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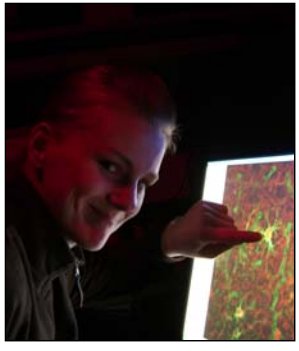
The Role of Perineuronal Nets in Critical Period Closure of the Avian Song System



The zebra finch (*Taeniopygia guttata*) is an excellent model for speech development in humans. Both species learn their vocalizations during a two-staged sensitive period that includes a sensory phase and a sensorimotor phase. During the sensory phase, species specific sounds of adult tutors are memorized. The sensorimotor phase begins with attempts at producing the memorized sounds and ends with a crystallized song in the finch or a solid basis of sounds that serve as building blocks for language in the human. Perineuronal nets (PNNs) play a role in the closure of a sensitive period for ocular dominance plasticity in rats, apparently by increasing inhibitory transmission. (Hensch 2005) PNNs are composed of chondroitin sulfate proteoglycans and can be degraded in the adult rat visual cortex using the enzyme chondroitinase to increase ocular dominance plasticity. (Pizzarusso et. al. 2002) In zebra finches, extracellular PNNs form around neurons located in areas of the brain involved with song production during the vocal learning sensitive period and reach their highest levels in adults that are no longer capable of dramatically modifying their vocalizations. Work currently underway in our lab suggests that degradation of PNNs in zebra finch song nuclei increases vocal plasticity. Preliminary results also indicate that early closure of the critical period can be induced through experimentally increased testosterone levels as well as through over-stimulation with auditory playback of a tutor song during the sensory phase. Ascertaining the role of PNNs in critical period closure of the avian song system is an important step in the overall process of researching and understanding neural mechanisms of vocal learning.

Poster Number: Session: