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Meiotic Pairing and Gene Expression Disturbance in Germ Cells from an Infertile Boar with a Balanced Reciprocal Autosome-Autosome Translocation

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Abstract

Individuals carrying balanced constitutional reciprocal translocations generally have a normal phenotype, but often present reproductive disorders. The aim of our research was to analyze the meiotic process in an oligoasthenoteratospermic boar carrying an asymmetric reciprocal translocation involving chromosomes 1 and 14. Chromosome pairing analysis allowed us to identify different multivalent structures (quadrivalent and trivalent plus univalent). Some of them were characterized by the presence of unpaired autosomal segments with a histone γ H2AX accumulation and an association with the XY body. Gene expression was studied using RNA-DNA-FISH on spermatocytes, and microarray-based testis transcriptome analysis. Our results showed a decrease of gene expression for chromosomes 1 and 14. In addition, a disturbance of the meiotic sex chromosome inactivation (MSCI) process was observed. Indeed, the expression of some X-chromosome genes, normally repressed at this stage of meiosis, was detected. We hypothesized that the meiotic arrest and the reproductive failure observed in this boar might be due to the silencing of crucial autosomal genes and the reactivation of X chromosome genes.