Roentgen therapy is never safe prior to surgery except in chiasmal and pituitary adenomas, where diagnosis can be certain. Edema increase is possible. Medulloblastoma is the only additional type favorably influenced.

Angiomas call for no surgery. Radiation may help.

Hemangioblastomas, commonly cystic, call for removal of nodule and cyst.

Tumors of skull require extirpation.

**Etiology:**

The problem, like in all tumors, is still obscure. Gliomas do not metastasize, except those which involve the retina.

Heredity: Only in neurofibromata, cerebellar hemangioblastomas and hemangiomas do we find familial incidence.

Embryonic rests may cause:

(a) Chordomas

(b) Cholesteatomas from squamous epithelial cells

(c) Cranioopharyngiomas develop from epithelial rests near the pituitary gland

Trauma has been stressed but there is no proof that it causes brain tumor.

**More recent researches:**

Intraperitoneal injections of saline emulsions of gliomas of brain tissue into guinea pigs and intravenously in rabbits have been found to produce specific antibodies. (Weil and Liebert.) The same has been shown for glioblastomas.

**Irradiation:**

Medulloblastomas, ependymomas and astrocytomas have been shown to indicate radio sensitivity. (Frazier and Alpers.)

(Some illustrative cases were reported.)

Mr. Carlgren: I want to thank you, Dr. Michael.

Most of you have met the next speaker, Dr. Engberg, our Superintendent of the State School for Feeble-Minded. Dr. Engberg will speak to us on the subject, "Hereditary and the Transmission of Hereditary Characteristics." Dr. Engberg.

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**HEREDITY AND THE TRANSMISSION OF HEREDITARY CHARACTERISTICS**

E. J. Engberg, M.D.

By heredity is meant the transmission to individuals of certain physical or mental qualities in parents or more remote ancestors. Biological laws operate to make this possible.

An individual offspring results from the meeting of two "Gametes," the egg or female cell and the sperm or male cell, each carrying hereditary units which appear in the resulting offspring to determine the physical and mental characteristics except as they be influenced by good or bad environmental factors.

The term genotype is used to describe an individual's hereditary equipment which is the total sum of the hereditary units, called genes, received and this was determined irrevocably the moment the mature sperm and egg cells met. A personality, or individual, is, however, the product of two sets of forces, that of internal ones carried by the genes which he could not control and the external forces about him, or the environment which can be influenced to some degree.

It is important to know what conditions appearing to be inherited are truly so, as many earlier ideas were wrong. We now know that syphilis and tuberculosis are not inherited but are the results of direct infection. Congenital syphilis is the result of infection and not of inheritance even if the disease is evident at birth. The female type of plumage might readily be considered due to inheritance but is due instead to the effect of hormone activity as the removal of the ovaries results in the appearance of male plumage.

Environmental conditions may greatly influence inherited characteristics such as the harmful effects of x-ray radiations on eggs and larvae to be mentioned later and as demonstrated by the existence of certain plants which are either terrestrial or aquatic in form depending upon whether grown in dry or moist surroundings.

Harmful effects in the environment may impair the individual's efficiency and if sufficiently severe the result is called sickness while harmful effects resulting from internal inherited agencies result in defects. Medical investigations have tended to focus attention in the reaction of the individual to changes in the environment and not to recognize the important role played by inheritance in causing disabilities or freedom from them.

All living organisms consist of multitudes of minute microscopic cells consisting of two types of protoplasm or living matter, the cytoplasm and nucleus. All organisms with the sexual form of reproduction develop from a single cell called the zygote which results from the union of one mature sperm cell with a mature egg cell. The fertilized egg or zygote immediately divides in two cells and each of these into two others successively until the various parts of the completed offspring result. Each time before
the parents meet in the offspring, they do not blend to give some color
sisters, they yield equal numbers of white and black. The fundamental
white rabbits are bred together all their offspring are white, but the black
spring, and again in the ratio of three black and one white. Furthermore
only while the other two black by inbreeding give black and white off­
if bred together act differently as one of them by inbreeding gives black
these in a fixed ratio of three black and one white. Furthermore when these
first generation will be black. If we breed these black rabbits together,
and in each successive generation half of the chromosome material is that
furnished by the father and the other half by the mother.

