THE SURFACE MEMBRANE SPECIALIZATION SEEN ON THE RECEPTOR CELLS IN THE FREE NEUROMAST OF SOME VERTEBRATES

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It has recently been recognized that the free neuromast, so-called pit organ, of some lower vertebrates are sensitive for the change of the environmental ion concentration, monovalent cations, as well as for the mechanical stimulations.

The fine structure of the free neuromast of shark (Elasmobranch), sea eel (teleost) and *Xenopus* (Amphibian) has been observed.

In the free neuromast, the apical surface of the receptor cell is studded with sensory hairs consisting of a kinocilium and a group of regularly arranged stereocilia. The arrangement of sensory hairs is similar to that of the sensory hairs in the lateral line canal organs.

In the case of shark and sea eel, the sensory cells of the free neuromast are oriented with their kinocilium toward the dorsal or ventral directions. The ratio of the cells with opposite polarity is roughly 50 : 50. Whereas in the canal organ, the sensory cells are oriented with their kinocilium toward the cranial or caudal directions.

The kinocilium is composed of an axial core of nine peripheral double tubules and two central tubules. A "necklace" structure can be recognized at the base of the kinocilium. Each sensory hair of the stereocilial type is composed of an axial core of dense fibrillar material basally tapering down into a root which is mounted in the cuticular plate.

Each sensory cell is surrounded by a layer of supporting cell cytoplasm. The apical end of the supporting cell is studded with many microvilli which encircle each group of the sensory hairs. The surface coat covering the apical end of the supporting cell consists of filamentous material about 100 nm thick.

The surface coat covering the sensory hairs of the receptor cell is thinner than that of the supporting cell. It is interesting to note that the surface coat on the kinocilium is thinner than that of the stereocilia.

In ruthenium-red stained materials, surface coat covering the stereocilia is seen to consist of an electron dense layer of about 13 nm thick and the irregular accumulation of dense materials which protrude from the former layer giving the star-like appearance to the cross section of the stereocilia. The surface plasma membrane covering the free surface between the sensory hairs is covered by similar surface coat materials. On the other hand, the surface coat covering the kinocilium mainly consists of an electron dense layer of about 13 nm thick and the accumulation of dense materials is not so conspicuous as that seen on the stereocilia. The surface coat covering the side of the receptor cell is about 7 nm thick which is slightly

thicker than that of the adjacent supporting cell.

The local difference of the surface coat thickness may have some significance in the receptor mechanism of the free neuromast.

FIG. 1. Sensory hairs of the free neuromast of sea eel. A kinocilium (K) is located at the periphery of the stereocilia group. The fuzz on the surface of the microvilli (M) of the supporting cell is thick. The fuzz on the stereocilia (S) is more conspicuous than that of the kinocilium. $\times 55,000$.

FIG. 2. Sensory hairs of the free neuromast of sea eel, rutheniumred stained material. Surface coat on the stereocilia (S) is thicker than that of the kinocilium (K). R: Apical part of the receptor cell. $\times 65,000$.