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TITLE

A comparative study on the frequencies of radiation-induced
chromosome aberrations in the somatic and germ cells in mouse
and monkey

FINAL REPORT FOR THE PERIOD

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AUTHOR(S)

F.H. Sobels

INSTITUTE

University of Leiden
Department of Radiation Genetics and
Chemical Mutagenesis
Leiden
The Netherlands

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A comparative study on the frequencies of radiation-induced chromosome aberrations in somatic and germ cells of mouse and rhesus monkey.

During the contract period mainly two systems were used for studying the relationship between radiation induced chromosome aberration frequencies in somatic and germ cells. The first system consists of reciprocal translocation induction in bone-marrow cells of mice compared to reciprocal translocation induction in spermatogonia (scored in descending spermatocytes) of the same mice. From the shapes of the dose-response curves for induced aberrations in both cell types (0-100-200-300-400-500 and 600 R X-rays) and from the effect of changes in the exposure-rate (130-1.92-0.0287 R/Min.) of a 400 R γ -ray exposure on the two cell types it could be concluded that mitotically dividing germ cells respond in an entirely similar way to radiation as mitotic dividing germ cells (see also previous reports). However, modifying factors after irradiation, such as clonal proliferation or selective elimination of aberration-carrying cells can cause great differences in absolute aberration frequencies.

With respect to the second system we tried to do the same type of study in the rhesus monkey as in the mouse but it appeared that rhesus monkey bone-marrow cells were very unsuitable for obtaining induced reciprocal-translocations. Consequently, in the rhesus monkey stimulated peripheral blood lymphocytes were studied instead of bone-marrow cells. After exposures of 100, 200 and 300 R X-rays the frequencies of induced dicentric chromosomes were recorded and compared to the frequencies of induced reciprocal translocations in spermatogonia. Parallel experiments with human peripheral blood were also performed. From these experiments it could be concluded that:

- a. The absolute frequencies of chromosome aberrations in somatic and germ cells of the rhesus monkey are low in comparison to most other mammalian species.
- b. The ratio between dicentric frequencies and reciprocal translocation frequencies was, at 100 R and 200 R, significantly different from the 4 to 1 ratio found by Brewen *et al.* in the mouse and the Chinese hamster and the 2 to 1 ratio found in the marmoset and man.
- c. Although the numbers of 'effective chromosome arms' in man and rhesus monkey are similar (81 vs 83), the rhesus monkey showed at all doses a lower rate of induction of dicentrics in blood lymphocytes than man, reaching statistical significance at the 300 R level.

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P.P.W. van Buul

List of publications

VAN BUUL, P.P.W. Comparison of frequencies of radiation-induced stable chromosomal aberrations in somatic and germ tissues of the mouse. *Mutation Res.* 20, 369-376 (1973).

VAN BUUL, P.P.W. Comparison of frequencies of radiation induced chromosome aberrations in somatic and germ cells of the rhesus monkey. (Abstract) *Int. J. Radiat. Biol.* 27, 589-593 (1975).

VAN BUUL, P.P.W. and R.A.Chr. ROOS. The effect of exposure rate on translocation induction in somatic and germ cells of the mouse (*Mus Musculus*). *Mutation Res.* (1976) (in press).

VAN BUUL, P.P.W. Exposure-rate effect on the induction of chromosome aberrations in spermatogonia and bone-marrow cells of the mouse. Joint meeting of the Dutch and Belgium Radiobiological Societies, 9-19 Jan. 1976 Liège. (Abstract to be published in *Int. J. Radiat. Biol.* 1976).

VAN BUUL, P.P.W. A comparative study of the frequencies of radiation induced chromosome aberrations in somatic and germ cells of the rhesus monkey (*Macaca mulatta*). *Mutation Res.* (1976) (in press).

VAN BUUL, P.P.W. Dose-response relationship for radiation induced translocations in somatic and germ cells of mice. *Mutation Res.* (1976) (in press).

