EDITOR'S PAGE

HUMAN GENETICS

Human genetics has been described as the next big step in medicine. Since the report by TJIO and LEVAN[1] in Sweden in 1956 that the chromosome number in man was 46 and not 48 as was previously thought, rapid, and at times feverish progress has been made in this area of human knowledge. The developments which have taken place during the past five years have not only been astonishing, but have elucidated certain aspects of human biologic behaviour about which there was not much previous knowledge.

Simultaneous with the increase in this knowledge, publications began to appear on the subject. The advances made in the new discipline were so rapid, especially in the area of chromosome genetics, that an element of confusion began to invade the minds of the members of the medical profession. BERNARD LENNOX[2] aptly describes it in *The Lancet* in May, 1961 in the following words: "In this subject of human chromosome anomalies, we are all beginners. It is so new that even the old hands were new themselves two years ago. It has travelled so fast that it has shot past the average reader before he has had time to notice that it has begun to move, and he begins already to be frightened of it. This is a pity: the chromosomes are still essentially a very simple matter"; and again elsewhere in the same article, he says: "Let us take the bull by the horns and begin with one of those exasperating pictures with which *The Lancet* has been so freely littered recently and which are said to look like masses of squashed spiders". He was referring to the microphotograph of a normal mitosis in metaphase, stained to reveal the 23 pairs of chromosomes within the nucleus of the human cell.

In numerous medical centres throughout the American and European continents to-day, human genetics has an important place. Not only have rapid advances been made in chromosome genetics, but population genetics, psychological and behavioural genetics, neurological genetics, genetic counselling, biochemical and clinical genetics are all steadily advancing.

So far as the pediatrician is concerned, some knowledge of human genetics is essential, since several congenital and familial disorders in children are genetic in origin. During the past five years certain diseases have been shown to have a genetic etiology. One such example is galactosaemia, a condition which occurs in siblings, with a high incidence in the children of consanguinous marriages, affecting both sexes equally, and is absent in the parents. All these findings suggested that galactosaemia might be transmitted by a simple autosomal recessive gene; and in fact, studies on galactose 1-phosphate uridyl transferase—the enzyme which is deficient in galactosaemia—revealed in carriers of the condition *i.e.*, the heterozygotes, enzyme activity lower than that found in normal controls[3].

In mongolism, to cite another example, the incidence of which at birth varies from 1 : 636 to 1 : 776 in different countries[4], and which is not infrequently seen in India, two different chromosome anomalies have been detected. Though WAARDENBURG[4], as far back as 1932, was of the opinion that a specific

1. J. H. TJIO and A. LEVAN—The chromosome number of man. *Hereditas*, **42** : 1, 1956.
2. BERNARD LENNOX—Chromosomes for beginners. *Lancet*, May 13, 1047, 1961.
3. A. HOLZEL—Galactosaemia. *Brit. Med. Bull.*, **17** : 213, 1961.
4. L. S. PENROSE—Mongolism. *Brit. Med. Bull.*, **17** : 184, 1961.

chromo-somal aberration was responsible for mongolism, it was not until 1959 that LEJEUNE and his associates demonstrated that there was an extra chromosome in mongols, the additional member being a small acrocentric chromosome belonging to No. 21 (Denver classification). These mongols have a total of 47 chromosomes instead of the normal 46, and this trisomy of chromosome 21 has since been found consistently in clinically typical mongols. The explanation put forward for the presence of this anomaly is non-disjunction of the chromosome pair 21 at meiotic division during gametogenesis resulting in the production of a gamete with 24 instead of 23 chromosomes. In cases of familial mongolism, however, POLANI and his associates[5] have found on chromosomal analysis a total of 46 chromosomes, but an abnormal karyotype. In the chromosome group 13-15, which consists of the large acrocentrics, one of the pairs is replaced by a chromosome resembling the chromosomes of group 6-12 and the X chromosome. The authors conclude that the abnormal chromosome is the product of a reciprocal translocation between one of the chromosomes of group 13-15 and a chromosome 21. In effect this combination of chromosomes provides the patient with three chromosomes in group 21, the same number as the trisomic mongol described above, possesses. The familial type of mongolism is of particular importance since it may be transmitted from one generation to the other through a translocation " carrier ". It is in such cases that genetic counselling is essential.

In children with congenital abnormalities an additional chromosome has also been found, identifiable with different chromosome groups.

It is thus obvious that chromosomal aberrations can produce physical and mental defects in children.

The fact that two international conferences of human genetics have already been held since 1956 in itself bears testimony to the rapid developments taking place in this new discipline. An account of the second conference appears elsewhere in the *Journal*.

From the considerations set out above, it is hardly necessary to emphasize the point that the time has come for the members of the profession as a whole to acquaint themselves with the basic principles of human genetics and the application of this discipline to clinical medicine and pediatrics.

A. C.

5. P. E. POLANI, T. E. BRIGGS, C. E. FORD, C. M. CLARKE and J. M. BERG —mongol girl with 46 chromosomes. *Lancet*, **1**: 721. 1961.