr. Rita Y. Sibello Hernández PhD

Center for Environmental Studies (CEAC)

ORCID: 0000-0003-1308-2917

Maikel Hernández Núñez BA

Center for Environmental Studies (CEAC)

ORCID: 0009-0003-9507-6760

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Abstract

Since the triumph of the Cuban Revolution, relations between Cuba and the United States have been very tense, making collaboration between scientists from both nations difficult. Despite this, in 2018, researchers from the American universities of Vermont and Oberlin and the Cienfuegos Environmental Studies Center from Cuba proposed an academic exchange, based on the execution of a research project. The main objective was to evaluate the implications that the transition from intensive to conservation agriculture has had on the landscape of Cuba. The technique used to evaluate soil erosion in these two periods was the nuclear technique, based on the use of radionuclides as environmental tracers. Low-background gamma spectrometry was used to measure radionuclides. In addition, the waters and sediments of the monitored rivers were chemically characterized, about which existed scarce information. Metal concentrations in sediments were determined by X-ray fluorescence. The objectives proposed in the project were achieved and the results corroborate the positive impact of conservation agriculture on water quality and soil protection. The academic exchange carried out is an example that collaboration between scientists from Cuba and United States is possible and necessary. This scientific activity was developed in a friendly and respectful environment, where Americans and Cubans worked together and shared their experiences and knowledge.

Keywords: *academic exchange, soil erosion, water quality, radionuclides*

Introduction

The academic exchange between the U.S. universities of Vermont and Oberlin with the Center for Environmental Studies of Cienfuegos, Cuba, was preceded by several communications between researchers from both countries who had found related topics in their work, thus arising a mutual interest in collaboration.

The United States (U.S.) scientific leaders, Oberlin College Assistant Professor of Geology, Amanda H. Schmidt PhD, and University of Vermont Professor of Geology, Paul R. Bierman PhD, found in the searches that they had carried out, that there were similarities in their research. Bierman, found in the bibliographic searches of their interest, scientific articles related to the application of nuclear techniques in investigations of soil erosion and sedimentation processes, by CEAC researchers, among them, Dr. Carlos M. Alonso Hernández, Dr. Misael Díaz Asencio (sediment dating using lead-210 (210Pb)) and Rita Y. Sibello Hernández (soil erosion using cesium-137 (137Cs)). Thus the idea of scientific exchange was born. On the Cuban side, it was Dr. Sibello Hernandez, who led the processing of the official protocols to carry out the exchange with the researchers from the United States with the Department of International Relations of the Ministry of Science, Technology and Environment of Cuba (CITMA), and obtained the approval.

It was at the end of January 2018, when the CEAC institutions received Dr. Schmidt and Dr. Bierman from the United States for the first time. CEAC was represented by its then director, Reinaldo A. Acosta Melián PhD, Dr. Alonso Hernández, Dr. C. Sibello Hernández and other researchers and specialists of the institution. The meeting lasted two days and the scientific leaders of both nations presented their experiences in the topic of interest as well as their main results.

The work agenda concluded with the presentation of a research project related to erosion processes in important watersheds in the central, western and eastern regions of Cuba. The project would involve the joint participation of researchers, specialists and

students from the three institutions. The funds would be covered by the National Science Foundation (NSF) of the United States; and Cuba's Agency for Nuclear Energy and Advanced Technologies (AENTA) would finance the national projects "*Use of Nuclear and Isotopic Techniques for Greater Efficiency in the Management of Water and Soil in Agriculture, Linked to Climate Change Adaptation and Mitigation Strategies - ISOAGRI*", led by Sibello Hernández, and "*Proyecto Soluciones a Problemas Específicos del Manejo Integrado de Cuencas y Áreas Costeras en Cuba, a través de Técnicas Isotópicas y Nucleares (TIN) -MICATIN*" led by Alonso Hernández, which would function as counterpart projects.

The idea of the project is based on the fact that -as is well known- in order to avoid the negative effects of deforestation and intensive and mechanized agriculture, conservation agricultural practices are often employed. Although these lower impact practices have been implemented around the world, the results have rarely been quantified at the landscape scale. In this sense, Cuba is shown as a unique test laboratory, in which, for 30 years after the revolutionary triumph, large-scale industrial agriculture was developed, characterized by the use of heavy machinery, pesticides and fertilizers, which —hypothetically— should be related to negative environmental impacts of pollution and increased erosion-sedimentation processes, until the 1990s, when the socialist camp disappeared and our country was isolated and agricultural supplies began to be scarce. Since then and up to the present, organic and conservation agriculture has been practiced, which means a substantial decrease in pollution and soil erosion.

This fact led to propose the research hypothesis that the implementation of the project would allow the evaluation of the effects of conservation agriculture in reducing the extent of erosive processes and would allow the comparison of natural changes in the landscape in the long term.

All participants in the first meeting agreed that the implementation of the proposed research project would be beneficial for both countries. For the Cuban researchers it would be an opportunity to train in sampling and to become acquainted with novel analytical techniques used for the quantification of soil erosion and sedimentation by other methods based on the measurement of 10Be and 26Al isotopes. The academic exchange would favor the transfer of the know-how of the technique to the Cubans and would allow comparing the results expected within the framework of the collaborative project with those existing in the country, thus validating the implemented methods. In addition, they would determine the erosion and sedimentation rates in sites of interest, where there is insufficient data on these environmental processes.

For the U.S. researchers, the motivation would be the unique opportunity to apply these methods of erosion-sedimentation studies in different socio-environmental conditions, which would contribute to their strengthening as researchers, in addition to exchanging experiences person to person with researchers from Cuba.

Development

A particular group of environmental radionuclides, called radionuclides from radioactive fallout, are used to determine the magnitude of erosional processes and over what period of time they have occurred. These include artificial radionuclides such as cesium-137(137Cs) and geogenic radioisotopes such as lead-210(210Pb) and more recently cosmogenic radionuclides such as beryllium-7 (7Be). These have been used globally to obtain rates and patterns of soil erosion and deposition at various temporal and spatial scales (Zapata & Nguyen, 2009; Mabit, 2008; Zapata, 2002).

> "[...] **for 30 years after the revolutionary triumph, large-scale industrial agriculture was developed** [...]"

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Cs137 is an artificial radionuclide, a product of the nuclear fission of uranium-235 (235U), which exists in the environment especially due to the high-powered open-pit nuclear tests that took place mainly during the 1950s and 1960s, which caused measurable quantities of this radionuclide to be emitted into the stratosphere and dispersed almost homogeneously throughout the planet due to atmospheric movements. Then, through atmospheric "fallout" deposition, the radionuclides reached the earth's surface and became strongly bound to fine soil particles, becoming an unparalleled radiotracer of the physical movements of the soil. This, together with the radioactive properties of 137Cs: a relatively long half-life of 30.2 years and its easy detection by gamma spectrometry, thanks to its characteristic emission line of 662keV, make it possible for it to be used to study soil distribution in the landscape (Ritchie & Mchenry, 1990; Walling & Quine, 1991; Walling & Quine, 1993).

On the other hand, Pb-210 is a naturally occurring radionuclide belonging to the radioactive uranium-238 (238U) series. From the 238U in the ground, radium-226 (226Ra) is produced by radioactive decay, which in turn, upon decay, forms radon-222 (222Rn), which is a noble gas. By the disintegration of 222Rn, trapped in the soil, plomosoport (210Pbsoport.) is formed in the same soil. Another part of the 222Rn diffuses through the soil, passes into the atmosphere and in its radioactive decay originates 210Pb. This 210Pb, formed in the atmosphere, reaches the soil by atmospheric precipitation, producing an excess of 210Pb in the soil (210Pbexc.) (Walling & He, 1999).

Due to the atmospheric origin of 137Cs and 210Pb exc. their distribution in the soil profile are similar and they are found in the upper soil layers. However, the soil entry times of these radionuclides are different. The entry of 137Cs into the soil occurred mainly in the 1960s, a time when intensive agriculture was being developed in Cuba. The 210Pb exc. is deposited in the soil continuously. Thanks to this difference, by determining the presence or absence of both radionuclides, it is possible to evaluate the characteristics of soil erosion, given by its speed and depth (Walling & Woodward, 1992).

When 137Cs is present, the soil experiences slow surface erosion during and after 137Cs deposition (1945-present). When 137Cs is absent, the site experiences rapid and deep erosion during or after 137Cs deposition. When 210Pbexc. is detectable, the site is experiencing slow surface erosion. When 210Pbexc. is absent, the site is currently experiencing rapid and deep erosion. By determining the presence or absence of both radionuclides in soil samples, we can evaluate past and present soil erosion characteristics (Walling & Woodward, 1992).

On the other hand, landscape-scale denudation is known to occur by both physical removal of mass (erosion) and the chemical dissolution of minerals in rocks. Sediment produced by bedrock erosion moves downslope to the base level, while rock dissolution moves mass in solution from the landscape to rivers and then to the ocean. Thus, measurement of cosmogenic nuclides in river sediments can be used to infer the spatially averaged sediment generation rate of a drainage basin (Brown *et al*., 1995; Granger *et al*., 1996; Bierman & Steig, 1996), but does not provide information on processes, such as rock dissolution, that occur at depth. Assuming a source rock density, equivalent rates of landscape reduction over time can be calculated.

In a steadily eroding basin, the concentration of nucleidocosmogenics in a sediment sample reflects the rate at which mass was removed from and near the surface as material was exhumed, both through physical weathering and rock dissolution (Lal, 1991). Measurement of multiple nucleidocosmogenic nuclides with different half-lives (radioactive half-lives) in the same sample can provide further information on the exposure history of surface materials, such as soil mixing and residence time (Lal & Chen, 2005), as well as sediment storage within the watershed (Granger&Muzikar, 2001). Among these nucleidocosmogens are aluminum-26 (26Al) and beryllium-10 (10Be). 26Al is produced from atmospheric argon (Ar) due to the spallation of cosmic ray protons (i.e., protons with very high energy). Beryllium-10 (10Be) is also produced in the Earth's atmosphere by spallation, produced by the bombardment of high-energy cosmic radiation on oxygen and nitrogen nuclei.

Because beryllium tends to exist in aqueous solution at pH values lower than 5.5, this atmospheric beryllium. s washed away by rainwater (whose pH is usually lower than 5.5), Once in the ground, the solution becomes alkaline, precipitating beryllium that remains stored in

the soil for a long time (half-life of 1.387 million years). It is known that the production ratio of 26Al/ 10Be, at the surface in mid and low latitudes is ~6.75 (Nishiizumi *et al*., 1989; Balco *et al*., 2008). This ratio has been used to study the role of sediment transport, deposition and storage, and erosion. If sediment that has accumulated cosmogenic nuclides is buried in such a way that its production is negligible, this ratio decreases because 26Al disintegrates faster than 10Be.

Similarly, vertical mixing within a soil column has the effect of increasing the near-surface residence time of sediment grains, suppressing the 26Al/10Be ratio in sediment detached from the landscape surface during erosion (Makhubela *et al*., 2019).

All these fundamentals described above constitute the basis for the techniques implemented in the research within the framework of the proposed collaborative project.

In the month of August of that same year, 2018, the Cuban researchers had adequately processed the flying visas and customs permits for the arrival of the North American colleagues, accompanied by the equipment that would be used in the field activities of the project, as well as the permits to access the natural areas that would be monitored in the central region of Cuba.

The group of researchers that carried out the first campaign was made up of 7 Cubans and 6 North Americans, including, in addition to the scientific staff, science and environmental writer Joshua E. Brown of the University of Vermont and the University of California, Berkeley, and on the Cuban side Maikel Hernández Núñez, CEAC communicator. Joshua and Maikel were involved in these activities and were to fulfill their mission of communicating to a wider audience the execution and achievements of the campaign.

> “[…]
> **The entry of 137Cs into the soil occurred mainly in the 1960s**
> […]”

The scope of the campaign was to collect water and sediment samples in about 30 sites in the provinces of Villa Clara, Sancti Spiritus and Cienfuegos. The selection criteria for these sites were given by several factors. First, they should have representative watershed slopes of these provinces and should be representative of the intensity of land use, agricultural use and vegetation and, finally, the watersheds to be monitored should be large enough to have streams that accumulate and transport a lot of sediment from erosion within the watershed. The objective was to elucidate the magnitude of erosional processes on the landscape over a considerable time (over 50 years), which included a first period of approximately 30 years (1959-1990) of intensive agriculture, followed by a similar time period (1990-2018), but of conservation agriculture. This crusade initiated an extensive work schedule, contributing to “agricultural research and management techniques for soil and forest conservation”, one of the eight areas of cooperation contemplated in the Memorandum of Understanding between the United States Department of Agriculture (USDA) and the Ministry of Agriculture of Cuba, signed on March 21, 2016 (USDA, 2016).

To accomplish the campaign, the personnel was divided into two groups, trying to have an equal number of Cubans and Americans in each group, which would facilitate the exchange between researchers of the two nations. One group was led by Paul Bierman and Alejandro García Moya Msc, the latter a CEAC researcher. In addition to other specialists and students, this group included Joshua, the American journalist. The other group of researchers and students from both countries was led by Amanda Schmidt and Rita Sibello, accompanied by Maikel Hernández, the CEAC communicator.

For this purpose and to characterize the environment, 25 rivers were selected in the central region, with different land uses, from forest to agricultural use, and the sites selected for investigation were divided between the two groups, each of which would cover different sites. At each sampling site, river sediment samples were collected and sieved, taking samples smaller than 63 microns and samples with a particle

size of 250 - 850 microns (Figure 1). From each sample, one half went to the CEAC Environmental Assay Laboratory (EAL) and one half to the U.S. university laboratories. The samples were packaged in nylon bags and properly labeled to identify the source site and carefully transported. These samples, both at the LEA and at the foreign laboratories, would be analyzed by X-ray fluorescence (XRF), gamma spectrometry, and the stable isotopes of carbon and nitrogen would be determined.

Figure 1. Science and environmental writer Joshua E. Brown of the University of Vermont takes images as U.S. and CEAC researchers screen sediments. Brown of the University of Vermont takes images as U.S. and CEAC researchers perform sediment sieving. Photo: Maikel Hernández

For the river water samples, different parameters such as temperature, dissolved oxygen and conductivity, which characterize the monitored rivers, were determined in situ and duplicate samples were also taken for isotopic analysis at the LEA and in the laboratories of US universities (Figure 2). Also, the most probable number (MPN) of E. coli bacteria was determined in the water samples from the monitored rivers, incubating them in the field (Figure 3). In addition, the concentrations of some anions present in the water, such as nitrates, chlorides and phosphates, were determined in the field.

Figure 2. The team of Cuban and U.S. researchers filtering river water for subsequent anion and stable isotope determinations in the laboratories of both countries. Photo: Maikel Hernández.

Figure 3 Researchers Amanda H. Schmidt, Oberlin College, Paul R. Bierman of the University of Vermont, Alejandro Garcia Moya and Rita Y. Sibello of CEAC, during bacteriological incubation of samples. Photo: Joshua Brown.

