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W. Berkeley Murray.
On

The Hereditary Transmission of Disease.

Whether we look upon the subject in a scientific point of view, or as bearing upon the practice of our art, the recognition of the causes of disease must always be of the greatest interest and importance.

Science may indeed be considered as the proper reference of Effects to Causes, and its whole progress in our age, proving as it has done the fallacious dogmas and erroneous conclusions of a bygone philosophy teaches us how much depends upon a proper knowledge of causation.

What a wide field was opened to the Natural Philosopher when the true nature of Electricity was first arrived at and scientific men began to perceive the boundless extent of its influences. The facts of a thousand years were filed up as it were in the obscurity of a vast store-closet, and only the key was wanting when Newton discovered the great law of Gravitation; the key was found, and the immense collection was at once
capable of arrangement and utilization.

The imperfect state in which the Science of Medicine necessarily lingers is owing chiefly to our ignorance concerning the Causes against which we have to contend, and the Science will progress in proportion as these Causes are better known.

In the practice of Medicine we can empirically cure some diseases without knowing their Cause; we have a few Specifics which act uniformly, but very different is our position with regard to the majority of the diseases which come under our notice. Empirically still, we are driven to tentative efforts, and but too often dare harms instead of the good we purposed.

In the midst of this uncertainty, it is a matter of common experience that by becoming cognizant of a cause we are enabled to effect results which before this knowledge we laboured in vain to produce. Our very diagnosis is often totally altered by such knowledge.

But it is in the study of the Prevention of disease that we become most fully aware of the necessity for a knowledge of its Cause, and the importance of this study is constantly becoming more evident.
The prophylactic Prevention is better than cure, in older than our science, but men not being able at all to compare Prevention have devoted their energies mainly to the accomplishment of Cure. We know somewhat more of cause than our fathers did, and we are gradually tending towards a prophylactic in preference to a curative process of treatment.

Did we but thoroughly know all the causes of disease, we should be one grand step towards the realization of the old myth of Analepsies.

It will be evident at once that such a direct predisposing cause as Hereditary Transmission must be a very important one, and the clear establishment of its truth or error, and the definition of its extent and bearings cannot fail of interest.

It would appear at first sight a matter of no great difficulty to determine the mere fact whether disease is capable of transmission from parent to child, but the more we examine the subject the less grounds do we find for positive opinion.

There are innumerable obstacles in our way, and especially do we find them when we attempt to apply the numerical methods of research.
To mention a few of them.

The want of exactitude in the great mass of published matter renders it unreliable in the extreme, and both falsification and fallacy come in to make the discrimination of truth more difficult.

The Author quotes as facts what his Authors merely advanced as theories, or draws deductions only warranted by the colouring which he affixes to facts.

Another falls into the common error of medical logic, Post hoc ergo propter hoc is but too oftne the whole basis upon which statements the truth or falsehood of which is of the greatest importance, are boldly made.

Moreover in the actual investigation there is often considerable difficulty in obtaining reliable information from patients as to the diseases of their parents or relatives.

Last of all but not least in the most carefully conducted observations we are met by the varying conditions under which our patient has been placed, and all of which might tend to produce the same results as the reception of a Hereditary tendency. And what stands in our way perhaps
more than anything else, the uncertainty which still exists as to the primary cause and mutual relations as to causation of diseases.

The subject indeed wants a fuller investigation than has yet been accorded to it, for it seems highly desirable that the belief should be either abandoned or thoroughly understood as well as recognized by the members of our Profession and the world in general.

Certainly, the general opinion is in favor of a belief in the hereditary transmission of disease and it is interesting to notice how the idea arose and how it has obtained such a hold upon the general mind.

Popular ideas are always founded upon a certain amount of observation, and arrived at by a process of deduction from the observed facts. The chief fallacies to which they are liable are, an insufficiency of facts, a wrong estimate of their frequency, and false or partial deduction from them.

