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EDITORIAL : VAN DIE REDAKSIE

KEEPING UP WITH CHROMOSOMES

Knowledge of human chromosome abnormalities is at present growing in a logarithmic fashion. The earlier work on 'squash' preparations was recently summarized in this *Journal*.[1] Since then a symposium has been held on this subject at King's College Hospital, London, which has been discussed in *The Lancet*.[2]

Important earlier findings included, first, the definite demonstration that the human diploid chromosome number was 46. Three aberrations were described—in mongolism there was a single extra small autosome, making the chromosome number 47; in chromatin-positive Klinefelter's syndrome there were also 47 chromosomes, but here the additional member was an extra X sex chromosome; in chromatin-negative Turner's syndrome (gonadal dysgenesis) one sex chromosome has been lost, there being only one X and no Y, so that the total number is only 45.

In our Editorial[1] uncertainty was expressed regarding what the chromosome pattern in the syndrome of testicular feminization would turn out to be. This is an example of apparent 'sex reversal', or extreme male pseudo-hermaphroditism in which the patient appears to have external female characteristics, with good breast development and female external genitalia. She possesses no uterus, but has two intra-abdominal testes, which secrete oestrogen rather than androgen. Her nuclear pattern is male (i.e. chromatin-negative). This interesting condition is inherited as a sex-linked recessive characteristic (like haemophilia), or possibly a sex-limited autosomal dominant. Jacobs and her associates[3] have now reported the chromosome counts in four cases of this syndrome, and in all of them the normal number of 46, with normal sex chromosomes, were found. It is interesting to note that one of these patients was colour blind, and the similarly affected 'sister' of another was also colour blind. It would appear then, that this syndrome, unlike Turner's and Klinefelter's, is a true example of 'sex reversal'.

Similar normal-chromosome findings were reported at the symposium mentioned above in cases of anencephaly, epiloia, the Laurence-Moon-Biedl syndrome, neurofibromatosis, arachnodactyly, osteogenesis imperfecta, and achondroplasia.

Jacobs and her co-workers[4] have described a new anomaly which they term 'super female'. The patient had 47 chromosomes in the nuclei of cells cultured from skin and bone marrow, including three X chromosomes. Such a state had been previously described in drosophila, in which organism a primary non-disjunction of the X chromosome occurs with a frequency of about 1 in 2,000, so that ova-bearing XX, when fertilized by spermatozoa-carrying X, give rise to XXX 'super females'. Many of these do not live. In Jacobs' patient the only abnormality appeared to be moderate hypoplasia of the ovaries and genital organs, with oligomenorrhœa, poor breast development and an early menopause. It was remarkable that in both buccal mucosa and polymorph leucocytes occasional double sex-chromatin bodies were observed, and so it may be that such a finding on ordinary nuclear smears will act as a pointer to the discovery of further 'super females'. It is perhaps sad that this alluring term has been used to label a female who is really rather inferior as judged by the popular 'vital statistics' conception of the phrase in this 'Miss World' age.

Baikie *et al.*[5] described some remarkable findings in acute leukaemia. No chromosome abnormalities were found by them in chronic leukaemia or in myelomatosis. Four cases of acute leukaemia were abnormal. In one the chromosome number ranged from 46 to 50. In two others the number was constantly 46, but abnormal chromosomes were seen in a large proportion of cells, suggesting that a previous translocation had given rise to an aberrant cell line. In the fourth case, the bone-marrow cells had a model chromosome number of 48, as well as abnormalities of chromosomal form. After several months of treatment with steroids the modal chromosome number changed to 47, while terminally there appeared a race of cells in an irradiated area of bone with a modal number of 49. In a fifth case of acute leukaemia, no gross abnormalities were found.

Baikie *et al.*[5] consider the implications of their findings. They suggest three possibilities: First, the chromosome changes might arise simply as epiphenomena in a grossly disordered bone marrow. Secondly, the visible chromosomal changes may include the fundamental change which has rendered the cells neoplastic. Thirdly, the visible changes may be more or less remote consequences of subtle alterations in genetic constitution of the affected cells. Baikie and his associates prefer the latter possibility, by which acute leukaemia arises as a change in the genetic material in the cell—a change which can apparently be induced by radiation in certain people.

Finally Lejeune[2] has reported the case of a child who was dwarfed, with low intelligence and multiple malformations of spine and sella turcica. Only 45 chromosomes were present, one of the smaller chromosomes having apparently become attached by translocation to one of the medium sized ones.

Ford[2] summed up the present situation. Major anomalies of large chromosomes (including the X) are usually lethal, and so will not be expected to be found in clinical material. Most of the conditions so far described involve trisomy, that is, the addition of an extra chromosome to a pair. In Turner's syndrome we find the loss of one of the smallest and probably the least important chromosome, the Y. There may be many more examples of irregular lesions such as the translocation found by Lejeune, but it is likely that these are unique events—accidents of some sort leading to multiple congenital anomalies of a type which may not be reproducible. Clearly it would be advantageous if all cases of a typical multiple congenital abnormality could be examined for their chromosome material.