The first monitoring campaign in the central region of the country was successful; the proposed objectives were met and a broad characterization of the monitored watersheds was achieved. Important conclusions were reached that corroborate the benefits of conservation agriculture for the environment. Cuba's transition to today's sustainable agriculture, also involving the reduction in the use of chemical fertilizers per hectare of soil, has resulted in a much lower concentration of nutrients in the waters of the rivers investigated and, therefore, a higher quality of their waters, which is an example for other types of economies. With respect to erosive processes, it has resulted in a decrease in

the speed and depth of erosion, contributing to the recovery of soils.

The results obtained by these researchers in the campaign performed in the central region of Cuba were published in the prestigious scientific journal GSA Today (Bierman *et al*., 2020). In this publication, the authors concluded that the composition of water and the presence of total dissolved solids in the rivers of the central region vary with the type of rock, suggesting a close connection between water chemistry and the underlying rock units. For example, the high concentrations of calcium (Ca) and magnesium (Mg) and alkalinity in many samples are consistent with the mapped presence of carbonate rocks in the drainage basins.

At other sites, where the bedrock consists of post-Eocene marine sediments, higher values of rubidium (Rb), strontium (Sr), barium (Ba) and uranium (U) were found than in other rivers (Figure 4).

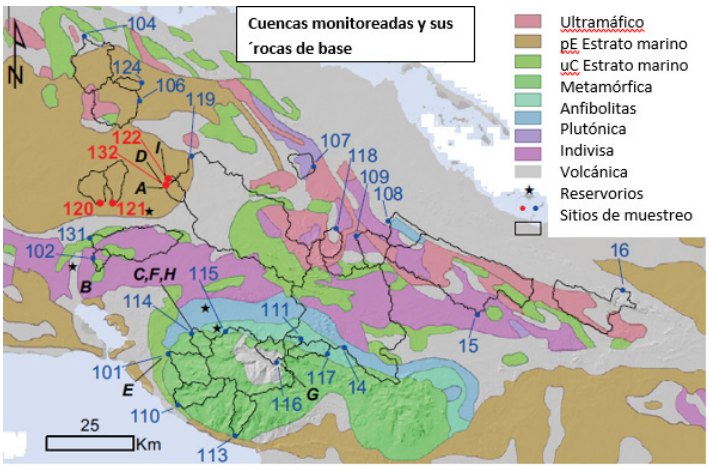

Figure 4. Geological map of the monitored basins (French & Schenk, 2004). Source: Bierman *et al*., 2020.

The group of scientists, thanks to chemical analyses carried out in the laboratories of both nations, determined that arsenic (As), barium (Ba), chromium (Cr), manganese (Mn), nickel (Ni), strontium (Sr) and uranium (U) were present in some of the river water samples analyzed, but in all cases these values were below the maximum permissible concentrations for drinking water.

These researchers also stated that the values obtained for Conductivity and Total Dissolved Solids (TDS) in the river waters were high (130-1380 µS/cm) and from 117 to more than 780 mg/L, respectively. They consider that high TDS values are not dangerous, but could limit some water uses and that these high TDS values could cause clogging of industrial and domestic pipes. The pH values were neutral to slightly alkaline with high bicarbonate values (65-400 mg/L) (Bierman *et al*., 2020).

Another parameter measured in river waters was dissolved oxygen (DO), measured in situ, with values ranging from 59% to 145% and an average value of 97% (Bierman *et al*., 2020). DO is essential for the decomposition of organic matter by bacteria, which helps maintain the balance of ecosystems.

The bacteriological analysis of the monitored river waters of the central region showed the presence of E. coli in all these rivers and is related to the existence of animals in the nearby surroundings, the development of livestock and the use of farm equipment for transportation.

Resulting from this investigation, high rates of weathering and denudation of the landscape were calculated and thus inferred the presence of flow paths through the fresh rock. In general, the field determinations of anions correlated well with the values subsequently determined in the laboratory.

The tests performed at both the CEAC and the U.S. laboratories allowed comparisons between them, which served as a quality control of the analytical results.

In their article (Bierman et al., 2020), these researchers conclude that the river waters of central Cuba are evidence that agriculture does not need to contaminate rivers, reservoirs and coastal areas with nutrients. Nitrogen and phosphorus are present in Cuban rivers, but at lower concentrations than in the waters of the United States, where agriculture is intensive and much fertilizer is used. Fertilizer use in Cuba peaked in 1978 and then declined, while fertilizer use in the U.S. has remained high since 1961. Sustainable agriculture implemented in Cuba after the Soviet assistance era has resulted in less fertilizer use and higher river water quality, said researchers from both nations.

"These results are a comprehensive snapshot of the chemistry of water moving through rivers in central Cuba," said Dr. Bierman.

By reducing sediment and manure loads, economic benefits can be achieved, because rivers discharge

into the coastal zone, where suspended sediment and bacteria from agricultural activity negatively impact water quality and transparency in coral reefs and beaches, frequented by tourists, a source of income for Cuba," say the researchers (Bierman *et al*, 2020).

Another achievement of the Vermont-Oberlin- CEAC academic exchange was to be able to interpret, by means of nuclear and isotopic techniques, the erosive and denudation processes that have taken place in the hydrographic basins of the central region that were monitored during the first campaign.

These results were published in the scientific journal Geochronology

Terminology referring to watershed mass loss has been ambiguously applied in the past and can be confusing. Here, reference is made to the rate of landscape mass loss calculated from 26Al and 10Be concentrations as erosion rates; these rates include all processes (physical and chemical) that remove mass within approximately 2 m, from the Earth's surface (Campbell *et al*., 2022).

Landscape mass loss rates inferred from stream water chemistry measurements, combined with estimates of annual runoff volumes, refers to rock dissolution rates. The term denudation is used to refer to the total mass loss from the watersheds sampled. All these rates are expressed in terms of mass per area per time (Mg km2 yr-1), which can be converted to depth over time assuming rock density (Campbell *et al*., 2022).

These researchers (Campbell *et al*., 2022), detail in their article that using measurements of 26Al and 10Be, contained in the sands of the 25 rivers monitored, together with estimates of the flow of the dissolved load in the river, it was possible to characterize the processes and the rate of change of the landscape in the central region of Cuba. These authors state in this work that long-term erosion rates inferred from 10Be concentrations in the quartz extracted from the sand of the rivers of central Cuba range from 3.4 to 189 Mgkm2yr-1 (mean 59, median 45). Dissolved loads, calculated from solute concentrations in the modeled stream and runoff, range from 10 to 176 Mgkm2yr-1 (mean 92, median 97), which, in 18 of 23 watersheds, exceeded erosion rates derived from 10Be cosmogenic. This disparity —according to these authors— indicates that, in this environment, landscape-scale mass loss is not fully represented by nucleido-cosmogenic measurements.

The 26Al / 10Be ratios were found to be lower than expected for steady-state exposure or erosion in 16 of 24 samples. Reduced26Al /10Be ratios were obtained in many of the basins having the greatest disparity between dissolved loads (high) and erosion rates inferred from concentrations of cosmogenic nuclides (low).

Reduced 26Al/10Be ratios are consistent with the presence of a deep, mixed regolith layer that provides extended storage times on slopes and/or prolonged burial and storage during fluvial transport. Chemical analyses of river water indicate that many basins with lower 26Al/10Be ratios provide extended storage times on slopes and/or prolonged burial and storage during fluvial and high 10Be concentrations are underlain, at least in part, by rapidly dissolving evaporite rocks (Campbell *et al*., 2022).

These authors state in their scientific paper that the data obtained show that, when assessing mass loss in the humid tropical landscape, it is particularly important to take into account the contribution of rock dissolution at depth. In such hot and humid climates, mineral dissolution can occur many meters below the surface, beyond the penetration depth of most cosmic rays and, therefore, of the production of most nuclides and cosmogenic nuclides.

The researchers (Campbell et al., 2022) concluded that their data suggest the importance of estimating solute fluxes and measuring nuclide-cosmogenic pairs to better understand processes and rates of mass transfer at the basin scale.

Conclusions

Cuba's transition to today's sustainable agriculture (and reducing fertilizer use per hectare of cropland) has resulted in much lower nutrient concentrations in the rivers of central Cuba than in the water of the Mississippi River in the United States and is a model for other types of economies, the research team said.

The group of scientists also believes that the implementation of other management strategies to reduce manure and sediment loads (such as keeping livestock away from rivers) could in the future bring rapid im-

provement in river water quality and consequent economic benefits to the country.

The results of these investigations contributed to the Cuban State Plan to confront climate change (Tarea Vida), specifically with regard to soil and water protection, providing a diagnosis of soil erosion in the sites studied, as well as water quality, related to the deposition of sediments originated in erosive processes and the presence of pollutants associated with these sediments, closely linked to anthropic agricultural and livestock activity.

On the other hand, public communication played an important role in the research and the participants in the Cuba-US academic exchange consider that Cuba can be a catalyst to increase public awareness of the importance of soil conservation.

The performance of the academic exchange between Cuban and American scientists demonstrated that differences in ideologies and economic systems do not matter when there is maximum respect, tolerance and acceptance of inequalities. In the Vermont - Oberlin - CEAC exchange, a fraternal atmosphere of respect and solidarity prevailed at all times, given by the common objective of having a good performance in the execution of the project and the results obtained speak for themselves.

The following year, the delegation of experts from U.S. and Cuban institutions met again in the Caribbean nation to carry out the second sampling campaign in the province of Pinar del Río. This will be material for another paper.

Profiles

The University of Vermont is a state university in Burlington in northwestern Vermont and is recognized in the fields of biology, environmental, agricultural and life sciences. Oberlin College, located in Oberlin, Ohio is a private college, a member of the Association of Great Lakes Colleges and Universities and the Five Colleges of Ohio. Its most popular majors have been English, Biology, History, Politics and Environmental Studies.

The Cienfuegos Center for Environmental Studies is a research center attached to the Ministry of Science, Technology and Environment (CITMA), dedicated to the study and solution of environmental processes, recognized by the International Atomic Energy Agency (IAEA) as a Regional Reference Center for the application of nuclear techniques to the solution of specific problems of integrated coastal management, since 2007. It is currently accredited as a "Collaborating Center of the International Atomic Energy Agency (IAEA) for the Application of Nuclear and Isotopic Techniques in the Study of Marine-Coastal Ecosystems in the Latin American and Caribbean Region".

Articles published on the results of the U.S.-CEAC exchange, Cuba

In Cuba, Cleaner Rivers Follow Greener Farming. doi.org/10.1130/GSATG419A.1

¡Cuba! River Water Chemistry Reveals Rapid Chemical Weathering, the Echo of Uplift, and the Promise of More Sustainable Agriculture (2020, March-April) . *GSA Today, 30*(3-4).

Cosmogenic nuclide and solute flux data from central Cuba emphasize the importance of both physical and chemical denudation in highly weathered landscapes. 2021. https:doi.org/10.5194/gchrom

Results presented at scientific events

- MARCUBA, Habana, 2018: Water Quality of central Cuban rivers; implications for the flux of material from land to sea.
- Ecoagua Workshop. Hanabanilla. March 2020. Paper: Evaluación del Impacto de la Meteorización Química y de la Agricultura Sostenible en la Calidad de las Aguas de los ríos de la Región Central de Cuba.
- XVI Forum de Ciencia y Técnica del CEAC. June, 2020. Paper: Evaluación del Impacto de la Meteorización Química y de la Agricultura Sostenible en la Calidad de las Aguas de los ríos de la Región Central de Cuba.

References

Balco, G., Stone, J. O., Lifton, N. A., Dunai, T. J. (2008). A complete and easily accessible means of calculating surface exposure ages or erosion rates from 10Be and 26Al measurements. *Quat. Geochronol.,* 3, 174-195. https://doi.org/10.1016/j.quageo.2007.12.001

Bierman, P. R., Steig, E. (1996). Estimating rates of denudation using cosmogenic isotope abundances in sediment. *Earth Surf. Proc. Land.*, 21, 103-203.

Bierman, P. R., Sibello Herdandez, R. S., Schmidt, A., Cartas Águila, H. A., Bolaños Álvarez, Y., Guillén Arruebarrena, A., Campbell, M. K., Dethier, D., Dix,

M., Massey-Bierman, M., García Moya, A., Perdrial, J., Racela, J., Alonso-Hernández, C. (2020). ¡Cuba! River Water Chemistry Reveals Rapid Chemical Weathering, the Echo of Uplift, and the Promise of More Sustainable Agriculture. *GSA Today*, 30, 4-10.

Brown, E. T., Stallard, R. F., Larsen, M. C., Raisbeck, G. M., Yiou, F. (1995). Denudation rates determined from the accumulation of in situ-produced 10Be in the Luquillo Experimental Forest, Puerto Rico. *Earth Planet. Sc. Lett.*, 129, 193-202. https://doi.org/10.1016/0012-821X(94)00249-X

Campbell M. K., Bierman P. R., Schmidt A. H., Sibello Hernández R., García-Moya A., Corbett L. B., Hidy A. J., Cartas Águila H., Guillén Arruebarrena A., Balco G., Dethier D., Caffee M. (2022). Cosmogenic nuclide and solute flux data from central Cuban rivers emphasize the importance of both physical and chemical mass loss from tropical landscapes. *Geochronology*, 4, 435-453. https://doi.org/10.5194/gchron-4-435-2022

French, C. D., And Schenk, C. J. (2004). Map showing geology, oil, and gas fields, and geologic provinces of the Caribbean Region: U.S. Geological Survey Open-File Report 97-470-K. https://pubs.usgs.gov/of/1997/ofr-97-470/OF97-470K/

Granger, D. E., Kirchner, J. W., Finkel, R. (1996). Spatially Averaged Long-Term Erosion Rates Measured from in Situ-Produced Cosmogenic Nuclides in Alluvial Sediment. *J. Geol.*, 104, 249-257.

Granger, D. E., Muzikar, P. (2001). Dating sediment burial with in situproduced cosmogenic nuclides: theory, techniques, and limitations, Earth Planet. *Sc. Lett.*, 188, 269-281.

Lal, D. (1991). Cosmic ray labeling of erosion surfaces: in situ nuclide production rates and erosion models, Earth Planet. *Sc. Lett.*, 104, 424-439.

Lal, D., Chen, J. (2005). Cosmic ray labeling of erosion surfaces II: Special cases of exposure histories of boulders, soils and beach terraces, Earth Planet. *Sc. Lett.*, 236, 797-813. https://doi.org/10.1016/j.epsl.2005.05.025

Mabit, L., Benmansour, M., & Walling, D. E. (2008). Comparative advantages and limitations of fallout radionuclides (137Cs, 210Pb and 7Be) to assess soil erosion and sedimentation. *J.Environ. Radioact.*, 99, 1799-1807.

Makhubela, T. V., Kramers, J. D., Scherler, D., Wittmann, H., Dirks, P. H. G. M., Winkler, S. R. (2019). Effects of long soil surface residence times on apparent cosmogenic nuclide denudation rates and burial ages in the Cradle of Humankind, South Africa. *Earth Surf. Proc. Land.*, 44, 2968-2981. https://doi.org/10.1002/esp.4723

Nishiizumi, K., Winterer, E. L., Kohl, C. P., Klein, J., Middleton, R., Lal, D., Arnold, J. R. (1989). Cosmic ray production rates of 10Be and 26Al in quartz from glacially polished rocks. *J. Geophys. Res.*, 94, 17907-17915. https://doi.org/10.1029/JB094iB12p17907

Ritchie, J. C., & Mchenry, J. R. (1990). Determination of fallout 137Cs for measuring soil erosion and sediment accumulation rates and patterns. *J. Environ. Qual., 19* (1990) 215-233., 19, 215–233.

