Editorial

Metabolic profile in heart disease

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The practice of cardiology today is largely dominated by a mechanical approach to the treatment of cardiac diseases. Both percutaneous and surgical procedures have made dramatic advances over the past 20 years, mostly as a result of a constant improvement in the technology and equipment available. Yet, despite these advances, there remain important unmet medical needs in the treatment of patients with cardiac disease.

Procedures have become progressively more widely applicable, and their use has been extended to a widening range of disease and patient subgroups. Worldwide, the number of procedures, including revascularization for ischemic heart disease or implantation of a cardioverter-defibrillator with or without randomized clinical trial for heart failure, has increased year after year. However, the overall impact of this mechanical approach on mortality and morbidity for cardiac disease remains highly controversial. Even when a significant reduction in mortality has been reported, this often translates, from the patient's perspective, into no more than a limited survival gain.

As far as symptoms are concerned, revascularization procedures in chronic ischemic heart disease are followed by the relief of angina in the majority of patients. Nonetheless, persistence of angina after ''successful'' revascularization procedures has been reported in up to 67% of patients, and recurrence of angina during follow-up does occur, after an initial pain-free interval, in the majority of patients – so much so that, after 3 years, there is no significant difference in the prevalence of angina between patients who have undergone revascularization and those treated medically.

Overall, the limitations of the mechanical approaches underscore the need for a better understanding of the metabolic mechanisms underlying cardiac diseases as a prerequisite for the discovery of more effective treatments.

Cardiac energy metabolism may be altered in many forms of cardiac disease, including ischemic heart disease and heart failure. Some changes occurring in disease conditions may be beneficial and compensate, at least in part, for the underlying abnormalities. Others may be detrimental and worsen the cardiac condition. Because of the importance of cardiac energy metabolism in several cardiac diseases, pharmacologic interventions that optimize cardiac energetics are emerging as an exciting and promising alternative in the treatment of cardiac disease. Therapeutic modalities that can increase cardiac efficiency by modulating cardiac energy metabolism are effectively and extensively discussed by Drs Ussher and Lopashuck in the main clinical paper of this issue of *Heart and Metabolism*.

Understanding these concepts is critical to understanding the potential of metabolic interventions for heart disease. Transgenic mice may be of great help in defining the causal role of metabolic remodeling in the pathogenesis and progression of heart disease, including heart failure. This is clearly documented in the Basic Article by Dr Tian, in which he considers animal models in a discussion of the functional consequences of altered substrate metabolism and sheds light on an innovative, phenotype-based, therapeutic concept.

Magnetic resonance spectroscopy (MRS) is a versatile and powerful tool for the non invasive study of cardiac metabolism. Drs Hove and Neubauer offer a brief overview of the possible applications of cardiac MRS, providing a pathophysiological insight into the evaluation of the metabolic changes associated with heart diseases. To date, MRS has been applied as a research tool; however, technical improvements allowing a better matching of voxels to the shape of the heart and a more favorable signal-to-noise ratio promise to bring MRS into the clinical arena in the near future.

The hypothesis that fatty acids may regulate gene expression at the nuclear level is discussed by Drs Sampath and Ntambi, opening novel, exciting alternatives to the treatment and prevention of heart disease.

Metabolic profiling as a new type of diagnostic test is proposed by Dr Grainger. By using nuclear magnetic resonance spectroscopy or chromatographic separation, a ''molecular fingerprint'' can be generated that could be used to identify metabolic profiles associated with atherosclerotic lesions, moving from pathogenesis to risk stratification.

The current issue of *Heart and Metabolism*, true to its name, provides strong evidence that cardiac metabolism is a major player in a number of cardiac conditions, both on the pathogenetic side and on the therapeutic side. Agents such as trimetazidine, which can optimize cardiac energy metabolism, offer an innovative and extremely promising alternative for the treatment of heart diseases. Large-scale studies, based on a better understanding of the possible beneficial effects of metabolic modulation, are urgently needed to establish the role of these agents in clinical practice.