



EDITORIAL

Notes on the Anniversary of Center for Proteins Studies: 20 years at the Service to Cuban Science — A tribute to Professor Maya Chávez

Notas sobre el aniversario del Centro de Estudio de Proteínas: 20 años al servicio de la ciencia cubana — Tributo a la Profesora Maya Chávez

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The motivation

The Cuban Journal of Biological Sciences (*Revista Cubana de Ciencias Biológicas*) dedicates part of this issue to the twentieth anniversary of the Center for Proteins Studies (CEP) of the Biology Faculty. CEP was founded at the end of 2000 under the leadership of Professor María de los Ángeles Chávez, Maya, who had led protein studies at the University of Havana for approximately 30 years before the Center was founded and was its most tenacious promoter. These brief notes are intended to pay tribute to Maya and the team of professors from the Department of Biochemistry who gave birth to this initiative and have devoted their talent at the service of Science in Cuba for 20 years from the University of Havana.

CEP is an academic institution in which research of a high scientific level has been oriented towards objectives of a high social commitment linked to the development of Biotechnology and Biomedicine in the country. Its genesis dates back to the 70s, when the group of professors of proteins and enzymes, essentially chemists, biochemists and pharmacists from the then School of Pharmaceutical Biochemistry, founded the high-level studies in proteins and enzymes at the University of Havana. The accumulated experience and the scientific level achieved made them become the Group of Prioritized Objectives of Proteins and Enzymes (GOP), in 1986, with a clear orientation towards new research goals, the expansion of the professional team, which allowed a greater multidisciplinary approach to obtain new products and technologies, mostly new proteins of interest.

Continuing this tradition, CEP was founded as an institution that has supported all scientific-academic activity and projects towards higher objectives in accordance with the needs of Cuban society and in line with world trends.

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¹ Prof. Carlos M. Álvarez Valcárcel has been a member of the Faculty of Biology since the foundation of the CEP and was its Director in the period 2003-2010. Prof. María E. Lanio Ruiz was a co-founder with Prof. Maya Chávez of the CEP (2000) and contributed to its direction for more than 10 years.

Together with the Department of Biochemistry, CEP has contributed to the postgraduate training of countless specialists who work in many other centers in the country and abroad linked to Biochemistry and Molecular Biology. During the last stage of its development, the scientific activity of the Center has been characterized by an even greater concentration in its research directions and a stronger alliance with the Cuban Biotechnology Industry, basically with the institutions from BioCubaFarma, the medical-pharmaceutical industry business group responsible for the production of medicines and medical equipment in Cuba.

A more detailed account of the academic-research activity of the GOP that crystallized into the creation of CEP can be found at *The Center for Protein Studies of the University of Havana: scientific contribution and social commitment* (Chávez *et al.*, 2010) and a look at the most recent evolution of CEP's activity and its connection with the Biotechnology Industry in Cuba, its perspectives and insertion in the panorama of Science, Technology and Innovation has been summarized in *The university in the innovation system: Case study on the university-biotechnology industry link in Cuba* (Álvarez *et al.*, 2017).

The origins

It is important to remember, briefly, that CEP was founded in December 2000 from the teaching and research experience accumulated over more than twenty years by the group of professors and researchers dedicated to the study of proteins and enzymes of the Biochemistry Department belonging to the School of Pharmaceutical Biochemistry, later integrated into the Biology Faculty, University of Havana.

During the 80s, science in Cuba moved to a higher level of organization. Research activity was structured through national, branch and territorial scientific-technical programs. As a result of these transformations, the group of professors of the Department of Biochemistry was organized under a GOP at the end of the second half of the 80s. This led to a rise in the number of researchers and specialties that integrated the GOP and the focus of research objectives was redirected to obtain important products for the country. From here, a second stage in the development of the research team can be identified.

In fact, during the fifteen years of existence of GOP, the investigations led to the discovery and characterization of novel protein molecules as well as the production of several protein and enzymes for clinical lab diagnosis and other analytical purposes. Not all, but many of the novel proteins were obtained from marine organisms with potential applications in biotechnology and biomedicine, which determined the granting of several national patents. The group developed a broad and multidisciplinary study of the molecular and functional characterization of several protein families, such as protease inhibitors and proteases of different mechanistical classes as well as toxins with membranotropic action, which contributed to the introduction of advanced technologies and to expand the knowledge in the field. This supported the application and granting of national and international projects, the publication of scientific articles in peer-reviewed periodicals, and the presentation of numerous papers at international events, inside and outside Cuba.

The results achieved by GOP allowed the consolidation of a group at the Biology Faculty, in the fields of Biochemistry and Biotechnology, capable of addressing with multidisciplinary character, several research directions ranging from the isolation and purification of proteins to structure-function studies. In addition, close bi- and multi-directional collaboration was achieved with research and production centers in the country, including those of the so-called *Polo Científico*, the multi-institutional organization created in the 80s as part of the reorganization of the Science, Technology and Innovation Program, and later incorporated into the BioCubaFarma (2012) medical-pharmaceutical industry business group (Álvarez *et al.*, 2017).

The foundation

As continuity and strengthening of the Science Technology and Innovation system at the University of Havana, the Centre was founded in December 2000. From the beginning, CEP focused its research activity not only on strategies to obtain and characterize proteins, but also on other advanced technologies in biotechnology and in more wide sense in molecular biosciences, in line with the new challenges of scientific-technological development. CEP faculty is mainly composed of biochemists that collaborate with biologists, microbiologists, physicists and chemists, forming a multidisciplinary group with a more integrated vision of scientific practice.

