**TITLE:**
CaSR: linking nutrition to microbial ecology and gut inflammation

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**RESEARCH PROJECT DESCRIPTION:**

The mucosal surfaces are continuously exposed to microbes, both pathogenic and nonpathogenic commensal organisms. Accordingly, nature has evolved an array of microbe-sensing mechanisms such as the pattern-recognition receptors to impose balance between immunity and tolerance. In this way, the host can detect potential pathogens and react against invasion with minimal harm to beneficial commensal microbes and host cells. Different from other mucosa such as respiratory and genitourinary mucosa, the primary function of the gastrointestinal (GI) mucosa is to handle daily nutrients. Thus, the GI mucosa must develop additional mechanism(s) to balance nutrition, microbes and functional immune responses. Understanding this mechanism(s) may lead to the development of novel therapeutic approaches not only for autoimmune disorders but also for prevention and treatment of infections. Over the past years, we have generated evidence that suggests that the extracellular calcium/nutrient-sensing receptor (CaSR), a newly characterized unique G protein coupled receptor, is such a mechanism. Thus, candidate students will have the opportunity to address such basic questions as how the nutrient sensor interacts with bacteria sensors to maintain gut homeostasis and whether disruption of this interaction leads to diseases. With this new knowledge, the students will be expected to participate in designing novel nutritional therapies or improving classical therapies such as TEN (total enteral nutrition) – a primary therapy widely used clinically to induce Crohn’s disease remission. Besides routine molecular cellular genetic and immunopathological techniques, students will also have the opportunity to learn both the state of art cell-imaging using 2-photon microscopy and the classical physiological and electrophysiological techniques including the Ussing chamber/short-circuit current recording and pH stat measurement.


