COMPARATIVE VERTEBRATE HISTOLOGY

GENERAL SENSORY LABORATORY EXERCISES

"Simple" receptors. These receptors include unencapsulated and encapsulated sensory nerve endings.

Unencapsulated nerve endings have no associated cellular capsule. They are located in the skin and transduce mechanical and thermal stimuli arising when the body touches an object, or when the environmental temperature changes. Nociceptors are high-threshold unencapsulated nerve endings, activated by stimuli strong enough to cause potential or actual tissue damage. These receptors may respond to several modalities.

Bare nerve endings are very difficult to observe in standard histological preparations. The nerves involved are small, and special staining is required to make them visible. We have no slides in the collection that show these structures.

Encapsulated nerve endings are usually mechanoreceptors, responding to stretch, deformation, pressure or vibration. The most common types found in the skin of many vertebrates are Pacinian corpuscles, single nerve endings with large Schwann cell capsules and sensing coarse touch, pressure and low-frequency vibration; and Meissner's corpuscles, in which a single axon branches to form multiple terminals, surrounded with a sheath in which the Schwann cells are arranged in spirals. These receptors are much smaller than Pacinian corpuscles.

Human slide 216, human slide 26 are both samples of thick skin of the type found on the soles of the feet and the palms of the hands. Slide 108 (human) is from the lip. These regions are very responsive to touch, pressure and vibration, because of the large numbers of encapsulated receptors present. Identify Pacinian and Meissner's corpuscles in these tissue samples.

Special senses: olfaction and taste.

The chemoreceptors involved in providing the brain with inputs related to chemicals in the surrounding medium or in food items placed into the mouth are associated with supporting structures necessary for these receptors to function. Olfaction depends on chemicals coming into contact with chemoreceptors on the membranes of dendrites of olfactory neurons; these dendrites extend into an aqueous film covering the surface of the olfactory epithelium. Taste bud chemoreceptors are not neurons, but still have microvilli with membrane chemoreceptors that extend into an aqueous film of saliva (if in the mouth) or into water around the animal (if in the integument).

Olfaction.

Human slide 130, olfactory epithelium. This epithelium is modified respiratory epithelium, so is pseudostratified squamous epithelium. There are no goblet cells or cilia, however. Chemicals to be sensed must first dissolve in the aqueous film covering the epithelium, secreted by glands in the lamina propria under the epithelium. Can you distinguish the three main cell types present in the epithelium?

CVH slide 62, dogfish olfactory epithelium. In this slide the olfactory epithelium is extensively folded in a series of lamellae, with a connective tissue core containing blood vessels and olfactory nerves. The nerves are made up of the axons of the olfactory neurons, projecting to the olfactory bulb in the nearby skull. This is a non-choanate fish (no internal nares) so the fish swims through the water to expose the olfactory epithelium to new odors. Compare this olfactory epithelium to that on human slide 130.

Taste.

Human slide 17, section of the tongue. Look for taste buds along the sides of vallate papillae associated with the oral surface of the tongue. Do taste buds occur on papillae anywhere on the tongue? Observe the details of the taste buds. Can you see a taste pore? The chemoreceptors cannot be differentiated from the supporting columnar epithelial cells in this slide. Can you see basal cells in the taste buds? Can you find any nerves associated with these structures? What is secreted by the numerous glands under the oral epithelium of the tongue?

Taste buds look very similar in all vertebrates, however they may be present all over the inside of the oral cavity in many terrestrial vertebrates, and in the integument in aquatic animals. What might be an advantage of such a wide distribution of taste buds?