PROJECT TITLE: Molecular mechanisms in bone deposition: cell interaction and signaling between MSC and osteocytes

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Project Description

I investigate questions regarding the determinants of bone development, function and shape. In particular, I focus on the influences of ontogeny, function and evolution on craniofacial morphology. It is my goal to apply the outcomes of this research directly to clinicians, assisting them in treating children with craniofacial abnormalities, either congenital or acquired, through translational and laboratory-based research endeavors. Recently, our lab has collaborated with the lab of Dr. John van Aalst who is researching better ways to fill critical size bone defects using bone tissue engineering.

Bone cells communicate with each other and various cell populations during growth, development, and healing using chemical signals that inform cell differentiation and where extracellular matrix should be deposited. To better understand how this signaling might influence bone tissue engineering, ex vivo cultures of pig craniofacial bone will be submitted to a variety of different tests to determine how the cells in the bone (osteocytes) communicate with mesenchymal stem cells (MSC) during tissue engineering experiments. An essential component of finite element analyses involves having reliable material properties in the structure.

For the course of the summer project, the student will be assisting with the collection of bone samples, cell culture work, and the collection of data from histology and microscopy.