

The origin and development of INCAP

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This project, which summarizes the early research on many different aspects of health and society by the Institute of Nutrition of Central America and Panama (INCAP) starting in the early 1950s, was begun ten years ago. The research described has made significant contributions to the modern recognition of the role of nutrition in both infectious and chronic disease.

It has not been an easy project to bring to fruition because the INCAP researchers responsible have scattered in a diaspora, making important additional contributions in other parts of the world. Authors of two important papers, Guillermo Arroyave and Miguel Guzmán died in the past year, but not before they had approved their final edited versions.

This Special Issue was developed because the Institute of Nutrition of Central America and Panama (INCAP) was pioneering work in many different fields of nutrition at a time when there was very little nutrition research in developing countries. Much of its early research on kwashiorkor and marasmus, nutrition and infection, energy, protein, and amino acid requirements, low-cost, protein-rich foods, diet and atherosclerosis, endemic goiter, growth and development, malnutrition and cognitive behavior, and social anthropology cannot be duplicated because conditions have changed. But the INCAP research findings are still relevant to many developing countries that do not have the facilities or resources to find solutions to their nutrition and health problems.

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Many of the research studies of INCAP were published before scientific journals were indexed, and their contents are not available to Internet searches. The purpose of this Special Issue is to make conveniently available to nutrition and health workers worldwide the most important published research findings of INCAP from its founding in 1949 to, in some cases, the end of the 20th century. Each of the papers here synthesizes the content of many different studies.

In the early 1940s, the Rockefeller Foundation supported the establishment of an Institute of Nutrition for Food Analysis in Mexico, and the Kellogg Foundation funded institutes in Cuba and Colombia for food analysis. These three institutes were started at the initiative of students of Professor Robert Harris of the Massachusetts Institute of Technology (MIT). When the Minister of Health of Guatemala heard of these institutes, he asked Harris to help obtain Kellogg Foundation support for a similar institute in Guatemala. Harris told him that the institute should be for all of the Central American countries and that it should not be limited to food analysis.

The Kellogg Foundation offered to provide fellowships for advanced training of staff and to equip a building for a Central America Nutrition Institute, on the condition that the Pan American Sanitary Bureau, soon to become the Pan American Health Organization (PAHO) Regional Office for the Americas of the World Health Organization (WHO), would accept administrative and fiscal responsibility. PAHO agreed, and the Minister of Health of Guatemala convened a meeting of the Ministers of Health of all five Central American countries and Panama that was also attended by representatives of the Kellogg Foundation and PAHO and by Professor Harris. The countries agreed to pay an annual quota of \$8,500 upon legislative ratification of the agreement. Guatemala was to provide a suitable building, and the Kellogg Foundation, additionally, was to pay \$15,000 yearly for 3 years to PAHO for the salary of the director of the institute, his travel, and a secretary.

At first, only Guatemala, El Salvador, and Honduras

ratified the agreement and began paying. Each nominated a physician, a biochemist, and a nutritionist for 1-year Kellogg Foundation fellowships at MIT with Professor Harris in 1948–49. In the same year, I was designated Director of INCAP and Regional Advisor in Nutrition for Latin America. Because of research obligations at the University of Rochester, I could not take up the position before the summer of 1949. One of the Kellogg Foundation fellows at MIT, Guillermo Arroyave, spent an additional 2 months in my laboratory at the University of Rochester to learn the ultramicro methods for determining nutrients in capillary blood that I was using for a study on nutrition in pregnancy. He then went to Guatemala 2 months ahead of me to set up the laboratory. The government of Guatemala had arranged for the use of a small adobe building in the Botanical Garden belonging to the National University, the University of San Carlos.

