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A5 – GENERAL ANIMAL BIOLOGY

A5.1

09:00 Sunday 28th June 2009

Follow your nose: Chemical communication throughout the European eel (*Anguilla anguilla*, L.) life-cycle

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European eels are important in both scientific and economic terms. Unfortunately, current populations are becoming increasingly endangered and urgent management is needed. Several aspects of eel biology, together with their highly developed sense of smell, suggest that chemical communication could be involved at key stages of their life-history. Thus, advances in this area could generate novel tools for stock management.

Eels have acute olfactory sensitivity to substances released by conspecifics. Both the bile fluid and skin mucus have been implicated as routes of release for these odorants. Furthermore, the nature of these odorants depends on both the sex and reproductive status of the donor. Exposure to water conditioned by mature con-specifics causes stimulation of sexual maturation in immature eels. This is consistent with a role for chemical communication during reproduction. Also, eels can detect bile acids from other species; this may be involved in prey search and/or predator avoidance. Bile acids may well be important odorants in this respect; eels have higher sensitivity for sulphated C27 'ancient' bile acids rather than C24 'modern' forms. Our last study demonstrated different olfactory sensitivity to several odorants according to the environment and reproductive status. This may reflect changes in diets between seawater and freshwater eels and/or the changing role of chemical communication during different life-stages (e.g. maturation and migration). We propose the eel as a model species for studies on olfaction and chemical communication in fish because of its ancestral status in teleost evolution, its high olfactory sensitivity and its physiological plasticity.

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Functional asymmetry in the olfactory system of a flatfish, the Senegalese sole (*Solea senegalensis*)

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The two olfactory epithelia of the family Soleidae are exposed to different water sources; the upper (right) epithelium samples the water column whereas the lower (left) samples interstitial water. Given that one of the major prey species of the Senegalese sole (*Solea senegalensis*) is the ragworm *Hediste diversicolor* which lives in the substrate, we hypothesized that the lower epithelium may have evolved sensitivity to odorants released by the ragworm whereas the upper epithelium may be more involved in chemical communication and therefore is more sensitive to odorants released by conspecifics. Using a combination of solid-phase extraction, liquid chromatography linked to mass spectroscopy and electrophysiological recording from the olfactory epithelia (the electro-olfactogram), we identified a prey-related odorant (the aromatic amino acid, l-phenylalanine) and a conspecific-related odorant (the bile acid, taurocholic acid). The lower epithelium was significantly more sensitive to the former whereas the upper was more sensitive to the latter. Furthermore, cross-adaptation and pharmacological blockade of adenylate cyclase (SQ-22536) and phospholipase C signaling pathways (U73122) suggested that the receptors and transduction mechanisms involved, respectively, are different in the two epithelia; specific receptors for l-phenylalanine in the lower epithelium act *via* the phospholipase C pathway whereas specific receptors for taurocholic acid in the upper epithelium act *via* both adenylate cyclase and phospholipase C mediated pathways. These results are consistent with our hypothesis and suggest a functional asymmetry in the olfactory system of this flatfish.

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