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Personalized Psychiatry and Neurology

Letter

Brain Genomics and Personalized Medicine

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Dear colleagues!

The human brain remains enigmatic despite centuries of investigation. From the biomedical point of view, one may insist that mechanisms of brain dysfunctions leading to numerous psychiatric and neurological diseases are as yet elusive. However, continuous advances in human (medical) genomics contribute to uncovering genetic etiology of brain diseases. As a result, new steps forward on the road to cure devastating disorders of the central nervous system are consistently made.

Genomic analysis is currently a diagnostic tool for a wide spectrum of psychiatric and neurological diseases. Uncovering genomic variation (mutations) in the human brain per se has demonstrated new mechanisms for the dysfunction of the central nervous system in epilepsy, intellectual disability, autism, schizophrenia, early- and late-onset neurodegenerative diseases. Genomic studies have highlighted a large number of abnormal intracellular, intercellular and intratissular processes, which underlie disease pathogenesis or, more precisely, pathogenetic cascades leading to abnormal brain functioning. These processes have become promising therapeutic targets for treatment of psychiatric and neurodegenerative disorders. Moreover, genomic/chromosomal instability has been found to be an important element of the pathogenetic cascade in a variety of psychiatric and neurological diseases (e.g., schizophrenia and Alzheimer's disease). Taking together, discoveries in the field of brain genomics represent a growing body of research that advance modern neuroscience and personalized medicine.

Current brain genomics has several directions of the development. Firstly, a large body of research of brain genomics is dedicated to mutational analysis of individuals suffering from brain diseases. Associations of pathogenic DNA changes (gene mutations, chromosomal abnormalities etc.) with specific clinical conditions is the laboratory basis for managing patients with genetic disorders of the central nervous system. Moreover, it allows to study molecular and cellular processes, which mediate brain dysfunction. Secondly, genomic variations found in individuals with brain diseases are evaluated by system (bioinformatic) and functional analysis in the pathogenetic context. This approach to uncover alterations of molecular and cellular pathways in brain diseases is a technological basis for neurogenomics, which aims at discovering candidate processes for brain diseases according to genomic data. Successful neurogenomic studies provide opportunities for effective therapeutic strategies in brain diseases, i.e., from optimization of conventional

therapy to developing orphan drugs for rare diseases of the central nervous system. Thirdly, there is a growing number of studies focused on genomic variations in brain cells. This part of brain genomics provides new data on causes and consequences of genomic/somatic mosaicism (presence of cells with normal and abnormal genomes in a cellular population) and genome/chromosome instability producing brain dysfunction, abnormal neurodevelopment and/or neurodegeneration. To this end, it is to state that all these directions in brain genomics are intimately interconnected with each other and form the firm basis for further developments in the fields of personalized psychiatry and neurology.

In total, one has to recognize that the aforementioned directions in brain genomics contribute to the development of personalized medicine. Certainly, genetic defects affecting either all the cells of an orgasm or exclusively brain cells are directly associated with diseases, which are studied under the scope of psychiatry and neurology. Thus, genomic and genetic studies of brain dysfunction appear to bring new insights into our understanding of the etiology, pathogenesis and therapeutic opportunities in a wide spectrum of neurological and psychiatric diseases

Despite increasing interest in brain genetics, there is still a limited number of journals, allowing professional audience to follow recent advances in personalized genomics of brain diseases. Fortunately, *Personalized Psychiatry and Neurology* represents such a forum where basic neuroscience disciplines (i.e., neurogenomics or brain genomics) are able to meet practical medicine in the neurological and psychiatric context with special attention to personalization. Accordingly, the audience of the journal has an opportunity to read valuable collections of original articles and reviews dedicated to the fields of personalized psychiatry and neurology.

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