

Researchers participate in the design of a future vaccine for tuberculosis

May 4 2015



The research team in their laboratory.

Researchers from BIOCAPS will collaborate with scientists from seven countries to design a future vaccine against one of the most persistent diseases worldwide, an infectious disease that provokes one death every

24 seconds: tuberculosis. Specifically, experts from the Institute of Biomedical Research of Vigo (IBI) will search for biomarkers that are correlated with protective immune responses against the pathogen that causes the disease, a key step in the development of an effective vaccine.

The [infectious diseases](#) strategic area of the Biomedical Capacities Support Program (BIOCAPS) is thus addressing an important public health problem that affects countries around the world. This illness affects close to 9 million individuals each year, of which almost 1.5 million ultimately die, despite medical advances, making [tuberculosis](#) the second leading cause of death due to an infectious disease worldwide, behind the HIV virus. Inadequate diagnosis and the ability of the pathogen that causes the disease to adapt to antibiotics, becoming resistant to the drugs, highlight the urgent need to address this problem in a preventative manner, by developing a truly effective vaccine.

"The only vaccine currently available is that which uses mycobacteria bovis, yet it is not fully effective against [pulmonary tuberculosis](#) and it only combats the severe infant forms of the disease," explains África González-Fernández, co-ordinator of BIOCAPS.

The project will last for four years and has been awarded nearly 8 million euros of funding from the European Research programme - Horizon 2020. Co-ordinated by St George's Hospital at the University of London, other groups from the UK, Spain (as well as the group at BIOCAPS, a group at the CSIC's "Instituto de Investigaciones Marinas" -Institute of Marine Research- in Vigo and another group in Catalonia), Sweden, Italy, Mozambique and the Czech Republic will collaborate in the project, along with German and British companies.

The search for positive immune responses

Tuberculosis is caused by the bacteria known as mycobacterium

tuberculosis, which is airborne, penetrating the respiratory mucosa and generally producing lung infection, although it can also affect other organs and it can even produce systemic failure.

This project aims to design a new vaccine that will strengthen the immune system in a manner that will impede the passage of the pathogens across the respiratory mucosa, that is, at their point of entry.

Biomarkers are substances that serve as indicators of a biological state, such as pathogenic status or the response of the immune system. Therefore, they are very useful to identify diseases and the state of protection against them, to predict the success of a treatment, etc. For tuberculosis, there is currently no valid biomarker available, an indispensable requirement to develop truly effective vaccines.

This key phase in the process that will ultimately lead to the design of the new vaccine will be carried out by the researchers in Galicia. The Tuberculosis Unit in Pontevedra, led by Luis Anibarro, a BIOCAPS researcher, will carry out the selection of patients to perform extensive studies of their immune system in order to identify biomarkers related to the protective responses against the pathogen. "Exhaustive molecular studies will be carried out on patients, as well as on those individuals with whom they have contact, in order to evaluate how their immune cells behave", explains África González.

This will also help to reveal one of the greatest mysteries surrounding this disease: why some people are infected and others not, and why only 10 percent of those infected finally develop the disease. "Understanding their [immune system](#) and how it is controlled could help achieve a more effective prophylactic therapy," adds the co-ordinator from BIOCAPS.

Accordingly, the scientists at the IBI will carry out assays in vitro and in vivo, the former involving laboratory studies into the response of the

patient's cells. The use of animal models will enable them to test the vaccine prototypes to assess whether or not they offer protection.

As well as África González-Fernández and Luis Anibarro, the senior scientist Luiz Stark will also form part of the research group at BIOCAPS implicated in the project. The Galician team will be completed by Mónica Carrera, of the Instituto de Investigaciones Marinas (CSIC) in Vigo, that use the latest generation Orbitrap Elite mass spectrometry apparatus in their work, recently acquired by the IBI thanks to the BIOCAPS project.

Provided by Universidade de Vigo

Citation: Researchers participate in the design of a future vaccine for tuberculosis (2015, May 4) retrieved 24 April 2024 from

<https://medicalxpress.com/news/2015-05-future-vaccine-tuberculosis.html>

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