diagnose it in the absence of a history of severe attack and never for right iliac fossa pain only.

VISCEROPTOSIS.

The last subject I will mention is visceroptosis, and this will, perhaps, gently lead the way for Dr. Crichton Miller, for many of these cases have neurasthenic associations. By visceroptosis I mean a condition of undue mobility of the abdominal organs associated with pain and disordered action of the stomach and intestines. It is almost confined to women and is undoubtedly accompanied by, and probably the cause of, a great deal of invalidism.

A great stimulus has been given to the study of visceroptosis by the exact method of observation obtained by X ray examination after a barium meal, and the difficulty we had to contend with at first was that the normal was not properly known and many variations from the normal were considered pathological, that now, thanks to the researches of Dr. J. A. Ryle and others, we know to be compatible with perfect function. We have now given up believing that because a patient's hepatic flexure is normally below the level of the iliac crest in the standing position that any harm need result, and the normal haustrations of the transverse colon are no longer believed to be evidence of "catarrh." A stomach may be hypertonic or hypotonic and still be normal for that type of individual.

This change of opinion has necessarily been followed by a change in our practice, and operations for reefing and suspending the stomach are practically abandoned, and I hope that fixing the ascending colon, short circuiting the colon, and excision of the colon for stasis will soon be abandoned also. We must remember that all the abdominal organs should be capable in health of some degree of movement, and the fixation of, say, a kidney or the cæcum is contrary to the laws of nature and is, therefore, wrong in principle.

I believe we shall agree sooner or later that operations to fix what should be mobile organs are not successful, and that if operations must be done the indication is rather to free organs abnormally fixed, say, by adhesions, than to fix abnormally free.

(The opening remarks on the Mental Aspect of the question will be published in our next number.—ED.)

DURING October there was a goodly list of new subscribers to the POST-GRADUATE MEDICAL JOURNAL, including, in addition to those resident in Great Britain and Ireland, others practising in Canada, and in America, in India, South Africa, Egypt, New Zealand, and no fewer than eight in Burma. One applicant writes from Ontario: "I am glad to know of all the possibilities of post-graduate studies, as I was contemplating crossing the Atlantic for some post-graduate work somewhere in Britain. . . . I am intensely interested in the fact of the arrival of the JOURNAL, and shall look forward to each number, which will make me more conversant with the possibilities of certain courses in the Old Land."

ANTENATAL CARE AS IT AFFECTS THE CHILD IN UTERO.*

BY

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It is universally accepted among us that the care of infants and young children is one of the chief concerns of the State and of society. Public interest in the matter has been one of the main forces behind those developments which, in the last 25 years, have brought down our infant mortality-rate from 154 to 75 per 1000. I am asking you on this occasion to consider to what extent we as medical practitioners are also concerned with the well-being of the child before birth. French obstetricians have for many years been much more concerned about all matters pertaining to infant mortality than we have, on account of their falling birth-rate, which has now reached a point at which the depopulation of that country may be said to have commenced. Many years ago Adolphe Pinard pointed out that in reality the preservation of child life must be considered in relation to three periods.

(1) The *pre-conceptional period*, in which the seed to be sown and the soil in which it is to germinate are the elements concerned; (2) the *intra-uterine period*, in which development is carried from the blastomere stage up to the birth of the fully developed infant; (3) the *postnatal stage*.

It is Pinard's second period which concerns us—viz., that in which the child is developing in the uterus; this period is under the care of the obstetric department of medical practice. It is, therefore, part of our duty to consider whether there is anything we can do, and if so what, to ensure that the intra-uterine child is given the best chance of completing its development and entering upon its separate existence under the most favourable possible conditions. Antenatal work should not be regarded only as a maternal safeguard, although, of course, its primary object is to ensure that the expectant mother gets through her pregnancy with the minimum of risk, and that she enters upon her labour under the most favourable obstetrical conditions.

The question I am asking you to consider is to what extent can antenatal care of the mother influence the well-being of the child *in utero*. Can we in any degree safeguard it against the risks of intra-uterine death or against premature expulsion, either when non-viable or later on when viable but heavily handicapped by prematurity, or from grave defects of development,

* Post-graduate Lecture delivered at the Prince of Wales's General Hospital on July 19th, 1926.

or from transmitted intra-uterine disease, or from the perils of the birth process? We have, perhaps, in the past been too much inclined to wash our hands of all responsibility for the child until it is born. We have considered its fate as lying in the hands of the two great forces which control development—viz., heredity and environment—forces which may well at first sight appear to be beyond our control. Heredity we must not stop to consider; environment, on the other hand, we should certainly consider carefully, making use of the term in its broadest possible signification.

