A Sex Chromatin Study of Chinese School Children

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The present study is an attempt to investigate the frequency of sex chromatin abnormality among Chinese children based on samples derived from school children and to compare the results with those reported by others. The main purpose of the study is to establish a base line against which to assess the frequency of sex chromatin abnormality among the Chinese psychiatric population, which will be reported subsequently (see Tsuang, 1972 for a preliminary report).

Subjects

In Taiwan, primary and secondary education is compulsory and universal. There are no special schools for mentally subnormal children. The enrolment of children into the schools irrespective of the intellectual performances is strictly enforced by the government. Therefore, the frequency of sex chromatin subnormality found in the schools would represent that of the general population of the same age.

All 4339 children (2157 males and 2182 females) from a primary school located in the central area of Taipei, the capital city of Taiwan, were examined. Their ages ranged from 7 to 13. Buccal smears were taken from each child, and were stained by lacto-aceto-orcein (Sanderson and Stewart, 1961). One hundred 'suitable nuclei' (Maclean, 1966) of each smear were analysed and only those cells with marginal chromatin bodies on the nuclear membrane were regarded as sex chromatin positive cells. The number of cells with chromatin bodies on each smear was expressed as the percentage of chromatin positive cells.

Results

Males. Five of 2157 boys were chromatin positive (2-3/1000). They all had cells containing single sex chromatin bodies. Chromosome studies of peripheral blood lymphocytes by a modification of the technique of Moorhead et al (1960) were done on these 5 boys. Three boys whose percentage of chromatin positive cells were 1% (2% on repeat), 1% (3%), and 1% (1%) had, however, an abnormal chromosome constitution of 46,XY. Two boys whose percentages were 23% (18%) and 20% (22%) showed an abnormal constitution of 47,XXY.

Thus, 0-9 per 1000 (2/2157) boys were shown to have sex chromosome abnormalities.

Females. Out of the total 2182 girls, one had two chromatin bodies (0-5/1000). Her chromosome constitution was 47,XXX. All except this girl had single sex chromatin bodies. No abnormalities in size and shape of chromatin bodies were detected. The percentage of chromatin positive cells ranged widely from 2 to 64% with a mean of 18-20 and SD of 6-32. Chromosome studies of those 10 girls whose percentage of chromatin positive cells were less than 6% showed all of them had a normal chromosome constitution of 46,XX.

Some details of those 3 children (2 boys and 1 girl) with abnormal sex chromosomes are summarized in the following tables (Tables I and Table II).

Discussion

Males. The present study showed that 2:3 per 1000 (5/2157) boys were chromatin positive. Howe-
ever, out of the total 5 chromatin positive boys, 3 with very low percentage of chromatin positive cells ranging from 1–3% were shown to have a normal chromosome constitution in the peripheral blood lymphocytes. There is a possibility that these 3 might be mosaics. Unless chromosome studies of tissues other than peripheral blood can be performed, the possibility of mosaicism cannot be ruled out. When the present study was done, facilities for examining chromosomes of fibroblasts were not available in this laboratory.

In their original study of smears from the oral mucosa of 140 persons (81 males and 59 females), Moore and Barr (1955) report that the characteristic female sex chromatin is not found in males. Maclean, Harnden, and Court Brown (1961) state that sex chromatin bodies are never found in normal males in their study of 3000 male and 3000 female newborn babies. If the same criterion is applied to the present study, the figure of 2·3/1000 is very close to those reported by various other authors (Table III).

Those sex chromatin bodies found in males with very low percentages of chromatin positive cells may be nonspecific chromocentres arising from any chromosomes and partial products of artefacts of fixation (Moore and Barr, 1954; Barr, 1966). If this view is taken and the 3 boys with 1–3% of chromatin positive cells are excluded, the frequency of 0·9 per 1000 (2/2157) of the present study is the same as 0·9 (5/5314) found by N. Maclean who studied children attending school for the first time at 5 years of age during the years 1963–64 and 1964–65 (Court Brown, 1969). Other figures which are close to these are 0·7 (1/1156 liveborn males) from Kaluga (Bochkov et al., 1967) and 0·6 (1/11563 liveborn males) from Basle (Wieslil, 1962).

**Females.** The frequency of double chromatin
bodies was shown to be 0.5 per 1000 (1/2182). Table IV shows that similar figures are reported by others from Madison (Marden, Smith, and McDonald, 1964) and Leningrad (Davidenkova, Ponomarenko, and Verlinskaiia, 1966). Although the figure of the present study is lower than 0.8 reported from Edinburgh (Court Brown, 1969) and Melbourne (Balkie et al., 1966), it is not statistically different from them.

No girls were chromatin negative because of their considerable rarity and probable high infantile mortality rate (Court Brown, 1969). No mosaics were found even among those girls with lower percent of chromatin positive cells. As mentioned above, chromosome studies of tissues other than the peripheral blood are needed.

The percentage of chromatin positive cells in the present study were very low with a mean of 18.20 ± 6.32 and a wide range of 2–64%. In their original study of buccal smears, Moore and Barr (1955) report that 40–60% of cells have chromatin bodies at the periphery of nuclei. Maclean (1966) indicates that the variation of the percentages in different studies may be due to the selection of cells and therefore each laboratory must establish its own standards.

In addition to methodological factors, ethnic or geographical variations might, in the authors' opinion, influence the percentage of chromatin positive cells in females. In previous studies from Taiwan the mean percentage has varied from 12.7% in normal newborns (Lai, 1968), 13.4% in schizophrenics (Tsuang, 1972), to 24.9% in normals (Huang and Yang, 1964).

The two XXY boys and the XXX girl found in the present study showed no obvious physical abnormalities. The girl had a normal physical development with secondary sexual characteristics. She was mentally retarded with a relatively low verbal IQ, and appeared isolated with stereotyped thinking and inaccurate perception. The 2 boys were shy, quiet, and passive. One was mentally below average and the other was retarded with inaccurate perception and loose association of thinking. On the whole, these findings are compatible with those described by others (Court Brown, 1969; Kidd, Knox, and Month, 1963; Nielsen, 1969). It will be worthwhile following them up after puberty when further physical and mental changes, if any, will become obvious.

**Summary**

Buccal smears were examined of all 4339 children
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(ages 7–13) from a primary school in Taiwan. Five of 2157 boys (2:3/1000) were sex chromatin positive. Chromosome studies of the peripheral blood lymphocytes were done in these 5 boys. Two (0-9/1000) were 47,XXY. Three whose percentages of chromatin positive cells were very low (1–3%) had a normal chromosome constitution. Unless chromosome analyses of tissues other than peripheral blood are done, a possibility of mosaicism cannot be ruled out. One of 2182 girls (0-5/1000) had double sex chromatin bodies and her chromosome constitution was 47,XXX. No other chromosome abnormalities were found. The data were comparable with those reported by others. The mean percentages of chromatin positive cells in females were found to be very low (18:20 ± 6:32). Aside from various factors influencing the percentages of chromatin positive cells, there might be ethnic or geographical variations. Some clinical and laboratory data of the two XXY and one XXX found in the study were presented. They are compatible with those reported by others. It is worthwhile following them up after puberty when further physical and mental changes, if any, become obvious.

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