In the present case we have not far to seek for the facts which have given rise to their belief. Instances where all or several of the children of a Phytopathological parent or parents have fallen victims to that disease, where a man can trace
back the line of his ancestors through many
generations and the family govt seems to
have come down with the family estate, or
where insanity has clung to a family as far
back as its records reach, whilst side by side,
there is a family which has been quite frequent
near to all.

For a popular notice it has wider and
better grounds perhaps than usual, and we
shall see presently that the fault in this
instance lies in the partial and first sight
nature of the deduction which has been drawn
from the facts, since it is not the diseases
themselves but the tendency to them which is
derived.

And this belief has been fostered by the mem-
bers of the profession as long as it has existed. If
we go back to the earliest authority on the divide
of medicine we find the great principle express-
ted in its fullest force:

"Semem viene genitale ex omnibus corporis
pastibus procedit, ex sanguis quidem sanguis, et
ex morbos ex morbos; igitur ex calvis
calvi segmentur, ex caecis caecii, et ex disa
tortis et plurinum distorte, eadem quae.
in aestris formis velut ratio" litter Hippocrates in the treatize De aere, aguo, et locis; and all medical writers from his times have ascerted the same in principle. It is only in the present day that the principles have been denied.

But now to examine what is meant by hereditary transmission.

Practically the fact that "like produces like" has never been nor can ever be denied. For each succeeding generation does but add to the weight of proof in its favor.

On this primary fact the whole of biological science is founded. "As men gather grapes of thorns or figs of thistles" and upon it rests the entire superstructure of all attempts at classification.

But still that some latitude of variation, the extent of which is not determined, is another great law in nature. We see constantly in operation a tendency to vary from the specific characters, and we see its results in the infinite differences which distinguish individuals. In two individuals are exactly alike.
By hereditary transmission man is meant the preservation and handing down through successive generations of definite characteristics only modified by a tendency tary within these characteristics in certain minor points.

But beyond the preservation of specific characters when the species is kept to itself we see that the union of two individuals of different species in cases where such union is fruitful produces an offspring which combines certain characteristics of each parent, and that in a degree and order which are uniform and definite.

Now if we apply this definition to the human race, what do we observe?

Firstly we see that mankind is divided into great races which differ markedly from each other in anatomical as well as other characters mental and intellectual.

Many have been the hypotheses as to the origin and cause of these differences, but the important fact stands out that as long as these races are kept only to themselves these characteristics remain distinct.
In the subdivisions of these great races into nationalities we find the same lines of demarcation, the same perfections of specific peculiarities.

The most superficial observer would notice the anatomical differences between the Greek or Italian and the Negro. In colour of the skin, the shape of the cranium, the texture and arrangement of the hair, the conformation of the nose and lips, and a closer examination displays uniform differences in the height, the comparative length of the upper and lower limbs, and the comparative length of some of the bones of the skeleton.

There is no less marked a difference in the mental qualities and intellectual powers.

The Jewish nation may be pointed out as one which through strict intermarriages has retained the most distinct national peculiarities.

The same rules too are observable in the human species in the mingling of the races which are seen to prevail among the lower animals.
that is, the children produced by the union of individuals of different races partake in some degree of the peculiarities of each of their parents.

But it is when we narrow down the circle of our observation to families and individuals that the descent of characteristics from parent to child becomes most marked.

Now a priori there is a probability that as the two primitive cells which by their junction afterwards develop into the embryo, are derived directly from the bodies of the parents, the bodily qualities of the parents will be reproduced in their offspring, and so we find the case to be.

That children resemble both or one especially of their parents in some feature and the like in the vast majority of cases is an universally admitted fact, and we need only recur to instances of daily life for examples.

This may be partly attributed to the influence of constant intercourse, and we see how great may be the effects of this influence.
in the so-frequently noticed resemblance between husband and wife, which can arise in no other way.

Moreover that vague resemblance appearing only under certain conditions which constitutes what is commonly called a family likeness is doubtless more to be attributed to a similarity of expression than to any actual similarity of feature.