Let us first of all consider what are the present chances of the child completing its intra-uterine development and being born alive. It may be cut off either by miscarriage or by still-birth; and further, if born alive, it may be born in a condition which renders its survival impossible or at the best a matter of great uncertainty.

As regards the frequency of miscarriages, there are, of course, no official figures in this or any other country. Some years ago my colleague, Dr. Amand Routh, attempted to estimate the frequency of miscarriages, partly from the experience of several clinical observers, and partly from returns obtained from certain cities in the U.S.A. His figures indicated that almost one in five of all pregnancies terminated in miscarriage. If this figure is to be accepted for our own country it would follow that in England and Wales in the year 1924 something like 190,000 pregnancies terminated in miscarriage. I do not suggest that we should accept this figure without reservation, but there can be no doubt that miscarriage is a very frequent occurrence.

Regarding still-birth, there is information available in this country, but it is limited. We know the number of still-births notified under the Notification of Births Act, but no information as to the cause of death is given for still-births at all. According to the report for 1924 of the Chief Medical Officer to the Ministry of Health, over 25,000 still-births were notified in that year. This corresponds to a rate of 3.3 per cent. of live births.

In France, in the year 1922, according to Couvelaire, the proportion of registered still-births (and only those are included which had passed the sixth month) amounted to 44 per 1000 live births. The same author shows that in France it is in the great centres of population that the highest still-birth-rate is found; Paris had a rate in that year of 93 per 1000; a group of large towns a rate of 69 per 1000; rural departments only 26 per 1000. It is, therefore, clear that a very large wastage of foetal life occurs from miscarriage and from still-birth.

Foetal death is, however, not the only consideration to be borne in mind. Many infants born alive die in the very early days of the neonatal period from injury received in labour, from prematurity, from disease, or from debility of unknown origin.

Ballantyne divided the duration of intra-uterine life into three periods, and it will be a help to us to make use of his classification. The three periods were: first, the *embryonic period*, which extends from the act of fertilisation to the end of the eighth week; second, the *fœtal period*, from the end of the eighth week to the onset of labour; third, the *intranatal period*, comprising the birth process itself.

THE EMBRYONIC PERIOD.

The embryonic (organo-genetic) period is that in which are laid down the sex of the offspring, its inheritance of hereditary characters, and the general plan of all the organs of the body. Sex and inheritance are decided, according to modern views of development, at the moment of the first segmentation of the fertilised ovum. Malformations of all kinds are all initiated in the embryonic period.

Sex.—The mechanism by which the sex of the individual is determined in view of recent biological advances is now clearer than it has even been before; it even appears to be not impossible that experimental means may be found of altering the sex ratio—that is, the proportion of males to females—in the case of some creatures such as insects. It is, therefore, not out of the question that not we ourselves, but those who may follow us will discover some practical method of influencing the segmentation of the ovum in the direction of maleness or femaleness at will.

The idea that it was possible by extraneous measures to determine the sex of the unborn child has been tenaciously held since the beginning of history. Gifts to pagan deities and pilgrimages to shrines of saints represent the appeal to the supernatural which human nature is prone to make on all critical occasions. These are, however, not strictly speaking, therapeutic measures, and they do not concern us now. The belief still persists among the laity that matters can be so arranged by husband and wife as to produce a child of the desired sex, but this belief has no basis in accredited facts.

Malformations.—Let us now consider the causation of malformations. We have seen that the embryonic period is the time at which those deflections from the normal course of development occur which result in the production of malformations of all kinds. There was no clear idea possible of the causation of these defects until it was shown by experiment that they could be produced by subjecting the developing embryo to various kinds of abnormal stimuli. From small beginnings an extensive field of experimental teratology has now been covered, and it appears that there is no known malformation which cannot be experimentally reproduced in the case of certain classes of animals. It is, of course, admitted that the particular stimuli which have been made use of experimentally could not well be applied to the mammalian embryo. They are all sufficiently powerful to produce actual injury, and their effects may fairly be classed as

traumatic. These experiments lead us to believe that the cause of malformations in man must be sought in some alteration of environment which would be comparable to the physical or mechanical stimuli used in these experiments.

