

# Na<sup>+</sup>, K<sup>+</sup>- ATPase Activity in Early Embryonic Stages of Sea Urchin, *Paracentrotus lividus* (Lamarck 1816)

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## Abstract

Enzyme Na<sup>+</sup>,K<sup>+</sup>- ATPase consumes about 40% of the total metabolic energy during early development of the sea urchins. This energy is used to keep intracellular ionic gradients and to generate secondary active transport processes of ions and small organic molecules. The aim of our study is to evaluate significance of the enzyme Na<sup>+</sup>,K<sup>+</sup>- ATPase activity changes during embryogenesis.

Adult Sea urchins *Paracentrotus lividus* (Lamarck 1816) (Echinodermata:Echinoidea) were collected in coastal non polluted waters of Gruž Bay, in the vicinity of the city of Dubrovnik (Croatia) during summer and autumn, 2007. After KCl induced spawning individuals were turned back into the sea.

Our preliminary results show that specific activity of the enzyme was increased during the stage of early pluteus (prism stage) up to 0.9 μmol Pi h<sup>-1</sup> mg protein<sup>-1</sup> over the enzyme activity at the gastrula stage (0.5 μmol Pi h<sup>-1</sup> mg protein<sup>-1</sup>). The apparent K<sub>i</sub> value (ouabain concentration at which activity of total ATPase is 50% inhibited) was at 0.2 mM. This result expresses a low ouabain affinity to sea urchin enzyme. This method could be a reliable auxiliary tool for testing favorable conditions in commercial exploitation of sea urchins. Optimal energetic value of larval feed could be determined, therefore, contribute to further development of hatchery technology.

Key words: sea urchin, embryogenesis, Na<sup>+</sup>, K<sup>+</sup>- ATPase enzyme

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# Aktivnost enzima Na<sup>+</sup>, K<sup>+</sup>- ATPaze tijekom embrionalnoga razvoja hridinskog ježinca *Paracentrotus lividus* (Lamarck 1816)

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## Sažetak

Tijekom ranoga embrionalnog razvoja morskih ježinaca enzim Na<sup>+</sup>, K<sup>+</sup>-ATPaza, za obavljanje metaboličkih aktivnosti troši oko 40% od ukupne raspoložive energije. Energija se troši za održavanje ionskih gradijenata i generiranje sekundarno aktivnog transporta iona i malih organskih molekula.

Cilj naših istraživanja je praćenje promjena specifične aktivnosti enzima Na<sup>+</sup>,K<sup>+</sup>- ATPaze tijekom embriogeneze morskog ježinca, *Paracentrotus lividus* (Lamarck 1816) (Echinodermata:Echinoidea).

Odrasle jedinke hridinskih ježinaca, *P. Lividus*. prikupljene su u priobalnom moru Gruškoga zaljeva. Jedinke su vraćane u more nakon postignutog mriješta koji je induciran injektiranjem otopine KCl.

Naši preliminarni rezultati ukazuju da je specifična aktivnost enzima povećana tijekom ranog stadija pluteus (prizma), do 0.9 μmol Pi h<sup>-1</sup> mg protein<sup>-1</sup>, za razliku od aktivnosti za vrijeme stadija gastrula (0.5 μmol Pi h<sup>-1</sup> mg protein<sup>-1</sup>). Koncentracija specifičnog inhibitora Na<sup>+</sup>,K<sup>+</sup>-ATPaze ouabaina kod koje je inhibirano 50% od ukupne aktivnosti ATPaze iznosi 0.2 mM. Ovo ukazuje na nizak afinitet ouabaina na enzim hridinastoga ježinca.

Ova metoda mogla bi biti pouzdani alat u istraživanju povoljnih uvjeta za komercijalnu eksploataciju navedenih organizama. Energetska vrijednost različite ličinačke ishrane se može utvrditi i time doprinijeti razvoju mrjestilišne tehnologije.

Ključne riječi: morski ježinac, embriogeneza, enzim NaK-atpaza

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