It is surprising that before the knowledge of fertilization, the funda­
mental law of inheritance was disclosed by experiments conducted and
analyzed by Gregor Mendel, a monk and later abbot of a monastery in
Brünn, Austria. His work was published in 1866, but no one grasped its
tremendous importance and he died unknown in 1884. In 1900, however,
three botanists working independently rediscovered Mendel's work and
demonstrated that his basic principle of heredity was active through the
entire plant and animal kingdom and in man. The first human case was
reported in 1905 and was that of a hereditary shortening of fingers and
toes. Shortly before this the late Dr. W. A. Sutton while still a medical
student at Columbia University, demonstrated brilliantly the distribution
of chromosomes providing an adequate explanation for the marvelous
numerical consistency of the Mendel law of inheritance. Mendel worked with
various types of garden peas, but it is easier to cite an experiment in animal
life as described by Dr. Otto L. Mohr, Professor of Medicine, The Royal
Frederiks University, Oslo, in his book, "Heredity and Disease." If we
breed a pure bred black rabbit with a pure bred white, all the offspring in
the first generation will be black. If we breed these black rabbits together,
however, we obtain in the next generation both black and white rabbits and
these in a fixed ratio of three black and one white. Furthermore when these
white rabbits are bred together all their offspring are white, but the black
if bred together act differently as one of them by inbreeding gives black
only while the other two black by inbreeding give black and white off­
spring, and again in the ratio of three black and one white. Furthermore
if these two last described black are bred with their white brothers or
sisters, they yield equal numbers of white and black. The fundamental
principle demonstrated in this experiment is that though the genes from
the parents meet in the offspring, they do not blend to give some color
other than black or white and when the germ cells of the offspring ripen,
the parental genes will disjoin and segregate again without having any
modifying influence upon each other. The ratio in which the hereditary
traits reappear in later generations are a direct result of the segregation
of the corresponding genes.

The explanation for the color present in the various rabbits in the
experiment is that in the pure black there is in each member of one partic­
ular chromosome pair a gene for black coloring while in the pure white there
is in each member of the corresponding chromosome pair an antagonistic
gene causing the lack of color or albino state. The mature germ cell of the
hybrid black parents contains only one representative of the chromosome
pairs formed in the process of forming daughter germ cells or one black
gene in one and one white gene in the other. The resulting rabbits were all
black which is explained by the black gene being dominant rendering the
white or recessive gene inactive. The recessive gene can determine color
only when one recessive unit in fertilization combines with another mature
germ cell also carrying that particular recessive gene. Therefore, only pure
white bred with pure white results constantly in white offspring, as then
only recessive genes for color are present in each parent. The pure black
rabbit has two genes for color dominant for black while hybrid blacks have
one dominant and one recessive gene so in breeding them together there
results the combination of genes: black—black 25%, black—white 50%,
white—white 25%, or the first 25% carry the gene of color in two units
or are called purp, homozygous, for this gene and therefore are colored;
50% carry one unit for black and one for white but black being dominant
results in these offspring also being black; while 25% carry two units of
white resulting in white offspring. Accordingly, an individual may carry a
particular gene in double or single dose having received it from one or
both parents. The germ cells, however, are genetically pure and will have
a particular gene in single unit only. This discovery made by Mendel is
one of the greatest ever made in biology.

The same rule applies with reference to the color of the eyes in man.
Brown is dominant, blue is recessive and brown eyed or blue eyed indi­
viduals are born according to the Mendel formula for inheritance.

A simple dominant human case reported by Dr. Mohr, is that of finger
shortening effecting the second phalanx of the second finger and toes only
in which the dominant inheritance was traced back six generations to a
Norwegian woman born in 1764. Of her ten living and seven stillborn chil­
dren, the family record stated, "Every second child had, as she has herself,
a shortened crooked forefinger with one joint only."

