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**The Effect of Brain-derived Neurotrophic Factor on Neuritogenesis and Synaptic Plasticity in *Aplysia* Neurons and the Hippocampal Cell Line HiB5**

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Brain-derived neurotrophic factor (BDNF) plays a key role in the differentiation and neuritogenesis of developing neurons, and in the synaptic plasticity of mature neurons, in the mammalian nervous system. BDNF binds to receptor tyrosine kinase TrkB and transmits neurotrophic signals by activating neuron-specific tyrosine phosphorylation pathways. However, the neurotrophic function of BDNF in *Aplysia* neurons is poorly understood. We examined the specific effect of BDNF on neurite outgrowth and synaptic plasticity by using cultured *Aplysia* neurons and a multipotent rat hippocampal stem cell line (HiB5). Our study indicates that mammalian BDNF has no significant effect on the neuritogenesis, neurotransmitter release, excitability, and synaptic plasticity of cultured *Aplysia*neurons in our experimental conditions. In contrast, BDNF in combination with platelet-derived growth factor (PDGF) increases the length of the neurites and the number of spine-like structures in cells of HiB5.

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**Application of Interleukin-2 Cytokine for Tumor Therapy**

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Cytokine gene transduction into tumor cells has been a promising method for tumor therapy. The conventional strategy was known to activate non-specific immune cells and has various side-effects. To avoid such problems in cytokine gene therapy, B16F10 melanoma cells were genetically engineered to express membrane-bound form of IL-2. The tumor-associated antigens on MHC class I may function as a signal 1 and the cytokines on the cell surface may function as a signal 2 for direct activation of tumor-specific CTL. Engineered tumor cells were better immunogen and induced antitumor immunity. B16F10 clone expressing membrane-bound IL-2 was less metastatic and CD8+ T cell population in the lung was prominently increased in the mice injected with the engineered B16F10 clone compared with the B16F10 cells. The preferential target organs for metastasis are highly correlated with their chemokines profiles. We found that CXCR4 expression in the spleen cells was effectively induced in vitro by the B16F10 clone expressing the membrane-bound IL-2. These results suggest that B16F10 clone expressing membrane-bound IL-2 activates the CD8+ T cell population to express CXCR4 and recruit the cells into lung expressing the corresponding chemokine CXCL12. The proposed tumor vaccine may serve as an effective gene therapy method, possibly avoiding the toxicity in the recombinant cytokines and the conventional cytokine gene therapy.

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**Molecular Characterization of Transferrin in Greater Wax Moth, *Galleria mellonella***

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Complete mRNA sequence of transferrin in *Galleria mellonella* was obtained. The sequence was compared with those of other species. Until now, two types of insect transferrins were reported. Transferrins in cockroach and termite have two iron-binding sites while those in other insect groups, studied for the protein, have only one. It was suggested that the presence of two types of transferrins was related with transferrin evolution, because vertebrate transferrins have two iron-binding sites, called N- and C-lobe. It was shown that *G. mellonella* transferrin also has only one iron-binding site (N-lobe), and the sequence of the protein was most similar to those of *Manduca sexta* and *Bombyx mori*.

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**Functional Role of Cloned *Aplysia* AU-rich Element RNA Binding Protein, apELAV1**

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The Drosophila ELAV and its mammalian homologs, Hu proteins (HuB, HuC, HuD, and HuR) are mRNA-binding proteins that regulate AU-rich element mRNA stability. We have cloned *Aplysia*ELAV-like proteins (apELAV1, apELAV2) and investigated their function in *Aplysia*neurons. Putative amino acid sequences of apELAV1 and apELAV2 have three conserved RNA-recognition motifs (RRMs) and a linker region separating RRM2 and RRM3. Here, we investigated the function of apELAV1. When transfected into COS-7 cells, apELAV1 was detected mainly in the region of the nucleus excluding the nucleolus, which is analogous to the expression of mammalian HuR. We used RT-PCR assay to analyze the expression pattern of apELAV1 in various *Aplysia* tissues. It showed that apELAV1 was ubiquitously expressed in *Aplysia*tissues. We investigated subcellular distribution pattern of apELAV1 in *Aplysia*sensory neurons. In the portion of the neurite, apELAV1 formed distinctive granular structure, which is presumed ribonucleoprotein complex. Gel retardation assay showed that apELAV1 interact specifically with the c-fos 3 UTR RNA which contains AU-rich element.