Expression pattern of hydra synapsin indicates heterogeneity of synapses in the diffuse nervous system

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Hydra has the most primitive nervous system in the animal kingdom. The nerve cells in hydra form a simple network, the nerve net. In some hydra species, however, a neurite bundle called "the nerve ring" has been observed near the base of the hypostome. We hypothesize that the nerve ring is one of the phylogenetically oldest neuronal circuits. To examine molecular basis for the nerve ring formation and functions, we are screening for genes that are expressed near the nerve ring as a first step. Among such genes, we identified a hydra gene orthologous to *synapsins* in the other animals. Synapsins are a family of synaptic phosphoproteins which have been implicated in the modulation of neurotransmitter release at the synaptic terminal. The hydra *synapsin* was mainly expressed in the hypostome and tentacles in *Hydra oligactis*, which has the nerve ring in the hypostome. In *Hydra magnipapillata* in which the nerve ring has not been detected, the hydra *synapsin* was detected in the tentacles but not in the hypostome. Our results demonstrate that the hydra *synapsin* is expressed only in a part of the hydra nervous system, and indicate that the molecular architecture of synapses is heterogeneous in the hydra nervous system.