USDA (2016). Memorandum of Understanding Between United States Department of Agriculture and the Republic of Cuba Ministry of Agriculture On Cooperation in Agriculture and Related Fields.

Walling, D. E. & Quine, T. A. (1991). Use of caesium-137 measurements to investigate soil erosion in arable fields in the UK: potential applications and limitations. *European Journal of Soil Science*, 42, 147-165.

Walling, D. E., And Woodward, J. C. (1992). Use of radiometric fingerprints to derive information on suspended sediment sources: Erosion and Sediment Transport Monitoring Programmes in River Basins (Proceedings of the Oslo Symposium, August 1992), v. IAHS Publ. no. 210.

Walling, D. E. & Quine, T. A. (1993). Use of 137Cs as a tracer of erosion and sedimentation: Handbook for the application of the 137Cs technique [Report to the UK Overseas Development Administration].

Walling, D. E. & He, Q. (1999). Use of fallout 210Pb measurements to estimate soil erosion on cultivated land. *Soil Sci. Soc. Am. J.*, 63, 1404-1412.

Zapata, F. (2002). Handbook for the Assessment of Soil Erosion and Sedimentation using Environmental Radionuclides.

Zapata, F. & Nguyen, M. L. (2009). Soil erosion and sedimentation studies using environmental radionuclides. In: Froehlich, K. (Ed.), *Environmental Radionuclides: Tracers and Timers of Terrestrial Processes*.

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Cuban Foreign Policy. Main Potentialities and Threats in the Era of Covid-19

Náyade Caridad González González MSc

Professor at the Higher Institute of International Relations "Raúl Roa García". Havana, Cuba

ORCID: 0000-0002-1304-2766

e-mail: nayade27gg@gmail.com

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Abstract

Cuban foreign policy since 2020 has faced a complex and unfavorable international scenario, especially in the region. Influenced by external factors that have a negative impact on its internal situation, it is necessary to mention the covid-19 pandemic; the intensification of unilateral measures and economic and political coercion imposed by the United States government during the Trump administration and maintained by President Biden against Cuba, Nicaragua and Venezuela. Also the backward shift to the right in countries like Brazil, during the Jair Bolsonaro period; Argentina, during the administration of Macri and recently of Javier Milei; Colombia, under the government of Iván Duque; the Ecuador of Lenín Moreno and Guillermo Lasso and in Bolivia, with the coup d'état that temporarily removed the Movement to Socialism from the government. Despite this situation, the foreign policy of the Cuban Revolution continues to be characterized by its anti-capitalist, anti-colonial, anti-neocolonial, third world and anti-imperialist projection towards the countries of the continent and the global South. For these reasons, this article aims to study the main threats to Cuban foreign policy since the arrival of covid-19 pandemic in 2020.Also its main potentialities in relation to its projection towards Latin America and the Caribbean.

Keywords: *Cuban foreign policy, covid-19 pandemic, potentialities, threats*

Introduction

Since the year 2020, the Revolution has faced and is currently facing one of the most difficult moments in the history of the country. Not only was there a notable setback in the national economy, but the Cuban population suffered the impact of covid-19, a pandemic with unprecedented characteristics in the history of mankind due to its high rate of infection and lethality.

The international environment has also been complex, marked mainly by adverse trends such as: the intensification of the unilateral coercive measures of the United States imposed on Cuba between 2017-2021, still not reversed as promised by President Joe Biden ;the economic crisis suffered by Venezuela, Cuba's main trading partner and strategic ally in the region, conditioned by the commercial and financial blockade imposed by the US; and the shift to the right in countries of the region like: Brazil, during the period of Jair Bolsonaro; Argentina, during the administration of Macri and currently of Javier Milei; Colombia, under the government of Iván Duque; Ecuador, with Lenín Moreno and Guillermo Lasso; and Bolivia, with the coup d'état that temporarily removed the Movement Towards Socialism from government.

It is impossible to overlook that the Trump administration did not let up in a policy of maximum pressure since 2017, evidenced in more than 240 punitive presidential orders. This policy was maintained and increased with the utmost malice in the year 2020, when the pandemic unfolded all its danger of forcing the Cuban people to surrender by hunger and despair, raising the impact of the economic, commercial and financial blockade to 5.57 billion dollars in one year, although it has an accumulated cost of 144.413 billion in almost 60 years (Cuba's report on resolution 74/7 of the United Nations General Assembly, 2020).

Joe Biden's administration did not modify the restrictions of the coercive scheme against Cuba either. From its National Security Strategy, the approach it continued to promote towards Cuba, Venezuela and Nicaragua was to maintain an aggressive policy against these countries where, according to them, the will of the people is suppressed (ESN, 2022).

In the case of Cuba, this was evinced by the tightening of the blockade as a result of the continuation of the policy of maximum pressure and suffocation imposed by Trump. In the first 14 months of the Biden administration alone, the damages reported as a result of the blockade amounted to 6,364 million dollars, re-

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presenting an impact of more than 454 million dollars a month and more than 15 million dollars a day (MINREX, October 19, 2022).

Goes without saying that it is in the daily life of Cubans where the true impact of these effects is most deeply reflected. In this sense, it is valid to recognize that more than 80% of the current Cuban population has only known a Cuba with a blockade. (MINREX, 2023).

However, despite the complex international situation, the foreign policy of the Cuban Revolution towards the countries of the continent and the global South, in general, continued to be characterized by its anti-capitalist, anti-colonial, anti-neocolonial, Third World oriented anti-imperialist projection; as can be seen in the program of the PCC, in the First Socialist Constitution of the Republic of Cuba —with its successive reforms— and in the current Constitution. Thus, thanks to its international projection it was able to successfully overcome the unfavorable situation generated by the covid-19 pandemic.

Therefore, the purpose of this article is to identify the main threats to Cuban foreign policy since the arrival of the covid-19 pandemic in 2020. Likewise, its main potentialities in relation to its projection towards Latin America and the Caribbean and to the application of scientific diplomacy as a tool that contributes to improve relations with the United States.

Development

1.1 External factors that constitute threats to Cuban foreign policy in the complex scenario of covid-19

As noted above, two external factors have complicated Cuba's international situation: the Venezuelan economic crisis and the intensification of unilateral coercive measures applied by the Trump administration. It should be added that in recent years the regional environment has worsened for leftist forces in general with the electoral triumph of right-wing governments in countries such as Brazil, Colombia, Argentina, Chile, the shift to the right in Ecuador and the coup d'état that temporarily removed the Movement Towards Socialism from government in Bolivia.

Although there were variations favorable to the left with the electoral triumphs of reformist governments such as: Andrés Manuel López Obrador in Mexico; Alberto Fernández in Argentina and, Pb-210recently, Gustavo Petro in Colombia and Luis Ignácio Lula da Silva in Brazil.

> “[...] **In the first 14 months of the Biden administration alone, the damages reported as a result of the blockade amounted to 6,364 million dollars** [...]”

Regarding Cuba's relations with the United States, it should be noted that the powerful machinery of U.S. foreign, defense and imperial security policy, as well as its economic, financial, cultural and ideological apparatus imposed against certain nations of Latin America and the Caribbean, has been one of the significant characteristics of Donald Trump's administration.

The main purpose of the actions undertaken by this administration from its debut until its demise in 2021 was to strengthen its hegemony over the Western Hemisphere.

On this matter, it must be noted that the power of the USA has not diminished in absolute terms, as it is still the first military superpower and the largest global financial economy, since it has the majority control of the distribution of wealth generated by the world market of capital and by transnational corporations. This is owing to the privileges of the dollar, which continues to be the main world currency (Fernandez, 2020).

The US uses the geo-economic approach as an indispensable mechanism of its foreign policy that allows it

> “[...]
> **Cuba continues to have a well-earned prestige and leadership in the countries of the Global South**
> [...]”

to maintain a hegemonic position vis-à-vis the different world powers and impose its system of domination.

Thus, with the use of economic instruments of power they intend to fulfill their geopolitical objectives in international relations, influence the balance of global power and recover their share of hegemony, which has been in relative decline in recent times in the face of the advance of China and Russia and the influence of left-wing countries in the region (Fernandez, 2020).

With this in mind, the US intends to recover a part of its hegemony in the continent threatened —they say— by the malicious influence of non-hemispheric forces like Iran, North Korea, China and Russia, as well as the outmoded, authoritarian left-wing governments of Cuba, Venezuela and Nicaragua. (ESN.2017)-

To this end, the US has designed a set of actions covered by their National Defense Strategy since 2017 and with the approval of the ruling sectors and classes, which seek to overthrow the leftist governments that exist in the region, fundamentally the governments of Cuba, the Bolivarian Republic of Venezuela and Nicaragua. And to break the Latin American unity evidenced in the foundation in the early years of this century, of organizations such as the Bolivarian Alliance for the Peoples of Our America - Peoples' Trade Agreement (ALBA-TCP), the Caribbean Community (CARICOM), the Union of South American Nations (UNASUR) and the Community of Latin American and Caribbean States (CELAC).

Then, as expected, under Trump's mandate an aggressive campaign was unleashed against the Cuban government —presided since 2018 by Miguel Díaz-Canel Bermúdez— financing dissident groups and interfering with the reestablishment of relations between the US and Cuba, carried out in the last years of Barack Obama's administration.

The Caribbean nation was placed on the list of Governments Violators of Human Rights and State Sponsors of Terrorism.

On the other hand, with the justification of the implausible sonic attacks carried out in Havana on some officials of the US Embassy in Cuba, the US government expelled 17 officials of the Cuban Embassy in the US and reduced to the indispensable minimum the consular services offered by the US Embassy in Havana to Cuban citizens who wanted to travel to the US. In addition, U.S. officials were banned from traveling to Cuba (Suarez, 2022).

One of the elements that justify the aggressiveness of the Trump administration against our country is that it wants to present Cuba as the foreign power that intervenes directly in the preservation of the Maduro government in Venezuela. This country has been described by the president as an extraordinary threat to US national security.

That is the policy towards Cuba that Joe Biden inherited from his predecessor and that —in essence— he has not modified. This was shown when, a few days before Donald Trump's departure from the White House, the U.S. State Department announced the reinsertion of Cuba in the List of State Sponsors of Terrorism becoming one of the most harmful measures that reinforces the financial persecution.

As part of the policy of aggressiveness and maximum pressure towards Cuba, the government of the United States suitably used the situation generated by the covid-19 as an ally for its hostile policy against Cuba. Thus, the intention to strengthen the blockade at this juncture revealed its particularly inhumane face. The economic recession derived from the pandemic at world level was used to promote social instability trying to make the Cuban people surrender by hunger and desperation. (MINREX, 2023)

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Therefore, the scope of this policy in this period had a more perverse and harmful dimension from the humanitarian point of view.

The blockade causes extreme direct damage to all sectors of the country's economy. Between August 2021 and February 2022 alone, this policy caused losses to Cuba of approximately US$3,806.5 million[1] (MINREX, October 19, 2022), and the damages caused between March 1, 2022 and February 28, 2023 are estimated to be in the order of US$4,867 million. This represents an impact of more than 405 million dollars a month, more than 13 million dollars a day, and more than 555 thousand dollars for each hour of blockade (MINREX, 2023).

And from March 1, 2023 to February 29, 2024, the material damages caused by this system of unilateral coercive measures are valued in the order of US$5, 56.8 million, which represents an increase of US$189.8 million with respect to the 2023 report (MINREX, 2024).

On the other hand, the U.S. government has been deliberately willing to intimidate foreign investors and commercial entities through the application of Title III of the Helms-Burton Act. To this must be added the persecution of the country's financial and commercial transactions, the impossibility of processing non-immigrant visas in Havana, the constant threat to companies that send fuel supplies to the island, the attempts to frustrate the recovery of the tourism sector after the covid-19 pandemic and the demeaning campaign against Cuban medical cooperation programs (MINREX, 2023).

By depriving the country of financial income that is indispensable for acquiring food, medicines, fuel, equipment, parts and pieces, technologies and software, the impact of the blockade on the quality of life and the services provided to the population is undeniable. Therefore, the scope of this policy generates a situation of shortages, shortages, long lines and anxiety in the daily lives of Cubans and this situation motivates the increase in Cuban emigration.

To the above, we must add the media campaign that the U.S. communications and intelligence centers are waging against Cuba with the aim of creating a distorted reality in the virtual scenario, encouraging discontent, forming the perception of a situation of internal political crisis, demeaning government institutions and minimizing the enormous efforts that the country is making to overcome the challenges of a blockaded economy.

Despite the fact that these external factors constitute a threat to Cuban foreign policy, there are other external factors that facilitate it. For example:

- This context led the country to maintain and expand its collaborative health programs to regions where international medical cooperation[2] had never gone before. The example of Lombardy, in Italy, is case in point.
- The existence of a powerful program for the development of vaccine candidates, which contributed to uplift the prestige of Cuban medicine, a process that increasingly favors the application of scientific diplomacy to achieve certain foreign policy objectives.
- Strategic alliance relations with China and Vietnam. Also with Russia, whose geopolitical interests in the region make Cuba, due to its strategic position and its privileged relationship with the Venezuelan government, a partner of capital importance.
- The cooperative relationship with three key partners: Canada, the United Kingdom and the European Union.
- Norway has continued to support the role that Cuba has been playing as a facilitator of the peace dialogues in Colombia.
- Cuba continues to have a well-earned prestige and leadership in the countries of the Global South for its collaborative policies and its diplomatic capacity and maneuverability in multilateral environments.

1.2 Potentialities of Cuban foreign policy in its relationship with Latin America and the Caribbean after the arrival of the covid-19 pandemic

With the escalation of Donald Trump's imperial policy towards Cuba, the health crisis ensued forcing the closure of almost all activities between April and

1 This figure is 49% higher than that reported in the previous period.

2 International medical cooperation programs are of great significance for our economy, since they are an important source of foreign currency income in freely convertible currency.

June. Thus, in the first quarter of the year the GDP decreased by -5.5%; but in the second quarter the fall was -24.8% before a slow recovery began in July. (Rodriguez, 2021).

However, Cuba faced covid-19 with results far superior to those achieved by countries with more resources and possibilities. In this connection, it is worth noting that the country used resources of approximately 1.3 billion pesos and 100 million dollars.

This complex situation was reversed, among other things, by the provision of free health services, the mobilization of all the medical and paramedical forces necessary to care for the sick, the availability of sufficient medicines and hospital facilities, as well as the absolute priority given by the government to the fight against the pandemic and the contribution of Cuban science in that struggle. In addition, the majority support of the population for the measures adopted must be added.

The situation of tourism was deemed unfavorable due to the fact that the country was forced to close this activity since the arrival of covid-19. As a result, in the first four months of 2020 there was a 49% decrease in international visitors.

Similarly, the income from the export of skilled labor force, from health services, decreased approximately 16% in 2019. In 2020 this channel experimented further difficulties with the reception of liquid income from the Cuban collaboration in Venezuela and other countries as a result of the international economic crisis.

