Mechanisms underlying albinism as a consequence of ommochrome deficiency in cave isopods

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Abstract

Albinism, or loss of pigment, is a typical adaptation to living in caves and occurs in numerous cave dwellers. To understand the evolution of this trait, one must identify the type of biological pigment present in the phylogenetically closest surface relatives. The absence of pigmentation has been studied primarily in terms of melanin deficiency, while the exact mechanism of ommochrome loss in any cave dwellers is largely unknown. Ommochromes are tryptophan derivatives and generally belong to a less studied class of biological pigments previously described in protostomes such as isopod crustaceans. Using a simple method for extraction and detection of ommochromes in conjunction with liquid chromatography coupled with mass spectrometry (UPLC-MS), we characterized the nature of pigments in surface isopods. We detected, for the first time and to the best of our knowledge, ommochromes in three groups of surface isopods: the families Sphaeromatidae (Flabellifera) and Trichoniscidae (Oniscidea) and the genus *Proasellus* (Asellota). To determine which step of the ommochrome production pathway is disrupted in cave isopods, we quantified the precursors of ommochrome synthesis in closely related surface and cave species. Our results suggest that the disruption of ommochrome synthesis is preferentially located at the beginning of this anabolic cascade, as we observed an accumulation of the precursor tryptophan in albino species. To address this problem at the molecular level, we are trying to determine the exact genes and mutations that may be involved in the loss of ommochromes. We performed RNA-seq on two representatives of surface and cave species of the genus *Proasellus* and analyzed the data for expression changes in candidate genes.

Keywords

ommochromes, isopod, albinism, caves, transcriptome, UPLC-MS

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