Multiple phosphagen kinases from the cnidarian *Nematostella vectensis*.

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Phosphagen kinases catalyze the reversible transfer of the high-energy phosphoryl group of ATP to naturally occurring guanidine compounds. Phosphagen kinases are phylogenetically separated into two distinct groups: the arginine kinase (AK) group and the creatine kinase (CK) group which includes three CK isoforms (CyCK, MiCK and fCK). It is generally assumed that the CK lineage evolved from an AK-like ancestor via a gene duplication and divergence event.

The starlet sea anemone *Nematostella vectensis* is a well-known model organism among cnidarians. In this study, we found fragments of five phosphagen kinase genes from the draft genome sequence of *Nematostella vectensis* and complete cDNA sequence of those genes were determined by RT-PCR and RACE analysis. The cDNA of these phosphagen kinases are cloned into pET30 plasmid, and expressed it in *Escherichia coli*. The phylogenetic analysis, comparison of gene structures and the determination of the enzyme activity using recombinant proteins revealed the properties of *Nematostella* phosphagen kinases. Five phosphagen kinases from *Nematostella* were identified as three typical CK isoforms (CyCK, MiCK and fCK), unusual three-domain AK and one AK with very low activity. This is the first report of the presence of both AK group genes and CK group genes in an animal.