When I arrived in July 1949, the floor tiles, laboratory plumbing, and gas had not been installed. The building had three laboratories designated for food analysis, agricultural and food chemistry, and clinical biochemistry, plus a small darkroom, a large room for the field team, small rooms for a secretary, the director, and the assistant director, and a storeroom. A few weeks after my arrival, a freak storm blew off most of the corrugated iron roof while I was nearby at a staff member's children's birthday party. I soon ended up on the roof, nailing the sheets back in place while others pulled them up by a rope. We finished before rain arrived and prevented damage to partially unpacked instruments and supplies.

An inaugural ceremony was held on September 15, 1949, Guatemalan Independence Day. It was attended by the Ministers and Directors of Health from the countries signing the original agreement, representatives of PAHO, the Kellogg Foundation, and the Rockefeller Foundation, Professor Harris, and Professor William Darby of Vanderbilt University, who had recommended me for the position. Also attending were members of the diplomatic corps representing the proposed member countries, and a few others.

At the beginning, we made a number of decisions from which INCAP never wavered in its first 31 years. Its mission was to:

- » Determine the nutrition and related health problems of the countries of Central America and Panama;
- » Through research, find practical solutions to these problems; and
- » Assist the member countries to apply these solutions through advisory services and training of personnel at all levels.

Certain principles were established at the start:

- » INCAP must be a Central American institute, run by Central Americans, and not one dependent on expatriate researchers. This meant training Central Americans for the tasks from the beginning.

- » Research proposals must be presented to, and discussed by, the professional staff before support was approved.

- » Research must be published promptly, preferably in peer-reviewed journals in English, and reprinted promptly in Spanish in a supplement to the *Boletín de la Oficina Panamericana* (published by the Pan American Health Organization) (However, there were also many less formal reports, reviews, and other documents published only in Spanish for the immediate use in the member countries.)

In the early years, we never imagined how much INCAP's research findings and advanced training capacity would contribute to Latin America and the developing world. At the start, no one on the professional staff except the director had research training. Of the 7 trained for 9 months in food composition and nutrition by Harris at MIT, only 2 became permanent staff members—the Guatemalans, Guillermo Arroyave and Marina Flores. However, for the first 2 years, the Honduran, Salvador Pizzati, served as Chief of the Food Analysis Laboratory and the physician, Roberto Gandara, headed the Guatemalan field team.

Before the inauguration, we had recruited a Guatemalan, Jose Mendes de la Vega, and a Salvadorean, Miguel Guzmán, each with the equivalent of a master's degree in the United States. A Panamanian dietitian from Argentina, Susana Icaza, established the 4-year INCAP School of Nutrition and Dietetics, the first in Central America. She later obtained a Ph.D. in nutrition education from Columbia University. In addition, local high school graduates, trained as laboratory technicians, performed superbly.

We started the first year with a basic operating budget of \$25,500, plus supplies, equipment, and a few journals and books provided by the Kellogg Foundation grant. Costa Rica soon ratified the agreement, and Panama and Nicaragua followed. The quotas rose to \$12,500 and eventually to \$62,500, with PAHO also contributing. It soon became evident that I could not do two jobs. After several years, the Venezuelan, José María Bengoa, later the Head of the Nutrition Unit of WHO, was appointed by PAHO to be Regional Advisor in Nutrition, based in Washington. He was always helpful.

The first to receive a Kellogg Foundation fellowship was Guillermo Arroyave [1, 2], who obtained a Ph.D. in biochemistry from the University of Rochester. In INCAP's second year, Ricardo Bressani [3] returned to Guatemala with an M.S. and took charge of the Laboratory of Agricultural Biochemistry. He left after 2 years to obtain his Ph.D. from Purdue University. When he returned after 3 years, he became INCAP's longest-serving and most productive research scientist. Miguel Guzmán [4, 5] took over the Clinical Chemistry Division until it was his turn for a Kellogg Foundation fellowship and Ph.D. studies in biostatistics at the

University of North Carolina. Upon his return, Guzmán became head of the Division of Statistics.

