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## Review

# The Spanish biology/disease initiative within the human proteome project: Application to rheumatic diseases ☆



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## ABSTRACT

The Spanish Chromosome 16 consortium is integrated in the global initiative Human Proteome Project, which aims to develop an entire map of the proteins encoded following a gene-centric strategy (C-HPP) in order to make progress in the understanding of human biology in health and disease (B/D-HPP). Chromosome 16 contains many genes encoding proteins involved in the development of a broad range of diseases, which have a significant impact on the health care system. The Spanish HPP consortium has developed a B/D platform with five programs focused on selected medical areas: cancer, obesity, cardiovascular, infectious and rheumatic diseases. Each of these areas has a clinical leader associated to a proteomic investigator with the responsibility to get a comprehensive understanding of the proteins encoded by Chromosome 16 genes. Proteomics strategies have enabled great advances in the area of rheumatic diseases, particularly in osteoarthritis, with studies performed on joint cells, tissues and fluids.

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† In memoriam of Juan Pablo Albar.

**Biological significance**

In this manuscript we describe how the Spanish HPP-16 consortium has developed a B/D platform with five programs focused on selected medical areas: cancer, obesity, cardiovascular, infectious and rheumatic diseases. Each of these areas has a clinical leader associated to a proteomic investigator with the responsibility to get a comprehensive understanding of the proteins encoded by Chromosome 16 genes. We show how the Proteomic strategy has enabled great advances in the area of rheumatic diseases, particularly in osteoarthritis, with studies performed on joint cells, tissues and fluids.

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**1. The Spanish Hpp consortium**

Since its foundation, the Spanish Human Proteome Project consortium (SpHPP) is structured on two platforms on the basis of ProteoRed-ISCI network (Fig. 1). This consortium is integrated in the global initiative Human Proteome Project [1], which aims to develop an entire map of the proteins encoded following a gene-centric strategy (C-HPP) [2] in order to make progress in the understanding of human biology in health and disease (B/D-HPP).

The SpHPP project was conceived on a multi-centric configuration, assuming the standards and integration procedures already available in ProteoRed-ISCI (http://www.proteored.org), which are encompassed with the HUPO initiatives. Within this consortium, the Spanish C-HPP platform aims to identify and characterize previously known and unknown proteins of Chromosome 16, whereas the B/D-HPP platform aims the cooperation of basic researchers with clinical groups belonging to networks of the Spanish Institute of Health (ISCI): CIBERS (Networks of Biomedical Research Centers) and RETICS (Thematic Networks of Cooperative Health Research). This will facilitate not only the comprehensive study of the products of the 836 protein-coding genes in Chromosome 16 in diverse sample types (cells, tissues or biofluids), but also their possible role in disease pathogenesis, as well as their putative usefulness for the development of diagnosis, prognosis and treatment strategies.

**2. Chromosome 16 and disease**

Alterations in Chromosome 16, which comprises near 900 proteins, have been linked to several different disorders such

as obesity, autism, neurodegenerative diseases, cancer, thalassemia or spondyloarthropaties. Genetics Home Reference (http://ghr.nlm.nih.gov) lists 58 conditions that are related to genes on Chromosome 16. These conditions include not only common hemoglobinopathies such as alpha-thalassemia, but also different types of cancers, inflammatory bowel diseases such as Crohn and a number of metabolism-related syndromes. A comprehensive proteomic analysis of Chr. 16 proteins will be highly valuable for a better understanding of these pathologies.

**3. The Spanish biology/disease platform**

With the aim of coordinating all those efforts related with biology and disease driven projects within the HPP in Spain, the SpHPP consortium has developed a BD platform with a manager and five programs focused in selected medical areas, based on those genes located in the Chromosome 16 (Fig. 2): cancer, obesity, cardiovascular, infectious and rheumatic diseases. Each of these areas has a clinical leader (oncologist, endocrinologist, cardiologist, internal medical specialist and rheumatologist), and are co-chaired by a ProteoRed-ISCI member.

Clinicians are associated to proteomic investigators with the responsibility to get a comprehensive understanding of the proteins encoded by the genes and their relationship with disease. Based on the genes located in the Chromosome 16, ten diseases (colon cancer, brain cancer, breast cancer, obesity, atherosclerosis, candidiasis, rheumatoid arthritis and osteoarthritis) have been selected to acquire significant medical benefits, including improved capabilities for early detection and diagnosis, therapeutic development and monitoring and personalized healthcare programs.

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