The main research directions also organized in two research laboratories have been *Proteases and Protease Inhibitors* and *Toxins and Liposomes*. In addition to these directions, there is a *Bioinformatics Laboratory* that complements the theoretical approach needed to explain and predict experimental findings and two others dedicated to the *Immobilization of proteins* and the study of *Antimicrobial peptides*; all of them with interesting results. Linked to these research topics, undergraduate and graduate students carry out diploma, master in science, and doctoral thesis work.

As a result of CEP's scientific activity, it has been possible to design and obtain chimeric or modified proteins with preset or improved properties for biotechnological or biomedical use. The resolution of the three dimensional structure of inhibitors in solution and in complex with their proteases is other significant achievement of CEP. In addition, protein engineering techniques related to the modification of the microenvironment of molecules through their immobilization have been studied in depth.

The introduction of high performance techniques for the identification of molecules, based on protein-protein interaction and the development of basic questions, essential for the structural and functional characterization of proteins, have also been objectives of the Center. In this way, CEP has become one of the most important reference centers of the Ministry of Higher Education for the development of the Cuban biotechnology industry.

In parallel to the research work, postgraduate teaching was strengthened, especially through master's degrees, doctorates, consultancy and training. One of the most important achievements of the Center was the creation of the Curricular Doctorate in Molecular Biosciences, especially designed to respond to the academic training needs of specialists working in the Cuban biotechnology industry. With regard to teaching, CEP has maintained close ties with the Department of Biochemistry of the Biology Faculty and participates in training of future Cuban biochemists-molecular biologists and, jointly, develops postgraduate programs such as the Master in Biochemistry and the Curricular Doctorate.

As a result of CEP's activity, the research gained in focus, greater critical discussion, better international and national visibility through its numerous presentations at events and publication in peer-reviewed

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periodicals, organization of international courses and events, and the strengthening of collaborative networks. Likewise, there is a notable rapprochement to the main research centers of Cuban biotechnology, basically oriented to biomedical problems.

The strategic alliance with the Center for Molecular Immunology (CIM): the emergence of the Joint Laboratory UH-CIM

CEP has gradually consolidated itself as an institution with relevant scientific results, which since its origins has been well connected to international networks. At the national level, perhaps the most relevant result is the two-way channel of exchange with the Center of Molecular Immunology (CIM), one of the most representative centers of the Cuban biotechnology industry. This link was strengthened by bringing researchers from both institutions closer together, an initiative that was strongly supported by the CIM's direction and, of course, by the university authorities. As a result of this exchange on various levels, the Joint Laboratory University of Havana-Center for Molecular Immunology (Lab UH-CIM) was founded in April 2017.

Among the most relevant results derived from this joint venture, it is worth to mention the incorporation of some relevant projects from CEP to the project portfolio of CIM. This is the case, for example, of the vaccine platform based on combination of liposomes and the highly cytolytic toxin isolated and widely characterized by CEP, and more recently investigated as a tool to modulate the cellular immune response. CIM laboratories and facilities are crucial for carrying out CEP research projects, which range from basic scientific problems to those more focused on new products or technological platforms of mutual interest (Álvarez *et al.*, 2020).

As a result of the maturity of this relationship, in 2014 a second collaborative patent was issued, but in this case the main authorship lies with specialists from the University of Havana (Lanio *et al.*, 2014). In addition to these achievements, there are others in the pre and postgraduate training activities, including supervision of joint work, participation of CIM researchers in university teaching and the doctoral program, joint participation in projects and networks of national and international nature (Toxins of Interest to Biomedicine-CYTED, 2012-2015; OligoNanoMed-Horizon 2020), among others.

Although the Lab UH-CIM, of which CEP is at its core, is a superior form of development in university research, this integration poses new challenges to the organization and vitality of CEP as university research unit. Among the main challenges to be met we can mention: the integration of other research lines of CEP to the goals of the Lab UH-CIM, to ensure the effective presence of young researchers in the facilities of CIM (away from the headquarters of the Biology Faculty), a redesign of the plans and demands of the personnel oriented towards scientific productivity and a greater culture of innovation and patents. This aspect must be addressed without neglecting that universities must have the capacity to respond in the short term to more immediate social needs while maintaining some degree of autonomy and establishing long-term commitments to be genuine generators of new knowledge, one of their essential roles in society.

In summary, CEP fulfils the expectative for a Cuban higher educational institution based on the notion that academic excellence must be harmoniously combined with economic and social impact. Relevance and orientation to the satisfaction of social needs are essential requirements for academic performance of excellence (Álvarez *et al.*, 2017).

Final notes

As a result of the endeavor of its founders and the contribution of successive generations, CEP has received numerous awards and distinctions, including the Scientific-Technical Merit Prize, awarded annually by the Cuban Academy of Sciences (ACC), National Prizes at the Forum of Science and Technology, the Prize for the Result of the greatest scientific significance and originality corresponding to the annual awards of the University of Havana, the Prize for the Most Outstanding Scientific Research Team of the University of Havana and others in addition to numerous individual prizes and distinctions granted to professors and researchers that legitimize the results obtained.

In short, CEP responding to the needs of its time has developed a work with high scientific level and has played a leading role in protein research and the postgraduate training of many specialists. Despite the difficult material conditions in which it has carried out its work, the achievements are the result of the social commitment of its professionals and of a scientific strategy that has successfully combined the research tradition of its founders with the construction of national alliances and international cooperation, which has allowed to exhibit the achievements that today form part of CEP's history.

This issue of the RCCB gathers articles showing different angles that make up the CEP's scientific work platform, which is closely linked to the needs and priorities of science in Cuba and in line with the highest international quality standards.

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