Consanguineous marriages favor the appearance in offspring of reces­
sive traits and the defect may not have been apparent for several genera­
tions. The data on albinism is very extensive and illustrates this tendency
well as extensive studies have been made showing consanguinity in the pro­
duction of albinotic children in 50% of one series and 30% in another.
Theoretically such a mating will result in 25% being albinotic but in human
families with a small average number of children, many instances will show
no affected children in spite of the theoretical three and one ratio. Thus
February, 1937, is very interesting, and shows the social burden resulting from intermarriage between the families named as Callerquist and Larkeson. As a result of this union sixteen descendants have been in our institution. A study made by Miss Perkins of our Social Service Department of the B. Family shows the same result in social burden with the particularly interesting fact that as the result of the union of two feeble-minded, three were dead and mental state undetermined while the other four living children were inmates of our institution, as were the parents. Dr. A. R. T. Wylie kindly prepared a list for me to use in this presentation showing various instances of several members of the same family now in our institution. Of these families, in one instance we have eleven members and have had sixteen; another instance fourteen; five instances of four members still in institution and in one of these cases this consists of the father, mother and two children; another instance where we had four and still have two remaining, the other two having died; one instance of five of the same family; two instances of six of the same family; and one family of eight, including father, mother, two sons and four daughters.

The exact status of inheritance in the psychoses is not clear except that one considers, as do the English particularly, that the defect is one showing varying psycho-neurotic states such as psychoses, feeble-mindedness, epilepsy, migraine, etc. However, inheritance has been shown to be of a great deal of importance in the etiology of manic-depressive psychoses and schizophrenia. Of all the types of psychoses studied, the manic-depressive have shown the greatest frequency of hereditary taint and this predominantly with psychoses and more frequently in the direct line.

In the field of neurology many hereditary diseases are found among which may be mentioned different hereditary types of muscular dystrophy, Friedreich's Ataxia, Huntington's Chorea, which is typically dominant; Wilson's disease in which the brain and liver are involved and which defect is of recessive type; and Idiopathic Epilepsy which stands on a definite hereditary recessive basis. Quincke's angio-neurotic edema results in sudden swelling of the skin or mucous membranes. In one study it showed as a clear cut dominant defect in fifteen of twenty-eight affected family members.

Diabetes mellitus appears to be inherited as a recessive defect while diabetes insipidus is a clear cut type of dominant defect when inherited and is due presumably to hereditary dysfunction of the pituitary gland.

Alkaptonuria, a condition in which the urine turns black on exposure to air, is considered a clear cut recessive defect.

The four blood groups in man are inherited. This fact is employed in tests for paternity which cannot be used to pick out a particular man as the father of a given child but in one-third of the cases can exclude a particular man as being the father of the child. In two-thirds of the cases the blood group tests will not be of help.

The hereditary mechanism of tumor susceptibility has not been demonstrated with any degree of certainty. The somatic mutation theory has been advanced but at present is looked upon by careful students as a guess only.
In regard to criminalism, the inheritance studies based on identical twins as contrasted with fraternal twins have resulted in such observations that it appears that weakness of character may very well be due to an inherited defect.

Lethal genes may occur through mutation and this may be a sudden, spontaneous alteration in the character of a gene and this altered character being transmitted thereafter. In Sweden almost two-thirds of the Holstein-Friesian bulls are descended from two important great sires, Gallus and Prince Adolph. One of these bulls carried the gene which produces amputated calves while the other the gene for lethal congenital hairlessness. A similar situation is seen in horses in which a very undesirable gene was introduced into Japan from Ohio. This was through a Percheron stallion, "Superb," resulting in some of the offspring having atresia coli causing an obliteration of the large intestine at the pelvic flexure. This condition is reported to be widespread among the horses in Japan. Ichthyosis congenita in the human is explained on this same basis. This fact resulted in the following unusual occurrence reported by Dr. Mohr. A normal woman gave birth to five normal children by her husband. After his death she had three illegitimate children, all stillborn, having this condition of ichthyosis. Investigation showed that the father of these, though she did not know it, was her own half brother from the same father.

The results of x-ray treatment of eggs and larvae show some interesting and striking effects as mutation is increased tremendously and these changes frequently are like those of spontaneous origin. In some instances, new lethal genes have been reported in one out of every ten treated. No similar effect was observed through the effect of alcohol, nicotine, or lead or mercury.

