

The secret of pigmented coelomocytes in holothuroids

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Coelomocytes are known to be circulating cells within coelomic cavities, and to play a role in the immune response in different invertebrates including holothuroids, also known as sea cucumbers (Echinodermata). Among the various types of coelomocytes, haemocytes are distinguished by their intense red pigmentation, which has been attributed to the presence of intracellular haemoglobin for over a century. In contrast to other coelomocytes found in the hydrovascular and perivisceral fluids, haemocytes circulate exclusively in the hydrovascular fluid or are associated with internal organs membranes. The presence of haemoglobin indicated a potential role in oxygen transport, which could be particularly valuable for endobenthic species. However, our research on the haemocytes of *Holothuria forskali* revealed unexpected carotenoid concentrations instead of haemoglobin in this European epibenthic species. These findings led us to rename those cells as "carotenocytes" and to propose that they may act as immune regulators thanks to their antioxidant properties. This study focuses on the localization of carotenocytes and their pigments within the various tissues of holothuroids, with the objective of providing insight into their site of production and action. Furthermore, the aim is to extend the investigation into the pigment origin and the role of carotenocytes in diverse sea cucumber species of varying taxonomy and ecology. The study has already demonstrated the presence of carotenoids in the haemal system of *H. forskali*, which is otherwise populated by pigmented coelomocytes. Moreover, similar carotenoids have been identified in the Polian vesicle (a hydrostatic organ filled with hydrovascular fluid) of the tropical species *H. atra*. In conclusion, our studies support the hypothesis that the red pigmentation of pigmented coelomocytes has been incorrectly associated with haemoglobin across all holothuroids, or at least in certain species.

Keywords

Holothuroids; Coelomocytes ; Pigmentation; Carotenoids