EDITORIAL

Cardiovascular Proteomics

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The human heart beats over 100,000 times and moves ~5,700 liters of blood each day throughout the lifetime of an individual. To meet the dynamic demands placed on it, the heart undergoes short and long term adaptation to maintain sufficient cardiac output supplying blood to the body though the complex network of vasculature. To regulate these processes the cardiovascular (CV) system is composed of a number of specialized cell types including cardiac myocytes, fibroblast, neurons, endothelial and smooth muscle cells and newly discovered stem and progenitor cells. To date, the proteome of these cells are not well characterized nor has the interplay between the cell types been established in health or disease. This remains a significant challenge as CV disease is the number one killer world wide. The number of individuals surviving acute myocardial infarction (MI, heart attacks) has increased due to improved diagnosis and interventions yet, the number individuals with heart failure (HF) continues to grow at an alarming rate.

The myofilament proteome. The myofilament proteins, including troponin I are responsible for the contractile nature of the cardiac myocytes. In other words, the myofilament subproteome allows the heart to act as a pump. Two articles, Jin *et. al.* and Yuan and Solaro focus on the small but key subproteome. The myofilament proteins are highly regulated by a number of specific post-translational modifications (PTMs) some of which have been discovered through proteomic studies. PTMs of myofilament proteins can directly impact on the contractility of the heart.

Redox modifications in the cardiac proteome. Myocardial ischemia results in oxidative stress, which involves the mitochondria and many/all aspects of myocyte function. The review by Charles and Eaton focuses on the redox signaling and the host of PTMs that can occur. Due to the susceptibility of cardiac protein to oxidative damage proteomic can help to discover, quantify, and characterize these modifications. Nitric oxide is a key mediator of CV cellular response in acute and chronic disease settings. Goedecke *et. al.* discuss role of nitric oxide-induced PTMs and new approaches in the proteomics that can help identify and define this important pathway.

Cardiac cell death and mitochondria. Myocardial protection from myocyte injury due to ischemia has important therapeutic implications. MacLellan *et. al.* reviews recent work in this area highlighting the key contributions made by proteomic analysis. The interplay between multiple subproteomes within the myocytes is highlighted pulling together the larger picture for novel therapeutic strategies. One important subproteome is the mitochondria and White *et. al.* focus on proteomics in the study of this subproteome in myocardial protection, ischemia and the chronic development of HF.

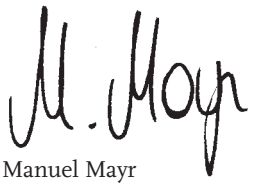
Cardiac biomarkers. Diagnosis of MI relies on the detection in serum of a cardiac specific isoform of the myofilament protein, troponin I which is released into the blood when the cardiac myocyte dies due severe ischemia (little or no blood flow). Earlier detection of MI or diagnosis of myocardial ischemia prior to cell death will help to allow even earlier intervention to save "potentially viable" heart muscle. Sut-

ton and colleagues describe a proteomic discovery pipeline for analysis of human plasma samples for patients with induced and control MI setting the stage for earlier detection of patents at high risk.

Secretory microvesicles and stem cell surface proteins. Recently, cardiac progenitor/stem cells have been viewed to have therapeutic potential. In these early days, it is important that the proteome of these cell types are investigated including the secreted/paracrine factors which influence the development and survival of these cells. Pula *et. al.* discuss the insight gained from proteomic analysis of vascular secretory protein and membrane vesicles. These proteins can affect homeostasis and communication within entire CV system in response to injury. Gundry *et. al.* focuses on the cell surface proteins of stem cells and their potential role in cardiac regenerative medicine. This paper discusses the identification of specific and unique proteins on the plasma membrane can provide insight into all stem cell biology but also could be used for identification, classification and selection of particular differentiating populations.

Each review in the Special Part of this issue focuses on the use of proteomic techniques to answer key biological and clinical questions in the broad area of CV disease.

In summary, the Special Part of this journal issue brings together a series of review articles in the area of CV disease. Each review focuses on the use of proteomic techniques to answer key biological and clinical questions in the broad area of CV disease. The excitement of this approach and the interesting and important data being derived is helping to create new opportunities in the treatment and detection. We thank each author for providing their insight into this exciting and quickly moving area of science.



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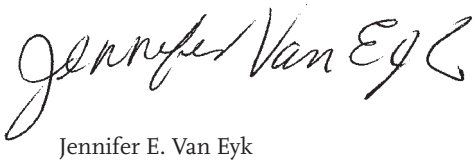

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