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Environmental enrichment and enviromimetics: Impact on brain plasticity in health and disease.

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Abstract

Brain plasticity refers to the remarkable property of cerebral neurons to modify their structure and function in response to experience. This fundamental theoretical theme has been inspiring a wealth of experimental work with a major focus on neural rehabilitation following brain disease. A very promising paradigm in this field is environmental enrichment (EE), consisting in an enhanced stimulation provided at multiple cognitive, sensory, social and motor levels. Recent research performed at the Institute of Neuroscience of CNR in Pisa (ITALY) has underscored a dramatic impact on adult brain functions elicited by EE, which was shown to reopen plasticity windows comparable to those characterizing juvenile sensitive periods, to rescue cognitive and sensory abilities in different pathological conditions (e.g. amblyopia and Down syndrome), and to restore plasticity processes in the old brain. A common feature of this plethora of beneficial effects is a prominent reduction of the cerebral inhibition/excitation balance, one major regulator of neuronal plasticity in the brain. Fluoxetine, a selective serotonin reuptake inhibitor (SSRI) widely prescribed in the treatment of depression and a variety of psychiatric disorders, turned out to be a powerful enviromimetic, a drug that can be successfully exploited, alone or in combination with EE, to reproduce or to strengthen the positive effects elicited by the environment on brain health and plasticity. These non invasive procedures have a great potential for clinical application in neurological disorders characterized by compromised cerebral plasticity.

Biography

Alessandro Sale has completed his Ph.D in Neurobiology from the Scuola Normale Superiore of Pisa (Italy) and postdoctoral studies from the Scuola Normale and the Centre for the Biology of Memory of the Norwegian University of Science and Technology, Trondheim (Norway). He is research scientist at the Institute of Neuroscience of CNR in Pisa, a first rate institution in the field of Neuroscience. He has published 25 papers in reputed journals, among which Science, Nature Neuroscience and Trends in Neurosciences, and has been awarded several national and international prices for his major research contributions.