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Transport of amino acids by two marine organisms: *Glycera dibranchiata* and *Platymonas subcordiformis*

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Biological Sciences

by

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ABSTRACT OF THE DISSERTATION

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Soft-bodied marine invertebrates are capable of taking up amino acids from dilute solution directly across the body wall. However, there has been a controversy concerning the subsequent fate of these compounds. Some investigators have argued that amino acids are restricted to the external epithelium after uptake from the medium. The first section of the dissertation demonstrates that these substrates are effectively translocated across the external body wall and distributed throughout the tissues of the annelid worm *Glycera dibranchiata*.

Sections two and three of the dissertation deal with uptake of amino acids by the marine phytoplankter *Platymonas subcordiformis*. The second section analyzes the responses of this green alga to nitrogen deprivation. When the organism is suspended in water free of organic

nitrogen, its capacity to remove free amino acids from sea water increases dramatically in the light compared to cells treated similarly but maintained in the dark. This response involves the synthesis of new transporter protein in the membrane rather than any change in affinity for substrate. This synthesis can be blocked by inhibitors of protein synthesis. Cells maintained in the dark retain their capacity to respond to light by synthesis of new transport protein.

The third section of the dissertation demonstrates the sodium dependence of transport of neutral amino acids in Platymonas. Two sodium ions enter the cells for each molecule of alanine or serine taken up. Other data permit estimation of the minimum ambient concentration from which Platymonas can acquire amino acids from the medium. Net uptake is thermodynamically favorable from sea water containing nanomolar amounts of total free amino acid which is two orders of magnitude lower than levels normally present in inshore marine waters.

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