Recipient of 2012 Student Fellowship Award – SSF-AADR REF

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Project Title: Cytoarchitecture of salivary gland acini as related to loss of function in Sjogren’s syndrome

Abstract
Sjogren’s syndrome (SS) is a chronic autoimmune condition that affects exocrine glands causing inflammation and decreased secretion. In the craniofacial region, it affects salivary and lacrimal glands. In the oral cavity, SS causes xerostomia, ulcerations, infections and increased dental caries and periodontal disease. An understanding of the disease process is critical in managing not just the primary symptoms of SS but also the effects on dental tissue. This study evaluates acinar morphology and distribution of actin and integrin α6β4 in normal and SS salivary acini using bioimaging techniques. The data obtained will be used in future studies to create predictive models of cellular tensegrity using finite element modeling/analysis. An interdisciplinary approach between biological and engineering sciences will help gain a better understanding of the disease process. Data obtained will provide valuable insight into the basic understanding of salivary gland structure-function relationships and potentially translate into bioengineering of artificial salivary glands.

Hypothesis
Abnormal distribution of cytoskeletal and membrane-linked molecules can affect the structural integrity of salivary gland acini, leading to loss of function in Sjogren’s syndrome.

A. Specific Aims

Specific Aim 1: To compare the morphology of human salivary gland acini in Sjogren’s Syndrome with normal human salivary gland acini using scanning electron microscopy (SEM). Based on our hypothesis, we would expect the morphology of salivary gland acini from patients with Sjogren’s syndrome to be altered from normal acinar morphology.

Specific Aim 2: To characterize the distribution of specific molecules, namely actin and integrin within salivary gland acini in Sjogren’s Syndrome using confocal microscopy. Pathology of the salivary gland acini resulting in loss of function could be due to loss of structural integrity of the cell. This could result from intracellular rearrangements of molecules such as actin and integrins. A correlative study using SEM and confocal microscopy will help us better understand the morphological changes of the acini as they relate to intracellular re-distributions of the molecules of interest.
The hypothesis of this study is that acinar cytoarchitecture is affected in salivary gland pathology, and this in turn affects the tensegral properties of the cell resulting in compromised function. Normal and pathological samples will be assessed using scanning electron microscopy and immunohistochemistry techniques to evaluate the presence and distribution of specific cytoskeletal and membrane associated proteins. Specifically, actin and integrin α6β4 will be evaluated. The long-term goal is to use the data obtained to create predictive models of acinar cell behavior in SS using finite element modeling techniques (collaboration with consultant in Mechanical Engineering).

The goals of this project include: adding to the existing literature; beginning to understand salivary gland molecular structure as a function of cellular tensegrity; obtaining data that can be utilized in the creation of artificial salivary glands.