

Discoveries in neurobiology

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Neurobiology is the study of cells of nervous system and their organization to form circuit in order to perform functions. The application of the techniques of molecular biology such as recombinant DNA technology, cDNA library, genomic library, hybridization techniques, molecular markers etc. to studies of nerve cells has resulted in much information about mechanisms of nervous transmission, triggering of gene expression in target cells and storage of information. Brain is the organ specialized for receiving, processing, storing and releasing of stored information. In invertebrates the infrastructure and operations for such functions are relatively less complex than in vertebrates. The human brain is the most advanced and has ability of thinking, storage or memory banks, a parallel computing capabilities and has unique capacity to store systematically the information obtained from the experience of a lifetime. From a study of behavior pattern under artificial and natural conditions, scientists have concluded that the behavior of learning is based on ability to store experience; they have classified learning into non-associative and associative types. In the former the experience results from a single type of event; in the latter, it is the outcome of the interaction of two or more experiences. Learning is dependent on a variety of neural components that include plasticity of nerve cell endings in making and altering patterns of nerve cell networking and neuroreactive molecules that are expressed on induction by stimuli.

The plasticity of neuronal extensions has been demonstrated in several ways. A particular neuron usually enervates a target cell with a large number of axonal branches. Along with age, most of these axonal branches disappear and only one or few remain. These are the consolidated neuritis. It is postulated that each experience is interpreted in a particular network pattern, which has been named as an "essential memory trace". Networks of such traces or essential memory trace circuits are supposed

to store experiences. Lesions in the cortical regions of the brain remove memory traces, but only for a short or longer period of time but not altogether for all time. This indicates that there is a possibility of memory traces not occurring in any one part of the brain, but could be sequestered in several sites, with memory trace elements distributed in the neural components or assemblages. Alterations in these sets and subsets of neural elements are caused by the input of environmental signals affect the electrical properties of nerve cell membranes, cause depolarization or hyperpolarization of the same via opening or closing of membrane channels for Na, K, Ca, Cl and so on, and induced the expression or regulation of specific neuroactive molecules. Some of the discoveries about nervous system in relation with innate behavior, neurotransmitter and memory are as follows:-

Innate behavior and nerve cells:

Innate behavior is a pattern of response to a particular set of environmental signals and is the only mode of behavior in most inhuman species. Innate behavior can depend on non-associative and associative type of learning.

Non-associative learning :

Habituation (decrease of response on repeated stimulation by the same signal) and sensitization (increase in response due to continued stimulation) are examples of non-associative learning.

Associative learning:

It can be distinguished into classical (Pavlovian) and instrumental types of conditioning. Two models of classical conditioning studied with the help of cloned DNA, are those represented by the giant, shell-less snail *Aplysia* and by *Hermisenda sp.* In both these models the neural mechanism of learning has been associated with alterations in ionic conductance in neural cell membranes.

Key words :

Innate behavior,
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