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Acute Coronary Syndromes

BIOENGINEERING SILICON QUANTUM DOT THERANOSTICS USING A NETWORK ANALYSIS OF METABOLOMIC AND PROTEOMIC DATA IN CARDIAC ISCHAEMIA

ACC Moderated Poster Contributions
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Authors: *Patrick Gladding, Folarin Erogbogbo, Mark Swihart, Katie Smart, Ralph Stewart, Irene Zeng, Mia Jullig, Katherine Bakeev, Raphael Hu, Stefan Schliebs, Banu Gopalan, Seif El-Jack, North Shore hospital, Auckland, New Zealand, University of Buffalo, Buffalo, NY, USA*

Background: The aim of this study was to discover biomarkers of ischemic preconditioning using metabolomics and translate these into nanotheranostics.

Methods: 33 patients underwent angioplasty after myocardial infarction. Blood was sampled from the coronary sinus, aorta and femoral vein before and 20 minutes from one minute of coronary occlusion. Plasma was analysed using GC-MS metabolomics and iTRAQ LC-MS/MS proteomics. Statistical and bioinformatic analysis included principal components analysis, and support vector machines. Results were mapped into Metacore network database (GeneGo, MI, USA). A cell surface protein and metabolite were used to fabricate a theranostic incorporating silicon quantum (SiQD) dots.

Results: Expression of 13 proteins were significantly different ($p<0.05$) as a result of PCI. Included amongst these was a cell surface marker of reperfusion injury. 38 metabolites were identified using a targeted approach. 42% of their variance was accounted for by 21 metabolites. Statistically significant pathways and networks showed changes related to hypoxia and oxidative stress, signal transduction ESR2, inflammation and complement system, immune response - phagocytosis, cell adhesion (platelet-endothelium-leukocyte interactions).

Conclusions: Multiple metabolic pathways of cardiac ischemia, reperfusion and preconditioning were identified. A cell surface marker and metabolite with therapeutic potential was used to create a micelle encapsulated theranostic.