Although the covid-19 pandemic imposed a new dynamic in the way of conducting the relations between the States and the different actors of the international system, our country maintained what is stipulated in Article 16 paragraph d of the Constitution of the Republic of Cuba, which reaffirms the will of the country to integrate and collaborate with the countries of Latin America and the Caribbean. Likewise, to perpetuate unity and solidarity with all Third World countries, to condemn imperialism, fascism, colonialism, neocolonialism or other forms of subjugation in any of its manifestations (Constitution of the Republic of Cuba, 2019).

The institutional capacity of the Cuban government and its diplomacy to face this adverse external scenario, aggravated by the health crisis, played a decisive role. In this regard, Cuba has maintained and continues to maintain an active participation in international forums. It maintains diplomatic relations with 195 states; it has deepened political and diplomatic ties with its main international partners, diplomatic and economic relations with Asia and the Middle East are progressing; it has increased its foreign medical cooperation actions in times of covid, despite the aggressive campaign of the United States against it. And it has a recognized leadership in several bodies and relevant issues of the global agenda.

For example, Cuba supported the fight against SARS-COV-2 in 42 countries and territories of the world, where 58 medical brigades arrived, in addition to the more than 27 thousand health professionals already working in 59 nations (MINREX, 2023).

> “[…]
> **Cuba’s foreign policy towards Latin America and the Caribbean since January 1, 1959, has been characterized in its praxis by maintaining respect for and defense of non-interference in the internal affairs of States**
> […]”

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Likewise, different medical cooperation brigades were sent to 29 countries in the region, as a clear demonstration of the principle of solidarity practiced by Cuba since the triumph of the Revolution.

In addition, Cuba's foreign policy towards Latin America and the Caribbean since January 1, 1959, has been characterized in its praxis by maintaining respect for and defense of non-interference in the internal affairs of States, as well as upholding the principle of the "Proclamation of Latin America and the Caribbean as a Zone of Peace", in addition to denouncing the aggressions orchestrated by the United States against Venezuela and Nicaragua (MINREX, 2020).

Relations with the Caribbean continued to deepen, a fact that materialized in the support given by the Heads of State of CARICOM and the Organization of Eastern Caribbean States and the Foreign Ministers of the Association of Caribbean States against the blockade and Title III of the Helms Burton Act.

Even under pandemic conditions, the country maintained its support and activism in the different regional organizations and forums. The Pro-Tempore Presidency of Mexico in CELAC was supported. The country participated in the ALBA-TCP High-Level Virtual Conferences on Economy, Finance and Trade; in the VII CARICOM-Cuba Summit and the XVIII ALBA-TCP Summit.

In a context of post-pandemic crisis of the world economy, of extreme reinforcement of the blockade imposed by the United States against Cuba, our country continued to make progress in the fulfillment of its foreign policy objectives. The country in 2022 maintained its traditional activism in international and regional organizations and forums.

It should be noted that at the IX Summit of the Americas, 17 countries of our region were against the exclusion of our country and 11 spoke out against the blockade. Meanwhile, the People's Summit was held in Los Angeles where the Cuban President participated virtually.

Díaz-Canel participated in a tour of the Caribbean and in the VIII CARICOM Summit held in Barbados, events where he signed agreements and strengthened cooperation with the States of the area. He attended the installation of the new presidential term of Daniel Ortega in Nicaragua. Days later, Cuban Prime Minister Marrero Cruz participated in the 43rd Anniversary of the Sandinista Revolution and in an official visit to Venezuela. Vice President Valdés Mesa attended the presidential inauguration in Honduras.

Cuba received official visits by the President of Mexico, Andrés Manuel López Obrador and Prime Ministers Roosevelt Skerrit, of the Commonwealth of Dominica John Briceño, of Belize, Ralph Gonsalves, of Saint Vincent and the Grenadines and Philip Davis, of the Commonwealth of the Bahamas.

The José Martí Order was conferred on López Obrador, Skerrit and Gonsalves. Visits were received from Venezuela's Executive Vice President Delcy Rodríguez and from the foreign ministers of Colombia and Suriname, Álvaro Leyva and Albert Ramdin, respectively (MINREX, 2022).

Our country continued to actively participate in CELAC activities. Three meetings of foreign ministers were held, in which our Foreign Minister participated. Also, the III CELAC-European Union (EU) Meeting, which made it possible to resume the bi-regional dialogue in an inclusive format.

In addition, several meetings of ministers from other sectors were held in which Cuba intervened in defense of regional integration. The XXI and XXII ALBA-TCP Summits were held in Havana, as well as the official visit to our country of ALBA Secretary General Sacha Llorenti. In turn, a Cuban delegation headed by the First Deputy Minister of the Ministry of Foreign Trade (MINCEX) participated in the ALBA-TCP Economic Complementation Council, organized in Bolivia.

Cuba hosted the VI International Cooperation Conference of the Association of Caribbean States (ACS) on November 10, where transformation and innovation in the region were discussed. It was attended by the foreign ministers of Guatemala, Grenada and St. Vincent and the Grenadines. In August, Prime Minister Manuel Marrero headed the Cuban delegation to the first meeting of Caribbean countries on change.

Cuban President Miguel Díaz-Canel greeted the participants of the General Assembly of the Organization of Ibero-American States for Education, Science and Culture (OEI) by means of a pre-recorded video. He also received in Havana the Ibero-American Secretary General, Andrés Allamand, and the Secretary General of the OEI, Mariano Jabonero. Both meetings contributed to consolidate Cuba's ties with these Ibero-American cooperation mechanisms (MINREX, 2022).

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Cuba's contribution as guarantor and alternative venue for the peace processes in Colombia was also recognized. Accordingly, the Peace Delegation of the National Liberation Army (ELN) that was in Cuba, returned to their country in compliance with the agreed safe return protocol, and the Government-ELN talks table was reinstalled. For this reason, both President Gustavo Petro and Foreign Minister Álvaro Leyva rejected the inclusion of Cuba in the List of State Sponsors of Terrorism imposed by the US.

Cuban medical collaboration was maintained with around 13 Caribbean nations, in addition to Argentina, Guatemala, Mexico and Uruguay. In response to the damage caused by the fire in Matanzas and hurricane Ian, solidarity aid was received from several governments in the region, especially Mexico and Venezuela. Other important donations were made by Antigua and Barbuda, Argentina, Belize, Bolivia, Colombia, Jamaica, Nicaragua, Dominican Republic and Uruguay (MINREX, 2022).

The year 2023 witnessed important activities in the field of foreign policy. Cuba took up the high responsibility of leading the largest and most diverse group in the multilateral sphere, with 134 member states representing two thirds of the United Nations and 80% of the world's population: the Group of 77 and China (G77 and China).

> “[...] the cooperation between Cuba and the United States in the scientific field shows that science is an adequate diplomatic channel [...]”

The pro tempore presidency of the G77 and China demanded a great effort from our institutions and the country in general, reflecting the historical commitment of the largest of the Antilles in defense of the causes of the countries of the Global South.

In the many multilateral events that took place during the year and in which it participated on behalf of the G77 and China, Cuba's revolutionary diplomacy demonstrated authority and leadership, its adherence to principles and respect for the norms of international law and the Charter of the United Nations (UN), the promotion of dialogue and cooperation and its ability to build consensus and defend the unity of developing countries.

The Summit of Heads of State and Government of the G77 and China, held in Havana in September, reinforced the voice of the South as a key player in international discussions, when the “Current challenges of development: the role of science, technology and innovation” was the central theme of the gathering.

This was followed by the recent G77 and China Leaders' Summit, which took place within the framework of the COP28 Conference of the Parties on Climate Change in Dubai; an unprecedented event in the history of this mechanism that contributed to strengthening the role of the bloc in the climate negotiations.

Cuba also attended -at the highest level- the Summit meeting held in Paris to analyze monetary-financial problems, the BRICS Summit, as well as various other meetings held in the context of the High-Level Segment of the United Nations General Assembly.

Despite the efforts of the United States to prevent it, joined by several anti-Cuban elements in Europe and in the United States itself, Cuba was re-elected, with broad support, to the Human Rights Council of the United Nations.

The election of Cuba to the Executive Council of the United Nations Educational, Scientific and Cultural Organization (UNESCO), with a very large vote, was a source of great satisfaction.

This year, our country hosted the Fourth Conference “The Nation and Emigration”, which ratified the

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permanent commitment to move towards an increasingly close, natural and integral relationship with Cubans living in other countries.

1.3 The application of science diplomacy as an alternative that contributes to improving relations between Cuba and the United States

In spite of the complicated political relations, the cooperation between Cuba and the United States in the scientific field shows that science is an adequate diplomatic channel that allows transcending the adversity that these countries face in the political sphere (Pastrana, 2023).

Thus, the bilateral relationship in the technological field serves as a tool to achieve certain policy objectives and as an instrument to solve international challenges related to issues such as health and the environment. (Gutiérrez, 2024).

There is no doubt that there are records of fruitful actions in the field of science and technology. They have occurred especially through the links that exist between the American Association for the Advancement of Science (AAAS) and the Academy of Sciences of Cuba (ACC).

Indeed, the strengthening of relations between the two institutions took place in 2009 when a group of scientific leaders led by AAAS President Peter Agre visited Cuba with the aim of promoting cooperation projects in areas such as meteorology, marine sciences, infectious diseases and science education.

Later in 2014, AAAS and ACC signed an agreement linked to the development of research in the fields of oncology, neurosciences and infectious diseases.

In 2017 scientists from the AAAS, the ACC and the Pedro Kourí Tropical Medicine Institute (IPK), met in Havana during a symposium where they pledged to work together to combat mosquito-transmitted diseases: dengue, chikungunya and zika viruses.

During the pandemic, exchanges also took place between actors in the U.S. and Cuban scientific community. For example, in 2020 the first virtual meeting was held between the IPK and the MEDICC Review magazine. In this instance topics related to the protocols and epidemiological control strategies adopted in Cuba with covid-19 patients were addressed (Gonzalez and Perez, 2023).

Another significant example of scientific exchange was the invitation of prestigious academic and university centers in the United States to the Cuban scientific community to participate in the event entitled: "Vaccine Development and Deployment: The Cuban Case", organized by the Rockefeller Center for Latin American Studies at Harvard University in 2021.

In June 2022 MEDICC organized a trip to Havana with a delegation of scientists from the United States, the Caribbean and Africa to study the development of Cuban vaccines against covid. (González and Pérez, 2023).

The continuity of cooperation between AAAS and ACC is guaranteed after the renewal of the Memorandum of Understanding signed between these institutions in March 2023. This shows that the values of science, such as transparency, research and respectful debate, can help to overcome the obstacles that prevent a new type of relationship between the two nations.

Conclusions

As stated, Cuban foreign policy recorded important successes in recent times. However, since 2017 a notable deterioration in the external scenario began to occur which had a negative impact on the country's situation. This has been exacerbated since 2019.

Thus, the adverse international conditions for Cuba's foreign policy are: a) the strengthening of sanctions and hostility of the United States government; b) the acute economic and financial crisis in Venezuela, Cuba's main trade and cooperation partner; c) the change in the correlation of dominant political forces in Latin America and the Caribbean, d) the far-reaching changes imposed by the covid-19 pandemic on the organization of production and trade worldwide; e) the worsening of the international economic situation and the crisis of multilateralism; f) the crisis of the mechanisms of coordination, cooperation and integration in our region, .

On the other hand, although these external factors constitute serious threats to the foreign policy of the Cuban Revolution, this situation did not deter the country's will to integrate and collaborate with the countries of Latin America and the Caribbean. Likewise, to perpetuate unity and solidarity with all the countries of the Global South and to condemn and denounce

imperialism. It was precisely its solidarity and its anti-capitalist, anti-colonial, anti-neocolonial, Third World and anti-imperialist projection which allowed it to collaborate with these countries in the areas of health, education and trade. This allowed Cuba to successfully overcome the unfavorable situation in the international scenario.

However, given the challenges imposed by the current complex international juncture on the Cuban economy, affected by the economic, commercial and financial blockade imposed by the United States and its aggressive policies against our country. In addition to the world economic crisis and the consequences of the health crisis, it is opportune to think about how Cuba could become more involved in the processes of coordination, cooperation and integration in the region in order to boost the economy.

In this sense, it is suggested that Cuba continue to use scientific diplomacy as a tool that contributes to the improvement of relations between Cuba and the United States.

In terms of trade and investment, it is recommended that Cuba be inserted into global value chains. For example, Cuba's sugar agro-industry could develop competitive potential and external insertion, as could the agricultural sector in general. Other potentialities could be identified from the external insertion in the service sector, information technology and communications, as well as in scientific and technological services, taking advantage of the abundant skilled labor force that exists in the country, considering that the covid-19 scenario has enabled the accelerated development of the biotechnology industry.

References

Constitution of the Republic of Cuba (2019). https://www.covidlawlab.org.

ESN (2017) National Security Strategy of the United States of America.Washington: Seal of the President of the United States.https://trumpwhitehouse.archives.gov.

Fernández Tabío, L. (2020) United States, the power decline debate and foreign policy strategy in 2020. Havana: Social Development Studies: Cuba and Latin America.

González Gómez, T. y Pérez-Valerino, D. (2023)Cuba-United States scientific exchange in the biopharmaceutical sector from the impact of covid-19. International Political Review. V. 3. https://rpi.isri.cu/index.php/rpi/article/view/415/1186.

Gutiérrez Nieto, G. (2024) VIII SCIENCE, A COMMUNICATING VESSEL BETWEEN CUBA AND THE UNITED STATES. https://www.diplomaticosescritores.org/article/viii-la-ciencia-un-vaso comunicante-entre-cuba-y-estados-unidos.

MINREX (2022) Main results of Cuban foreign policy in 2022. https://misiones.cubaminrex.cu/es/principales-resultados-de-la-politica-exterior-cubana-en-20202

MINREX (2023) Cuba Report. Pursuant to United Nations General Assembly resolution 77/7, entitled "Necessity of ending the economic, commercial and financial embargo imposed by the United States of America against Cuba. ." https://cubaminrex.cu/sites/default/files/2023.

MINREX (2024) Cuban Foreign Minister presents update of the National Report on the impact of the U.S. blockade. https://cubaminrex.cu/es/canciller-de-cuba-presenta-actualizacion-del-informe-nacional-sobre-el-impacto-del-bloqueo-de-los.

MINREX (October 19, 2022). Addendum to the Report of Cuba on United Nations General Assembly resolution 75/289, entitled "Necessity of ending the economic, commercial and financial embargo imposed by the United States of America against Cuba" (August 2021 - February 2022). https://misiones.cubaminrex.cu/es/articulo/informe-de-cuba-sobre-el-bloqueo-de-eeuu-contra-cuba-2022

MINREX. (2020) Main results of Cuban foreign policy in 2020.https://misiones.cubaminrex.cu/es/articulo/principales-resultados-de-la-politica-exterior-cubana-en-2020

Pastrana, S. (2023) The Scientific Exchange Between Cuba And The United States, From The Discovery Of Biodiversity, And The Transmission Of Viruses, Until The Bojeo To Cuba. https://www.cipi.cu/wp-content/uploads/2023/12/Sergo-Jorge-Pastrana.

Report of Cuba on United Nations General Assembly resolution 74/7 (2020) Necessity of ending the economic, commercial and financial embargo imposed by the United States of America against Cuba.

