et al.[2] Twenty suitably spread metaphases were counted. Nineteen had 46 chromosomes, one had 47 chromosomes. Detailed analysis of six metaphase plates revealed no abnormalities.

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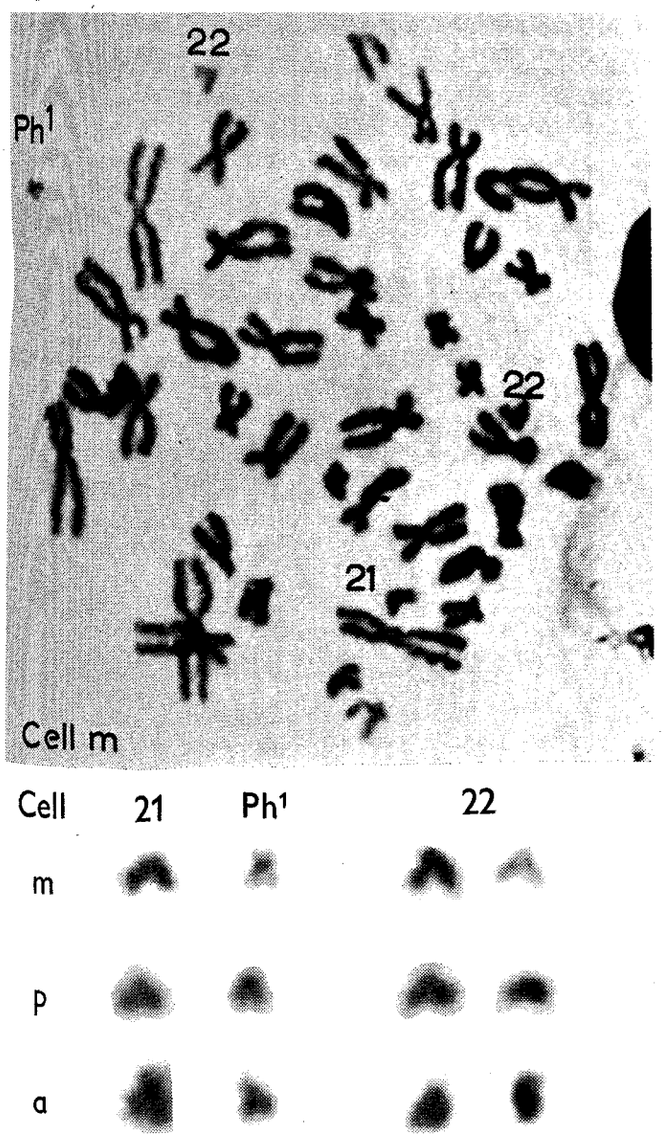
CHROMOSOME PATTERN IN MYELOID LEUKÆMIA IN A CHILD

SIR,—Through the kindness of Dr. Beryl Corner, we have had the opportunity of investigating the chromosome pattern in a female child, aged $2^1/_2$ years, whose illness had been diagnosed as myeloid leukæmia.



Cell in mitotic metaphase and (below) the 4 small acrocentric chromosomes from 3 of the modal cells.

We are indebted to Dr. Alan Raper for the original report on the blood:

"White cells 90,000, polymorphs 35,000 per c.mm. 12% of the nucleated cells were blasts; the rest of the maturation in the granulocyte series was normal. Platelets 1·28 million, large. Fairly numerous megakaryocyte nuclei were present in the blood. Normoblasts 2,000 per c.mm. Hæmoglobin 52%."

Starting on March 1, 1961, she was given prednisolone 20 mg. b.d. and 6-mercaptopurine 25 mg. daily for a fortnight.

We received a sample of venous blood on May 24, 1961, from which the leucocytes were cultured by the method of Moorhead et al.[1] The chromosome spreads were prepared by air-drying and stained with May-Giemsa after secondary fixation in methyl alcohol. Of fourteen cells selected for counting twelve contained 46 chromosomes, one 44, and one 62. An abnormally small acrocentric autosome, one of either pairs 21 or 22 in the Denver classification, was found in eight of the modal cells (see figure).

Morphologically this chromosome closely resembles the Ph[1] chromosome described as a constant abnormality in the majority of adult cases of chronic myeloid leukæmia.[2 3] In seven cases of acute childhood leukæmia, Hungerford and Nowell [4] found no consistent chromosome abnormality, although one case was granulocytic. If the small abnormal acrocentric chromosome in the case described above is, in fact, the Ph[1] chromosome, this seems to be the first time it has been reported in myeloid leukæmia in a child. The youngest case of chronic myeloid leukæmia containing the Ph[1] chromosome which we can trace is a girl aged 14, recorded by Tough et al.[5]

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MATERNAL RADIATION AND MONGOLISM

SIR,—Uchida and Curtis [6] report a possible association between ~~mong~~olism and a history of maternal radiation.

