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HEREDITARY INFLUENCES IN RELATION TO THE PROBLEM OF CHILD ADOPTION*

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SYNOPSIS

There is little exact information on the hereditary influences which are of greatest interest from the social and educational points of view. Many genes are involved in the origins of socially significant traits and there are usually many steps in the causal chain linking gene to trait. The value of genetical judgements is thus limited; they cannot be substituted for facts ascertained about the physical and mental state of the child itself at the time of adoption. Information on the family occurrence of recessive autosomal or sex-linked traits may be used for predicting the likelihood of the onset of diseases later on in life. The knowledge that a rare dominant abnormality is present in a close relative is especially important if the close relative is the subject's own parent. But most genetical problems in adoption cases concern graded characters, and here prediction can only be very tentative. A definite degree of likeness obtains within families for graded characters, but the genetical divergence may be considerable, and it can be accentuated by environment.

Basic Principles

Every individual is the product of an interaction between inborn tendencies and environmental influences; each of his morphological characters or his reaction patterns can be examined with the aim of finding either the inborn or the acquired determining factors. Thus hereditary constitution is a part cause of every illness—physical or mental. The contribution of each hereditary factor, however, is not absolute but relative to the total configuration of circumstances of time and place. The importance of hereditary causes in a given trait is sometimes judged by the difficulty of modifying the trait by known techniques of medicine or education. This attitude merely serves to emphasize the lack of absolute standards. The history of human genetics is crowded with examples in which a disease

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formerly believed to be hereditary and incurable has become amenable to treatment. When this happens, as it has, for example, in the case of leprosy, tuberculosis, and diabetes, the contribution of heredity as a cause, though actually unaltered, becomes of far less medical importance than formerly.

Present State of Knowledge on Human Genetics

It is generally, though not universally, accepted that human beings, like animals studied experimentally, inherit from their parents physico-chemical entities present in the germ-cell nucleus, known as genes. The manifest characters or traits in any given individual are not themselves inherited but are the end results of causal chains in which genes are significant elements. There are other known modes of biological hereditary transmission due to particles outside the nucleus, but at present there is very little evidence pointing to such processes in man.

The family patterns observed in numerous human traits give strong indications of almost complete dependence upon single-gene transmission. Very often, however, the manifestation of a trait is not constant because there are many steps in the causal chain between the direct chemical action of the gene and the trait to which this activity contributes. From the point of view of the present discussion, the main interest rests upon the predictive value of genetical knowledge with respect to social adjustments. Unfortunately, with few exceptions, the characters of interest from the social and educational point of view are among those about which least genetics is accurately known. Many genes are involved in their origin and there are many steps in the causal chains linking gene to trait. These considerations will limit the predictive value of genetical judgements. It should also be noted that, even when genetical processes can be accurately identified, predictive precision is limited by the very nature of heredity, which implies a chance selection of half the parental genes for transmission to the offspring.

Knowledge of the chief processes believed at the present time to occur in human heredity can be summarized as follows.

(*a*) Exact information is available about the inheritance of certain blood antigens, ABO, MN, Rh., etc. The rule is that if a child has an antigen, then one parent must have this same antigen.

(*b*) There is reliable information concerning the family occurrence of recessive autosomal traits, especially those causing individual biochemical peculiarities. The knowledge is most complete in the cases of rare anomalies. Some of these are associated with serious diseases or defects. The rules are that parents are nearly always unaffected, and that the incidence of the trait is increased by inbreeding. Carriers of sex-linked traits, such as haemophilia, can, however, sometimes be identified.

(*c*) There is less precise but nevertheless good information about rare dominant traits : on the whole there is more variation in such conditions than in recessive traits. The rule is transmission from parent to half the offspring. Nevertheless the transmission often appears to take place irregularly and to skip individuals. Even in such cases, the chance of recurrence of the trait in a close relative is considerably increased as compared with the general population risk. Cases may arise de novo on account of fresh mutation.