But still there are cases which are not susceptible of this explanation. There have been instances where the most startling likeness has existed between a child and a parent whom he has never seen.

Another class of these cases is those in which there is a recurrence of some marked or exaggerated feature through several generations, as for instance the long upper lip of the Austrian imperial family, and the chin of the house of Brunswick.

Shakespeare put into Falstaff’s mouth a notice of a likeness of feature between the Prince of Wales afterwards Henry V and his father: “That there art my son...... chiefly a villainous nose of thine eye, and a foolish hanging of thy...”
"Neither life doth warrant me."

There are also instances even more decisive than those where some deformity has been transmitted. Haller mentions a web-footed family descended from a mother who was afflicted with that deformity, and Dr. Watson gives an account of a doubtful paternity being settled by the fact that the child having six fingers on each hand, the father having also possessed two extra fingers. Reaumer and Maupertuis also record cases of hereditary sex-differences, and many other instances of this kind have been handed down to us.

The more generally observed resemblances are in height, complexion, colour of hair, figure, and in the shape and form of the features.

More than this, it is noticeable that not only the changes themselves, but the period of life at which certain bodily changes take place, is very often the same in father and son. The son becomes bald, or gray, or stout, or loses his teeth or his memory at the same period of life as his father before time.

So much is evident then that the external characters of parents are capable of
Transmission to children, are the sensual and intellectual characteristics likewise transmissible?

This is extremely probable. In the first place, because we know that all function is dependent upon and modified by structure. Apart from theory, the minds of man works and manifests itself solely through the brain, and upon the condition of that organ therefore must depend the force with which, and the direction in which, the mind acts.

Again, when man reproduces his species, it is not mere matter that is given birth to, but a new being endowed with life and from the beginning stamped with its individuality and the properties it is to retain through life, so that it is impossible to separate the Physical from the Psychological powers.

And if we look at the lower classes of animals, we find in the same species the same instincts and the same tendencies, and instinct must be regarded as a modification or perhaps only a lower development of the intellect of man.
Indeed the instincts of Animals show us how inseparable are the Physical from the corporeal qualities. For instance Carnivorous animals will never naturally become Herbivores, and why? Then we examine we find sufficient reasons in the fact that the teeth of each class of animals are formed in the manner best suitable for their propensities.

It may be urged that imitation has a great deal to do with their similarity both of intellect and instinct, but it has been repeatedly shown that Animals when removed from any possibility of imitation and under the most unfavourable circumstances will manifest their special instincts, or endeavour to do so.

In Man we have no instances of the application of this crucial test, but on the other hand we have nothing to show that there would not be the same result, and the argument from Analogy has a good deal of weight.

Still it cannot be denied that the situation and conditions under which an
individuals is placed have much influence upon his mental development, and the consideration of this influence will help to explain many of the cases where the rule of transmission seems to be violated.

It is manifest that for the full development of hereditary tendencies in a child, the most favorable conditions would be has being placed under the same circumstances throughout life as his parent before him. Was this condition would be the one where the influences of instruction and training would come most powerfully into play, and they would be in the same side as the hereditary influences, so that in many cases it would be difficult to define the limit of each.

There are numerous causes at work which fully explain why this law of transmission is so imperfectly manifested. Among them may be mentioned. The principle of variation already alluded to, the influences of which we see so widely manifested in the Animal and Vegetable Kingdoms.

Intermarriages, which bring fresh elements
into play for both parents, have their share in the mental organization of the offspring.

The important influence of training when it acts in opposition to the hereditary tendencies and the imitative faculty which may also be employed in the opposite direction.

It would appear then that both bodily and mental qualities are capable of transmission from parent to child.

The explanation of these facts will probably be found in the consideration of the natural order of developmental changes and their modifications by hereditary tendencies. Then is a certain general order of vital phenomena which is in the broadest sense hereditary, being in fact the specific characteristics of the human being.