Between 1948 and 1954 the potential genetic effects of the Hiroshima and Nagasaki atomic bombs were closely studied. 76,626 infants were examined shortly after birth, and of these, 21,788 had a second examination about nine months later.[7–9] Though, for a variety of reasons, mongolism might have escaped detection in the single examination shortly after birth, at the second examination, under much more favourable circumstances and after nine months' observation, a much greater diagnostic accuracy could be achieved. We shall base our remarks on the results of that second examination.

The accompanying table relates mongolism to maternal-radiation history (*fathers not exposed*). The term "exposed" means merely "present in the city at the time of the bombings", and so covers a range of doses from zero to the maximum compatible with survival. The problem of assigning individual doses has so far proved insurmountable. However, from further data [2] on the exposures in Hiroshima and Nagasaki, and the subclassification of the exposed (see section 4.9 and table 8.14), we can estimate *very roughly* a mean whole-body dose among the exposed mothers of 36 rep, with the true mean apt to lie between 26 and 45. Introducing a factor of 0·8 for the (probably maximum) attenuation of the gonad dose due to the superimposed tissues, the estimated mean gonad dose becomes 29 rep. The accompanying table shows no significant association of mongolism with maternal exposure; moreover, the deviation, such as it is, is actually in the direction of an excess among the unexposed. As reported previously, the exposed mothers are on

THE OCCURRENCE OF MONGOLISM IN RELATION TO MATERNAL RADIATION HISTORY (FATHERS NOT EXPOSED)

	Mother		
	Not exposed	Exposed	Total
Normal child	9440	5579	15,019
Mongolian idiot ..	12	3	15
	9452	5582	15,034
Frequency per 1000 ..	1·27	0·54	1·00

2. Moorhead, P. S., Nowell, P. C., Mellman, W. J., Battips, D. M., Hungerford, D. A. *Exp. cell. Res.* 1960, **20**, 613.
1. Moorhead, P. S., Nowell, P. C., Mellman, W. J., Battips, D. M., Hungerford, D. A. *Exp. cell. Res.* 1960, **20**, 613.
2. Nowell, P. C., Hungerford, D. A. *Science*, 1960, **132**, 1497.
3. Baikie, A. G., Buckton, K. E., Harnden, D. G., Jacobs, P. A., Tough, I. M. *Nature, Lond.* 1960, **188**, 1165.
4. Hungerford, D. A., Nowell, P. C. *Proc. Amer. Ass. Canc. Res.* 1961, **3**, 236.
5. Tough, I. M., Court Brown, W. M., Baikie, A. G., Buckton, K. E., Harnden, D. G., Jacobs, P. A., King, M. J., McBride, J. A. *Lancet*, 1961, i, 411.
6. Uchida, I., Curtis, E. *Lancet*, 1961, ii, 848.
7. Neel, J. V., Schull, W. J. N.A.S.-N.R.C. publication no. 461, 1956.
8. Schull, W. J., Neel, J. V. *Science*, 1958, **128**, 343.
9. Schull, W. J., Neel, J. V. *Amer. J. publ. Hlth*, 1959, **49**, 1621.

the average approximately half a year older than the unexposed, a circumstance that should if anything bias the observations towards an excess among the children of the exposed.

Uchida and Curtis [6] estimate that the risk of mongolism in the children of " treated " mothers is approximately four times as great as in the children of control mothers, with the 95% confidence limits for this estimate being 2 and 9. By " treated " they refer to " four or more exposures or fluoroscopy or both ". An " exposure " is defined as an X-ray examination of the gastrointestinal tract, urogenital tract, lumbar spine, or film of abdomen during pregnancy, and apparently refers to the *series* of films that accompanies such an examination. The task of approximating the exposure to radiation is complicated by the fact that in their table II, which describes " areas irradiated in mothers with four or more exposures or fluoroscopy ", they account for only 23 " exposures " in the mothers of mongols, whereas the number should be approximately 92 plus allowance for fluoroscopic examinations.

Uchida and Curtis do not try to calculate the radiation doses received by the mothers of the infants included in this study. Some attempt to do so, approximate though it has to be, seems necessary if we are to compare the " resolving power " of the observations here recorded with those previously presented. From the data summarised by Lindell and Dobson [10] we can, *very approximately*, estimate the gonad dose per " exposure " as a maximum of 2r, or the maximum total gonad dose per " treated " mother, assuming a (generous) average of 6 " treatments", as 12r. Uchida and Curtis refer to the observations of Patterson et al.[11] on the production of non-disjunction by X rays in drosophila: it is noteworthy that in an experiment which confounds the effects of X rays and " aging " of the eggs, a dose of 795r produced a sixfold increase in non-disjunction. The discrepancy between this rate and that to be inferred from the Uchida-Curtis data is intensified if one assumes that in non-disjunction, as in mutation production, spacing the total dose decreases the apparent effect of the radiation.

