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Plasticity of the mesothelium

A mesothelial 'stem' cell has not been identified but recent studies suggest that an undifferentiated progenitor mesothelial cell exists. Following injury, new mesothelium regenerates via centripetal ingrowth from the wound edge and from free-floating cells present in the serosal fluid, the origin of which is currently unknown. Studies have shown that these cells undergo an epithelial to mesenchymal transition and differentiate into myofibroblasts and smooth muscle cells, suggesting plasticity. Serosal pathologies including sclerosing encapsulating peritonitis and malignant mesothelioma show features of osteogenic tissue formation. However, the origin of bone-like tissue in these pathologies is unknown. We hypothesize that mesothelial cells are plastic in nature and can differentiate into other mesenchymal cell types such as osteoblasts and adipocytes.

Mesothelial cells were isolated from the omentum and peritoneal fat pads of 6-8 week old Lewis rats and pericardial fluid collected from patients undergoing open heart surgery and grown in culture for 0-27 days. A functional assay of bone formation was utilized where cells were maintained in either osteogenic medium (OM) or standard culture medium. Mesothelial cells were also treated with adipogenic medium (AM) to induce adipogenic differentiation. Rat and human mesothelial cells treated with OM progressed to form mineralized nodules as shown by von Kossa stain. mRNA and protein analyses for several key osteoblast markers were performed by RT-PCR and western blotting respectively. OM treated mesothelial cells expressed mRNA and protein for these osteoblast markers over time. Mesothelial cells treated with AM accumulated lipid and expressed mRNA indicative of adipocyte differentiation. We have strong evidence that rat and human mesothelial cells have the capacity to differentiate into cells of the osteoblast and adipogenic lineages, illustrating the multipotential nature of these cells.