Some of the most interesting studies in inheritance have been in the comparisons between various pathological conditions occurring in identical as compared with fraternal twins. Dr. D. E. McBroom and Dr. E. W. Brown a few years ago reported some very interesting observations in connection with a pair of identical twins in their institution suffering from epilepsy.

Reference was made earlier to some studies of this nature conducted in regard to criminalism. Another interesting example of recent observations made in the study of identical and fraternal twins is that susceptibility or resistance to certain diseases may be a transmitted hereditary quality. Thus Dr. Mohr reports in a series of thirty-seven identical twins both co-twins had developed tuberculosis in twenty-six pairs, only one of the twins in eleven pairs, while in sixty-nine pairs of fraternal twins tuberculosis was present in seventeen pairs and not present in fifty-two pairs. Among nine pairs where the twins were subject to the same amount of exposure and only one twin became affected, eight pairs were fraternal and one pair identical twins while conversely among seven pairs in which both members were affected without known exposure five pairs were identical and two fraternal twins. In some of these cases the clinical type was surprisingly similar, such as one in which two identical twin brothers within a four-year period each developed a surgical tuberculosis in the bone of the heel. It appears that some of the unexpected occurrences in tuberculosis are due to an inherited resistance or lack of it to tuberculosis bacilli.

In closing it is evident that much remains to be learned in regard to the effect of inheritance and the transmission of hereditary characters in man. It is apparent, however, that in all of the institutions represented here today are a great number of inmates requiring treatment and care as a primary result of defective germ plasm. The resulting social and economic burden is tremendous. The problem is vast and involved one but extremely fascinating in all its implications. We all should be alert to make and record possible helpful observations in material in our respective institutions as, in the future just as in the past, much of the research material is with us. It should be the ambition of society to render ultimately prevention as effective in this as in the other fields of medicine.

Mr. Carlgren: Thank you, Dr. Engberg.

We have with us this morning Dr. Sullivan, Senior Epidemiologist in the State Department of Health, who is going to speak to us on the subject of "Communicable Diseases and Their Control in State Institutions." Dr. Sullivan.

COMMUNICABLE DISEASES AND THEIR CONTROL IN STATE INSTITUTIONS

Dr. Sullivan

I have had the pleasure in the course of my comparatively brief tenure with the State Department of Health to become fairly well acquainted with the superintendents and staffs of a number of our State Institutions. It has been my sincere regret that I have not had the opportunity of meeting all, and what I believe more important, at more frequent intervals. For on all occasions I personally at least—and I feel quite sure the same is true of the Department as a whole—have come away with a better understanding of the problems of institutional management, particularly as they relate to the control of communicable diseases. I have on occasion thought that a periodic round table discussion preferably but not necessarily at regular intervals on communicable disease control problems participated in by the staffs of the State Institutions and the State Department of Health, would be helpful. There is much in this field that is controversial, that is subjected to changes in thought based on experience over a period of time, research, etc. Witness the changing ideas on that basic process of immunity for example, the value and the most efficient methods of immunization against a number of our important diseases. One especially interested in Epidemiology has to wade through a constant "outpouring" of literature to keep reasonably well informed. The State Department as a whole—have come away with a better understanding of the problems of institutional management, particularly as they relate to the control of communicable diseases. I have an occasion thought that a periodic round table discussion of this nature conducted in regard to criminalism. Another interesting example of recent observations made in the study of identical and fraternal twins is that susceptibility or resistance to certain diseases may be a transmitted hereditary quality. Thus Dr. Mohr reports in a series of thirty-seven identical twins both co-twins had developed tuberculosis in twenty-six pairs, only one of the twins in eleven pairs, while in sixty-nine pairs of fraternal twins tuberculosis was present in seventeen pairs and not present in fifty-two pairs. Among nine pairs where the twins were subject to the same amount of exposure and only one twin became affected, eight pairs were fraternal and one pair identical twins while conversely among seven pairs in which both members were affected without known exposure five pairs were identical and two fraternal twins. In some of these cases the clinical type was surprisingly similar, such as one in which two identical twin brothers within a four-year period each developed a surgical tuberculosis in the bone of the heel. It appears that some of the unexpected occurrences in tuberculosis are due to an inherited resistance or lack of it to tuberculosis bacilli.

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