With the support of the Heart of a Champion Research Fund, Dr. Stein is taking on the next important step in the study of epigenetics as it applies to cardiovascular medicine.

The Fund in Action

To date, the Heart of a Champion Research Fund has granted awards to two impressive investigators. Their work has already begun to have a sub impact on cardiovascular research at Michigan. Their examples epitomize the vision that drives the Heart of a Champion Research Fund.

2009 Award Winner: **Adam Stein, M.D.** | **Epigenetics**

The conventional wisdom in genetics is that humans are defined by a single DNA blueprint found in all cells of the body. Discoveries in the area of genetics have had a profound impact on modern medicine. Yet many fundamental questions are left unanswered by this classic understanding of DNA.

The field of epigenetics builds upon the traditional genetics foundation, studying other hereditary factors that can impact the appearance and function of cells. Epigenetic analysis has proven useful in describing what happens during cell development. But amazingly, science has yet to apply epigenetics to the understanding of how cells age or respond to disease.

With the support of the Heart of a Champion Research Fund, Dr. Adam Stein, Clinical Lecturer in the U-M Division of Cardiology, is taking on that next important step in the study of epigenetics as it applies to cardiovascular medicine.

Dr. Stein and his team are examining how epigenetic mechanisms work in the adult heart. Specifically, their research centers on the way DNA information is "packaged" within a cell. If all of the information contained in a single strand of DNA were to be stretched out, the strand would be approximately three meters long. To fit all of that information within a single cell requires that the DNA strand be tightly packaged, wrapped like thread on a spool. The type of packaging used to accomplish this on a cellular level is proving to play a significant role in the life of a cell, helping to determine which individual genes are turned "on" or "off" within it.

Dr. Stein uses both developmental biology and epigenetics to study whether and how the packaging of DNA might play a role in maintaining the integrity of a developed heart cell. He is collaborating with investigators undertaking similar studies with other organ types, the kidney for example. But he is the only academic investigator studying how epigenetics may impact the cardiovascular system. So far, his team's research has confirmed that epigenetic mechanisms regulate how the heart ages, and how it reacts to disease. Their next step is to utilize a process Stein has patented to determine whether changing specific epigenetic markers may be able to improve heart function.

The Heart of a Champion Research Fund award made it possible for Dr. Stein to develop his initial concept substantially enough to apply for an R-01 grant from the National Institutes of Health. Although still at an early stage, this pioneering work represents a substantial shift in the understanding of cardiac aging and cardiac disease response on a cellular level.