The varieties in particular individuals are chiefly in the methods and periods of the occurrence of the phenomena.

Now it has been already noticed that in the method and period of developmental changes there is observed a resemblance between children and their parents, and surely this resemblance is really derived and
It was no coincidence. For when the tissues were first formed they were endowed with life, and life involves the existence not only of certain ordinary processes of nutrition, growth, and function, but also of development. That is, the successive evolution of structure in accordance with laws, at present indeed little understood, but still doubtless in existence.

From what source, if not from the parent, can the stamp of the nature and order of such succession of development in the child proceed? However modified by extraneous conditions, it is impossible to conceive that the authors of its existence do not impress upon their offspring a nature which is the key to its whole existence, and that this various changes in development of the textures and organs of the body, and the progress of both mental and corporeal functions are not primarily and essentially dependent on that original nature.

If this be the case, and I believe that apart from theory, all experience and analogy, with the very nature of things in the world combine to prove it so, upon what grounds...
can it be denied that parents are capable
of transmitting to their children the germ
of certain diseases, distinguished by alter-
atations and modifications of that normal
state of nutrition or function proper to health?
It is perhaps impossible to define
perfect health: the infinite variations in
structure and function seen amongst men,
compatible with normal states of health,
der under the definition hopeless.

For it is necessary, the gradations
are so fine from the highest to the lowest state
of health, and all diseases acting so intimately
connected with natural changes, that it is
but a very short step from the transmission
of the methods of these natural changes to
that of the tendency to disease.

There are some distinguished authors
and especially of late years who are entirely
opposed to this doctrine of the transmission
of tendencies.

The famous author of the Pseudomonic
System writes that this theory of Hereditary
Taint is "a mere tale," and that upon the
ground that a man may not have the gout,
though his father was affected with it. He argues that because a person by care and
regulation may prevent or remove a disease, therefore there can be no Hereditary Talent.

But surely he makes sufficient admission when he writes "Nothing by Hered
ture", i.e., the supporters of Hereditary Talent, "further is as yet, than that a certain texture of
stamina is favourable to certain forms of disease", having just before written
"The stamina, or bulk of our simple solids
are so given us in our first conformation
that some persons are distinguished by a
good, others by a slender state of the whole man." He thus admits the parts of the whole matter.

But the arguments which are brought
against the transmission of tendency to abnor
dmal action from parent to child in the present
day are almost entirely founded upon statistics
and comparatively upon a very limited scale.

Now there is no method of reasoning
so apparently plausible, but is really worthless,
as that which founds its arguments on a
limited numerical investigation.

Fallible at the best, Statistics on a small
scale show nothing but that in the cases examined such and such was the case.

These instances may or may not have been exceptions to the general rules, and one gains no real knowledge of laws from them.

To deny a doctrine which has been upheld by the professors of our art from the earliest times, verified by the observation of every one, and the most probable from all we know of the operations of nature, on the authority of a few meagre tables of statistics, which after all may be as well used to uphold the doctrine, so little proof of any kind as they afford, seems most unphilosophical.

Does any one deny that likeness of feature is handed down from father to son, because in his own, or any other, or any fifty other families he may know, such likeness is not apparent?

To do so would be absurd, but not more so than to put one's faith to limited statistical tables on the transmission of disease.

Besides the limited extent of these statistics there are points in which they principally
on which they have been conducted are false, and calculated to mislead.

To take for instance, some of the statistics about tubercle, which perhaps has been the most worked at. The author takes disease of the subcutaneous lymphatic glands as his definition of tubercle and founds his statistics upon these. What can be more fallacious than such a table, as we know that enlarged glands is by no means the only way in which the symptoms of this disease begins itself?

Again others have contented themselves with examining the health of the parents only, omitting from notice the well known fact that a diathesis often is latent in one generation, and reappears in the next.

Such tables of statistics therefore can hardly be reckoned of much value.

