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X-ray microanalysis in pearls of *Mytilus edulis* L. (Bivalvia)

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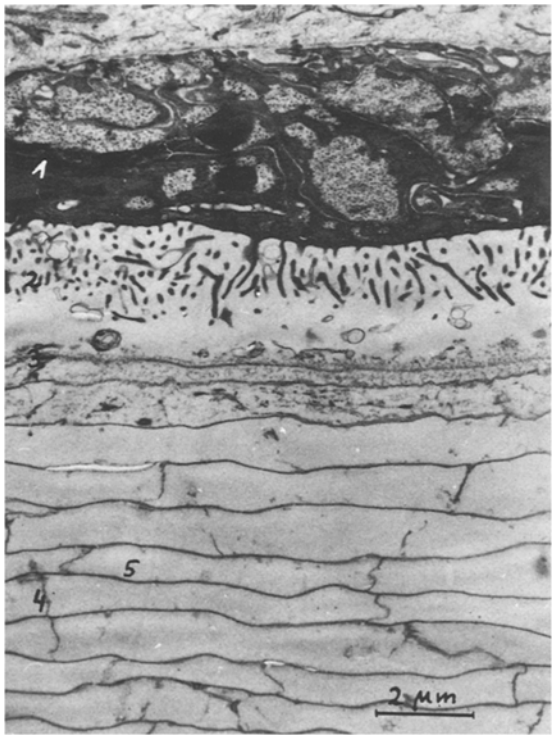
Summary. Metacercariae feeding on the tissues of Mytilus edulis deposit their excretes into the mussel. The clusters of excretes are surrounded by a 'pearl sac'. Increasing amounts of Ca-proteids are transported into the pearl sac epithelium and into the pearl.

In the common European bivalve Mytilus edulis L. the formation of pearls is induced by parasites. The metacercariae of a trematode (Gymnophallus choledochus) feed on the tissues of this mussel species and deposit clusters of excretes. The bivalve separates these excretes and surrounds them as well as dead metacercariae by conchin lamellae. The lamellae are arranged concentrically and radially, forming small pockets into which aragonite is deposited.



Electron micrograph of an ultrathin section through a small part of the pearl sac and the outer layers of a pearl (Mytilus edulis). *1* Epithelial cell of the pearl sac containing Ca-proteid complexes; *2* extracellular space with microvilli of the pearl sac epithelial cells; *3* outermost concentrical lamella of the pearl; *4* radial lamella; *5* pocket formed by concentrical and radial lamellae.

The accumulation of $CaCO_3$ in the tissues, the formation of a Ca-proteid complex and its transport into the pearl sac and into the pearl were studied by X-ray microanalysis in scanning electron microscopy, using a Siemens STEM 100 F[1].

The formation of a pearl starts as soon as the metacercaria has deposited its excrete cluster into the mussel tissue. Amoebocytes form the pearl sac which encloses the excrete products and which secretes mucopolysaccharides and proteids. The conchin lamellae originate from these organic substances by a condensation process. Several – at least 3 – concentric lamellae, as well as the radial lamellae are in simultaneous formation in the peripheral growing region of the pearl. After termination of the formation of the conchin lamellae, the crystallization of aragonite takes place. Probably, both substances, the proteids of the conchin and the $CaCO_3$ of the aragonite, originate from the same Ca-proteid complexes, which are traced in the cells surrounding the pearl. These complexes are found within smaller and larger vesicles in the pearl sac epithelium and in other adjacent tissues, too. They are not only different in their transmission electron microscopical appearance, but also in their chemical composition, as revealed by X-ray microanalysis. Especially, the contents of Ca, S, P, and Si are different. The occurrence of Ca-proteid complexes is not restricted to the area of pearl formation. According to the important role of the Ca-complexes in shell formation, shell repair and regulation of the pH, for example, they are also found within several other cell types of the molluscan body. But, immediately after a starting pearl formation, increasing amounts of Ca-proteids are transported to adjacent tissues of the pearl, into the pearl sac epithelium, and from there into the pearl. The calcium is transported as a complex form from the vesicles into the conchin pockets, passing the conchin lamellae which represent a network of very fine meshes (diameter about 25 nm[2,3]).

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