It cannot be overemphasised how rough both of these dosage estimates are, but the uncertainties are scarcely great enough to obscure the general conclusion of a greater exposure to radiation in the Hiroshima-Nagasaki material, even despite the rather unusual radiation histories of several of the mothers of affected children in the Uchida-Curtis series. If, now, exposure had increased by a factor of 4 the risk of mongolism, then the expected number of children with mongolism among the 5582 children of the exposed mothers in our table, assuming equality of dosage with the " treated " mothers of Uchida and Curtis (a very conservative assumption), would be $12/9452 \times 4 \times 5582$, or 28·3. The difference between observation and expectation is highly significant.

The roughness of these dose calculations will be apparent to every radiobiologist. It seems doubtful, however, whether future refinements in the evaluation of gonad dosage in either series can possibly obscure the fact of a major discrepancy between the observations of Uchida and Curtis and of ourselves.

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"MONGOLIAN BLUE SPOTS"

SIR,—Dr. Wallis (Jan. 20) refers to these patches of pigmentation. These " spots " or areas usually on the lumbar or sacral regions are also found in Canadian Indians and Eskimos. We call them " Mongolian tache " and have presumed that they indicate racial affinity and origin of our aboriginal races.

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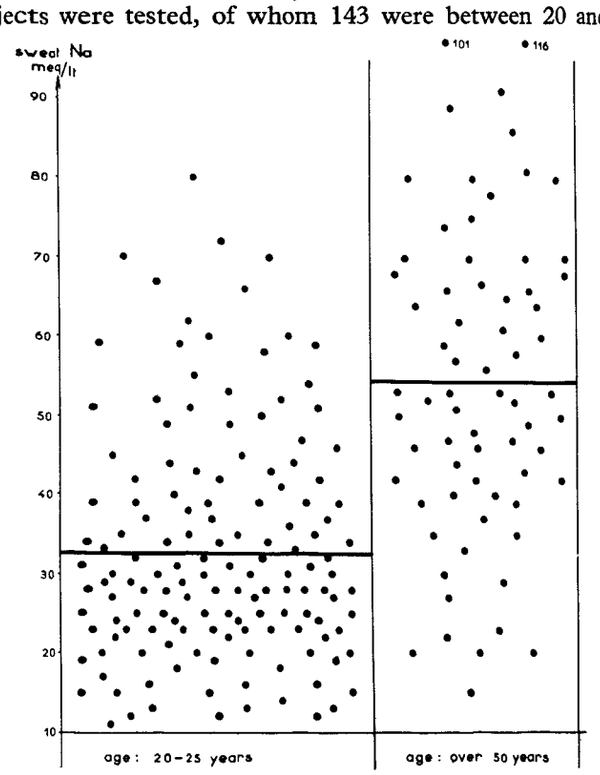
10. Lindell, B., Dobson, R. L. W.H.O. Public Health Paper no. 6, 1961.
11. Patterson, J. T., Brewster, W., Winchester, A. M. *J. Hered.* 1932, **23**, 325.

SWEAT SODIUM LEVELS

SIR,—We should like to emphasise the importance of Dr. McKendrick's article of Jan. 27. In children the sweat test is without doubt of great value in the diagnosis of cystic fibrosis of the pancreas, since the upper limit of the normal sodium level is well defined between 70 and 80 mEq. per litre. On the other hand, physiological variations are very important in adults. Up to now most authors [1–3] who tried to find a relationship between adult chronic bronchitis, diabetes, and muscoviscidosis (*formes frustes*) compared their results either with standards in children or with sodium levels of normal young adults, though their patients were generally over 50. For the first time, Dr. McKendrick draws attention to the change in concentration of the sweat sodium during life.

Our own results are similar:

In a three months' survey, 212 normal male and female subjects were tested, of whom 143 were between 20 and 25



Sweat sodium levels in normal adults, showing mean values.

years and 69 over 50. A family history of diabetes or chronic bronchitis was present in 33% of the first group and 27% of the second. Localised sweating was induced by iontophoresis with 0·2% pilocarpine nitrate at 2 milliamps.[4] Sodium was measured by a micromethod with a flame photometer. The mean values obtained increase from 32·6 mEq. per litre at 20–25 years to 54·3 mEq. per litre over 50 (see figure). With the same technique the average level in 6 children with fibrocystic disease, aged 4 months to 15 years, was 120 mEq. per litre.

This physiological variation with age must therefore be kept in mind in the diagnosis of *formes frustes* of mucoviscidosis in adults.

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SIR,—The article on this subject by Dr. McKendrick, correlating sweat sodium levels with different age-groups, is of great interest.

The range of " normal " sodium levels in sweat is indeed large when random samples are compared. It should be

1. Bohn, H., Koch, E., Rick, W., von Kügelgen, B., Grützner, A., Gumbel, W., Jesch, W. *Dtsch. med. Wschr.* 1961, **86**, 1384.
2. Koch, E., Lehmann, W., Rick, W., Gumbel, W. *ibid.* p. 1433.
3. Bernard, E., Israel, L., Debris, M. *Pr. méd.* 1960, **68**, 1691.
4. Gibson, L. E., Cooke, R. E. *Pediatrics*, 1959, **23**, 545.