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Title: Glycocalyx production in teleosts.

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Shielding the organism against harmful effects from the environment is one of the most important tasks of the outer covering of all animals. In the course of evolution there arose various different methods of promoting this function. The skin of terrestrial animals builds coverings of keratin or chitin. The epidermis of primarily aquatic organisms and the epithelia of organs which are exposed to water, such as the digestive or the urinary system, possess a film of glycoproteins and mucopolysaccharides, the glycocalyx.

The mechanism of their formation has been studied in a range of animal groups. Their constituent parts are formed in the rough-surfaced endoplasmic reticulum and in the golgi apparatus of epithelial cells. In the case of teleosts there exist somewhat divergent observations: Henrikson and Matoltsy (J. Ultrastruct.Res. 21, 194, 1968) consider the mucus of productive epidermal gland cells to be the sole producer of glycocalyx. The components of the gland cell mucus correspond to those of the glycocalyx (Albanese Carmignani, M.P., and G. Zaccone: Acta Histochem. 48, 51, 1974). Whitear (J.Zool.Lond. 160, 437, 1970) on the other hand points to co-operation of cells containing filaments. Bremer (Acta Histochem. 43, 28, 1972) and Albanese Carmignani and Zaccone (Acta Histochem. 52, 100, 1975) argue for the participation of both cell types. Also with some fish the club cells are believed to contribute to the production of mucus (Parakkal, P.F., and N.J. Alexander: Keratinisation, New York, 1972).

These relationships should be examined more closely in the case of the guppy, Poecilia reticulata Peters. Here the skin on scales of the abdominal region of fish acclimated to sea water, or fish treated with hormones in varying amounts,were studied under the ordinary light microscope and the electron microscope.

In the superficial filament-containing cells of the guppy epidermis, small vesicles with an electron thickness of about 100 nm diameter at the dictyosomes, were cut off. Vesicles of this kind are found predominantly in the distal region of the cell, in part right against the outer cell membrane, where they are openly deposited on the outside. This suggests that the vesicles contain glycocalyx material, as in higher vertebrates.

This hypothesis is supported by further observations. Under the influence of different hormones, the thickness of the glycocalyx coating is altered, in the same manner as in the acclimatisation from fresh water to salt water. The number of small , electron-thick vesicles correlates under almost all conditions with the thickness of the glycocalyx. Similar relationships also pertain to the

amounts by volume of the rough endoplasmic reticulum and the number of dictyosomes.

Since these relationships do not appear quite so clearly in every experiment, it is assumed that the method of formation of the superficial mucus in the rough endoplasmic reticulum golgi apparatus vesicle of the cells containing filaments is not the only one possible. A second method possibly goes through the gland cells, which in basal conditions are formed from undifferentiated cells, and generally migrate to the surface. While they first of all manifest a high number of dictyosomes and rough endoplasmic reticulum, they are imbued with increasing differentiation and on approaching the surface epidermis form drops of mucus of different electron thickness, which are finally released to the outside. The frequency of the mucus cells can be linked in almost all experimental conditions with the thickness of the glycocalyx.

The view that the cells containing filaments and the gland cells contribute jointly to the formation of the surface mucus, is supported by these results. As the results of the hormone treatments show, the respective significance of both secretion mechanisms is dependent on the physiological conditions of the tissue.

Notice

Please note that these translations were produced to assist the scientific staff of the FBA (Freshwater Biological Association) in their research. These translations were done by scientific staff with relevant language skills and not by professional translators.