F25.20: The Physiology of Infant Feeding, and the Impact of Premature Birth on Feeding

Function

Overview

Healthy infants experience feeding problems up to 25% of the time, and often must be prescribed interventions aimed to improve their performance. This is even more common in premature infants, in which up to 80% experience feeding difficulties. The challenges that premature infants face are compounded by the fact that they often must be bottle-fed, which is universally regarded as suboptimal compared to breastfeeding. For example, bottle fed babies have worse speech outcomes at the age of five than breastfed infants. One potential explanation for why these differences arise may be the differences in construction between bottles, which are hollow, and breasts, which are soft tissue ducted structures. These differences in design are known to impact feeding dynamics, and bottle-feeding is physiologically more similar to drinking from a cup than to breastfeeding.

In this project, the student will evaluate the potential for a ducted, biomimetic bottle-nipple to improve feeding outcomes, especially for premature infants. We will test how preterm and term infants respond to feeding on this biomimetic nipple, and see if performance is improved in both populations, especially those born prematurely, using a validated animal model for infant feeding. We hope that this work will (1) inform us of the neurophysiology of infant feeding, and the impact of premature birth on that physiology, and (2) lead to improved feeding outcomes in human infants in the long term.

What the student will DO and LEARN

Students working in the lab will learn several skills. First, they will learn how to process several different physiologic data modalities, including measures of respiratory function, muscle function, and feeding biomechanics. Students will also gain familiarity with X-Ray video data, learn how to use 3-D printing, and work with silicone casting methods.

Students working on the project also are taught how to code in the statistical programming language R, and will present research at several national and regional conferences. Following the period of the internship, students will have the opportunity to be paid full-time over the course of the summer to participate in data collection on infant mammals, with projected continuation into the following school year as a part of the lab.

Students interested in evolutionary biology, development, physiology, and biomechanics are especially encouraged to apply.

Additional benefits

Students participating in the internship will benefit by learning creative-thinking skills, an appreciation for how to evaluate the scientific literature, and several ‘hard skills’ associated with scientific research. Additionally, they will learn about performing sterile surgery on infant mammals, as well as animal husbandry and research practices. This research additionally addresses fundamental questions in

organismal physiology and biomechanics, in addition to having direct relevance to human health, and thus intersects with both basic science research and clinical research. Students in the lab will learn about the scientific fields of both practices, and gain appreciation for how each informs and benefits the other.

Finally, students will be able to use the internship to build their CV and will be first-authors on scientific presentations as well as coauthors on other students presentations. Along with this, students will be presented with opportunities for networking both locally and internationally.

Additional qualifications

Interest in physiology, vertebrate function, ability to work in a team.

Time commitment

6 hrs/week for 30 weeks