1. Editorial (1959): S. Afr. Med. J., 33, 743.
2. Editorial (1959): Lancet, 2, 448.
3. Jacobs, P. A. *et al.* (1959): *Ibid.*, 2, 591.
4. *Idem* (1959): *Ibid.*, 2, 423.
5. Baikie, A. G. *et al.* (1959): *Ibid.*, 2, 425.

ONDERSOEK NA STRALINGSGEVAAR

Dit is algemeen bekend dat röntgenstrale sowel as strale wat afkomstig is van radio-aktiewe materiaal soos radium, positiewe gebruike het, maar dat hulle ook gevare inhou.

Dit is nie ons doel om hier die positiewe en terapeutiese gebruike van bestraling van die aard waarna ons nou net verwys het, te bespreek nie. Dié gebruike is te goed bekend. Dat die gevare van bestraling egter nie altyd genoegsaam beklemtoon word nie, val nie te betwyfel nie. Trouens, hierdie gevare word glad te dikwels óf onderskat óf veronagsaam. Die toenemende gebruik (op die gebied van die handel en die geneeskunde) van ioniserende strale, wat die moontlikhede inhou om menslike weefsel te beskadig, stel byvoorbeeld groot getalle van die bevolking bloot aan 'n gevaarlike peil van bestraling wat selfs jare later tot onherstelbare skade kan lei.

Gebrekkige beenvorming is 'n voorbeeld van sulke skade wat deur bestraling kan ontstaan. Kromosoomveranderinge sou ook, om 'n verdere spesifieke voorbeeld te noem, kon ontstaan as gevolg van subtiele veranderinge van die genetiese samestelling van aangetaste selle. Baikie en sy medewerkers[1] reken byvoorbeeld dat leukemie op hierdie grondslag kan ontstaan, naamlik, as gevolg van veranderinge van die genetiese materiaal van selle—veranderinge wat skynbaar deur bestraling in die gevalle van sekere persone veroorsaak kan word.

Om hierdie hele saak grondig te ondersoek, is daar nou 'n kommissie van vyf deskundiges deur die Regering aangewys. Die opdrag van hierdie kommissie sluit in om ondersoek in te stel en verslag te doen oor: (1) Die gevaar vir die gesondheid van persone wat blootgestel word aan röntgen- of enige ander ioniserende strale wat nog nie deur wetgewing beheer word nie en die gebruike en misbruike van sodanige straling; (2) die hoeveelheid bestraling waaraan individue in verskillende hoedanighede blootgestel word; (3) die verwante gesondheids- en ander gevare waaraan pasiënte, personeel, en die breë publiek blootgestel word; (4) die onderskeie toelaatbare bestralingsdosisse; en (5) enige aanverwante aangeleentheid wat deur die kommissie nodig geag mag word.

Verder moet daar deur die kommissie aanbevelings gedoen word oor die vraag of die gebruik van alle soorte röntgenstrale aan statutêre beheer onderwerp moet word met inagneming van die bestaande wetgewing in verband met die beheer van radio-aktiewe isotope. Die kommissie moet hom ook uitspreek oor die soort wetgewing wat hy in die verband nodig ag. Ook moet aanbevelings gedoen word oor die moontlike opleiding van persone in die gebruik van röntgenstrale en oor navorsing wat op die gebied nodig geag mag word.

Die kommissie sal bestaan uit prof. S. F. Oosthuizen, President van die Suid-Afrikaanse Geneeskundige- en Tandheelkundige Raad, as voorsitter, tesame met die volgende lede: Prof. P. J. Kloppers, prof. E. M. Hamman, dr. M. Weinbren, en mnr. P. D. Hartzer.

Die aanstelling van hierdie kommissie is nodig sowel as tydig, en die resultate van hul ondersoek word met belangstelling afgewag.

1. Baikie, A. G. *et al.* (1959): Lancet, **2**, 425.

The Secretary of the Medical Association of South Africa, the Editor of the South African Medical Journal, *and the other members of the head office staff of the Association, extend hearty Christmas greetings to all members of the Association and all readers and supporters of the* Journal, *and wish them a happy and prosperous New Year*

Die Sekretaris van die Mediese Vereniging van Suid-Afrika, die Redakteur van die Suid-Afrikaanse Tydskrif vir Geneeskunde, *en die ander lede van die hoofkantoorpersoneel van die Vereniging, stuur hartlike Kersgroete aan alle lede van die Vereniging, en alle lesers en ondersteuners van die* Tydskrif, *en wens hulle 'n gelukkige en geseënde Nuwe Jaar toe.*