There has doubtless also been much miscalculation caused by the different degrees in which different authors have looked upon disease as hereditary. Some have endeavored to prove that the disease itself was handed down from parent to child, and others because
This could not be proved to have denied the existence of hereditary traits altogether. But these difficulties vanish when the great law is once clearly understood: that it is not a disease, but a tendency to disease which is transmitted, and that this tendency requires conditions both for its origin and development, as well as its transmission, not less than the reproduction of the species.

Such a tendency has always been recognized from the earliest times. The term habit, meaning arrangement or constitution was employed by Galen to signify the general habit, and since this time various other meanings have been attached to the word, but it is now generally restricted to the sense of a predisposition to disease.

Various theories have been proposed for the explanation of these tendencies. Among the ancients they were supposed to be the result of the predominance of one or more of the four elements which they considered to form the human body, viz. the Hot and the Cold, the Dry and the Moist.
and some of the names which Galen applied, Sauvages and Petites for example, have been retained in the classifications of the present day.

Perhaps the most satisfactory theory of these tendencies is founded upon the condition of the tissues of the body in their wise. Every man may be considered as presenting in his different relations with the external worlds, certain predominances of one or more of the elementary systems and parts of his body, such as the cellular, vascular nervous, or muscular.

From these predominances the disposition or character of the man is derived, what is commonly called his constitution.

In the same way the condition of these elementary systems decides the character of this diathesis, that is which system or systems will be most prone to disease.

These tendencies require the exercise of exciting causes to bring them into action, and in consequence of this fact many persons with marked diathetic tendencies, by careful living will escape throughout life the diseases to which
they are doubtless especially liable.

Thus we can explain why it is that one individual upon exposure to weather will be attacked by a fit of gout, whilst another after the same exposure will manifest the symptoms of Pulmonary Phthisis.

So too under the influence of defective nutrition, their different diatheses being brought into action various individuals will suffer from various diseases.

I have shown that diatheses are for the most part hereditary, but it is quite certain that they may be acquired, and that too in addition to others already existing.

Now it is a great law that tendencies once begun continue to develop themselves, but when they are grafted upon each other they are mutually modified, are intersecting or changing the direction of the other, and this so commonly takes place, that it is rare not to meet with a purs and reminisc'd diathesis in adults.

There are some very interesting points in connection with the hereditary transmission of disease which may be noticed briefly.
The condition of health of the parents at the time of the conception seems to have great influence upon the degree of intensity with which their diatheses are transmitted to the child, and this will account for the varying vigour of successive children which may be seen in any family.

The age of the parents at the time of the conception of the child is important; the children of old men are more liable to the diseases which are the result of the tertiary diatheses.

The respective ages also of the parents appear to make some slight difference; the older parent exercises the greater influence upon the diathesis of the child.

It would seem that the maternal influence in the transmission of diathetic tendencies is more powerful generally than the paternal, for diseases more often descend in the female line in the male branches of a family, but these two last points require the confirmation of further observations.

It is very noticeable that when a diathesis is transmitted, the diseases which are
the result of its development, observe the
same periods and methods of coming on
as they did in the parent. To take an instance
we see members of a family group
healthy to a certain age and then they are
attacked by the symptoms of Phthisis Pulmona-
tis. If any pass beyond this age and are
free they will generally escape the disease
altogether, and this is noticed also of other
family diseases.

It remains now briefly to notice the
diseases which are hereditary, the different
modes in which they are prone to develop
themselves, and the chief exciting causes
which especially conduce to the development
of each.

First in importance comes the Struma
disease, the development of which consists
in affection, principally of the Glandular
system and mucous membranes; these affec-
tions are generally characterized by the depo-
sition of a peculiar substance named in the
tissues affected.

Phthisis, pulmonary and otherwise,
and all the forms of Scorpius arise from these.
These diseases are especially those of early youth, and the great exciting cause is defective nutrition, the defect being usually in the quantity or quality of the food or air.

