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JOURNAL ARTICLE

Stage-specific apoptosis in the rat seminiferous epithelium: quantification of irradiation effects

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The effects of 3 Gy local X-irradiation on the adult rat testis were studied together with exact determination of the radiation dose distribution in the testis. Seminiferous tubule segments were isolated 8-66 hours postirradiation (p.i.), squashed between a microscope slide and a coverslip, and the exact stage of the seminiferous epithelial cycle was identified under a phase-contrast microscope. The squash preparations were subjected to in situ end labeling (ISEL) for visualization and quantification of apoptotic cells. In controls, the highest numbers of apoptotic cells were scored in stages XII-XIV and I. In situ end-label staining of cells was observed in A3-A4 spermatogonia, spermatocytes at zygotene, pachytene, and meiotic division phases, as well as in early spermatids. In irradiated testes, from 8 hours p.i. and onward, intermediate- and B-type spermatogonia were sensitive at stages II-VI. At 42 hours, in stage I, elevated numbers of degenerating spermatocytes were seen. Most of them had not undergone meiotic divisions at stage XIV and showed an apoptotic type of degeneration at stage I. At the time of irradiation, the cells were in stage XIII, suggesting that diakinetic spermatocytes are particularly sensitive to irradiation. Also, preleptotene-zygotene spermatocytes in stages VII-XII were sensitive to irradiation. Apoptotic-type of cell degeneration was confirmed by living cell squash preparations, electron microscopy, and DNA electrophoresis. In conclusion, irradiation may provide a useful model system for studying apoptosis, and its control in spermatogonia and meiotically dividing cells.

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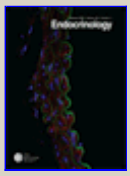

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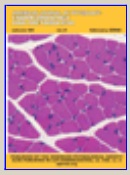

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