TECHNOLOGIES FOR THE HEART

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The heart is one of the most fundamental and critical organs of the human body. Since the dawn of humankind, the human heart and its health have been at the very core of our existence. From athletic endeavors to artistic pursuits to intellectual discussions, the heart plays a vital role.

However now, more than ever, there are an increasing number of ailments that affect the heart and its ability to perform these primary functions. Fortunately our scientific and medical knowledge of the heart and cardiovascular system are also growing rapidly. It is here, at the crossroads of medical knowledge and patient disease that engineers must find new ways of taking our current medical understanding and transforming that into solutions capable of enhancing human life.

Not so long ago the technologies available to "fix" heart ailments focused on a brute force approach. Large rigid external vascular assist devices were used to "aid" heart function. However, now there are many examples of miniature devices that provide a range of therapeutic options for the patient's exact heart condition. As these technologies evolve, the trend is for solutions that mimic the natural biologic conditions, constructs and behavior as closely as possible and work together with the body rather than dominate it. As such, engineered solutions to heal, repair, assist and/or replace the heart or its critical components in a harmonious way represent the frontiers of the technologies for the heart.

This session will begin with a description of the basic functions of the heart to give the audience an appreciation of the complexity of the cardiovascular system, and how crucial normal heart function is to the system's stability. From there the speakers will provide examples of engineered solutions to different heart problems. Specifically, a chronological overview of heart valves from their beginnings to the current best-in-class technology will be provided by Erin Spinner from Edwards Lifesciences. Following on from this industrial forefront, cutting edge research underway on tissue engineered valves will be presented by David Merryman from Vanderbilt University. Jason Burdick from the University of Pennsylvania will then discuss the state-of-the-art in biomaterials for treating heart tissue that has been affected by myocardial infarction. Finally, Tina Morrison from the FDA will give an overview of the regulatory environment and what is required to get the newest technologies to the patients who need them.