It would serve no practical purpose to enter at all fully into it, but one or two examples may be cited of the results of injury of the segmenting ovum. Some of the earliest experiments were made with the incubation of hen's eggs, when it was found that variation in the temperature of the hatching medium in either direction resulted in the production of a large percentage of deformed chicks. By shaking the eggs or standing them up on end, St. Hilaire produced double-monster chicks. Other observers worked with chemical stimuli, and it was found that the injection of alcohol into the blastomere of the incubating egg produced a large percentage of deformed chicks.

More recently experiments have been made with the ova of sea-urchins and similar forms. It has been discovered that by violently shaking the segmenting ova in a centrifuge the component cells become separated from one another and each separate cell may then develop a complete individual of proportionately smaller size than the normal. These experiments support the view that triplet, quadruplet, or quintuplet pregnancy may possibly be accounted for, not only by simultaneous fertilisation of more than one ovum, but by traumatic separation of the cells of the blastomere at a very early stage of its formation. With ascidian ova it has been shown that if, in the two-cell stage, one cell is destroyed by heat, the other develops into a half embryo. Similarly, if in the four-cell stage the two posterior cells are destroyed the remaining ones develop into an embryo minus a tail and other hinder parts.

We must not conclude that traumatism is the invariable cause of malformations, because F. W. Browne has shown that there is good reason to believe that the anencephalic foetus is the result of non-development of the pituitary body. And further, remarkable effects may be produced by alterations of nutrition. At any rate, it is clear from what has been said that deformities should not be regarded as mere freaks of the developmental forces, or as the result of hereditary vicious tendencies. The future may possibly teach us the nature of the terato-genetic forces which operate in man and how to avoid them. At the moment we have no gleam of light on the subject.

Causes of Embryonic Death.—Of the actual causes of death in the embryonic period we know little, and there is no reliable basis on which an estimate can be formed of the frequency of embryonic death. It is probable that a considerable number of miscarriages occur which are not the result of disease, but are either produced by slight traumatic causes or are due to a certain unfitness of the early embryo to complete its development. In all creatures the reproductive process is attended by a certain amount of wastage.

The character and causes of this normal wastage have been carefully examined by Arthur Robinson in the case of horses and ferrets, the former being either Clydesdales or thoroughbreds, about which accurate details as to mating and foaling could be obtained. Robinson showed that in ferrets a considerable proportion of the zygotes or fertilised ova perished at various stages of development, although in the same uterine cornu neighbouring zygotes on either side of them developed normally. He regarded their death as being due to structural unfitness of the zygote to fulfil its destiny and not to any abnormal maternal condition. In this conclusion he was no doubt right. The occurrence of foetal death in the case of mares is not clearly proved by Robinson's data, and it would appear that his conclusions are mainly to be read as applicable to animals which produce their young in litters, and in whom, consequently, a high foetal death-rate would not be prejudicial to the continuance of the species. In animals which produce only one, or at the most two, young at birth, like mares, a high foetal death-rate would be of graver significance. It may be admitted, however, that in man it is, at any rate, probable that a certain unknown proportion of the abortions which occur and for which no pathological explanation can be found may be set down to the reproductive wastage described by Robinson.

THE FŒTAL PERIOD.

Before proceeding to consider the conditions which are mainly accountable for loss of foetal life, it will be well to review one or two matters which are concerned with what may be called the general hygiene of the foetus *in utero*. Let us look at the case of the child of healthy parents suffering from no disease which can be transmitted to it such as the infections, or which can prove inimical to its continued existence such as toxic albuminuria and eclampsia. Besides providing it with food and shelter, does a healthy mother influence the condition of the child *in utero* by her own physical health, or by her occupation, or by the struggle for existence?

Transmission of Immunity.—On the threshold of this question lies the subject of the transmission of immunity. Is the new-born child in any way prepared, by the transplacental passage of immunity bodies from the mother, to resist infection acquired after birth? Clinicians have frequently drawn attention to the great susceptibility of young infants to infections of all kinds, and the view has been often expressed that the child does not acquire a power of actively resisting infection until the second year has been passed. Passive immunity may, however, to some extent be acquired from the mother—i.e., antibodies present in the mother serve to confer a certain measure of protection upon the child while its own powers of resistance are undeveloped. It will, perhaps, be of interest to summarise as

well as I am able the present state of our knowledge on this subject.

