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Transepithelial Flux of Amino Acids in Three Species of Marine Bivalve Mollusks

A dissertation submitted in partial satisfaction of the

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by

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ABSTRACT OF THE DISSERTATION

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The influx, net flux and internal distribution of exogenously supplied free amino acids (FAA) was studied in 3 species of bivalve molluscs, Mytilus edulis, Crassostrea gigas, and Mercenaria mercenaria. Amino acid entry rates and the subsequent tissue distribution of FAA were studied using high performance liquid chromatography (HPLC) and radiochemical techniques.

1. The uptake of FAA by the non-gill epithelia of the mantle cavity of Mytilus was studied and compared with uptake by the gills. Uptake via the non-gill epithelia lining the mantle cavity was separated by uptake via the gill by employing a preparation in which the gills were surgically removed. In two-hour experiments, transfer of substrate from the gills to other tissues is very limited. There is rapid transfer of FAA transported via the non-gill epithelia to deep tissues. The apparent density of α-amino acid carrier sites on both gill and non-gill epithelia is approximately equal. Taurine carrier density is apparently higher in non-gill epithelia.

ii. A technique is described in which irrigation of the mantle cavity of Crassostrea induces pumping at steady rates. Simultaneous net influx of ten amino acids was observed by HPLC. Influx of radiolabeled alanine closely corresponds to the net entry of alanine. FAA taken up from the medium are rapidly distributed to the internal tissues. This distribution is demonstrated for alanine, glutamate, cycloleucine and a-amino-n-butyric acid (ABA). Modification of FAA pools by exogenously supplied FAA was studied by HPLC.

iii. The effects of salinity on the uptake and internal distribution of FAA in Mercenaria was studied. Exposure of animals to reduced salinity does not alter the rate of alanine influx. In 34 o/oo salinity, entry of labeled alanine reflects the net flux of the amino acid. However, in 17 o/oo salinity, there is a net loss of alanine and other amino acids, mainly taurine to the medium. Reduced salinity induces greater incorporation of radiolabeled FAA into macromolecular fractions throughout the animal. The major factors in reducing intracellular pools of FAA is loss to the external medium and incorporation into macromolecules.