EDITORIAL

Epigenetics and Neuro-behavioral Modulations

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One of the distinct characteristics of the living organisms, in addition to the ability to retain parental characters and qualities, is their flexibility to cope with and adapt to external as well as internal needs. For that the organisms have evolved efficient controlling apparatus for immediate and for sustained long term needs within the same generation as well as in generations to come. The basic code for inheritance is provided by the DNA sequence, which is transferred to the offspring. This DNA sequence needs to be reasonably stable, at the same time its regulation must be flexible enough for refined control and fine-tuning of functions. Various inheritance, genetics, molecular biology, biotechnological and pharmacological approaches have provided us reasonable understanding about how DNA sequence is inherited and the mechanisms by which the inherited DNA sequence controls physiological processes

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as well as behaviors. However, it is intriguing that how those physiological processes, behaviors and life style are modulated even in a sustained manner including upon exposure to various environmental factors, how stress impacts our long term well-being particularly without affecting changes in the basic DNA sequence which is inherited to the progeny with or without the functional bias, how apparently identical genes (DNA sequences) produce different effects in twins, etc. These led to the studies which essentially investigate how genes may be switched on or off for the regulation of cellular functions particularly sustained ones including the complex behaviors within and/or future generations; such studies have been classified under epigenetics [1-3].

The revolutionary field of epigenetics is growing at a fast pace, trying to unravel the secrets underlying the questions raised above and attempt explaining the mechanisms by which the environmental factors interact with the basic backbone of genomic sequences to give rise to a particular phenotype. The beauty of the epigenetic changes is that although they are sufficiently stable in an individual, they are dynamic and get modulated in response to various external (environmental) and internal (within the body) stimuli; further they may be passed on to the future generations with or without modifications [4]. Another intriguing fact is that the mental and psychic changes may also induce epigenetic changes and vice-versa, which we have started to explore [5, 6].

The study of epigenetics is quickly spreading its roots in explaining several behavioral and physiological phenomena and has provided new vision for understanding different patho-physiological disorders. Neuroscience is no exception to it and has been revolutionized by this upcoming field of epigenetics [7]. Investigation of the brain epigenome and the role of epigenetic mechanisms in regulating the functions of central nervous system have provided an unprecedented approach for understanding neurodegenerative, neuropsychiatric disorders as well as neural development which has been collectively termed as Neuro-epigenetics or Behavioral epigenetics [8, 9]. The present issue has focused on some of the recent research and developments in the field of neuro-epigenetics. The reviews in this issue have highlighted some of the themes e.g. effect of epigenetic modulation on psychosomatic disorders including on memory function, psychological and cognitive changes, transcriptional regulation of noradrenaline due to changes in rapid eye movement sleep and vice versa, alterations in these mechanisms leading to drug development and treatment of neurological disorders.

As it will be evident from the contributions in this issue that although significant progress has been made to enrich our knowledge on epigenetic modulations in relation to neurobehavioral changes, it is tip of the iceberg and much needs to be done. Different models have been proposed by the authors in light of the current understanding of the field of epigenetics in the treatment of various neuro-patho-physiological disorders. The findings have broadened our understanding and attempted to unfurl underlying mechanism(s) of many existing phenomena; however, many questions regarding its inheritance, stability and several routine observations are yet unexplained. Notwithstanding, the silver lining is that several groups across the globe have been working on various aspects from human to animal cells as well as modeling studies using modern technology in the field, which are expected to yield results in near future.

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