

## Anticipating cardiac ischemic risk in cardiovascular patients through NMR metabolomics and Lipidomics

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### Introduction

There is a clear need for new biomarkers capable of identifying patients at risk of plaque destabilization and rupture. Among various pathological features of atherosclerotic plaques that define their propensity to rupture, the content and composition of plaque lipids deserve special consideration. Altered lipid metabolism and dyslipidemia in the context of inflammation and oxidative stress are driving forces in the transition from stable to unstable plaques. We have recently performed comparative lipidomics profiling of carotid endarterectomy specimens from symptomatic versus asymptomatic patients and highlighted the existence of a characteristic lipid signature within unstable human plaques. This prompted us to further investigate molecular lipid profiles in the circulation.

Cardiovascular diseases (CVD) are primary causes of mortality worldwide. Myocardial ischemia occurs when the blood flow to the heart is reduced, resulting in a decreased amount of oxygen received by the heart muscle. The aim of this ongoing study is to evaluate whether the plasma metabolic profile of subjects suspected to suffer CVD can be used to predict the likelihood of experiencing an ischemic event. The identification of an “ischemic fingerprint”, coupled with the traditional tests, could be extremely helpful to assess the ischemic risk more accurately.

Venous plasma samples of 208 patients were collected before and after the traditional treadmill or pharmacological stress test and both polar metabolites and lipid extracts have been analyzed using NMR spectroscopy. The preliminary results indicate that a marked metabolism imbalance is occurring in patients that are more likely to experience an ischemic event before the heart is forced to work under pressure (i.e. baseline levels). Moreover, the lipid profile appeared to be determinant for subgrouping patients in order to provide a better classification.