

A Novel Chicken W Chromosome Specific Tandem Repeat

Authors : Alsu F. Saifitdinova, Alexey S. Komissarov, Svetlana A. Galkina, Elena I. Koshel, Maria M. Kulak, Stephen J. O'Brien, Elena R. Gaginskaya

Abstract : The mystery of sex determination is one of the most ancient and still not solved until the end so far. In many species, sex determination is genetic and often accompanied by the presence of dimorphic sex chromosomes in the karyotype. Genomic sequencing gave the information about the gene content of sex chromosomes which allowed to reveal their origin from ordinary autosomes and to trace their evolutionary history. Female-specific W chromosome in birds as well as mammalian male-specific Y chromosome is characterized by the degeneration of gene content and the accumulation of repetitive DNA. Tandem repeats complicate the analysis of genomic data. Despite the best efforts chicken W chromosome assembly includes only 1.2 Mb from expected 55 Mb. Supplementing the information on the sex chromosome composition not only helps to complete the assembly of genomes but also moves us in the direction of understanding of the sex-determination systems evolution. A whole-genome survey to the assembly Gallus_gallus WASHUC 2.60 was applied for repeats search in assembled genome and performed search and assembly of high copy number repeats in unassembled reads of SRR867748 short reads datasets. For cytogenetic analysis conventional methods of fluorescent in situ hybridization was used for previously cloned W specific satellites and specifically designed directly labeled synthetic oligonucleotide DNA probe was used for bioinformatically identified repetitive sequence. Hybridization was performed with mitotic chicken chromosomes and manually isolated giant meiotic lampbrush chromosomes from growing oocytes. A novel chicken W specific satellite (GGAAA)_n which is not co-localizes with any previously described classes of W specific repeats was identified and mapped with high resolution. In the composition of autosomes this repeat units was found as a part of upstream regions of gonad specific protein coding sequences. These findings may contribute to the understanding of the role of tandem repeats in sex specific differentiation regulation in birds and sex chromosome evolution. This work was supported by the postdoctoral fellowships from St. Petersburg State University (#1.50.1623.2013 and #1.50.1043.2014), the grant for Leading Scientific Schools (#3553.2014.4) and the grant from Russian foundation for basic researches (#15-04-05684). The equipment and software of Research Resource Center "Chromas" and Theodosius Dobzhansky Center for Genome Bioinformatics of Saint Petersburg State University were used.

Keywords : birds, lampbrush chromosomes, sex chromosomes, tandem repeats

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