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JOURNAL ARTICLE

DNA-flow cytometry of defined stages of rat seminiferous epithelium: effects of 3 Gy of high-energy X-irradiation

M. Kangasniemi, T. Veromaa, J. Kulmala, A. Kaipia, M. Parvinen and J. Toppari

Department of Anatomy, University of Turku, Finland.

Testes of adult Sprague-Dawley rats were irradiated locally by 3 Gy of 4 MeV X-rays produced by a linear accelerator. This type and dose of radiation gives an even distribution through the testis and selectively kills the proliferating spermatogonia. The seminiferous tubular cells were quantified by DNA flow cytometry at defined stages of the epithelial cycle at 7, 17, 22, 38, 52, and 80 days after irradiation. The flow cytometric technique was modified by using frozen instead of fresh samples. Freezing did not alter cell numbers when compared with fresh samples. At 7 days post-irradiation no significant changes were observed in any cell population by DNA flow cytometry, whereas histological analysis revealed a reduction in intermediate and type B spermatogonia. At 17 and 22 days post-irradiation, the number of cells at meiotic prophase (4C) was decreased, particularly in stages II-V of the cycle. In stages VII-VIII, cell numbers were 40 and 31%, and in stages IX-XIII, 24 and 43% of that in non-irradiated controls at 17 and 22 days, respectively. At 38 days after irradiation, both 4C and 1C (haploid) cells were decreased in number. The 4C cells were reduced to 24, 17, and 13% of that in non-irradiated controls in stages II-V, VII-VIII, and IX-XIII of the cycle, respectively. The corresponding numbers of 1C cells were 5, 17, and 4%. At 52 days after irradiation, 1C cells had declined to 38 and 19% of control values in stages II-V and IX-XIII, respectively. In stages II-V, 1C' cells (haploid cells with condensed nuclei) declined to 28% of controls at 52 days. The present data provide a quantitative basis for the use of X-ray-irradiated rat testes as a model system in experiments pursuing interactions between Sertoli cells and spermatogenic cells.

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