

## Mantle Ultrastructure and Periostracum Formation of the Equilateral Venus, *Gomphina veneriformis* (Bivalvia: Veneridae)

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### Introduction

The epithelium of the mantle in bivalves is a dynamic system that functions in shell formation, secretion of mucous, establishment of ciliary pathways and uptake of dissolved nutrients. Observations by Beedham (1958) have presented the functions and the structures of the mantle of the lamellibranchia. The mantle lobes at the distal edge are important in periostracum and shell formation so, Saleuddin (1974) and Phillips (1977) founds the formation and structure of the periostracum. Moreover, Cranfield (1974) on *Ostrea edulis*, Prezant (1981) on Lyondiidae and Morrison (1993) on *Crassostrea virginica* had reported on the structure of the mantle using electron microscopy. An ultrastructural study of connective tissue in the bivalves mantle has been reviewed by Bairati *et al.* (2000). In this study we examined the ultrastructure on mantle and periostracum formation in *Gomphina veneriformis*, therefore we will be able to propose basic knowledge that can discuss with the bivalves that live in other inhabitation.

### Materials and Methods

Samples of *G. veneriformis* were collected at Jumunjin Kangwondo, Korea in early October 2001. Tissues were fixed Bouin's sol. for 1h then washed it for 24h. The mantle extracted from 0.5~0.7 cm<sup>2</sup>. It was then dehydrated, embedded in paraffin and section. For observation light microscopy, we performed H-E stain, AB-PAS reaction, PAS reaction, Masson's trichrome stain and AF-AB reaction. Material for electron microscopy was fixed in phosphate-buffered 2.5% glutaraldehyde, post-fixed with 1% osmic acid and embedded in Epon 812. Ultrathin sections were stained with uranyl acetate and lead citrate and observed with TEM (JEM-1200 EX II, JEOL).

## Results

The mantle divided into three zones: marginal zone, mid-mantle zone and apical zone. The marginal zone had four major folds. In the folds, distribution of the secretory cells indicated in inner fold (inner) and middle fold actively. These secretory cells were all weakly acid or neutral mucopolysaccharide. The epithelia surrounding the marginal zone was columnar epithelium (about  $16\mu\text{m}$  in height). The outer epithelia of the mid-mantle zone and apical zone were columnar (about  $9\mu\text{m}$  in height). The inner epithelium of mid-mantle zone was cuboidal (about  $6\mu\text{m}$  in height) and inner epithelium of the apical zone was low columnar (about  $5\mu\text{m}$  in height). There were two types of secretory cells in the mantle. Periostracum originated space between the intermediate cell and the first cell in the outer fold. Therefore the secretion of the periostracum is initiated by the first cell and intermediate cell. Fully formed periostracum had major two layers: the homogeneous layer and the fibrous layer. The homogeneous layer was divided into the dark homogeneous layer and the outer membranous layer. Several function of the periostracum is that it provides a waterproof covering for the shell and protecting it from dissolution by acids in the environment. The epithelium surrounding the outer plica of middle fold was low columnar (about  $5\sim 6\mu\text{m}$  in height) and the inner epithelium of the outer fold was columnar (about  $13\mu\text{m}$  in height).

## References

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