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Letter to the Editor

Sister Chromatid Exchanges (SCE) in Two Murine Strains*

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MOUSE studies have shown that genetic, hormonal, viral and other environmental factors are all involved and interrelated in the genesis of breast cancer [1]. Inbred strains of mice employed in mammary cancer research fall into two categories: (1) susceptible strains with a high incidence of cancer such as the C3H, RIII, GR and A; and (2) resistant strains with low incidence of cancer in breeding female, such as BALB/c, C57BL and CBA [2]. It was clearly demonstrated that the genesis of mammary carcinomas depends on a non-genetic (extrachromosomal) factor which is transmitted from mother to progeny [3] and identified as Bittner virus. In the C3H strain there is also an endogenous virus whose genetic information is incorporated in the cell genome [4–6].

The role of viruses in causing chromosome aberrations and their relationship with tumors has been reviewed [7]. Many viruses have been shown to be oncogenic; it is therefore important to specify the genetic damage that they may cause [8].

The recently developed BUDR Giemsa method [9] for the detection of sister chromatid exchanges (SCE) has proved to be useful in the evaluation of chromosomal damage.

In this paper we report the frequency of sister chromatid exchanges in two inbred murine strains, C3H and BALB/c, with high and low incidence of mammary tumors.

Ten embryos (12 days gestation each) were studied in the C3H and BALB/c strains. Each embryo was cultured in MEM medium, supplemented with 15% fetal bovine serum. When the monolayer was completed, the first subculture was carried out and 5 μg/ml 5-bromodeoxyuridine (BUDR) was added. The cultures were kept in complete darkness for 48 hr, after which they were killed by adding colchicine to a concentration of 0.1 μg/ml for 3 hr.

After this the hypotonicity was carried out with KCl 0.55% for 30 min. The fixation was performed with acetic acid–methyl alcohol (1:3) for 60 min. The slides were prepared by the air-dry technique and processed according to the Perry and Wolff technique [9] to detect the SCE. The SCE frequency was determined from the reading of 20 metaphases per specimen. Only cells with good differential and distinct chromosome morphology were analyzed.

The statistical evaluation was carried out by analysis of variance [10].

In this study 384 metaphases from two mice inbred strains were analyzed. In the BALB/c strain the frequency of SCE per metaphase was obtained from the reading of 184 metaphases of 10 specimens, showing a rate of $\bar{x} \pm$ S.E. $= 8.7 \pm 0.4$. The remaining 200 metaphases allowed to show a rate of $\bar{x} \pm$ S.E. $= 12.6 \pm 1$ for the 10 mice of the C3H strain (Table 1).

Table 1. Distribution of sister chromatid exchanges in BALB/c and C3H cells

Strain	No. of metaphases scored	Mean No. ± S.E. of exchanges per cell
BALB/c	184	8.7 ± 0.4
C3H	200	12.6 ± 1

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The distribution of frequency of SCE in both strains showed a rate of 4–9 interchanges, corresponding to the 65% of the BALB/c cells analyzed, while in the C3H strain 60% of cells with a frequency of 9–15 interchanges per metaphase was observed.

The statistical evaluation comparing both strains showed significant differences ($P < 0.005$). This significant increase in the frequency of SCE in the C3H strain although no chromosome abnormalities were detected might be explained by the integration of the endogenous virus genome that would increase the frequency in SCE.

Recent works indicate that viruses such as SV40 [11] and Rauscher virus [8] may cause an increase in SCE in cultured cells. The mechanism by which the viruses induce SCE is still unknown, but it appears that the virus might be in some way associated with an increase in SCE.

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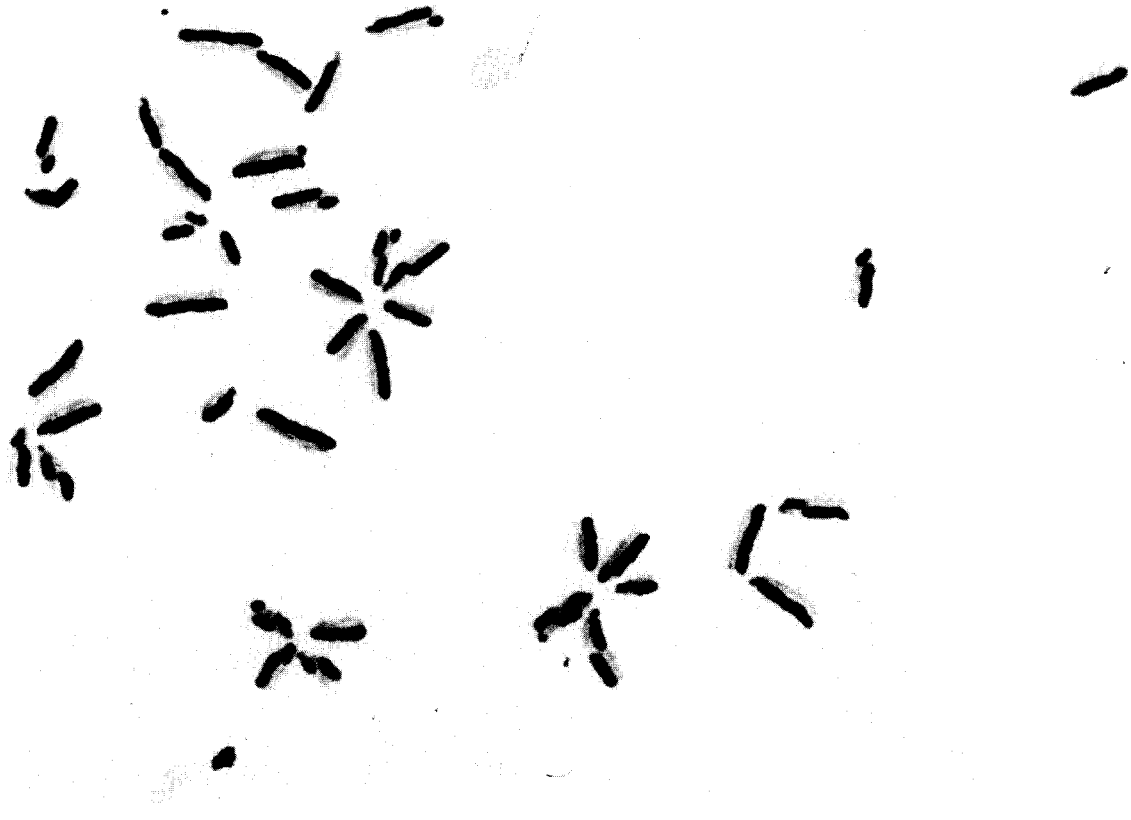

Fig. 1. *Metaphase from a C3H cell with* 22 *sister chromatid exchanges.*