Two key Guatemalan physician staff members were recruited in the first 3 years—Moisés Béhar when he returned from 2 years in the Children's Institute in Paris, and Carlos Tejada, after he completed pathology training at Massachusetts General Hospital. They became the second and third Directors of INCAP. Béhar left only to become Chief of the Nutrition Unit of WHO in Geneva [6]. The original Director of Field Studies was the Guatemalan physician, Antonio Muñoz who later worked for WHO in Africa. Werner Ascoli, a Guatemalan physician, with medical and public health training at Temple University, joined the staff in time to be the Field Director and physician for the Three-Village Study [4] and had a long and productive career at INCAP.

The Guatemalan physician, Carlos Pérez, served as Director of Country Services and Assistant Director before returning to private practice in 1961. He was replaced for a number of years by the distinguished Mexican pediatrician Joaquín Craviotto. The first statistician was Oudh Tandon, a national of India. A Brazilian physician, João Salomón made important contributions as an epidemiologist to INCAP field studies before returning to Brazil. Raquel Flores built what became the best nutrition library in the developing world, and Guillermo Palma maintained and expanded it. The anthropologists Richard Adams, Nancy Solein González, and later, Alfredo Méndez Domínguez, were essential in orienting our actions in villages inhabited by native Mayan populations.

The contributions of professional services from INCAP staff members, through positions in Latin America, the United States, and Europe and in international organizations dealing with regional and worldwide nutritional problems, are extensive. Mention should be made of a few persons who contributed importantly to INCAP's scientific productivity at one time or another and left INCAP for leadership positions in the United States or Europe. The Honduran physical anthropologist Reynaldo Martorell is now head of the Department of Nutrition at Emory University. Jean-Pierre Habicht, a Swiss physician with a Ph.D. in nutritional biochemistry and metabolism from MIT, became a distinguished professor at Cornell University. The Argentinean physician, Benjamín Caballero, who also later earned a Ph.D. from MIT, became head of the Department of Nutrition of the Division of International Studies of the Johns Hopkins University School of Public Health, and the physician Ivan Begin, who developed the Food Policy Division, eventually returned to academic leadership in his native Belgium. Cipriano Canosa initiated the first field study of nutrition and cognition before returning to head a pediatric department in his native Spain.

Names that cannot be omitted for their academic

and international contributions away from INCAP are José Villar, Rafael Flores, Omar Dary, Luis Mejía, Marie Ruel, Leonardo Mata, Ricardo Sibrián, Eric Boy, Alejandro O'Donnell, Erick Díaz, Juan José Aguilar, Isabel Nieves, Maarten Immink, Edmundo Alvarez, José Cruz, Salvador García, and many other INCAP trainees and former professional staff members who are outstanding professionals working throughout Central America and Panama. For myself, I became the head of food and nutrition at PAHO/WHO and later a full professor at the University of California, Berkeley, and a Scientist at Children's Hospital Oakland Research Institute.

By 1955, we had a large, new, permanent building provided by Guatemala with many laboratories, offices, an auditorium, and a large library. Separate facilities for animal colonies were added later. By the time I left in 1961 after 12 years as director, country quotas had considerably increased and PAHO was contributing significantly. In addition, INCAP was also receiving significant support from foundations, the US National Institutes of Health (NIH), and industry. The annual budget was approaching \$900,000 and the heads of all seven divisions had doctorates. By the time Moisés Béhar left, a second adjacent larger building had been constructed by the government of Guatemala for laboratories and classrooms as well as a separate small building for metabolic studies [7].

All of these developments would have had little meaning unless they were the result of increasing productivity. Far more important than buildings was the INCAP publication record. For its 25th anniversary in 1973, a complete bibliography of INCAP publication to date was distributed, containing a list of 695 scientific articles in English, 51 articles in cooperation with outside scientists, 700 articles in Spanish (many of them translations of the English articles), 154 theses for the degree of Licenciado, 35 miscellaneous publications, and 4 books [8].

