

## EVALUATION OF CARDIOVASCULAR RISK

### DESCRIPTION OF THE TECHNOLOGY

Cardiovascular disease remains one of the leading causes of death and disability in the Western world. Inflammation of the arterial wall has been consolidated as an etiopathogenic mechanism involved in the initiation, development and instability of atherosclerotic plaque.

Although nowadays the repercussions that different metabolic disorders can have on the circulatory system are known, the underlying mechanisms that originate them are not well understood. This is a constant reason for research to address new diagnostic and therapeutic possibilities.

Only 30% of heart attacks can be explained through total cholesterol. On the other hand, and despite the fact that HDL and LDL cholesterol lipoproteins are the main indicators of coronary heart disease (CHD), these lipoproteins are formed by heterogeneous subfractions that can influence in a different way in cardiovascular disease. This is why the study and evaluation of lipoprotein subfractions can be an important advance, not only for their contribution in this field of research, but also for the specific prediction of cardiovascular risk, as well as to evaluate different treatments.

Our research group has the tools and know-how to objectively determine some aspects of endothelial function, achieving the identification of those

individuals susceptible to develop cardiovascular disease.

The equipment available for these studies is:

**1. Parallel flow chamber** for *in vitro* evaluation of leukocyte-endothelium interactions.

Through an inverted microscope, rolling velocity, rolling flux and firm adhesion of the leukocytes to the vascular endothelium are analysed. The specialization of the professionals of the group in this *in vitro* technique allows a greater control of the experimental conditions, reproducing the dynamic conditions present in the blood circulation.

**2. Lipoprint Quantimetrix® System** for the determination of the lipoprotein subfractions

The Lipoprint system can calculate the particle size of LDL up to a maximum of seven sub-fractions called LDL-1 (larger particles) to LDL-7 (smaller particles), allowing to design patterns for each sample according to this profile.

**3. Luminex™ 200 System.**

Immunoassays based on Luminex™ xMAP™ technology allow the quantification and simultaneous detection of different secreted proteins, which are invaluable for the comprehensive study of biological systems.

### MARKET APPLICATION SECTORS

Our research group offers its services to both public and private centers that carry out biomedical R & D & I activities around the study of the atherosclerotic process in biological samples (hospitals, universities, research centers, and pharmaceutical, food and biotechnology companies).

### TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The evaluation at an early stage of cardiovascular risk by the group consists of:

- Determination of the diameter of LDL lipoprotein fractions and subfractions in serum. It could be accompanied by the determination of inflammatory parameters, adhesion molecules, and parameters of oxidative stress or hormones, among others. The method is technically simple, requires low sample volume and offers fast results.
- *In vitro* assays in different cell types to evaluate the protective or promoting effect of different compounds (drugs, antioxidants, nanoparticles,...) on the beginning of the atherosclerotic process, through the study of rolling, adhesion and migration of leukocytes. The analysis of these parameters is a fundamental tool to evaluate the presence and development of cardiovascular disease in its early stages, reproducing the conditions of the blood circulation.

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### CURRENT STATE OF DEVELOPMENT

Among the few tools that allow us to objectively determine the endothelial function, the parallel flow chamber allows the study of leukocyte-endothelium interactions that precede the formation of atherosclerotic plaque. In addition, the use of the Lipoprint Quantimetrix® System for the determination of LDL lipoprotein subfractions has been approved by the FDA for use in clinical diagnosis and allows determination of the diameter of LDL particles – another known factor that promotes atherogenesis –. Finally, the study of biological markers of this inflammatory process (endothelial adhesion molecules, cytokines, etc.) will help to define in a more concrete way the cardiovascular risk associated with the biological sample, with results comparable to ELISA tests but with greater efficiency, speed and dynamic range.

### INTELLECTUAL PROPERTY RIGHTS

We have the know-how and experience of our professionals to approach each and every one of the stages of the study, from its design and advice to the interpretation of the results. All protocols are standardized and we have reference values of different populations.

### COLLABORATION SOUGHT

Collaboration with other research groups, both national and international, in the field of cardiovascular diseases, interested in analysing the initial stages of atherosclerosis.

Evaluation of compounds or molecules from the industry, involved in the atherosclerotic process.

### RELATED IMAGES

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