

Navigating the spectrum of sea cucumber pigmented cells: from hemocytes to carotenocytes!

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Sea cucumbers are marine invertebrates belonging to the phylum Echinodermata. Their immune system is based on circulating cells called coelomocytes. These cells circulate in the fluids of the perivisceral cavity and the hydrovascular system of these organisms. For some species of sea cucumber, hemocytes are the predominant type of coelomocytes in the fluid of their hydrovascular system. These cells are also found in abundance in an organ of this system known as the Polian vesicle. Hemocytes can be easily discriminated from other coelomocytes by their characteristic red pigmentation. It has long been assumed that this pigmentation is due to the presence of hemoglobin and that these cells may play a role in oxygen transport, which would be useful for species living in anoxic environments. However, a recent study has highlighted the crucial role of hemocytes in encapsulating foreign particles (Caulier et al., 2020). In another study, it was shown that stress related to predator exposure led to an increase in the number of hemocytes (Hamel et al., 2021). According to these findings, these cells appear to be involved in the immune system. Moreover, our analysis of pigments, using spectrophotometry and High-performance liquid chromatography (HPLC), revealed a high concentration of carotenoids in the hydrovascular fluid, Polian vesicle and hemocytes isolated from hydrovascular fluid. Carotenoids have been identified in various forms, including astaxanthin, canthaxanthin, echinenon, and β -Carotene but the pigment that was the most abundant was canthaxanthin. This strongly suggests that these are the class of pigments responsible for the pigmentation of the hemocytes! Carotenoids play a key role in marine food chains, they are transferred from phytoplankton to zooplankton and other small marine organisms, becoming integral components of their tissues. These compounds have also a range of functions beyond their role as pigments. They may be used as indicators of the nutritional quality in the marine ecosystems, as their presence and diversity can reflect the health and productivity of aquatic environments. Additionally, they contribute to various physiological processes, such as antioxidant defense mechanisms (Liaaen-Jensen, 2012). Thus, carotenoids are essential for maintaining the health of marine organisms and the balance of the marine environment. The discovery of this class of pigments opens new perspectives on the function of these reddish cells in the immune response of sea cucumbers. Finally, these pigmented cells could be wrongly interpreted as hemocytes, when in fact they would be a different type of cell that could be called carotenocytes. References Caulier, G., Hamel, J.-F., & Mercier, A. (2020). From coelomocytes to colored aggregates: cellular components and processes involved in the immune response of the holothuroid *Cucumaria frondosa*. *The Biological Bulletin*, 239(2), 95–114. Hamel, J.-F., Jobson, S., Caulier, G., & Mercier, A. (2021). Evidence of anticipatory immune and hormonal responses to predation risk in an echinoderm. *Scientific Reports*, 11(1), 1-10. Liaaen-Jensen, Synnqve. (2012). Marine carotenoids. *Marine Natural Products, Chemical and Biochemical Perspective*. (Scheuer, PJ ed.) Vol, 2, 1-73.

Keywords

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