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Mini Review

Ability to Alter the Activity Level of Serotonin by Parasite

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Abstract

Parasites modify the host's behavior by regulating the host's neurotransmitter serotonin levels Biogenic amines e.g. neurotransmitter serotonin have been linked to osmoregulation and temperature tolerance in crustaceans. The combined effects of elevated temperature and parasitic infection probably affects the performance of the crustacean brain and thus behavioural responses. Parasites in invasive hosts may have different ability to alter the activity level of serotonin in compete with native hosts.

Keywords: *Biogenic Amines; Physiological Tolerance; Behavioural Traits*

Introduction

Biogenic amines e.g. dopamine [1], serotonin [2] and noradrenaline [3] and steroid hormone e.g., corticosterone [4] have been linked to osmoregulation and temperature tolerance in crustaceans. Changes in biogenic amines may be responsible for the alteration in infected crustacean behaviour by acanthocephalan parasites e.g. *Pomphorhynchus laevis* [5] or *Polymorphus minutus* [6].

Behavioural manipulation

Parasites start their development in the intermediate host and can manipulate the physiology and behavior of their intermediate hosts [5]. Parasites have been shown to have the ability to alter the activity level of serotonin (5-hydroxytryptamine, 5-HT) in the brain of their intermediate hosts [5]. Serotonin is a known neuromodulator of biogenic amine [7] modulating stress response [8]. As a neurotransmitter, serotonin relays signals between nerve cells, or neurons [9]. The serotonin contributes to a variety of physiological processes, from neuroendocrine stress response to gut contraction [10]. Serotonin plays a role in several behavioural traits, including thermotaxic behaviour - movement of an organism in response to temperature- [11], phototaxis behaviour - movement of an organism in response to light - [12] and geotaxis - swimming of an organism to the top or bottom of the water column- [13].

The role of serotonin in feeding behaviour [14] and oxygen consumption [15] have been shown by many previous researchers. Serotonin is a neurotransmitter that affects water and salt movements in crustacean gills through osmoregulatory mechanisms, which in turn may make intermediate host more tolerant to higher salinity levels [1]. The most important role of serotonin is related to regulating escape response [16] and predator avoidance [17,18].

Discussion and Conclusion

Several previous studies have shown an effect of temperature and salinity on the distribution of organisms in aquatic ecosystems [19,20]. Serotonin production increases with water temperature in invertebrates [21]. The metabolic rate of acanthocephalan parasites is highly dependent on temperature [22]. The combined effects of elevated temperature and parasitic infection probably affects the performance of the crustacean brain and thus behavioural responses, such as phototaxis [23]. Parasites in invasive hosts, with wider physiological tolerance to different water temperature [24] may have different ability to alter the activity level of serotonin in compete with native hosts.

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