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3D-REPOSITIONING OF CHROMOSOME TERRITORIES LEADING TO PRIMATE KARYOTYPIC EVOLUTION

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Individual chromosomes in the cell nucleus are highly compartmentalized. These so called chromosome territories (CTs), can be visualized by three-dimensional fluorescence in situ hybridization (3D-FISH) technique. The spatial positioning of CTs has important roles for gene regulation and chromosomal translocations. The contact between two different, particular CTs is called chromosome kissing and is well documented to be involved in gene silencing or activation. From the evolutionary viewpoint, human chromosome 2 was formed from the fusion of two separate chromosomes which are still conserved in the great apes and Old World monkeys. To address how the relative positioning of CTs is involved in evolutionary translocations, we examined CTs in human 2p and 2q homologs in various primates by 3D-FISH. The results showed that the frequency of chromosome kissing between 2p and 2q homologs was lower among the Old World monkeys and higher in the great apes. This result suggests that the tendency of chromosome kissing between 2p and 2q homologs is higher in the species which are phylogenetically closer to humans. On the other hand, macaque chromosome 7 is constituted by two acrocentric human chromosomes 14 and 15. This situation is not simply the opposite case to that of human chromosome 2 because this syntenic association is considered to be the ancestral condition of the primate phylogenetic lineage. The synteny between 14 and 15 exists in macaques, New World monkeys, and some prosimians. We are investigating the relative positioning of human 14 and 15 homologous CTs in humans, great apes, and other primates by 3D-FISH. In this symposium we will discuss how 3D-repositioning of CTs can contribute to our understanding of evolutionary translocations in primate karyotypic evolution.

Keywords: chromosome territories, chromosome kissing, chromosomal translocation, 3D-FISH