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https://cubaminrex.cu/es/informe-de-cuba-en-virtud-de-la-resolucion-747-de-la-asamblea-general-de-las-naciones-unidas.

Rodriguez, J. (2021) The Cuban economy in 2020 and prospects in 2021. A preliminary assessment. www.onei.gob.cu.

Suárez, L. (2022) United States vs. Our America. El Gobierno de Donald Trump. Havana: Ediciones Política Internacional.

The White House. (2022) National Security Strategy. https://www.whitehouse.gov.

Building Bilateral Health Solutions: a Government-Academic Partnership to Improve Community Health

Katherine Y. Tossas, PhD, MS[1]

Organisations: Virginia Commonwealth University Massey Comprehensive Cancer Center; Virginia Commonwealth University School of Public Health; Cuban Ministry of Public Health; Mile Square Health Centers; Cuban Ministry of Foreign Affairs.

ORCID: 0000-0001-6872-2294

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Abstract

This article details the process of developing a groundbreaking academic-government partnership between the University of Illinois Cancer Center (UICCC) and Cuba's Ministry of Public Health (MINSAP). This first-of-its-kind collaboration aimed to address maternal and child health (MCH) inequities in Englewood, a structurally underserved, predominantly Black neighborhood in Chicago. Cuba's healthcare system, globally recognized for its innovative and community-based primary care model, boasts an infant mortality rate (IMR) of 4.3 deaths per 1,000 live births, compared to the U.S.'s 5.6. This remarkable achievement, despite limited resources, highlights Cuba's success in leveraging preventive care and universal access to improve public health outcomes.

The manuscript serves as a process paper, documenting the formation of this unique partnership and its efforts to adapt Cuba's Health Situation Analysis (HSA) framework to the U.S. context. It outlines the steps involved in securing regulatory approvals, fostering cross-cultural exchange, and engaging the local Englewood community to address health disparities. By leveraging Cuban expertise in primary care and addressing social determinants of health, the partnership sought to create actionable solutions to reduce infant mortality and improve overall health equity.

The article provides valuable insights into the challenges and successes of cross-national collaborations, offering a replicable model for addressing systemic health inequities in underserved communities. By detailing the partnership's development, this work emphasizes the importance of culturally competent, community-centered approaches to transforming health outcomes in resource-constrained settings. Lessons from this initiative underscore the potential of global partnerships to drive innovation and equity in public health.

Keywords: *bilateral collaboration, maternal and child health, healthcare delivery, Cuba-U.S. relations, community health, infant mortality, health inequities*

Introduction

Dynamics between the United States (U.S.) and Cuba are shaped by a complex interplay of political, economic, and social factors, as well as their location just 90 miles apart (Espinosa, 2006; Rehman *et al*., 2024). Despite their geographic closeness, the U.S. and Cuban healthcare systems differ significantly (Ciano, 2024). Cuba has emerged as a global leader in community health and preventative medicine, achieving remarkable public health outcomes in low-resource contexts, both domestically and internationally (Keck & Reed, 2012). In contrast, with the highest per-capita spending globally, the U.S. healthcare system operates within a framework that effectively treats many disease conditions for those with access. (Papanicolas *et al*., 2018)

Gaps in the U.S. public health and preventative care infrastructure contribute to significant health inequities (systematic differences in health or health risks disproportionately affecting disadvantaged social groups due to social, economic, and policy-driven factors).(Braveman, 2006) These health inequities are particularly evident in maternal-child health (MCH) outcomes, such as infant mortality, where Black babies die at more than 2.5 times the rate of white babies, (Singh & Yu, 2019) largely due to structural inequities and unequal access to vital resources for health and well-being (Wallace, Crear-Perry, Richardson, Tarvar & Theall, 2017). In contrast, with comparatively fewer

1Collaborators: José Armando Arronte Villamarín, MD, MPH3; Sonia María González Vega, MD, MPH3(ORCID: 0000-0002-9075-1726); Berta María Bello Rodríguez, PhD, MPH3 (ORCID: 0000-0002-6803-6726); Némesis Pérez Martínez, RH3 (ORCID: 0000-0001-6568-8334); Karriem S. Watson4 (ORCID: 0000-0002-5575-7102), Alfonso Casanova Valdés, BS5 (ORCID: 0000-0002-0724-8637); José Ramón Cabañas, PhD5 (ORCID: 0000-0001-7778-3566); Robert A. Winn, MD1(ORCID: 0000-0001-5948-9291)

> “[…] Historically, healthcare providers, scientists, and public health professionals in the United States (U.S.) have had limited opportunities to collaborate with or learn from their counterparts in Cuba […]”

resources, Cuba boasts an infant mortality rate (IMR) of 4.3 deaths per 1,000 live births —lower than the overall U.S. IMR — (Table 1, Espinosa, Lauzurique, Alcázar, *et al*., 2018). This contrast highlights the potential for cross-national partnerships with Cuba to inform strategies that address U.S. health inequities, particularly the disproportionate rates of high infant mortality observed in impoverished communities of color (Brun, Pawloski & Robinson, 2019).

Historically, healthcare providers, scientists, and public health professionals in the United States (U.S.) have had limited opportunities to collaborate with or learn from their counterparts in Cuba despite shared public health challenges and interests (Pastrana & Clegg, 2008). These include advancements in understanding disease transmission, weather science for mitigating tropical storm damages, and Cuban innovations in public health, healthcare, and biotechnology (Pastrana & Clegg, 2008; Jorje-Pastrana, Gual-Soler & Wang, 2018). Onerous requirements for scientific travel and exchange have posed significant challenges to collaboration, impacting scientific advancement and productivity (DeWeerdt, 2001; Fink, Leshner & Turekian, 2014; Ronda-Pupo, 2024). However, there have been notable instances of scientific collaboration, particularly during the Obama administration, which fostered partnerships in marine science, ocean conservation, and other areas of shared interest (Machlis et al., 2012). Collaborative efforts, such as those between the Cuban Academy of Sciences and the American Association for the Advancement of Science (Pastrana, Gual-Soler & Wang, 2018), demonstrate that scientific networks can persist and thrive even in the face of historical tensions and restrictive policies (Ronda-Pupo, 2021).

The Obama administration sought to ease tensions with Cuba through policies to restore diplomatic relationships, fostering opportunities for scientific collaboration between the two nations (Morrison & Gannon, 2015). These efforts culminated in re-establishing diplomatic ties in 2015, marking a significant shift after decades of strained relations (Alexandra, 2019; Lee & Park, 2016). Within this context, a groundbreaking partnership was initiated between the University of Illinois Cancer Center (UICCC) and the Cuban Ministry of Public Health (MINSAP). This collaboration represented the first governmental-academic partnership between Cuba and a U.S. research institution. The initiative aimed to leverage Cuba's effective healthcare delivery and public health practices to address maternal and child health (MCH) inequities in structurally underserved communities in Chicago. By adapting Cuban MCH care models to the local context, the partnership sought to tackle specific health challenges these communities face and improve overall health outcomes (Kim *et al.*, 2019).

Herein, we describe the partnership and our work together implementing Cuban Health Situation Analysis (HSA) in a low-income, predominantly Black neighborhood of Chicago, Englewood, where IMRs are approximately three times the U.S. national average (Bishop-Royse, Lange-Maia, Murray, Shah & DeMaio, 2021). We will first provide context for our work with an overview of U.S. health inequities related to infant mortality, the Cuban context, HSA as a tool for improving health outcomes, and the community of Englewood, which parallels the

low resource settings seen in other developing nations. Next, we describe the formation of the partnership as a response to the needs identified by Englewood residents, including policy-level hurdles to collaborative work. Once our partnership had secured funding and needed approvals, a MINSAP delegation consisting of two Cuban primary care physicians, a community nurse, and an epidemiologist visited UIC for four months of intensive collaboration. During that time, we utilized the HSA framework in Englewood. While the findings of the HSA will be detailed in a forthcoming publication, the results section focuses on the partnership itself, emphasizing the processes, challenges, and impacts of our collaborative efforts.

Finally, in the discussion section, we argue for increased scientific collaboration, building on the groundbreaking precedent we set for governmental cooperation in health research and practice between the U.S. and Cuba. By fostering such partnerships, there is potential to improve health outcomes in communities like Englewood and create a model for addressing health inequities across the U.S. This initiative represents a significant milestone in global health collaborations and underscores the importance of community engagement and culturally competent healthcare solutions.

The U.S. Health Inequities in Infant Mortality

Despite the highest healthcare spending of any country on Earth, the U.S.'s IMR lags behind 25 other Organisation for Economic Cooperation (OCED) countries (MacDorman, Mathews, Mohangoo & Zeitlin, 2014). Notably, infants born very preterm in the U.S. survive at comparable rates to their European-born counterparts, which speaks to the U.S.'s utilization of expensive medical technologies and curative expertise in keeping very premature babies alive. However, babies' survival rates decrease with gestational age; moderately preterm and term babies are more likely to die in the U.S. than in almost all other OECD countries (MacDorman, Mathews, Mohangoo & Zeitlin, 2014). The high mortality rates for babies born slightly before and at term reflect social drivers of health and gaps in preventative, primary care, and public health infrastructure despite access to the advanced medical technology necessary for keeping very premature babies alive. (Lorenz, Ananth, Polin & D'Alton, 2016). Importantly, structural inequities and unequal access to care significantly contribute to stark disparities in MCH and birth outcomes (Alhusen, Bower, Epstein & Sharps, 2016). These inequities are evident in IMRs, which varied in 2018 from 10.8 per 1,000 live births among Black populations to 9.4 among Native Hawaiian and Pacific Islander, 8.2 among Native American/Indigenous and 4.6 among white populations. These disparities resulted in an overall U.S. IMR of 5.58 per 1,000 live births (Table 1, Jang & Lee, 2022) and are due to several factors, including documented differential access to prenatal care and differential treatment by healthcare

Table 1 - Health Indicators in Englewood, as Compared to Chicago, Illinois state, the U.S., and Cuba

Indicator	Englewood (Chicago)	Chicago	Illinois	U.S.	Cuba
Infant Mortality Rate (per 1,000 live births)	17.3	6.3	5.6	5.6	4.3
Unemployment Rate	22.40 %	8.20%	3.90%	3.40%	1.40 %
Less than High School Education	20.80 %	13.40%	9.90%	10.90%	0.20 %
Percentage of People Living Below the Poverty Line	36.02 %	16.93%	11.80%	12.50%	90 %
Median Income	$ 27,792	$ 71,673	78,433	75,149	$ 400
Percentage of Pregnant People Initiating Prenatal Care in First Trimester	71.60 %	75.00%	76.70%	77.00%	95.00 %
Percentage of Residents Who Are Black / African-American / Afro-Cuban	90.50 %	28.40 %	13.70 %	12.10 %	9.30 %
Data Sources and definitions in Appendix A					

providers, contributing to earned mistrust of the healthcare system (Attanasio & Kozhimannil, 2015; Salm Ward, Mazul, Ngui, Bridgewater & Harley, 2013; Slaughter-Acey *et al*., 2019).

A recent study suggests that patient-physician racial concordance in the delivery room reduced intrapartum Black infant mortality by a factor of nearly 50% (Greenwood, Hardeman, Huang & Sojourner, 2020). Patients of color with racially concordant providers are also more likely to utilize healthcare services, demonstrating the importance of culturally and racially aligned care (LaVeist, Nuru-Jeter & Jones, 2003). Structural inequities further exacerbate these disparities, with higher exposure linked to increased IMR among Black individuals while paradoxically decreasing IMR for white individuals (Vilda, Hardeman, Dyer, Theall & Wallace, 2021).

Residential segregation, often a result of systemic divestment from communities of color, remains a critical driver of racial differences in infant mortality. Segregated urban areas exhibit disproportionately higher mortality rates for Black infants (Polednak, 1996). Likewise, the stress associated with daily experiences of discrimination contributes to diminished MCH outcomes, including infant mortality (Alhusen, Bower, Epstein & Sharps, 2016; Slaughter-Acey *et al*., 2019). For example, a study found that after the surge in anti-Arab and anti-Muslim violence following the 9/11 World Trade Center attacks, women with Arabic surnames experienced significantly elevated rates of low birth weight and prematurity—both risk factors for infant mortality—suggesting a causal link between discrimination and adverse birth outcomes (Lauderdale, 2006). Similarly, longstanding evidence shows statistically significant associations between racial discrimination and adverse birth outcomes such as low birth weight and prematurity among Black pregnant individuals (Collins, David, Handler, Wall, & Andes, 2004).

Structural inequities also affect numerous social drivers of health, disproportionately impacting communities of color. These include higher rates of poverty and reduced access to essential resources such as nutritious food, stable housing, and opportunities for family and community connection (Beech, Ford, Thorpe, Bruce & Norris, 2021; Dagher & Linares, 2022). A study of Chicago neighborhoods found that IMRs in low-income communities were an average of 2.53 times higher compared to affluent neighborhoods, with rates ranging from 1.4 in the wealthiest areas to 24.5 in the poorest. Neighborhoods with the highest concentrations of Black residents experienced IMRs that were 3 to 3.5 times higher than in predominantly white neighborhoods, further underscoring the profound impact of structural inequities (Bishop-Royse, Lange-Maia, Murray, Shah & DeMaio, 2021).

Cuban Health System Advances

Cuba's health system has drawn significant attention for its achievements in public health, particularly in MCH. For instance, a study comparing birth outcomes in rural Alabama to those in Cuba highlighted the success of Cuba's community-based healthcare approach in reducing the prevalence of low birth weight, a key predictor of infant mortality (Neggers & Crowe, 2013). The Cuban model, characterized by integrated services and a strong emphasis on preventive care, has been recognized as a potential source of insights for U.S. healthcare reform (Cooper, Kennelly, & Ordúñez-García, 2006; Keck & Reed, 2012). Cuba's focus on universal access and community-oriented primary care has consistently delivered improved health outcomes, despite economic challenges (Dresang, Brebrick, Murray, Shallue & Sullivan-Vedder, 2005; Watson, Rhein &

“[...] Cuba's health system has drawn significant attention for its achievements in public health, particularly in MCH [...]”

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Fanelli, 2021). Furthermore, Cuba's robust engagement in global health initiatives and its contributions to international medical education —training thousands of healthcare professionals, including some from the U.S.— provides a strong foundation for fostering future collaborative efforts (Motala & Wyk, 2019; Wenham & Kittelsen, 2020).

Health Situation Analysis Overview

The core framework of this collaboration centers around the Health Situation Analysis (HSA), an analytical tool supported by the World Health Organization and extensively applied within Cuba's public health system to evaluate and prioritize healthcare needs in resource-limited settings (Pyone, Smith & Broek, 2017). HSA originated in Cuba following the 1984 National Health System reforms, which introduced the "Family Doctor and Nurse" model (Lamrani, 2021). As part of this model, HSA became a cornerstone for addressing community health issues and informed public health decision-making across multiple levels. Structured as an "analytical-synthetic process," HSA assesses the health status of a population by identifying health problems, social drivers, and health sector needs. By measuring health indicators and determinants, HSA supports governments and health systems in resource-constrained environments, informing needs assessment, program development, and outcome evaluation.

