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Deposition of amorphous calcium carbonate within the terrestrial crustacean *Porcellio scaber* by epithelial calcium and proton transport.

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Crustaceans have a mineralized exoskeleton that is replaced in regular time intervals in a process called moulting. Terrestrial isopods moult first the posterior and then the anterior half of the body. Before the moult they store cuticular $CaCO_3$ within the ecdysial gap between the old and new cuticle of the first four anterior sternites. These deposits consist of amorphous $CaCO_3$ (ACC) originating from the posterior cuticle and an organic matrix forming mainly microspherules. After the moult of the posterior and before the moult of the anterior half of the body the ACC deposits are completely resorbed and used for the quick mineralization of the new cuticle.

The cells of the anterior sternal epithelium (ASE) that are differentiated for ion transport mediate deposition and resorption of ACC. Electron microprobe analysis shows that at least part of the calcium is transported via a transcellular route raising the issue of toxic effects of high intracellular calcium concentrations. By analysing transport molecules within the ASE cells during non transporting and calcium transporting stages it is possible to derive a model for the molecular mechanisms for $CaCO_3$deposition and resorption. Posterior sternal epithelial (PSE) cells can be used as a control tissue. Semi quantitative RT-PCR and *in situ* hybridisation revealed that a plasma membrane Ca^{2+} transport ATPase and a Na^{+}/Ca^{2+} exchange mechanism contribute to epithelial Ca^{2+}-transport. In situ measurements of the smooth endoplasmic reticulum Ca^{2+}-ATPase (SERCA) activity suggest a contribution of the SER to

intracellular Ca^{2+}-transport. Deposition and degradation of ACC requires also the transport of protons from and to the ecdysial gap, respectively. Expression analysis suggests a role of a V-type H^+-ATPase. Immunocytochemistry and ultrastructural localisation of the H^+-ATPase in high pressure frozen and freeze substituted epithelia indicate a transition of the V-type H^+-ATPase from the basolateral to the apical plasma membrane compartment between $CaCO_3$ deposition and resorption, respectively. The results provide new insights in the mechanisms of epithelial calcium transport and H^+-transport reversal.

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