Homologous and unique structures and functions of ascidian peptidic signaling molecules

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The critical phylogenetic position of the ascidian, *Ciona intestinalis*, as protochordates suggested its potential appliciability as a model organism in diverse fields of comparative biology involving neuropeptides and hormones. However, only a few ascidian peptides were structurally and functionally characterized from ascidians. In our recent study, a combination of mass spectrometric analyses and database-searching detected 35 peptides. These peptides are categorized into three types. i) orthologs of vertebrate peptides including tachykinin, calcitonin, galanin, RF-amide peptides, and neurotensin-like peptides. ii) vasopressin and GnRH-related peptide possessing ascidian-specific molecular forms and/or functions. iii) novel family peptides such as LF peptides and YFL/V peptides. These results showed that ascidians, unlike other invertebrates including traditional proteostome model organisms, *Caenorhabditis elegans* or *Drosophila melanogaster*, possess a variety of homologs and/or prototypes of vertebrate neuropeptides and peptide hormones, and that several ascidian peptides were diverged in ascidian-unique evolutionary lineages. Furthermore, we have substantiated a novel protease-associated oocyte growth pathway regulated by tachykinins and neurotensin-like peptides using *C. intestinalis*, which is the first functional characterization of tachykinins and neurotesins in ovaries of any organisms. These findings provide new insight into the molecular and functional evolution and diversity of peptidergic systems in chordates.