The application of HSA extends beyond individual clinical care to community-level health planning, strongly emphasizing prevention and addressing structural inequities through data-driven insights. HSA's cross-sectorial approach provides a comprehensive understanding of social drivers, providing an evidence-based framework for prioritizing public health interventions. It has proven effective in supporting political and institutional prioritization, mobilizing resources, and developing health policy. The Cuban healthcare model's success in maintaining low infant mortality and high life expectancy in low-resource settings is primarily attributed to this integrative and preventive approach, which has also demonstrated adaptability in diverse populations outside of Cuba (Gorry, 2013).

Englewood, Chicago, United States

Englewood, a neighborhood of approximately 21,000 residents on Chicago's South Side, faces profound socioeconomic challenges, systemic health inequities, and long-standing governmental disinvestment (Chicago Metropolitan Agency for Planning, 2024). The community is predominantly Black (90.5%), compared to 28.4% of Chicago's overall population, in a city and state marked by high levels of residential segregation and the resulting maternal and child health (MCH) inequities (Bishop-Royse, Lange-Maia, Murray, Shah, & DeMaio, 2021). Educational attainment in Englewood reflects significant disparities, with over 20% of adults lacking a high school diploma—nearly double the rate citywide—and more than 52% having never pursued education beyond high school (CMAP, 2024). These factors contribute to an unemployment rate of 22.4%, almost triple Chicago's overall rate of 8.2%. The neighborhood's disability rate is similarly alarming, with 23.6% of residents living with disabilities —more than double the citywide rate of 11.3%— and limited access to necessary supportive services exacerbating this issue. Economically, Englewood's median household income is strikingly lower than the Chicago average. Nearly half of all households in Englewood earn less than $25,000 annually, with an additional 22% earning between $25,000 and $49,999, starkly contrasting with the citywide rates of 20% and 17%, respectively (CMAP, 2024).

These disparities underscore the inequitable distribution of resources and opportunities, which are deeply rooted in structural segregation and disinvestment. The city of Chicago assigned Englewood a hardship index score of 94, one of the highest in the city (Chicago Data Portal, undated). This chronic disinvestment directly contributes to adverse health outcomes, including elevated rates of infant mortality and low birth weight that rival those in developing countries (Zaimi, 2021). Englewood residents also experience disproportionately high rates of chronic illnesses, such as diabetes and heart disease, along with some of the lowest vaccination rates in Chicago, reflecting inconsistent access to healthcare services (Krumrey, 2021).

Significant gaps in transportation infrastructure and vehicle ownership compound these challenges, with nearly 50% of Englewood residents lacking access to a vehicle (CMAP, 2024). This transportation deficit limits access to essential healthcare services and resources (Tung *et al*., 2019). Furthermore, disinvestment has fueled elevated crime rates, poorer overall

> “[…] Facilitating a U.S.-Cuba collaboration required navigating complex administrative processes […]”

health outcomes, and reduced lifespans. On average, Englewood residents live at least seven years less than other Chicago residents (Krumrey, 2021). These interwoven challenges highlight the profound impact of systemic inequities on Englewood's social and health landscape.

Englewood is served by the Mile Square Health Center, a Federally Qualified Health Center (FQHC). FQHCs are community health clinics designed to address healthcare shortages and provide primary care and other essential health services to vulnerable populations (Xue et al., 2018). Unlike many other healthcare institutions in the U.S., FQHCs are mandated to offer comprehensive services to all patients, regardless of their ability to pay. This makes FQHCs an essential safety net, especially for the 25.6 million U.S. residents who lack health insurance, which otherwise provides coverage for healthcare services through paid premiums or government assistance (Department of Health and Human Services, 2024).

However, when UIC partnered with the FQHC as part of a grant to increase cancer screening utilization, we identified significant gaps in engagement and a visible disconnect between the community and the clinic. Many Englewood residents expressed disenfranchisement and a lack of trust in healthcare systems, undermining their participation in available services (Moss et al., 2022). Through conversations with FQHC patients and other community members, we uncovered a pervasive perception that the FQHC was primarily an STI clinic, a legacy of its historical role. This misconception left many residents unaware of the clinic's expanded scope of services and its commitment to providing free care for those unable to pay.

Community members also voiced frustration over persistently high infant mortality rates (IMRs), a deeply felt and urgent priority for the neighborhood. Many saw this as an unjust burden compounded by what they perceived as insufficient effort from the FQHC, the university, and other institutions to address this critical issue. Responding to these concerns, we embarked on a collaborative learning process to identify interventions and strategies that could effectively reduce infant mortality and address maternal and child health (MCH) inequities in Englewood.

Development

Partnership Initiation and Formation

The UICCC's engagement with Cuban health practices began in 2015 when Dr. Robert Winn, then Director of the UICCC, joined a team in Cuba to explore its exemplary health outcomes. During this visit, the team participated in the CUBA-SALUD conference, analyzing national health indicators such as infant mortality and life expectancy, particularly within low-income, multiracial populations (Cuban Ministry of Public Health, n.d.). When community residents in Englewood identified reducing infant mortality as a top priority, we set out to address the profound health inequities in the neighborhood. Initially, we conducted a thorough literature review and consulted national colleagues to identify effective U.S.-based interventions for reducing infant mortality. Unfortunately, we were unable to find models tailored to the unique needs and cultural nuances of Englewood.

This gap prompted us to consider the Cuban approach, renowned for its community-engaged care model and its emphasis on healthcare professionals being embedded within and deeply connected to the communities they serve. Recognizing striking parallels between the health challenges faced by structurally

underserved communities in Chicago and those successfully addressed in Cuba, UIC identified the Cuban Health Situational Analysis (HSA) model as a promising framework for tackling health inequities. This approach offered a valuable opportunity to address maternal and child health (MCH) disparities while fostering community trust and connection in Englewood.

The UICCC's engagement with Cuban health practices began with a series of deliberate and collaborative steps to establish a partnership that could address pressing health inequities, including the high infant mortality rate (IMR) in Englewood. Initially, we worked with a local Chicago consulting firm to conceptualize what such a partnership with Cuba might look like. Building on these early efforts, we made initial connections with the Cuban Embassy in Washington, D.C., with MINSAP and the Cuban Ministry of Foreign Affairs (MINREX) to express our commitment to a mutually beneficial collaboration. These discussions emphasized the shared goal of addressing MCH inequities, particularly in underserved communities like Englewood.

We secured funding from the W.K. Kellogg Foundation, a key supporter committed to improving MCH outcomes in the U.S., to support this effort. Upon securing this funding, our communications extended to Ambassador Jeffrey DeLaurentis, then serving as Chief of Mission at the U.S. Embassy in Havana, Cuba. Ambassador DeLaurentis assisted us in navigating the necessary diplomatic channels and regulatory requirements, including preparing a proposal for submission to the Office of Foreign Assets Control (OFAC) and the Cuban Embassy in Washington, D.C., under the leadership of Dr. José Ramón Cabañas. The Cuban Embassy then submitted this proposal to MINSAP and MINREX to broker the partnership.

At this stage, we directly engaged with MINSAP leadership, leveraging relationships Dr. Winn had developed during his visit to Cuba in 2015, where he participated in the CUBA-SALUD conference. In his correspondence, Dr. Winn underscored our intent to create a mutually educational collaboration that could help address health inequities, particularly those related to infant mortality, as identified by Englewood residents as a top priority.

Recognizing the importance of sustained relationship-building and cultural concordance in fostering meaningful partnerships, Dr. Winn strategically built a team led by a bilingual and bicultural Puerto Rican epidemiologist with extensive experience in partnership development, program implementation, and process management. This combination of expertise and cultural insight uniquely positioned the team to bridge the collaboration by leveraging professional expertise and the natural connection rooted in the shared cultural and historical ties between Puerto Rico and Cuba. This cultural concordance and deep understanding of the region's dynamics enriched the collaboration, strengthening the foundations of trust and mutual respect critical to the partnership's success.

These efforts culminated in establishing a formal partnership in 2016, supported by a W.K. Kellogg Foundation grant. This partnership laid the groundwork for developing and implementing innovative strategies to reduce health disparities in Englewood, rooted in Cuba's proven community-centered healthcare approaches.

Administrative Processes

Facilitating a U.S.-Cuba collaboration required navigating complex administrative processes, particularly concerning regulations and licenses for resource exchange. Current U.S. regulations permit scientific collaborations as a legitimate basis for exchanges between U.S. and Cuban nationals. However, initiating such collaborations involves considerable preparation, strategic communication, and compliance with legal requirements.

To advance the partnership, the team adopted a multi-faceted approach. Recognizing the importance of strong political and institutional backing, we engaged community leaders and local, state, and national government officials to garner support. This effort resulted in more than 40 letters from prominent members of Congress, Senators, and other representatives, all emphasizing the project's necessity and its potential to address health inequities in underserved U.S. communities. These letters were crucial in demonstrating the project's significance and advancing the administrative review process.

Additionally, we drafted a comprehensive operational plan, in close consultation with the Cuban Embassy, MINSAP, and MINREX, detailing the research partnership's proposed activities, timelines, and logistics.

The plan covered essential elements such as visa management, travel and lodging arrangements, health insurance for Cuban researchers, communication strategies, and transportation. It also outlined potential benefits, including visiting professorships, co-authorship opportunities, and the co-development of future grants.

A pivotal aspect of the operational plan addressed obtaining necessary licenses from the U.S. Office of Foreign Assets Control (OFAC) to allow resource exchange with Cuba. Initially, U.S. regulations required submitting license applications for projects involving financial transactions with Cuba. The team launched a political strategy to overcome this hurdle, elevating the project to national attention. This advocacy effort underscored the partnership as a model example of reciprocal collaboration, showcasing Cuba's strengths in primary healthcare delivery and its potential to improve health outcomes in the U.S. These efforts culminated in a significant regulatory amendment on October 17, 2016 when OFAC exempted medical research projects like ours from the requirement to submit license applications for resource exchange. This milestone validated the bilateral nature of the partnership and underscored its importance. The regulatory change and widespread political support signaled a broader shift toward acknowledging the value of U.S.-Cuba collaborations in addressing global health challenges.

In close consultation with the Ambassador to Cuba in the U.S. at the time, Dr. José Ramón Cabañas, and the Ambassador to the U.S. in Cuba, Jeffrey DeLaurentis, we developed and submitted the necessary proposals to OFAC and coordinated with the Cuban Embassy to gain approval from MINSAP and MINREX. These steps legitimized the collaboration, paving the way for implementing innovative strategies based on Cuba's successful community-centered healthcare model. This rigorous and collaborative administrative process laid the foundation for a partnership built on mutual respect, shared goals, and the potential for transformative impact on maternal and child health inequities.

Project Goals and Objectives

This project aimed to establish a formal, bilateral medical research partnership between UIC and MINSAP to conduct a comprehensive evaluation

> “[…] the project began with a series of relationship-building activities, including monthly video and conference calls […]”

using the Cuban HSA framework in Chicago's underserved neighborhoods, with Englewood as the pilot site. We also sought to co-develop an implementation plan for scaling effective Cuban health strategies within the U.S. healthcare landscape, adapting Cuban models of MCH to the local context to address specific community health challenges (Kim *et al*., 2019) We hoped that this initiative could serve as a crucial step in advancing cross-cultural health research and offer a model for leveraging international expertise to meet the health needs of structurally underserved communities like Englewood that experience high levels of health inequities.

Phases

We used a tri-phase approach: *Phase 1 (Figure 1), Relationship Building and Cultural Immersion,* ran from March 2016 to June 2016. During this time, we established an officially recognized relationship between UICCC and MINSAP, with active collaboration fostering a bilateral exchange of best practices for addressing MCH inequities. This phase emphasized cultural immersion, allowing UICCC stakeholders to gain firsthand insights into the Cuban context, healthcare system, and outcomes. *Phase 2 (Figure 2), Reciprocal Visits,* which ran from August 2016 to January 2017,

brought a Cuban delegation to Englewood. Cuban healthcare professionals gained practical experience in Chicago's community healthcare settings, such as the FQHC. Finally, *Phase 3 (Figure 3), HSA Implementation*, from August 2017 to December 2017, consisted of conducting a modified HSA as a cross-national team. This allowed us to gain experience adapting and assessing the impact of Cuban MCH practices, such as the HSA, to the needs and contexts of structurally underserved communities in the U.S. to improve IMRs and other essential health outcomes.

Figure 1: Visit to Policlínico 26 de julio in Habana during Phase 1

Figure 2: Image of Senator Dick Durbin of Illinois with initial Cuban Delegation visit during Phase 2. L to R, Dr. Robert A. Winn (UICCC Director), Dr. Carlos Calvis Cabrera, Dr. Sonia Maria Gonzalez Vega, Dr. Katherine Y. Tossas, Senator Dick Durbin, Dr. Robert Barish (UIC Sr Vice Chancellor), Dr. José Armando Arronte Villamarín)

Figure 3 L to R – Cuban epidemiologist Dr. Berta Bello Rodríguez and Cuban Community Nurse Nemesis Perez Martinez join Dr. Carla Pinto (UICCC research team) during a Phase 3 home interview conducted in Englewood, Chicago, IL, as part of the Health Situation Analysis.

Relationship Building and Reciprocal Visits

To ensure a robust and effective collaboration, the project began with a series of relationship-building activities, including monthly video and conference calls to foster open communication and collaborative planning. These calls served as a platform for project coordination, sharing insights, and aligning goals and expectations. The UIC team undertook an in-depth study of the Cuban healthcare system using resources such as the *Anuario Estadístico de Salud de Cuba*, a comprehensive annual

statistical publication detailing health indicators by age, gender, and province, which provided critical context for understanding Cuban health practices and their application to underserved communities (Ministerio de Salud Pública de Cuba, 2024). Additionally, MINSAP and other peer-reviewed research recommendations helped guide the planning process. To enhance MINSAP's understanding of the U.S. context, the UIC team shared relevant data and insights on U.S. healthcare systems and the unique challenges faced by the Englewood community.

Englewood residents were actively engaged in this phase through focus groups and community town halls, ensuring their voices and needs were central to the project. In August 2016, the UIC team traveled to Cuba for a week-long visit, which included tours of Havana polyclinics, in-depth discussions with Cuban health officials, and participation in community-based health assessment activities. These visits exposed the Cuban healthcare system firsthand, including its preventive care practices and community-based health assessment methodologies.

Parallel to these efforts, the UIC team continued the complex process of securing visas for the MINSAP team to visit Chicago. This process involved navigating U.S. OFAC regulations, leveraging support from prominent political figures, and collaborating with the Cuban Embassy in Washington, D.C., and the U.S. Embassy in Havana. Ambassador Jeffrey DeLaurentis and Deputy Coordinator for Cuban Affairs, Mr. Mark Wells, were instrumental in expediting the approval process.

In January 2017, a historic exchange occurred as a MINSAP delegation visited the UIC campus, various community health centers, and Englewood neighborhoods for the first time. This initial visit was followed by a second MINSAP delegation visit from August to December 2017, during which the team participated in a four-month immersion period. The MINSAP team engaged in various research activities, including conducting comprehensive qualitative interviews in the homes of women of reproductive age who agreed to participate in the study. These interviews aimed to identify factors that participants associated with infant mortality and maternal and child health in their community. Additionally, the MINSAP team learned about clinic data systems to assess patterns and opportunities for improving health outcomes and participated in collaborative discussions with FQHC staff to better understand underserved populations' operational and systemic challenges. This immersive approach ensured that the delegation gained an in-depth understanding of the community's needs, fostering a stronger foundation for developing tailored interventions collaboratively. The delegation also met with community members for ground-truthing and to better understand local health needs and cultural dynamics.

