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The NOTCH signaling pathway has been shown to play a vital role in determining cell fate of human Adipose Stem Cells (hASCs) and Mesenchymal Stem Cells (MSCs). Misregulation of the pathway is responsible for specific developmental diseases and cancers, including breast cancer. To date, the role of the four individual NOTCH receptors has not yet been characterized in adult stem cells. The aim of this project is to characterize the role of NOTCH3 in the maintenance and differentiation of hASCs. NOTCH3 appears to have the highest level of expression of the four receptors in hASCs. siRNA-mediated knockdown of NOTCH3 shows that while self-renewal and cell viability is unaffected by the loss of NOTCH3, there is a significant increase in adipogenesis when cells are encouraged to differentiate into adipocytes. This suggests that the NOTCH3 pathway is used to regulate adipogenic stem cell fate. We hypothesize that differentiation is caused by the contact dependent pathway. Future studies include a Notch 3 knockdown's effect on the levels of Notch ligands Jagged 1 and 2, and delta like ligand 1, 3, and 5. Since regenerative medicine relies heavily on controlling stem cell fate, the characterization of the NOTCH signaling pathway will act as a gateway for clinical advances.