Significance of Tissue Aminotransferases in Brachyuran Species of Diverse Habitats

K V RAMANA RAO & Y DAYAKAR
Department of Marine Zoology, S V University P G Centre, Kavali 524 202, India
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In the tissues of Scylla serrata (Forskal) from brackish water, Ocypode platyaris (Milne H. Edwards) from seacoast and Oziotelphusa senex senex (Fabricius) from paddy fields the free amino acid (FAA) content is high. The muscle has the highest FAA content. The tissue aspartate (AAT) and alanine (AlAT) aminotransferase activities are high in muscle followed by gill and midgut gland indicating operation of gluconeogenesis for energy. AAT/AlAT ratios in the tissues largely demonstrate preponderance of anaerobic metabolism. The AlAT activity also indicates adaptability of these brachyurans to their respective habitats against temperature, salinity, oxygen content, etc.

Of the different aminotransferases alanine (AlAT) and aspartate (AAT) aminotransferases mainly serve as link enzymes between carbohydrate and protein metabolisms thus favouring gluconeogenesis. These 2 enzymes are usually active under stress, starvation, disease or any altered physiological condition. AlAT activity is considered as an index of adaptability. The crabs are known for their wide diversity, distribution and adaptability to varied environments. In this study AlAT and AAT are assayed in the selected tissues of 3 brachyuran species of different habitats to know their level of adaptability and to visualise the extent of amino acid contribution to the gluconecogenic pathway.

Crabs from different habitats, viz. Scylla serrata (Forskal) from brackish waters near Thummalapenta seacoast, Ocypode platyaris (Milne H. Edwards) from the sandy shores of the Thummalapenta seacoast (lat. 14° 55' N; long. 80° 03' E) and Oziotelphusa senex senex (Fabricius) from the paddy fields of Alur (lat. 14° 54' N; long. 80° 03' E) were used. The intermolt crab species collected were of uniform size (carapace diameter 42 ± 5 mm and weight 35 ± 2 g) and only active forms were taken. Collection of crabs and isolation of tissues were done at a fixed timing between 0600 and 0800 hrs to avoid rhythmic effects. The isolated tissues were weighed and homogenized in 0.25 M cold sucrose solution and centrifuged at 1000 g for 15 min. Cell free extracts were used for the assay. AAT and AlAT activities, protein content and free amino acid content (FAA) were determined. The data were statistically analysed following the methods given in Bailey.

Since there is no experimental condition, the data on different parameters obtained in the 3 crab species were compared against S. serrata which served as an arbitrary control.

Crustacean tissues have high FAA content as in the present study (Table 1). All tissues of O. platyaris have relatively higher FAA content compared to S. serrata and O senex senex. Among tissues, the muscle FAA content is higher compared to the midgut gland and gill tissues (Table 1). FAA's maintain osmotic and acid-base balance. Apart from this they also contribute to the gluconecogenic pathway towards energy metabolism in crustaceans. Reports show fatty acids and amino acids contribute to the energy metabolism.

Interestingly, AlAT and AAT activities in tissues of the 3 brachyuran species tested are also quite high. AlAT and AAT activities are much higher in O. senex senex compared to S. serrata and O. platyaris. Tissue wise, AAT and AlAT of muscle dominate over gill and midgut gland (Table 1). This demonstrates that in the 3 crab species, the muscle tissue is the major contributor of FAA for the aminotransferase activities and for the gluconecogenic pathway. This trend is acceptable because the muscle tissue is rich in amino acids. This is followed by the gill tissue. The extra hepatic tissues have higher aminotransferase activities than the hepatic tissue indicating that more emphasis is given to physiological functions rather than metabolic functions perhaps attuning to their energy requirements.

Species wise, O. senex senex has more of AAT and AlAT activity followed by S. serrata and O. platyaris (Table 1). This suggests two possibilities, (1) cith-
er *O. senex senex* is more dependent on aminotransferases for its energy or (2) that environmental factors like temperature, salinity, tides, etc.\(^1\) should be influencing enhancement of aminotransferase activities because the activities of these enzymes are found to be stress mediated\(^3,15\).

Tissue AAT/AlAT ratios of the crabs show that they favour more of AlAT activity except the muscle of *O. platytnris* which favours AAT. The terminal product of AlAT is pyruvate and of AAT is oxaloacetate, which means that most tissues of the 3 brachyurans favour pyruvate production and therefore, glycolytic in nature, except *O. platytnris* muscle which produced oxaloacetate thus favouring aerobic metabolism. The overall trend agrees with the earlier report that intermolt crabs favour glycolysis\(^16\).

Since AlAT is not only concerned with gluconeogenesis but also adaptability\(^4,17\) the overall higher AlAT activity in tissues of the crabs studied justified their adaptability to their respective habitats namely brackish waters (*S. serrata*), sandy shore (*O. platytnris*) and paddy fields (*O. senex senex*) and also to favour glycolysis.

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**References**