Throughout their stay, the MINSAP team resided in Chicago, ensuring a deep immersion in the health realities of Englewood. They collaborated closely with FQHC staff, including participating in interdisciplinary team meetings, observing clinic workflows, and co-developing tailored health interventions. These reciprocal visits and immersive activities established a strong, mutually beneficial partnership. They highlighted the potential for cross-cultural learning to address health inequities in structurally underserved communities.

Adapting HSA Methodology to Conduct an Adapted HSA in Englewood

As detailed below, the MINSAP and UIC teams collaborated to design and implement an adapted version of the Health Situation Analysis (HSA) in Englewood. Using the Cuban HSA framework, the project integrated primary and secondary data sources to comprehensively understand the health and social drivers impacting the Englewood community.

Setting and Population

To address the community-identified priority of high infant mortality, the HSA focused on women and individuals assigned female at birth, aged 18-49, residing in Englewood, Chicago. Recruitment efforts were multifaceted, leveraging clinic referrals, community outreach, and digital platforms. Eligible participants were invited to participate in interviews, home visits, and surveys. These invitations were extended through FQHC clinicians, flyers, and social media campaigns, ensuring diverse and inclusive engagement across the community. Institutional Review Board (IRB) approval was obtained through UIC's IRB, and all participants provided informed consent before participating in the study.

> “[...] Qualitative and quantitative data collection methods were employed to comprehensively assess Englewood’s health and social drivers [...]”

Data Collection and Analysis

Qualitative and quantitative data collection methods were employed to comprehensively assess Englewood's health and social drivers. Individual interviews were conducted to gather insights into the social determinants of health, healthcare needs and experiences, community priorities, and perceptions of maternal and child health. The study team, comprised of graduate students and staff, was co-trained by UICCC and the Cuban delegation. This interdisciplinary team ensured culturally sensitive and methodologically rigorous data collection using a collaboratively developed structured interview guide.

In-person paper-based surveys complemented the interviews, capturing additional perspectives from the study population. Quantitative, community-level data were reviewed to evaluate key health metrics, such as prenatal care utilization rates. This collaborative review between UIC and MINSAP provided a dual lens of expertise and local context.

Data were securely stored and analyzed using REDCap for qualitative data management and Stata 15 for quantitative assessments. The analysis integrated qualitative synthesis of community insights with quantitative evaluations of sociodemographic and health indicators, resulting in a nuanced understanding of Englewood's health landscape and its drivers.

Health Situation Analysis (HSA) findings were presented during community forums to validate results and foster engagement. These forums served as a platform for member checking, ensuring that the findings accurately reflected community experiences and perspectives while promoting transparency and collaboration.

Key Activities and Stakeholders

The collaboration engaged a wide range of stakeholders, including the Infant Welfare Society (IWS), Mile Square Health Centers (MSHC), the Illinois Medical District (IMD), and various political entities such as the Congressional Black Caucus and Illinois political leaders. Each partner contributed unique expertise, facilitating the planning and operationalization of this international partnership.

Summary of Partnership Development Process

This manuscript focuses on the outcomes of the UIC-MINSAP partnership development process rather than the specific results of the Health Situation Analysis (HSA). Findings from the HSA, including community-level insights and health data, will be published in a subsequent manuscript. Here, we highlight the significant milestones, successes, and challenges of establishing this historic collaboration and the lessons learned from this cross-national, academic-governmental partnership.

The development of the UIC-MINSAP partnership required a strategic, phased approach. Initial efforts focused on relationship-building, cross-cultural immersion, and establishing shared goals. The partnership was formally launched in 2016, supported by grant funding from the W.K. Kellogg Foundation. The initial planning phase engaged multiple stakeholders, including community organizations, healthcare providers, academic institutions, and government entities, to align priorities and strategies for addressing maternal and child health (MCH) inequities in Englewood.

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From the outset, UIC leadership prioritized cultural concordance and sustained relationship-building as core principles. The UIC team leveraged existing relationships with MINSAP officials, developed during a 2015 visit to Cuba, to emphasize the mutual educational nature of the collaboration. The partnership was grounded in a shared commitment to improving MCH outcomes and adapting Cuban health strategies to the U.S. context, focusing on addressing the community-identified priority of reducing infant mortality in Englewood.

To operationalize the partnership, the UIC team worked closely with U.S. and Cuban governmental agencies, including the Cuban Embassy in Washington, D.C., and the Office of Foreign Assets Control (OFAC). Advocacy efforts included securing over 40 letters of support from local, state, and national policymakers to demonstrate the project's significance and garner regulatory approval for the MINSAP delegation's visit. These efforts led to a critical regulatory amendment by OFAC, which exempted joint medical research projects with Cuba from licensure requirements, facilitating the exchange of resources between U.S. and Cuban partners.

Cross-Cultural Immersion and Exchange

A key partnership element was the cultural exchange between UIC and MINSAP teams. UIC team members visited Havana Polyclinics to observe Cuba's integrated, prevention-focused healthcare system. These visits underscored the effectiveness of community-based health assessments and the importance of building strong relationships between healthcare providers and community members. These lessons informed the design of a pilot HSA in Englewood.

Conversely, MINSAP delegates participated in a four-month cultural immersion in Chicago from August to December 2017. During this period, they engaged in research activities, including structured interviews with Englewood residents to identify health challenges and community priorities. The delegation also collaborated with UIC researchers to analyze clinic data and assess systemic barriers to care. Through these exchanges, both teams gained valuable insights into each other's healthcare systems, fostering mutual respect and understanding.

Unexpected Diplomatic and Policy Impacts

The partnership had significant policy implications, demonstrating the potential of cross-national collaborations to influence broader regulatory frameworks. UIC's operational plan and advocacy efforts were instrumental in amending OFAC regulations and simplifying the process for U.S.-Cuba medical research collaborations. This regulatory change marked a milestone in U.S.-Cuban relations and highlighted the potential for bilateral partnerships to address public health disparities.

Challenges and Lessons Learned

Developing the UIC-MINSAP partnership involved navigating numerous challenges, including administrative and cultural differences. Securing visas and managing financial logistics for the MINSAP delegation required navigating complex regulatory processes, often exacerbated by the embargo. Additionally, the Cuban delegation's adjustment to U.S. cultural and environmental contexts, including safety concerns and transportation challenges, highlighted the need for robust support systems during cross-cultural exchanges.

Cultural differences also influenced working styles. While the MINSAP team was accustomed to structured environments and standardized protocols, U.S. healthcare's fragmented and market-driven nature posed unique challenges. Effective communication and mutual patience were essential in bridging these differences.

One notable contrast was the approach to patient privacy. The U.S. system prioritizes individual privacy under regulations such as HIPAA, while Cuba's healthcare model emphasizes collective health management, often involving family and community members in care decisions. This cultural difference required adjustments from the Cuban delegation and highlighted the challenges of adapting health strategies across systems with divergent values.

Conclusions

This paper highlights a groundbreaking collaboration between a U.S. academic institution, the University of Illinois Cancer Center (UICCC), and Cuba's Ministry of Public Health (MINSAP). The partnership leveraged insights from Cuban healthcare practices to address maternal and child health (MCH) inequities,

including high infant mortality rates, in Englewood—a predominantly Black Chicago neighborhood experiencing systemic poverty and resource scarcity. Working together, the UICCC and MINSAP teams adapted and implemented a modified version of Cuba's Health Situation Analysis (HSA). The HSA has been instrumental in Cuba's success at reducing infant mortality to near biological minimums, and its adaptation in Englewood provided critical insights into the drivers of health inequities in the U.S. context.

This paper focused on the results of the partnership development process rather than the specific findings of the HSA itself, which will be detailed in a forthcoming publication. The significance of this collaboration lies in its potential to offer a scalable model for addressing health disparities in resource-constrained communities by fostering transnational cooperation.

Partnership Process and Insights

The partnership demonstrated the potential for identifying and addressing structural inequities through Cuban-style approaches emphasizing prevention, equity, and community engagement. For example, Cuba's healthcare system has long prioritized social drivers of health, integrating low-tech, high-touch strategies to build trust and strengthen relationships between healthcare providers and communities. (Keck & Reed, 2012) This approach informed the design of Englewood's HSA, where community engagement was central to identifying actionable solutions.

Challenges in Adapting Cuban Practices to the U.S. Context

Adapting Cuban healthcare practices to the U.S. required significant effort and innovation. Navigating regulatory hurdles required extensive advocacy and administrative work to secure approvals for resource exchanges and facilitate the MINSAP delegation's travel to Chicago. This included engaging with the U.S. Office of Foreign Assets Control (OFAC), which ultimately amended its regulations to exempt joint medical research projects with Cuba from licensure requirements. While this regulatory change was a major milestone, other challenges persisted, such as managing financial logistics for the Cuban delegation and addressing cultural differences in healthcare approaches.

Cultural contrasts also posed challenges. Cuban delegates, accustomed to working in structured environments with standardized protocols, had to adapt to the U.S.'s fragmented, market-driven healthcare system. Moreover, the U.S. emphasis on individual privacy, exemplified by HIPAA regulations, diverged from Cuba's collective approach to healthcare, where family and community members are often directly involved in patient care decisions. These differences required ongoing communication, patience, and mutual learning.

The collaboration fostered trust, respect, and mutual understanding despite these challenges. The Cuban delegation's four-month immersion in Englewood allowed them to engage deeply with the community, conducting in-home interviews with women of reproductive age to understand local health challenges and priorities. Their observations highlighted the importance of addressing social isolation and building community capacity to improve MCH outcomes.

Lessons Learned and Future Implications

This partnership underscored the value of cross-national collaboration in addressing health inequities in underserved communities. The Cuban delegation's

> "[…] The partnership leveraged insights from Cuban healthcare practices to address maternal and child health (MCH) inequities […]"

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recommendations for Englewood emphasized the need for comprehensive health assessments, coordinated care systems, and community-driven health education initiatives. These strategies reflect Cuba's proven success in reducing health disparities and offer valuable insights for adapting similar approaches in the U.S. (Gorry, 2019; Huish & Kirk, 2007)

The collaboration also demonstrated the potential for U.S.-Cuba partnerships to catalyze systemic change beyond healthcare delivery. By highlighting the structural drivers of health inequities, this partnership called attention to the need for broader policy interventions addressing environmental justice, food security, and economic opportunity. The process also revealed the potential for integrating Cuban innovations —such as the dispensarización risk stratification system— into U.S. healthcare practices to improve equity and outcomes.

Our experience leads us to strongly recommend that other U.S. researchers partner with Cuba to address their communities' most pressing health priorities. Such partnerships are in line with Cuba's demonstrated commitment to advancing global health and providing medical disaster relief especially if one considers, as we do, U.S. health inequities as preventable disasters. We recognize that shifts in the U.S. political environment post-Obama may pose additional challenges to scientific collaboration. However, our partnership was facilitated by changes to OFAC regulations to exempt scientific collaborations from obtaining licensure to exchange funds. These regulatory changes are still in place and may ease some logistical challenges. Other U.S. researchers desiring collaboration with Cuba are advised to enlist widespread support, citing the value and breadth of Cuban health innovation (Lage, 2019).

Cuba-U.S. scientific partnerships hold the potential to greatly enhance U.S. access to innovative Cuban technologies, including treatments to prevent diabetic foot ulcers—a leading cause of amputation and disability—and vaccines targeting lung cancer (World Health Organization, 2015). Current collaborations between the two nations highlight this potential. For example, Cuba's Molecular Immunology Center and Roswell Park Cancer Institute in Buffalo, New York, are advancing a groundbreaking Phase I clinical trial for a vaccine against non-small cell lung cancer (Crombet Ramos et al., 2015). Cuban marine scientists have partnered with NOAA oceanographers and fisheries biologists to study Atlantic bluefin tuna (National Oceanic and Atmospheric Administration, 2016). Most recently, the U.S. Food and Drug Administration (FDA) approved Discovery Therapeutics Caribe Company's move forward with a Phase III clinical trial of Heberprot-P for diabetic foot ulcers, set to begin by the end of 2024 (Mas-Bermejo, Marimón-Torres, & Dickinson-Meneses, 2024). These partnerships, like ours, exemplify the transformative potential of Cuban expertise to address critical health disparities in the U.S. and beyond.

The UICCC-MINSAP partnership represents a pioneering model for leveraging international expertise to address health inequities in underserved U.S. communities. While the process was not without challenges, the collaboration demonstrated the transformative potential of transnational partnerships in advancing health equity. This work serves as a call to action for researchers, policymakers, and healthcare providers to explore similar collaborations, recognizing that solutions to the U.S.'s health inequities may lie beyond our borders. As this paper focuses on the partnership development process, the results of the HSA and its implications for Englewood will be detailed in a forthcoming publication. This partnership exemplifies the possibilities of mutual learning and cooperation in pursuing health equity.