(*d*) Concerning the genetics of common variations, graded characters for which the human species is polymorphic, there is little exact knowledge. Eye, hair, and skin colours, stature, length of life, personality, and mental ability are each dependent on more than one gene; the same applies to abnormal behaviour traits such as the common psychoses, epilepsy, psychoneuroses, and mental deficiency. The number of steps between the quality which is of social interest and any given gene is, at the present time, unascertainable, but is probably very large. It is important to note that the definitions of such characters as insanity, criminality, and mental defect are largely based upon social standards which vary enormously in different cultures.

The rule with graded traits is a direct consequence of the offspring's receiving half its complement of genes from each parent : it is that the average value for children is the same as that of their parents, though any given child can deviate far above or below the mean parental level. Most of these common polymorphic traits are greatly influenced by environment. Since a kind of average of parental environments is also usually transmitted to the children, it is very difficult to separate the genetical from the environmental sources of variation in these traits. Too much reliance should not be placed on the results of twin studies purporting to separate these two sets of causes. Monozygotic twins give useful but incomplete information because differences between such twin pairs only demonstrate the minimal possibilities of environmental modification. Furthermore, monozygotic-twin pairs are themselves anomalous, so that the effects of environment on them may be different from its effects on other members of the population. Inferences from twin studies must not therefore be interpreted rigidly.

Practical Significance of Knowledge of Heredity in Cases of Adoption

No amount of genetical speculation can substitute in any way for the first desideratum in cases of adoption—namely, as complete as possible physical and mental examinations of the child. The possibilities are limited by the age of the child. Up to the age of one or two years it will

be possible to exclude by physical examination many physical disabilities and all gross defects, mental or physical. I shall not deal here with the limitations of mental tests for prognosis at such an age. If the child is found to exhibit a defect, whether or not the defect is believed to have hereditary causation (e.g., spina bifida, corneal opacities, pyloric stenosis, diabetes, achondroplasia, hare-lip, haemophilia, Cooley's anaemia, phenylketonuria), the case can be judged on its own merits without reference to its antecedents. A knowledge of medical genetics will merely aid the physician in his search for obscure diseases, and he will make a particularly careful examination of the child's urine, blood, eyes, skin, etc. Many behaviour disorders and physical illnesses which are influenced by heredity to a noticeable degree do not have their onsets until later on in life, and it is usually concerning these that the geneticist is asked to give an opinion.

Referring back to the main branches of human genetical knowledge, it may be asked what practical assistance they are likely to give in relation to the problems of child adoption.

No special predictions about the child's future development can be made on the basis of (*a*) above.

The value of (*b*)—apart from such general information as may be useful to the child when it is grown up and wishes to marry—is limited to the possibility of predicting the likelihood of occurrences of recessive diseases with onset later on in life. This would be a special risk only if close relatives were known to have suffered from such conditions, but with rare recessive traits it would not often be a serious one. Diseases falling into this class include certain types of epilepsy, nervous degenerations and myopathies but not, as sometimes stated, schizophrenia.

The knowledge that a rare dominant abnormality (*c*) is present in a close relative is especially important if the close relative is the subject's own parent. The standard case is Huntington's chorea; its presence in a parent implies about a 50% chance that the child will develop the disease at about the age of 35 years. An unaffected parent younger than 35 years who has close relatives affected may also be a transmitter. Fortunately, Huntington's chorea is among the very few socially significant diseases inherited in this manner. It is sometimes stated that manic depressive insanity (cyclothymia) is due to a single dominant gene. This is very far from being established, and it does not follow that half the offspring of a cyclothymic parent will be similarly affected.

Most of the genetical problems which are presented in adoption cases come within category (*d*). How far will the character traits, abilities, or disabilities which the child may develop depend upon those existing in its close relatives ? To this question genetics give only the most tentative answers which agree fairly well with common-sense judgements. The rule for inheritance of graded characters implies (subject to a certain amount of variation) a definite degree of likeness between parent and child.

