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SPECIAL ARTICLE

Biobanks: Experience of the School of Medicine and the “Dr. José Eleuterio González” University Hospital of the Universidad Autónoma de Nuevo León

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Abstract Medical research has greatly benefited from molecular biology and increasingly relies on tools from the “omics” disciplines (mainly genomics, transcriptomics, proteomics and metabolomics). The availability of biological samples preserved with high quality standards is a *sine qua non* condition for such studies and their repositories are referred to as biobanks. Biobanks support the transportation, storage, preservation, and initial pathological and analytical examinations of biospecimens, as well as the protection of relevant information and the comparison of clinical and laboratory findings. A biobank facility is one of the most valuable tools the academic medicine organizations can offer to their researchers to improve the competitiveness of their current and future medical research. It acts as an essential bridge and an effective catalyst for research synergies between basic and clinical sciences, and it can be potentiated with efforts to raise funds for acquiring and maintaining cutting-edge analytical infrastructure to better serve its clinical, pharmaceutical and biotech clients.

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Merging assistance and research

Medical research benefits more and more from laboratory tests which scrutinize patients’ gene pools (genome), sets

of transcripts (transcriptome), protein patterns (proteome), and metabolite profiles (metabolomics).

When these researches are geared towards discovering the causes of the leading health conditions -commonly

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caused by the effect of multiple and often subtle metabolomic, proteomic, transcriptomic, or genomic alterations (i.e., single nucleotide polymorphisms), it is necessary to include in the research protocols a large number of patients, and to ensure follow-up for several years. This is crucial in an attempt to associate the findings at a molecular level with the prognosis of diseases and their response to treatment (pharmacogenetics). Therefore, the procurement, preservation, distribution and analytical processing in optimal conditions of biospecimens (and their associated information), is key in order to maximize their validity, reach and impact.¹

What is a biobank?

The term “biobank” is relatively new. It first appeared in PubMed during the 90's, yet it was not until the year 2000 that it became more frequently used.^{1,2} Biobanks gather, store, preserve, process and distribute biological samples and all associated data. The importance of sample preservation has increased in recent years and countries like the United Kingdom, the United States of America, China, Switzerland, Estonia, France, Japan, Spain, Norway, and Canada rely on biobanks for large-scale sample preservation.³

Biobank benefits

Thanks to standardized and systemic biospecimens and related data storage, biobanks are accelerating the development of new biotechnological medications, medical devices and personalized medicine tests. The combination of clinical, demographic, epidemiologic, and genomic information of populations -on occasion entire populations (as DeCODE genetics conducts in Iceland), allows us to explore and decipher complex interrelations between genes, the environment and habits, thus placing us in the path to discover the causes of multifactorial complex diseases.³

Human biospecimens stored in a biobank may be used to:

- a. Identify and validate therapeutic targets (genes and gene products).
- b. Discover cellular mechanisms underlying diseases.
- c. Investigate biomarkers associated with certain subtypes of diseases.
- d. Group patients based on their genetic characteristics and response to treatment, which allows for the development of new individualized therapies.
- e. Try disease associations with a genetic variation in genomes of a certain population and compare it to other populations.

How does a biobank work?

Most of the materials stored in biobanks are specimens derived from human blood and other tissues, along with the donors' information. The stored samples correspond to patients who, fully informed and voluntarily, decided to donate them with the purpose of supporting scientific research properly approved by the Research Ethics Committee of the participating institutions. Biobanks operate with dual responsibilities; on one hand they have to preserve the biospecimens and their respective information; on the other hand they

are obliged to protect the privacy and confidentiality of such information, granting access exclusively to authorized researchers under the applicable institutional guidelines.^{2,4}

Personnel working in biobanks offer the following services:

- a. Obtaining a signed consent form including the storage of biospecimens.
- b. Compiling the necessary information from the donors.
- c. Transporting biospecimens in good time and in an appropriate manner for their preservation.
- d. Codifying all relevant information, guaranteeing confidentiality.

Origins of the Biobank of the School of Medicine and University Hospital of the Universidad Autónoma de Nuevo León (UANL)

The Department of Biochemistry and Molecular Medicine (DBMM) of the UANL's School of Medicine has been leading edge in its country in the study of the molecular biology of various diseases. These studies were made possible thanks to the collaboration of different departments and services of “Dr. José Eleuterio González” University Hospital (HU-UANL). Among these researches, the first two gene therapy protocols (for prostate and cervical cancer) carried out in Latin America stood out over 10 years ago.

Supported by their current infrastructure, the DBMM's Medical Biotechnology Unit (MBU) has considerable experience in large-scale biological sample storage, which was created through a research project in collaboration with the State Secretary of Health concerning cervical cancer risk factors. In 2002 almost 5000 samples from voluntary females were gathered for this project. This and subsequent large-scale biospecimen storage experiences have made evident the need to have an institutional biobank.

Gradually, this “pilot biobank” initiated at UBM has been supporting more and more projects and theses of the different departments of the UANL's HU and Faculty of Medicine.

An innovative idea

Because the development of clinical research in our institution is expanding, the implementation of its biobank is not only crucial, but a strategic pillar for the aspirations of excellence in effective assistance, research and connection with pharmaceutical and biotechnological industries. The implementation of the institution's hospital biobanks will allow the preservation of valuable samples for subsequent analysis.

Visionary tasks

The institution began implementing its biobank so that researchers -distributed over 52 different departments- may multiply their excellent researches in scientific and technological approaches, meeting international standards (bioethics included), with a wider reach and preferably connected to multi-center projects of interest in public and private sectors, domestically as well as internationally.

The institutional Biobank will include reception, sampling, extraction, labs and biomolecules analysis areas, massive low-temperature storage refrigeration of biospecimens, and computational infrastructure for sample and data control, etc.

The Biobank project is being subjected to evaluation for its possible approval by our institution’s Research Ethics Committee. Once the Biobank is operating, each researcher who requests biological sample preservation there will be required to have the corresponding protocol’s approval letter from said Committee as an essential requirement to store the biological material.

Contribution to regional and economic development

The proposed institutional biobank will bring social benefits; having higher quality researches will contribute to the generation of more and better health in the community, while alliances with more pharmaceutical and biotechnological industries will contribute to regional and economic development.

At the same time, the project will help create a new era for clinical research in Latin America, a region that despite having become one of the most relevant in the research of new medications and medical devices, has not grown to its full potential due to the lack of biobanks.

Conflicts of interest

The authors have no conflicts of interest to declare.

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