The Affiactive diathesis predisposes to diseases of the serous and mucous membranes, connective tissues and the coats of arteries, and is distinguished by the abnormal formation of uric acid in the system, whence it has also been called the uric acid diathesis.

We see the development of these tendencies in Gout, in Uric Acid Calculi and Gravel, and in Attheros of the Arteries.

These diseases are usually those of middle and advanced life, early appearing before puberty, and their usual exciting cause is hypernutrition from over-eating.

The Syphilito-Sturmian diathesis seems to be a modification of the Sturmian, and is transmitted generally by syphilitic parents.

It shows itself in the forms of Tuberculosis, and in the affections of secondary Syphilis.

The Hæmorrhagic diathesis is sufficiently distinct and is a modification of the Affiactive.
It is characterized by a great susceptibility to hemorrhage from slight causes, or without any apparent external cause at all.

Hemorrhoids and bleeding from mucous surfaces generally are the form in which it manifests itself.

The nervous diathesis predisposes to diseases of the nervous system, and mental disorders, and is markedly hereditary.

We see its developments in Insanity in its various forms, epilepsy, catalepsy, and chorea, and idiocy.

The chief exciting cause is central excitement of any kind, frequently repeated and long continued, and the commonest form is excessive stimulation of the sexual organs.

Cancer has been reputed hereditary, and is perhaps a disease dependent on the strong diathesis occurring usually later in life than the other developments of that diathesis.

Phrenologic asthma is notoriously a transmitted disease, but our ignorance of its exact nature renders it a difficult disease to
refer dialectically. By sense, it has been placed among the results of the Articular diathesis.

There are one or two affections which have long supposed to be hereditary, because they sometimes appear in several members of the same family, such as cataract and congenital deafness and blindness. There can be but little doubt that in these cases, they are the result of diathetic changes which are probably hereditary.

Some authors have put many more constitutional diseases in the list of hereditary diseases, but the transmission in these cases is by no means so marked as in those which I have mentioned, and I have preferred to confine myself to these.

I have thus passed briefly in review the chief aspects of the question. Can disease be transmitted by the act of generation? and how does this take place? and the truth of the principle therein contained would seem to be undeniable.

It is deeply to be regretted that this subject has been so much neglected, as the superficial notice with which it has been passed,
over by most authors sufficiently attests.

The very brief mention of hereditary trait
by Dr. Brown in his "Elements of Medicine" is a
very good example of the amount of regard
attached to the subject by most of the writers
on the "Principles of Medicine."

It is a subject on which good statistics
would be of the utmost value, and it is a
pity that there we have are so incomplete.

Nevertheless it will be very difficult to compile
good statistical tables, but the advantages
obtained would render the labour required
well bestowed.

The essential points for valuable statistics
would be: 1st. The recognition of all the forms
of development of the diathesis which is under
examination, 2nd. The consideration of the
health of at least three generations, in conse-
quence of the alternate principle which diathes-
ises in some instances more, and 3rd. the
accurate investigations in known cases of the
effects of the mingling of diatheses, and how
each is modified by the addition of others.

With these points kept steadily in view
very valuable additions to our knowledge on the
subject of hereditary transmission might be obtained by means of statistics.

With regard to the bearing of marriages upon the transmissions of disease, it is hardly likely that the world in general will ever agree to regulate its choices by any considerations of the health of its descendants, but it is doubtless true that much of the constitutional disease which we see around us might be obviated by a due attendance to the tendencies of parents before marriage.

Breeding "in and in" as it is called by the cattle breeders, from the same stock always leads to a degeneration of the race, and a fortiori the consequences of the union of two parents with the same diathesis well marked in each cannot but be disastrous in the extreme.

It is with great difficulties that their imperfect composition is committed to its destination. It can pretend to nothing original, for there is but little opportunity in the student's life for original investigation on such a subject, but it has been the result
of much thought and a considerable deal of labour, and the writer humbly hopes that the imperfections of his work may meet with lenient consideration at the hands of his judges.

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