

Gill (Na⁺, K⁺)-ATPase from the Amazon River shrimp, *Macrobrachium amazonicum* (Decapoda, Palaemonidae): effect of exogenous biogenic amines on enzyme activity in juveniles and adults

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INTRODUCTION: *Macrobrachium amazonicum* shows high potential for small-scale enterprises in Amazonia. Life in fresh water demands the ability to acquire essential ions. Several enzymes and transporters are responsible for ion transport in crustacean gills, including the (Na⁺, K⁺)-ATPase. Various biogenic amines are involved in the hormonal control of water and salt movements (osmoregulation), however their role in regulating (Na⁺, K⁺)-ATPase activity in crustacean gills is unclear as yet. **OBJECTIVE:** This investigation provides an extensive kinetic characterization of the effects of the exogenous polyamines spermine, spermidine and putrescine on (Na⁺, K⁺)-ATPase activity in gill microsomal preparations from juvenile and adult shrimps at varying concentrations of ATP, Mg²⁺, Na⁺, and K⁺, and on inhibition by ouabain. **MATERIAL AND METHODS:** Gill (Na⁺, K⁺)-ATPase activity was assayed spectrophotometrically at 340 nm and 25 °C using a PK/LDH linked system in which ATP hydrolysis was coupled to NADH oxidation. **RESULTS AND DISCUSSION:** (Na⁺, K⁺)-ATPase activity in both juvenile and adult shrimps is inhibited by spermidine (55-65%) and putrescine (35-45%) while spermine has a negligible inhibitory effect (<10%). Putrescine affects the kinetics of ATP hydrolysis and enzyme affinity (K_M) for ATP in both enzymes, while spermidine alters specific activity only. Spermidine increases Mg²⁺ affinity of the adult (Na⁺, K⁺)-ATPase while putrescine decreases Mg²⁺ affinity in both enzymes. Spermidine decreases Na⁺ affinity by 50% in both enzymes while putrescine increases affinity of the juvenile enzyme 2-fold. These biogenic amines cause slight changes in K_M values in both enzymes. **CONCLUSION:** Our study disclosed important differences compared to the euryhaline swimming crabs *Callinectes danae* (Silva et al., Comp. Biochem. Physiol. 149B: 622, 2008) and *C. ornatus* (Garçon et al., J. Memb. Biol. 244: 9, 2011) raising the possibility that the effect of biogenic amines on gill (Na⁺, K⁺)-ATPase may be both species- and stage-specific.

Keywords: Gill (Na⁺, K⁺)-ATPase; *Macrobrachium amazonicum*; biogenic amines.

Financial support: FAPESP, CNPq, FAPEAM, INCT-ADAPTA.