At the 40th anniversary in 1989, the proceedings of a 2-day scientific symposium in Spanish were published in a volume of over 440 pages. A second publication list was compiled. By that time there were 1,507 articles in English, 1,251 in Spanish, 444 theses, 65 miscellaneous publications, and 51 books [9]. The articles in this Special Issue provide summaries and references for most of this work, but many original references in Spanish have not been cited. These references can be located through INCAP's library services and/or the authors listed in the references of the summary papers in this publication.

In addition to the leadership and enthusiasm of the professional staff, two other factors contributed to the rapid and sustained development of high-quality research at INCAP. First was the appreciation and encouragement of a strong research agenda by Fred Soper, the Director of PAHO, and Marcel Candau, his Deputy, who became Director General of WHO. In

1958, Soper was succeeded by Abraham Horwitz of Chile, who was Director until 1975. Both were unwavering in their support of INCAP and its programs. It is significant that when Horwitz retired, he devoted the rest of his life to nutrition, including chairing the Subcommittee on Nutrition of the United Nations System from 1975 to 1986.

Second was the Technical Advisory Committee. In the early years, it included Paul Gyorgy of the University of Pennsylvania, the discoverer of three of the B vitamins; Charles Glen King, the President of the Nutrition Foundation; Antonio Peña Chavarría, Director of the Children's Hospital in Costa Rica; William Darby, Head of the Department of Biochemistry and Nutrition, Vanderbilt University; Leonard Maynard, Head of the Division of Nutrition of Cornell University; Henry Sebrell, Director of the US National Institutes of Health Institute for Arthritis and Metabolic Diseases; Professor Robert Harris; and in later years others equally distinguished, including, among them, Malcolm Merrill, Director of Public Health of the State of California, Salvador Zubirán, Founder and Director of the Hospital for Nutritional Diseases in Mexico City and Professor Charlotte Young of Cornell University. For five full days each year, they met and thoroughly reviewed the work of each researcher. They not only stimulated young researchers, but also identified weaknesses and helped correct them. They became strong external supporters of INCAP.

Each of the chapters that follow summarizes the research in a different area, with some unavoidable overlap, and is written by the leaders of the respective research divisions or projects. The titles are self-explanatory. They endeavor to cite all of the relevant INCAP publications pertaining to the topic. Space does not allow description of all of the results of the hundreds of studies reviewed, but the reference lists should make it possible to refer to the original articles that are of individual interest. The findings of the remarkable 12-year study of Leonardo Mata have been published in detail in his book *The Children of Santa María Cauqué*

[10] but are summarized in the article by Guzmán in this issue [4].

When Moisés Béhar left the Directorship of INCAP for WHO, Carlos Tejada took over as Director. With his experience and leadership skills, he set about moving INCAP to a new level by developing products and processes for adoption by industry. He was succeeding brilliantly when on a fateful day in June 1980, a new terrorist group invaded a staff meeting, lined up the staff, and kidnapped the Director and Chief of Administration for ransom, believing that the United Nations agency responsible for INCAP would pay a large sum. When they learned that the United Nations would not pay a ransom under any circumstances, they demanded that the newspapers of Central America publish their manifesto. This was, of course, impossible. Fernando Viteri, an author of two chapters in this Special Issue, and a close friend of Tejada became the mediator between the kidnappers and the families of the hostages. The weeks and months dragged on, and the hostages were in danger of being killed. Finally, they were released for a small amount provided by the families but the kidnappers were so frustrated that they told Viteri that he and his family would be killed if they did not leave Guatemala immediately. Viteri, who had been slated to become the next Director when Tejada's term ended, complied. Tejada also left the country. Neither ever returned to INCAP. Reynaldo Martorell was also threatened and left Guatemala. Why INCAP did not recover rapidly is addressed briefly by Moisés Béhar in his "Reflections on the legacy of INCAP," the final paper in this Special Issue [6].

Acknowledgments

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