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**Final Program  
& Abstracts**

# Symposia/Oral Abstracts

61.4

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VISUAL AND OLFACTORY PROJECTIONS TO THE BRAINSTEM AND SPINAL CORD OF THE LEOPARD FROG, *RANA PIPIENS*

Using the leopard frog, *Rana pipiens*, as a model organism, our lab has been investigating the anatomical basis for sensorimotor integration regulating feeding behavior. Previous research shows sensory inputs for feeding may be integrated in the reticular formation (RF) of the brainstem. If correct, the sensory inputs initiating feeding behavior (olfaction and vision) should converge here, as has been demonstrated with glossopharyngeal (taste) and hypoglossal afferents. Using double labeling (fluorescent tracers or Neurobiotin) and differential interference microscopy, we demonstrate that retinal afferents monosynaptically project to the cerebellum, RF, hypoglossal motor neurons (that activate tongue muscles) and ventral horn motor neurons in the spinal cord. Olfactory projections terminate directly on the cerebellum, RF and hypoglossal motor neurons. Data show that both optic and olfactory nerves are in place for direct activation of hypoglossal neurons and premotor circuits in the reticular formation, but it is unclear whether these two nerves converge on exactly the same cells in the reticular formation. Experiments are ongoing to physiologically verify these anatomical projections. *Funded by NIH P20RR16454.*

3.5

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SALMON SHARK (*LAMNA DITROPS*): AN ENDOTHERMIC FISH FROM POLAR AREA WITH HIGHER SERCA2 ACTIVITY

The endothermic sharks (family Lamnidae) and tunas (family Scombridae) display evolutionary convergence for a number of morphological and physiological properties. While both bluefin tuna and salmon sharks maintain elevated internal body temperatures, the heart operates at ambient temperature in both fishes. Electronic tracking data have shown that salmon sharks occupy waters ranging from 4-24°C with high occupancy of cooler waters. In this study, we tested temperature effects on the salmon shark SERCA2 enzyme. This protein removes  $\text{Ca}^{2+}$  from the cytosol to lower the intracellular  $[\text{Ca}^{2+}]$  calcium and allow the relaxation of the cardiac muscle. The results indicate that salmon shark ventricular SERCA2 activity exhibits a strong temperature dependence between 5 and 35°C, with activity levels similar to those of rat. SERCA2 activity in salmon shark atrium was on average 2.5 times higher than the ventricle at all temperatures tested. Comparisons of temperature sensitivity indicate that salmon shark cardiac SERCA2 activity is on average 5 times higher than that of the endothermic bluefin tuna (*Thunnus thynnus*) and 7 times higher than that of other sharks (mako *Isurus oxyrinchus* and thresher *Alopias vulpinus*). The higher salmon shark SERCA2 activity suggests that cardiac performance in cold may be strongly dependent on SR  $\text{Ca}^{2+}$  cycling and may be a key adaptation allowing these fishes to occupy niches in cold water. *Funded by NSF.*

26.7

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BEHAVIORAL TESTS OF A CONTACT PHEROMONE IN MALE RECOGNITION OF RECEPTIVE FEMALES IN THE SHRIMP *PALAEMONETES PUGIO*

*Palaemonetes pugio* is a small estuarine shrimp found along the Atlantic and Gulf coasts. Males recognize (suddenly attempt to grasp and to mate) newly molted (postmolt) parturient females upon contact of their chemotactile antennal flagella with any part of the female cuticle. Our objective was to determine if male sexual attraction to postmolt, pre-spawning parturient females is due to visual, chemical, or textural cues (a soft cuticle). Males allowed visual but not direct contact with sexually attractive females did not respond with copulatory behavior. We tested the nature of the chemotactile stimulus by exposing males to (a) postmolt females with mature ovaries, (b) premolt females with mature ovaries, (c) postmolt females with immature ovaries, (d) intermolt females incubating embryos, and (e) postmolt males. Postmolt individuals have a soft exoskeleton while premolt and intermolt individuals have hard ones. Males only responded with sexual behavior (grasping, copulation) to postmolt females with mature ovaries and with a slight positive response (following) to postmolt females with immature ovaries. Male response to postmolt females with mature ovaries was tested as a function of time after the female molt using time-lapse video observations. There was a gradual decrease in attractiveness of postmolt parturient females to males from 0-8 hours after the female molt. Our results indicate that males detect receptive females by a nonsoluble substance on the newly molted female cuticle that degrades or changes rapidly with time from the molt. The texture (softness) of the newly molted exoskeleton is not a stimulus. The pheromone appears to be perceived by contact chemoreceptive (taste; gustation) sensilla on the male second antennae.

74.4

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SUGAR ABSORPTION IN BATS. ARE THEY MAMMALS OR BIRDS?

Absorption by the paracellular pathway is a declining function of molecule size, probably due to sieving in the tight junction between cells. One emerging pattern is that in birds studied to date, paracellular absorption across the intestine exceeds that in mammalian species by a factor of at least three times, when controlling for molecular size using molecular weight (MW). The relatively high paracellular absorption in birds could be interpreted to be a compensatory mechanism for birds smaller intestinal surface areas, the latter possibly selected for to minimize body mass and thus lower the power requirements for flight. Bats share with birds both the features of flight and small intestines that are relatively smaller than in similar-sized nonflying mammals. Therefore, we predicted that paracellular absorption in bats would decline with increasing MW, and in magnitude be more bird-like than mammal-like. *Artibeus literatus* were captured at the campus of the Universidade Estadual Paulista in Rio Claro (Brazil) and kept with food and water ad libitum. Using a standard pharmacokinetic technique, we gavaged or injected the relatively inert carbohydrates L-rhamnose (MW = 164 Da) and cellobiose (MW = 342 Da) and subsequently measured the appearance of probes in blood over time (HPLC with fluorescence detector) to calculate the fractional absorption (*F*) of the probes. As predicted, *F* declined with increasing MW (rhamnose, 91 ± 1%; cellobiose, 20 ± 7%) and was much higher than observed previously in mammals but similar to the high values in birds. Thus, the data support this first test of the hypothesis of a functional convergence in paracellular absorption for water-soluble compounds by flying vertebrates. Supported by FONCYT (01-03101), UNSL CyT 9502 to EC-V, NSF IBN-0216709 to WHK.