Thus very able parents are likely but not certain to produce children with abilities above the average, and moronic parents are likely but not certain to produce children of less than the average intelligence level. With personality traits, the chances of the child and parent being similar in different environments are somewhat less than for intelligence level. The stature of the child will resemble that of the parent, but common observation shows how great are the divergences in many families. Intelligence and character are more easily moulded than stature, and to this extent the genetical prognosis for such traits is less accurate. The same considerations also apply to the common psychiatric disorders.

It is sometimes urged that the significance of hereditary constitution is in the setting of limits to individual development. It is equally true that the limits are set only by the rigidity of environment. Adoption produces an experimental situation in which the effects of changed environment can be critically studied. If accurate records of adoption cases are made available for scientific study more frequently in the future than has been done in the past, in succeeding years the effects of environment upon physical and particularly upon mental traits may be better understood than they are today.

RÉSUMÉ

Chaque individu est la résultante de l'interaction entre les tendances qu'il a héritées et les conditions du milieu dans lequel il s'est développé. La constitution héréditaire intervient, pour une part dont il est le plus souvent impossible de prévoir l'importance, dans toute maladie physique ou mentale. L'histoire de la génétique humaine est riche d'exemples de maladies considérées autrefois comme héréditaires et incurables — la lèpre, la tuberculose, le diabète — qui sont aujourd'hui justiciables de traitement. Dans certains cas, le facteur « hérédité », bien qu'il n'ait pas varié en fait, a actuellement une importance médicale moins grande que par le passé.

L'auteur cherche à établir dans quelle mesure les données de la génétique humaine peuvent permettre de prévoir le comportement social d'un individu, particulièrement en vue de l'adoption. Or, à quelques exceptions près, les caractères intéressants au point de vue social sont ceux dont la transmission d'une génération à l'autre est la moins connue. Au reste, même si elle l'était, sa valeur de prévision serait limitée, par le fait que la moitié seulement du patrimoine héréditaire de chaque parent passe à la descendance.

Les connaissances les plus précises que l'on ait en génétique humaine concernent la transmission de certains antigènes sanguins (ABO, MN, Rh), l'hérédité récessive de certains caractères biochimiques autosomiques ou liés au sexe, la transmission de certains caractères dominants à la moitié de la descendance. D'autres caractères tels que la couleur des yeux, la durée de la vie, la capacité intellectuelle, les psychoses courantes, l'épilepsie, les psychonévroses et la déficience mentale sont liés à plus d'un gène et il y a de nombreuses étapes entre le gène et son expression phénotypique. Les connaissances dans ce domaine sont, de ce fait, beaucoup moins précises, et c'est surtout à propos de celles-là que des avis seront demandés lorsqu'il s'agit d'adoption. De plus, la définition de la folie, de la criminalité et de la déficience mentale dépend en grande partie des normes sociales, qui varient selon les formes de civilisation. Les informations que pourrait donner la

génétique, lorsqu'il s'agit de l'adoption d'un enfant, ne remplacent pas un examen physique et mental approfondi. Les renseignements que l'on obtiendra seront évidemment limités par l'âge. Jusqu'à un ou deux ans, l'examen révélera pourtant un grand nombre de défauts, hérités ou non, tels que l'hémophilie, le bec de lièvre, l'opacité de la cornée. Quant aux connaissances sur l'hérédité de l'enfant, elles pourraient surtout aider le médecin dans la recherche de maladies latentes, mais la plupart de celles-ci n'apparaissent que plus tard dans le développement.

Les réponses que la génétique peut faire aux questions qui lui sont posées sur l'avenir physique et mental d'un enfant, dans la première enfance, sont donc à peu près celles du bon sens. On dit volontiers que le rôle de l'hérédité se manifeste par les limites qu'elle impose au développement de l'individu. Il n'en est pas moins vrai que la rigidité d'un milieu peut avoir le même effet. L'adoption crée une situation expérimentale qui mériterait d'être étudiée scientifiquement. Si, à l'avenir, des recherches plus nombreuses étaient faites, il serait possible de serrer de plus près le problème de l'influence de l'ambiance sur le développement physique et mental de l'enfant.