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References

Alexandra, F. W. M. (2019). US foreign policy in restoring diplomatic relations with Cuba in 2015-2016. Sociae Polites, 20(2), 81-102. https://doi.org/10.33541/sp.v20i2.1459

Alhusen, J. L., Bower, K. M., Epstein, E., & Sharps, P. (2016). Racial discrimination and adverse birth outcomes: An integrative review. Journal of midwifery & women's health, 61(6), 707–720. https://doi.org/10.1111/jmwh.12490

Attanasio, L. M. S., & Kozhimannil, K. B. (2015). Patient-reported communication quality and per-

ceived discrimination in maternity care. Medical Care, 53(10), 863–871. https://doi.org/10.1097/MLR.0000000000000411

Beech, B. M., Ford, C., Thorpe, R. J., Jr, Bruce, M. A., & Norris, K. C. (2021). Poverty, racism, and the public health crisis in America. Frontiers in public health, 9, 699049. https://doi.org/10.3389/fpubh.2021.699049

Bishop-Royse, J., Lange-Maia, B., Murray, L., Shah, R. C., & DeMaio, F. (2021). Structural racism, socio-economic marginalization, and infant mortality. Public health, 190, 55–61. https://doi.org/10.1016/j.puhe.2020.10.027

Braveman, P. (2006). Health disparities and health equity: Concepts and measurement. Annual Review of Public Health, 27(1), 167–194. https://doi.org/10.1146/annurev.publhealth.27.021405.102103

Chicago Metropolitan Agency for Planning. (2024). Englewood Community Data Snapshot. https://www.cmap.illinois.gov/wp-content/uploads/dlm_uploads/Englewood.pdf

Ciano, A. (2024). From revolution to resilience: The impact of the US embargo on the post-revolutionary Cuban public health system (Doctoral dissertation, University of North Carolina at Chapel Hill). https://cdr.lib.unc.edu/concern/honors_theses/rb68xp25t?locale=en

Cooper, R. S., Kennelly, J. F., & Ordúñez-García, P. O. (2006). Health in Cuba. International Journal of Epidemiology, 35(4), 817–824. https://doi.org/10.1093/ije/dyl175

Collins, J. W., Jr, David, R. J., Handler, A., Wall, S., & Andes, S. (2004). Very low birthweight in African American infants: the role of maternal exposure to interpersonal racial discrimination. American journal of public health, 94(12), 2132–2138. https://doi.org/10.2105/ajph.94.12.2132

Crombet Ramos, T., Rodríguez, P. C., Neninger Vinageras, E., Garcia Verdecia, B., & Lage Davila, A. (2015). CIMAvax EGF (EGF-P64K) vaccine for the treatment of non-small-cell lung cancer. Expert review of vaccines, 14(10), 1303–1311. https://doi.org/10.1586/14760584.2015.1079488

Cuban Ministry of Public Health. (n.d.). Convención Internacional de Salud International Health Convention. https://cubasalud.sld.cu/en/convencion

Dagher, R. K., & Linares, D. E. (2022). A critical review on the complex interplay between social determinants of health and maternal and infant mortality. Children (Basel, Switzerland), 9(3), 394. https://doi.org/10.3390/children9030394

DeWeerdt, S. (2001). Embargoing science: U.S. policy toward Cuba and scientific collaboration. BioScience, 51(8), 612. https://doi.org/10.1641/0006-3568(2001)051[0612:ESUPTC]2.0.CO;2

Dresang, L. T., Brebrick, L., Murray, D., Shallue, A., & Sullivan-Vedder, L. (2005). Family medicine in Cuba: Community-oriented primary care and complementary and alternative medicine. The Journal of the American Board of Family Medicine, 18(4), 297–303. https://doi.org/10.3122/jabfm.18.4.297

Espinosa, M. C. S., Lauzurique, M. E., Alcázar, V. R. H., et al. (2018). Maternal and child health care in Cuba: Achievements and challenges. Revista Panamericana de Salud Pública, 42, e27. https://doi.org/10.26633/rpsp.2018.27

Fink, G. R., Leshner A.I., & Turekian, V.C. (2014). Science diplomacy with Cuba. Science, 344(6181), 1065. https://doi.org/10.1126/science.1256312

Gorry, C., (2013). Primary care forward: raising the profile of Cuba's nursing profession. MEDICC Review, 15(2), 5-9. https://doi.org/10.37757/MR2013V15.N2.2

Gorry, C. (2019). Six decades of Cuban global health cooperation. MEDICC review, 21(4), 83–92. https://doi.org/10.37757/MR2019.V21.N4.15

Greenwood, B. N., Hardeman, R. R., Huang, L., & Sojourner, A. (2020). Physician–patient racial concordance and disparities in birthing mortality for newborns. Proceedings of the National Academy of Sciences of the United States of America, 117(35), 21194–21200. https://doi.org/10.1073/pnas.1913405117

Huish, R., & Kirk, J. M. (2007). Cuban medical internationalism and the development of the Latin American School of Medicine. Latin American Perspectives, 34(6), 77–92. https://doi.org/10.1177/0094582X07308119

Jang, C. J., & Lee, H. C. (2022). A review of racial disparities in infant mortality in the US. Children, 9(2), 257. https://doi.org/10.3390/children9020257

Keck, C. W., & Reed, G. (2012). The curious case of Cuba. American Journal of Public Health, 102(8), e13–e22. https://doi.org/10.2105/ajph.2012.300822

Kim, S. J., Ramírez-Valles, J., Watson, K. S., Allen-Mears, P., Matthews, A. K., Martinez, E., Odoms-Young, A., Daviglus, M., & Winn, R. A. (2019). Fostering health equity research: Development and implementation of the Center for Health Equity Research (CHER) Chicago. Journal of Clinical and Translational Science, 4(1), 53–60. https://doi.org/10.1017/cts.2019.415

Krumrey, Y. (2021, June 23). Englewood: Critical care. South Side Weekly. https://southsideweekly.com/critical-care/

Lamrani, S. (2021). The health system in Cuba: origin, doctrine and results. Études Caribéennes, (7). https://doi.org/10.4000/etudescaribeennes.24110

Lage, A. (2019). Science and challenges for Cuban public health in the 21st century. MEDICC review, 21(4), 7–14. https://doi.org/10.37757/MR2019.V21.N4.2

Lauderdale, D. S. (2006). Birth outcomes for Arabic-named women in California before and after September 11. Demography, 43(2), 185–201. https://doi.org/10.1353/dem.2006.0008

LaVeist, T. A., Nuru-Jeter, A., & Jones, K. E. (2003). The association of doctor-patient race concordance with health services utilization. Journal of public health policy, 24(3-4), 312–323.

Lee, W., & Park, S. (2016). Similar but divergent pathways: US–Cuba and US-North Korea relations. Pacific Focus, 31(2), 187–210. https://doi.org/10.1111/pafo.12070

Lorenz, J., Ananth, C., Polin, R., & et al. (2016). Infant mortality in the United States. Journal of Perinatology, 36, 797–801. https://doi.org/10.1038/jp.2016.63

MacDorman, M. F., Matthews, T. J., Mohangoo, A. D., & Zeitlin, J. (2014). International comparisons of infant mortality and related factors: United States and Europe, 2010. National vital statistics reports: from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System, 63(5), 1–6.

Machlis, G., Frankovich, T. A., Alcolado, P. M., García-Machado, E., Hernández-Zanuy, A. C., Hueter, R. E., Knowlton, N., Perera, E., & Tunnell, J. W. (2012). US-Cuba scientific collaboration: Emerging issues and opportunities in marine and related environmental sciences. Oceanography, 25(2), 227–231. http://www.jstor.org/stable/24861362

Mas-Bermejo, P., Marimón-Torres, N., & Dickinson-Meneses, F. (2024). Cuba-US scientific collaboration: Science diplomacy in challenging times. Perspective, 10, 17. https://doi.org/10.1126/scidip.adt9910

Ministerio de Salud Pública de Cuba. (2024). Anuario Estadístico de Salud 2023 2023 Statistical Yearbook of Health. https://temas.sld.cu/estadisticassalud/2024/09/30/anuario-estadistico-de-salud-2023/

Morrison, J. S., & Gannon, S. (2015). Health cooperation in the new US-Cuban relationship. Health Affairs Forefront. https://www.healthaffairs.org/content/forefront/health-cooperation-new-u-s--cuban-relationship

Moss, A., Rousseau, J., Lowell, G., Kaintz, K., Cavenagh, Y., Vidis, J., Robinson, C.L., Wilkerson, J., & Logan, C. (2022). Collaborating to advance health equity for families with newborns through public-private partnerships. Journal of Health Care for the Poor and Underserved, 33(4S), 107–123. https://doi.org/10.1353/hpu.2022.0161

Motala, M., & Wyk, J. V. (2019). Where are they working? A case study of twenty Cuban-trained South African doctors. African Journal of Primary Health Care & Family Medicine, 11(1), Article 1977. https://doi.org/10.4102/phcfm.v11i1.1977

National Oceanic and Atmospheric Administration. (n.d.). United States and Cuba open doors to marine science cooperation. NOAA. https://www.noaa.gov/news/united-states-and-cuba-open-doors-to-marine-science-cooperation#:~:text=Scientists%20from%20the%20two%20countries,of%20the%20larger%20marine%20ecosystem.%E2%80%9D

Ronda-Pupo, G. A. (2021). Cuba—U.S. scientific collaboration: beyond the embargo. Plos One, 16(7), e0255106. https://doi.org/10.1371/journal.pone.0255106

Ronda-Pupo, G. A. (2024). The dynamics of Cuban international scientific collaboration: A scientometric analysis over a century. Scientometrics, 129, 5211–5226. https://doi.org/10.1007/s11192-024-05137-6

Neggers, Y. H., & Crowe, K. M. (2013). Low birth weight outcomes: Why better in Cuba than Alabama? The Journal of the American Board of Family Medicine, 26(2), 187–195. https://doi.org/10.3122/jabfm.2013.02.120227

Papanicolas, I., Woskie, L. R., & Jha, A. K. (2018). Health care spending in the United States and other high-income countries. JAMA, 319(10), 1024–1039. https://doi.org/10.1001/jama.2018.1150

Pastrana, S. J., & Clegg, M. T. (2008). U.S.-Cuban scientific relations. Science, 322(5905), 345. https://doi.org/10.1126/science.1162561

Pyone, T., Smith, H., & Broek, N. v. d. (2017). Frameworks to assess health systems governance: a systematic review. Health Policy and Planning, 32(5), 710-722. https://doi.org/10.1093/heapol/czx007

Polednak, A. P. (1996). Trends in U.S. urban black infant mortality, by degree of residential segregation. American Journal of Public Health, 86(5), 723–726. https://doi.org/10.2105/AJPH.86.5.723

Salm Ward, T. C., Mazul, M., Ngui, E. M., et al. (2013). "You learn to go last": Perceptions of prenatal care experiences among African-American women with limited incomes. Maternal and Child Health Journal, 17, 1753–1759. https://doi.org/10.1007/s10995-012-1194-5

Singh, G. K., & Yu, S. M. (2019). Infant mortality in the United States, 1915–2017: Large social inequalities have persisted for over a century. International Journal of Maternal and Child Health and AIDS, 8(1), 19–31. https://doi.org/10.21106/ijma.271

Slaughter-Acey, J. C., Sneed, D., Parker, L., Keith, V. M., Lee, N. L., & Misra, D. P. (2019). Skin tone matters: Racial microaggressions and delayed prenatal care. American journal of preventive medicine, 57(3), 321–329. https://doi.org/10.1016/j.amepre.2019.04.014

Tung, E. L., Hampton, D. A., Kolak, M., Rogers, S. O., Yang, J. P., & Peek, M. E. (2019). Race/ethnicity and geographic access to urban trauma care. JAMA Network Open, 2(3), e190138. https://doi.org/10.1001/jamanetworkopen.2019.0138

Vilda, D., Hardeman, R., Dyer, L., Theall, K. P., & Wallace, M. (2021). Structural racism, racial inequities and urban-rural differences in infant mortality in the US. Journal of epidemiology and community health, 75(8), 788–793. https://doi.org/10.1136/jech-2020-214260

Wallace, M., Crear-Perry, J., Richardson, L., Tarver, M., & Theall, K. (2017). Separate and unequal: Structural racism and infant mortality in the US. Health & place, 45, 140–144. https://doi.org/10.1016/j.healthplace.2017.03.012

Watson, C. C., Rhein, L., & Fanelli, S. (2021). An American perspective of the dental and public health initiatives in Cuba. Journal of Advanced Oral Research, 13(1), 14–21. https://doi.org/10.1177/23202068211030143

Wenham, C., & Kittelsen, S. (2020). Cuba y seguridad sanitaria mundial: Cuba's role in global health security. BMJ Global Health, 5(5), e002227. https://doi.org/10.1136/bmjgh-2019-002227

World Health Organization. (2015). Cuban experience with local production of medicines, technology transfer and improving access to health. World Health Organization. https://iris.who.int/bitstream/handle/10665/336685/9789241509718-eng.pdf?sequence=1

Xue, Y., Greener, E., Kannan, V., Smith, J. A., Brewer, C., & Spetz, J. (2018). Federally qualified health centers reduce the primary care provider gap in health professional shortage counties. Nursing outlook, 66(3), 263–272. https://doi.org/10.1016/j.outlook.2018.02.003

Zaimi, R. (2021). Rethinking "disinvestment": Historical geographies of predatory property relations on Chicago's South Side. Environment and Planning D: Society and Space, 40(2), 245–257. https://doi.org/10.1177/02637758211013041

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Appendix B. Data Sources and Definitions for Table 1

Data Sources by indicator and by locality	Englewood	Chicago	Illinois	US	Cuba
Infant Mortality Rate (per 1,000 live births)	https://chicagohealthatlas.org/indicators/VRIMR?topic=infant-mortality-rate	https://dph.illinois.gov/content/dam/soi/en/web/idph/publications/idph/topics-and-services/life-stages-populations/maternal-child-family-health-services/maternal-health/perinatal-health/infant-mortality-data-report-2024.pdf	The number of infant deaths per 1,000 live births https://www.cdc.gov/maternal-infant-health/infant-mortality/index.html#cdc_data_surveillance_section_2-infant-mortality-rates-by-state-2022		https://nnoc.org/cuba-reduces-infant-mortality-rate-to-4-3-in-2016/
Unemployment Rate	In Labor Force: Unemployed* (Population 16 years and older) http://www.cmap.illinois.gov/documents/10180/126764/Englewood.pdf		ACS 2022		https://www.macrotrends.net/global-metrics/countries/CUB/cuba/unemployment-rate#google_vignette
Less than High School Education	Less than High School Diploma (Population 25 years and older) http://www.cmap.illinois.gov/documents/10180/126764/Englewood.pdf				illiteracy = 0.2% https://world-education-blog.org/2020/12/18/education-of-students-with-disabilities-in-cuba/
Percentage of People Living Below the Poverty Line	Percent of residents in families that are in poverty (below the Federal Poverty Level) https://chicagohealthatlas.org/indicators/POV?topic=poverty-rate	Percent of residents in families that are in poverty (below the Federal Poverty Level) https://chicagohealthatlas.org/indicators/POV?topic=poverty-rate	ACS 2022		Almost 90% of the Cuban population lives in 'extreme poverty' according to new study https://english.elpais.com/international/2024-07-29/almost-90-of-the-cuban-population-lives-in-extreme-poverty-according-to-new-study.html

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Data Sources by indicator and by locality	Englewood	Chicago	Illinois	US	Cuba
Median Income	Median income: Household Income, 2018-2022 http://www.cmap.illinois.gov/documents/10180/126764/Englewood.pdf	http://www.cmap.illinois.gov/documents/10180/126764/Englewood.pdf	ACS 2022		Their median household income ranges from about $300 to $400 per year, and they struggle to meet their basic needs. https://www.bcg.com/publications/2016/globalization-consumer-products-understanding-evolving-cuban-consumer#:~:text=People%20in%20this%20group%20represent,to%20meet%20their%20basic%20needs.
Percentage of Pregnant People Initiating Prenatal Care in First Trimester	Average annual births and percent of births with prenatal care initiated in the first trimester by community area of residence of https://www.chicago.gov/content/dam/city/depts/cdph/statistics_and_reports/BirthsinChicago1999thru2009Dec172012.pdf	https://www.marchofdimes.org/peristats/data?reg=99&top=5&stop=34&lev=1&slev=4&obj=18&sreg=17	In Illinois in 2023, 76.7% of live births were to women receiving early prenatal care	Prenatal care beginning in the first trimester https://www.cdc.gov/nchs/data/nvsr/nvsr73/nvsr73-02.pdf (National Center for Health Statistics. (2024). National Vital Statistics System, natality data file. National Vital Statistics Reports, 73(2).)	https://journals.lww.com/stdjournal/citation/2016/12000/cuba_validated_as_the_first_country_to_eliminate.3.aspx

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Data Sources by indicator and by locality	Englewood	Chicago	Illinois	US	Cuba
Percentage of Residents Who Are Black / African-American / Afro-Cuban	http://www.cmap.illinois.gov/documents/10180/126764/Englewood.pdf	http://www.cmap.illinois.gov/documents/10180/126764/Englewood.pdf		2022 ACS	Black 9.3% (2012 est.) https://en.wikipedia.org/wiki/Demographics_of_Cuba