Insulin and long-term potentiation in the pond snail

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The pond snail *Lymnaea stagnalis* is capable of learning conditioned taste aversion (CTA) and consolidating this CTA into long-term memory (LTM). Previous studies showed that the molluscan insulin-related peptide II (MIP II) was up-regulated in snails exhibiting CTA-LTM. We thus hypothesized that MIP II plays an important role at the synapses underlying the LTM consolidation process. To examine this hypothesis, 1) we observed the distribution of MIP II and the MIP receptor and determined the amounts of their mRNAs in the *Lymnaea* CNS; and 2) we investigated the effects of CNS secretions that are expected to include MIP II on the change in synaptic transmission that is thought to underlie CTA-LTM. We show here that MIP II was only observed in the cerebral ganglia, but the MIP receptor was distributed throughout the entire CNS including the buccal ganglia. The application of exogenous mammalian insulin or the secretions from *Lymnaea* MIP II-containing cells evoked long-term potentiation (LTP) at the synapses between the cerebral giant cell and the Buccal 1 motoneuron. These data suggest that MIP II triggers changes in synaptic connectivity that are correlated with CTA learning and its consolidation into LTM in the *Lymnaea* CNS.