

Editorial

Molecular Cyto(post)genomics

The special hot-topic issue of *Current Genomics* dedicated to molecular cytogenetics in the postgenomic era provides new and valuable knowledge about structural and behavioral variations of the genome at chromosomal level. An international panel of researchers fruitfully working in molecular, evolutionary, medical and psychiatric genetics, cytogenetics, reproduction, oncology, neurosciences and bioinformatics has shared their experiences to advance current genomics.

The issue begins with an overview of postgenomic perspectives on molecular cytogenetics. Prof. Heng and his colleagues justify the unique role of “modern” cytogenetics in postgenomic basic and medical research concluding the postgenomic era to be featured by big data and analyses from the various large scale omics studies. This is continued by a proposal of an intriguing cytogenomic hypothesis suggesting behavioral variability to be mediated by somatic mosaicism. Since behavioral sciences are inseparably related to genetics, somatic genomic variations have become a key to the formation of neurobehavioral phenotypes. To support the hypothesis, an article about mosaic brain aneuploidy in mental illnesses is included in this special hot-topic issue of *Current Genomics*. The demonstration of an association of low-level mosaic aneuploidy with common and comorbid psychiatric disorders provides firm support for a model suggesting increased burden of rare *de novo* somatic chromosomal mutations (low-level mosaic aneuploidy) playing disruptive roles in mental illness.

The next article (Prof. Liehr and colleagues) highlights the power of postgenomic molecular cytogenetics for uncovering the way small supernumerary marker chromosome provides information on dosage-insensitive pericentric regions in human. An example of postgenomic molecular cytogenetic analysis significantly improving postnatal diagnosis of the X chromosome structural rearrangements is illustrated by the contribution of Dr. Manolagos and his colleagues. To be more illustrative of the power of molecular cytogenetic postgenomics in personalized medicine, this special hot-topic issue of *Current Genomics* includes a contribution about molecular and neuropsychological aspects of rare 4q21.2q21.3 duplication. This is a useful example of cytogenomic and bioinformatic analysis of clinically significant copy number variations in patients with intellectual disability. Socio-medical importance of molecular cytogenetic postgenomic studies is clearly described in a landmark contribution of Prof. Heng and colleagues about chromosome condensation defects in gulf war illness patients.

Evolutionary cytogenetics/postgenomics is described by an article about molecular cytogenetic analysis of one African and five Asian macaque species, which reveal identical karyotypes as in mandrill. New insights into karyotypic evolution of old world monkeys are described accordingly. This area of evolutionary cytogenomics is further explored by a contribution on karyotypic evolution of *Macaca arctoides*, *M. fascicularis*, *M. nemestrina*, *M. assamensis*, *M. sylvanus*, *M. mulatta* and *Mandrillus sphinx*. Evolutionary genomic mechanisms (accumulation of repetitive sequences, cessation of recombination and gene loss) that drive the evolution of sex chromosomes are carefully reviewed in the next article dedicated to early stages of XY sex chromosomes differentiation in the fish (*Hoplias malabaricus*, Characiformes, Erythrinidae). Finally, a mini-review by Prof. Zhimulev and his colleagues shows polytene chromosomes as a portrait of functional organization of the *Drosophila* genome and demonstrates implications of these data for functional genomics.

We do hope that this hot topic issue dedicated to molecular cytogenetics in the postgenomic era would contribute to current biomedical literature and would be found interesting for wide and rigorous readership of *Current Genomics*.

This thematic issue of *Current Genomics* is dedicated to the memory a geneticist Iliia Soloviev, a pioneer of human molecular cytogenetics, genome and chromosome research, whose prominent work has formed our current research directions. This issue includes (important albeit non-original) data previously obtained through funding by two Russian Science Foundation projects (project #14-15-00411 at Mental Health Research Center - bioinformatic and molecular cytogenetic studies; project #14-35-00060 at Moscow State Psychological and Pedagogical - neuropsychological and genomic studies).

Yuri B. Yuorov and Ivan Y. Iourov

Guest Editors

Mental Health Research Center
Zagorodnoe sh. 2, Moscow 119152
Russian Federation

E-mails: y_yuorov@yahoo.com; ivan.iourov@gmail.com