# Taxonomic Distribution and Molecular Evolution of Mytilectins

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## Abstract

R-type lectins are a widespread group of sugar-binding proteins found in nearly all domains of life, characterized by the presence of a carbohydrate-binding domain that adopts a $\beta$-trefoil fold. Mytilectins represent a recently described subgroup of $\beta$-trefoil lectins, which have been functionally characterized in a few mussel species (Mollusca, Bivalvia) and display attractive properties, which may fuel the development of artificial lectins with different biotechnological applications. The detection of different paralogous genes in mussels, together with the description of orthologous sequences in brachiopods, supports the formal description of mytilectins as a gene family. However, to date, an investigation of the taxonomic distribution of these lectins and their molecular diversification and evolution was still lacking. Here, we provide a comprehensive overview of the evolutionary history of mytilectins, revealing an ancient monophyletic evolutionary origin and a very broad but highly discontinuous taxonomic distribution, ranging from heteroscleromorphan sponges to ophiuroid and crinoid echinoderms. Moreover, the overwhelming majority of mytilectins display a chimera-like architecture, which combines the $\beta$-trefoil carbohydrate recognition domain with a C-terminal pore-forming domain, suggesting that the simpler structure of most functionally characterized mytilectins derives from a secondary domain loss.