Heparin Impairs Bone Marrow Cells (p 854)

Heparin could be a hindrance to cardiovascular cell therapies, report Seeger et al.

Injury to the heart caused by myocardial infarction can lead to loss of cardiac functionality, heart failure, and ultimately death. Researchers are thus investigating a variety of cell replacement therapies to treat such injuries. One approach has been to inject bone marrow stem cells into the coronary artery of heart failure patients, with the hope that these cells will migrate into the tissue and repair the damage. However, these injections run the risk of occluding the artery, which could make matters worse. Using an anticoagulant such as heparin might solve the problem but, as Seeger et al have now discovered, heparin ultimately negates the effectiveness of bone marrow cells. Heparin binds to and blocks chemottractant and receptor molecules that recruit these cells into the heart. In fact, human bone marrow cells treated with heparin performed poorly in both in vitro and in vivo recruitment assays. The good news, however, is that a small synthetic peptide anticoagulant called bivalirudin did not exhibit such adverse effects on the bone marrow cells. The authors therefore suggest bivalirudin as the preferred anticoagulant for patients undergoing intracoronary cell therapies.

Paracrine Activation by Porcine iPSC-Derived ECs (p 882)

Gu et al are the first to create endothelial cells from pig induced pluripotent stem cells.

Endothelial cells promote blood vessel development and growth, and thus also play an important supporting role in both cardiomyocyte survival and function. As such, they have been considered for their therapeutic potential in treating infarction-induced ischemic heart tissue. Using induced pluripotent stem cells to create endothelial cells would not only provide an endless supply, it would also enable the use of a patient’s own cells for repair. Before such cells can be regularly used in therapy, however, extensive preclinical modeling and testing is required. To this end, studies in pigs would be beneficial because of their anatomical and physiological similarity to humans. Therefore, Gu et al created the first pig induced pluripotent stem cell-derived endothelial cells. These cells not only expressed high levels of proangiogenic proteins in hypoxic conditions in vitro, but decreased infarct size, increased capillary numbers, and improved function in the infarcted hearts of mice. When injected into pig hearts, the cells also successfully localized to infarcted tissue. The team’s next challenge will be to test whether these cells can actually improve heart function in pigs as well.

Chromatid Segregation During Stem Cell Division (p 894)

Heart stem cells that asymmetrically segregate chromatids successfully repair damaged myocardium, report Kajstura et al.

Although it is generally accepted that the heart contains stem cells, details about their origins, behavior, and reparative capacity remain unclear. The immortal strand hypothesis suggests that, at mitosis, stem cells divide their old and new DNA asymmetrically. The cell retaining the original DNA remains a stem cell, whereas the other differentiates. However, the extent to which asymmetric chromatid segregation (ACS) occurs in the heart, and elsewhere, remains unknown. Kajstura et al discovered that although some human heart stem cells perform ACS, others segregate their chromatids randomly. Using a DNA staining technique, the team learned that ACS cells constitute approximately 5% of cardiac stem cells, and that they require dynein, a motor protein, to perform ACS. More importantly perhaps, these ACS cells repaired rat cardiac tissue after infarction far better than their randomly segregating counterparts, restoring more than twice the amount of tissue and reducing the risk of arrhythmia to zero. The random segregators only cut this risk in half. Thus, ACS stem cells should be a focus of future regenerative medicine research, say the team.

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