

Heart Failure Development and Elevated Galectin-3 levels

Heart failure is one of the most common medical conditions in the Western World. It is responsible for more loss of life and hospitalizations than all common cancers combined. There is a growing body of literature that points to the importance of fibrosis in the development and progression of heart failure. Fibrosis can be thought of as a type of scar that forms and replaces normal tissue. In 2004 two important discoveries implicated a type of lectin, called Galectin-3, in the development of heart failure. Lectins are sugar-binding proteins. First, it was found that increased levels of galectin-3 best predicted heart failure development. The follow-up observation that administration of purified galectin-3 in an experimental model caused fibrosis in heart muscle, thereby reducing cardiac output and leading to impaired function of the heart, led to the hypothesis that galectin-3 was a mediator of the fibrotic form of heart failure. If it could be measured in plasma, a simple blood test could identify patients with heart failure on the basis of active fibrosis.

In November 2010, the FDA cleared the assay to measure galectin-3 in blood plasma or serum. This was the first new cardiovascular in-vitro diagnostic test to be cleared by the FDA in more than 5 years and marks the first clinical application derived from the galectin-3 research. Galectin-3 has since been the subject of over 1,500 published scientific articles. Galectin-3 levels measured in over 1000 volunteers who were 55 years old or greater followed a close to normal distribution. Heart failure patients with levels >17.8 ng/mL had increased risk for hospitalization and death, after adjusting for established factors such as age, gender, NYHA class, and ejection fraction. Approximately 30-50% of patients with heart failure have elevated levels of galectin-3.

Heart failure is generally considered an end stage disease that has an insidious onset. In most patients, this is preceded by conditions such as ischemic heart disease caused by coronary artery disease or chronic high blood pressure. Interestingly, only a minority of patients with these pre-existing conditions goes on to develop heart failure. Based on the biology of the disease process, it is likely that galectin-3 elevation precedes the onset of heart failure symptoms. If this is confirmed in further clinical studies, measurement of galectin-3 could identify those with highest near-term risk. A recent case-control study in patients with acute coronary syndrome confirmed that elevated levels are associated with an increased likelihood of subsequently developing heart failure. Thus, galectin-3 could be used to identify those at risk for heart failure development and for the first time provide a model of secondary heart failure prevention.

Probably the most intriguing discovery is natural carbohydrates derived from dietary pectins can inhibit that galectin-3, present in the vegetables and fruits that are part of our diet. In animal experiments, these natural carbohydrates bind to the galectin-3 and block galectin-3 dependent fibrosis development, perhaps explaining why a diet rich in fruits and vegetables reduces heart failure incidence. This is important for all, but in particular those patients with chronic conditions such as high blood pressure, lipid disorders, and diabetes who are found to have elevated levels of galectin-3.