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# SISTER-CHROMATID EXCHANGE IN 4 HUMAN RACES

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## SUMMARY

The frequencies of sister-chromatid exchanges (SCE) were investigated in lymphocytes in 32 normal adult individuals of both sexes with no interracial familial backgrounds from Caucasian, American black, oriental and native American races. There was no significant difference in the average frequency of SCEs in the 4 races.

Sister-chromatid exchanges (SCE) are the result of apparent exchanges of DNA between chromatids and may be visualized in metaphase chromosomes after growth of cells for 2 cycles in bromodeoxyuridine and appropriate staining procedures. The frequency of SCEs is thought to be a sensitive indicator of genetic instability and early chromosome changes (Perry and Evans, 1975; Solomon and Bobrow, 1975; Vogel and Bauknecht, 1976; Carrano, 1978).

The analysis of SCEs is useful in the detection of genetic damage in humans exposed to various mutagens and carcinogens (Allen and Latt, 1976; Craig-Holmes and Shaw, 1977; Butler et al., 1980). In order to conduct SCE experiments with human subjects in which individuals of different races are included, the SCE frequency of normal individuals of the human races should be considered. Herein, SCE data are presented in 32 normal individuals from 4 human races to examine differences, if any, in the SCE frequencies between races.

## Materials and methods

32 healthy adult individuals of both sexes with no history of significant illnesses, medication or X-ray exposure within the past 6 months were sampled from Caucasian, American black, oriental, and native American subjects. The subjects selected were not related and denied genetic impurity or interracial familial backgrounds. All subjects were living in the United States and selected from the American population. The oriental group consisted of individuals from Chinese or Japanese descent. The native Americans were members of the Nebraska Omaha tribe. The subjects had not been knowingly exposed to environmental or occupational hazards.

Peripheral blood (0.4 ml) was added to 8 ml of Basal medium–Eagles supplemented with 20% fetal calf serum, penicillin (40 U/ml), streptomycin (40 μg/ml), phytohemagglutinin, and 20 μM 5-bromodeoxyuridine. The cultures were incubated at 37°C in the dark. Colcemid was added after 69 h of incubation and the cells harvested at 72 h then treated with hypotonic saline (0.075 M KCl) and fixed in 3:1 methanol–acetic acid. Air-dried slides were stored in the dark for 1 day then stained with the fluorescence plus Giemsa (FPG)

technique (Perry and Wolff, 1974). The slides were analyzed for SCEs at the microscope. The SCE frequency for each subject was based on the number of SCEs in a minimum of 20 cells.

## Results and discussion

The use of sister-chromatid exchanges (SCE) to determine genetic instability has increased in recent years. With expanded SCE experimentation in human disorders, the emphasis on SCE standardization between laboratories becomes apparent. To aid in accomplishing SCE standardization, factors which are known to influence the SCE frequency should be controlled (Speit, 1980). To keep other extraneous factors at a minimum and to analyze the effect of a particular factor, such as race on the number of SCEs, a careful medical history and screening program should be followed.

In order to conduct SCE experiments with human subjects in which individuals of different races are included the racial difference, if any, in the SCE frequency should be known. Therefore, an attempt to examine the SCE data of individuals in 4 human races was made.

The average SCE frequency and standard deviation from the 4 groups were: Caucasian, 8.1 ± SD 0.48; American black, 8.2 + SD 0.84; oriental, 8.7 + SD 0.65; native American, 8.6 ± SD 0.57 (Table 1). The Kruskal–Wallis one-way analysis of variance test by ranks (Kruskal and Wallis, 1952) was applied to the SCE data ($H = 5.01$, 3 degrees of freedom, $0.1 < p < 0.2$ from chi-square distribution). The value obtained was not considered significant, therefore no significant difference in the SCE frequency between races could be detected by the method described. Also there was no correlation between the age or sex of the individual and the SCE frequency.

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**TABLE 1**

SISTER-CHROMATID EXCHANGE (SCE) DATA IN CAUCASIANS, AMERICAN BLACKS, ORIENTALS AND NATIVE AMERICANS

| Group | Number of subjects | Age | | Sex | Average number of SCE per cell per individual | | Total number of cells analyzed |
|---|---|---|---|---|---|---|---|
| | | Mean | Range | M/F | Groups mean ± SD | Range | |
| Caucasian | 9 | 32.0 | 25–58 | 5/4 | 8.1 ± 0.48 | 7.2–9.0 | 215 |
| American Black | 8 | 25.2 | 21–36 | 3/5 | 8.2 ± 0.84 | 7.4–9.8 | 185 |
| Oriental | 8 | 27.9 | 23–31 | 4/4 | 8.7 ± 0.65 | 8.1–9.8 | 190 |
| Native American | 7 | 32.4 | 24–41 | 4/3 | 8.6 ± 0.57 | 7.8–9.5 | 174 |