Neurobiological bases of autistic spectrum disorder and attention deficit hyperactivity disorder: neural differentiation and synaptogenesis

Martinez-Morga M, Quesada-Rico MP, Bueno C, Martinez S.


Abstract

AIM:
To know the neural processes linked to the activity of brain circuits in order to understand the consequences of their dysfunction and their role in the development of neurodevelopmental diseases, such as autistic spectrum disorders (ASD) and attention deficit hyperactivity disorder (ADHD).

DEVELOPMENT:
The activity of neuronal circuits is the neurobiological basis of behavior and mental activity (emotions, memory and thoughts). The processes of differentiation of neural cells and the formation of circuits by synaptic contacts between neurons (synaptogenesis) occur in the central nervous system during the late stages of prenatal development and the first months after birth. ASD and ADHD share biological features, mainly related to alterations in brain circuits and synaptic function, which allow us to treat them scientifically together. From the neurobiological aspect, ASD and ADHD are manifestations of anomalies in the formation of circuits and synaptic contacts in the brain regions involved in social behavior, and especially in the prefrontal cerebral cortex. These anomalies are caused by mutations in genes involved in synaptogenesis and synaptic plasticity, regulation of dendritic spine morphology, synaptic cytoskeletal organization, synthesis and degradation of synaptic proteins, and control of excitatory and inhibitory balance in the synaptic function.

CONCLUSIONS:
ASD and ADHD are functional alterations of the cerebral cortex, which present structural anomalies in the arrangement of neurons, in the pattern of connections of cortical columns and in the structure of dendritic spines. These alterations affect mainly the prefrontal cortex and its connections.