ISSN: 2754-4761

Journal of Pulmonology Research & Reports

SCIENTIFIC Research and Community

Review Article

Open Access

Specific Biobank for Chronic Thromboembolic Pulmonary Hypertension (Perspectives and Implementation)

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ABSTRACT

Chronic thromboembolic pulmonary hypertension (CTEPH) is a disease characterized by incomplete resolution of the thrombus after an acute pulmonary embolism (PE), accompanied by changes in the pulmonary vasculature with thickening of the intima, changes in pulmonary endothelial cells and subsequent fibrosis. These changes lead to an increase in pulmonary vascular resistance, right ventricular dysfunction and, ultimately, to this day we do not have a complete explanation of its pathophysiology. In recent years, knowledge of molecularmechanisms and metabolic changes have provided elements but a window remains open for further exploration.

The development of Biobanks offers an opportunity as a tool in translational research in several lines.

This article aims to show the development of a specific biobank for chronic thromboembolic pulmonary hypertension, its lines of work and future potential.

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Received: September 23, 2024; **Accepted:** September 26, 2024; **Published:** October 08, 2024

Keywords: Biobank, Biorepository Chronic Thromboembolic Pulmonary Hypertension, Clinical Research

Introduction and Background

Translational research offers a wide range of possibilities to understand pathophysiological processes, identify markers, both diagnostic and prognostic, and use this in pathologies whose knowledge is under permanent construction

It is essential to have the availability of quality biological samples, adequately phenotyped.

It is precisely this demand that has led to the creation of Biobanks over the past decade, supported by different institutional or private organizations.

Definition of Biobank

A Biobank is a repository of biological material (and associated clinical information) for biomedical research purposes, with sufficient infrastructure, technology and legal ethical framework to guarantee not only the quality of the sample, but also the confidentiality of the donor [1].

This allows for the availability of sample collections of a particular pathology with longitudinal monitoring, which allows for reducing the time taken to carry out and validate studies, while facilitating the development of meeting frameworks with other researchers for the establishment of collaborations and joint projects. From this perspective, the implementation of a Biobank is a basic instrument of high strategic value [2].

Importance of a Biobank Focused on Chronic Thromboembolic Pulmonary Hypertension

Chronic thromboembolic pulmonary hypertension is characterized by incomplete resolution of the thrombus after an acute pulmonary embolism, generating various adaptive changes in the pulmonary vasculature (remodeling), which leads to panvasculopathy, development of pulmonary hypertension and right ventricular dysfunction [3].

Conditions such as thrombophilias, dysfibrinogenemias and chronic inflammatory states have been associated with chronic thromboembolic pulmonary hypertension, and in recent years the focus has been on chronic thromboembolic disease, even in stages without the presence of pulmonary hypertension but with all the potential to be developed and with functional changes. The molecular mechanisms underlying this disease are also little known.

Building a specific CTEPH Biobank will facilitate the development of lines of research that allow improving the knowledge, prevention and care of patients with Pulmonary Hypertension (group 4) CTEPH.

The biobank will be one of the most important tools for both basic research and clinical research, therefore, for the “translation” of knowledge towards the latter [4].

The specific CTEPH Biobank will not be limited to processing and safeguarding samples and data associated with them to store them indefinitely, but will maintain at all times an active policy

generating lines of research in this pathology.

It also aims to go beyond the concept of a "sample repository" and will promote dynamic interactions between groups of researchers (basic, translational and applied, both nationally and internationally) that use the samples and information generated around each donor, to find answers to the clinical problems presented by their patients [5,6].

Objectives

Develop a specific Biobank for chronic thromboembolic pulmonary hypertension (CTEPH)

Evaluate Retrospectively (patients who are already being followed with a diagnosis of CTEPH and who have had different specific therapies), collect plasma samples, and once they have been adequately processed (Coded and clinical data collected in the same way) continue to progress in the construction of the Biobank

To Evaluate Prospectively (new patients diagnosed with CTEPH) in these patients the biological sample to be preserved will be Plasma and in those undergoing Thromboendarterectomy, surgical samples of thrombus and endothelium (anonymized and clinical data collected in the same way) [7-9].

We seek to evaluate the molecular and functional characteristics associated with chronic thromboembolic pulmonary hypertension using a multifaceted approach.

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With Different Lines of Work Such As

- Studying metabolic changes (glucose deregulation, lipid metabolism deregulation through abnormal use of fatty acids [10].
- Changes in the Transforming Growth Factor Beta (TG B) cascade and cell signaling [11, 12].
- Inflammatory mediators [12].

Rational Approach to the Various Lines of Research

The increasing use of sophisticated but expensive technologies that produce increasingly large and complex data sets to analyze only makes sense when complemented by an exhaustive knowledge and control of the clinical and demographic data associated with the samples. Even if their analysis and characterization uses tools such as artificial intelligence, the entire flow of clinical data is not analyzed together [13].

This is essential to minimize variations and biases, and serves as a basis not only for ongoing research, but also as a solid starting point for a multitude of future studies.

This nuanced approach not only improves our understanding of the intricate variations in the pathophysiological mechanisms involved in CTEPH and given the great heterogeneity of patients, but also reveals additional mechanisms, especially in the context of comorbidities, associated diseases and predisposing mutations [14-16].

Conclusion

Developing a biobank is a task that inevitably requires a multidisciplinary team with common objectives and a high dynamic interaction, which will result in a final objective knowledge base to improve the lives of patients with this pathology.

Funding: The authors declare that the work was not funded.

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject of this publication.

Author Contributions: DA: conceptualization, writing, original draft, and review; AF: investigation, review, editing; NL: formal analysis, investigation; JM: investigation; MZ: review; ER: formal analysis, investigation; MN: review.

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