

# Point of Care Assessment using Multi-Modal Spectroscopy (POCAMUM) – Potential in Cardiovascular Disease

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## **Abstract**

Background: Cardiovascular disease still accounts for the highest number of deaths in the developed and developing world. Despite dramatic improvements in cardiovascular diagnostics and therapies, many gaps exist in the “live” assessment of cardiac tissue. This is partly constrained by the fact that biopsies of a beating structure like the heart are fraught with the risk of complications. We provide an overview of needs and possible solutions

The Needs so far: Morphological needs include live tissue level assessment of inflammation, immune reactions, myocardial fibrosis, muscle architecture, and cardiac adipose tissue. Examples include myocarditis, scar evaluation at surgery, monitoring cardiac rejection in transplants, epicardial adipose tissue evaluation. Metabolic assessment of the heart is currently missing data related to tissue oxygenation, oxygen debt, lactate production, phosphate utilization and energetics are especially important in heart failure. All of these can potentially be addressed by vibrational spectroscopy

Electro-anatomic features that cause abnormal rhythms such as adipose cell rests, amyloid deposition and fibrosis, conduction tissue location, are areas of exploration that will help guide therapeutic interventions. Delineation of coronary artery disease that accurately evaluates plaques for metabolic activity and vulnerability will dramatically improve management of this very common condition.

Solutions:

Point of Care Assessment using Multi-Modal Spectroscopy (POCAMUMS) of the Heart include

1. Combination of modalities to diagnose myocarditis, cardiomyopathies, cardiac rejection in transplanted hearts, diabetic changes in the heart.

2. The combined modalities can evaluate viability of the myocardium during or prior to revascularization, epicardial adipose tissue (EAT) assessment in disease.
3. Assessment of myocardial reversibility in heart failure and this would guide mechanical support of the heart.
4. Mapping of the atria in treatment of atrial arrhythmias such as atrial fibrillation and map guided ablation of ventricular arrhythmias.
5. Differentiation of valvular abnormalities in conditions such as culture negative endocarditis with an assessment of embolic potential.
6. Evaluation of a variety of mechanistic pathways in cardiac tissue in experimental animal models where the need for terminal studies can be minimized by adopting protocols of serial POCAMUMS aided assessments.