For a long time it was thought that such antibodies as the young infant possesses reach it through the mammary secretion, and that mainly through the special secretion of the first two to three days, known as the colostrum. This view was the outcome of experimental work done on ruminant animals such as the cow, the goat, sheep, and also on pigs and horses. In these animals antibodies do not reach the foetus *in utero* at all, but they are present in large amount in the breast milk, and can be found in the blood of the young after suckling. Two American observers, Kuttner and Ratner, have recently shown that these results do not hold good for all mammalia, and that in certain rodents antibodies can be detected in the umbilical blood at birth. Similarly, these observers have shown that antibodies can also be found at birth in the blood of the new-born human infant. This difference between ruminants and rodents is attributed by these investigators to a difference in placentation; in the former the placenta consists of a double layer of epithelium, while in rodents and in man the placental epithelium consists of only a single layer, and is, therefore, more readily permeable.

The experimental work has been done mostly with the antitoxin of diphtheria, because in the cutaneous reaction known as the Schick test we have a very convenient means of checking the individual power of resistance to the diphtheria toxin.

Kuttner and Ratner found in a series of 30 observations that whenever the mother gave a Schick negative test the diphtheria antitoxin could be detected in the blood of the umbilical cord as well as in that of the mother. In a further series of 15 cases in which quantitative tests were applied, they found that the amount of antitoxin in the umbilical blood was identical with that in the mother's blood. This observation has been amply confirmed by other investigators. There is, therefore, in these animals (rodents) no loss of antitoxin in passage through the placenta, which clearly allows these bodies to pass through freely. These immunity bodies transmitted from the mother's blood during pregnancy would confer immunity on the child in the same degree as it exists in the mother.

The observation was first made in 1895, and has since been established beyond question by numerous observers, that the new-born child is protected against diphtheria. According to Zinsser, 93 per cent. of new-born infants give a negative Schick reaction provided that the mothers are negative also. This protection diminishes during the first year, so that at the beginning of the second year two out of every three infants have no antitoxin in their serum. The immunity of the new-born infant is brought about by the transplacental distribution of the antitoxin present in the mother's blood, and, as we have just seen, the amount of

antitoxin is the same in both the mother's and the child's blood.

One further observation I should like to mention in relation to immunity. Kleinoff claims to have shown that the umbilical blood of the new-born child possesses definite hæmolytic or bacteriolytic powers. He found that if the serum of the infant's blood were added to cultures of certain bacteria the growth of these organisms was inhibited, and in some cases the bacteria were broken up. The effect is the same, although less in degree than that obtained with the blood-serum of an adult. It is clear, therefore, that the foetus acquires certain passive immunities *in utero* through the placental interchanges. What may be the actual extent of this process of passive immunisation of the child we cannot tell in the meantime. A very wide field is opened up by these suggestive experiments, and although at present the number of infections in respect of which it is possible to confer passive immunity is not large, it must be remembered that the science of immunology is in its infancy and great developments may be witnessed in the future.

Effect of General Maternal Conditions.—Next we must consider to what extent the well-being of the foetus *in utero* can be influenced by general maternal conditions such as nutrition, occupation, hardship, and what we may, perhaps, term "nervous stress." The tendency within the profession has been to consider that the foetus, like all parasitic organisms, would succeed in looking after itself no matter how much the mother might suffer from such conditions as hardship or under-feeding. It is doubtful if this view can be maintained absolutely, and there are certain facts and considerations bearing upon the point to which I should like to draw your attention.

If an inquiry is made as to what extent the occupation and environment of the expectant mother may affect the well-being of the child at birth, a serious difficulty is at once encountered—viz., that it is very difficult to find any reliable criteria of well-being in the new-born except that of weight and length. It does not necessarily follow that the heaviest infants are the most vigorous at birth, or that they make better progress than the others. There are undoubtedly exceptions, but, as a rule, babies under the average weight at birth are less vigorous than those of normal or more than normal weight. It does not necessarily follow that every few grammes added to the weight of the child add in corresponding degree to its vigour and to its chances of survival. It is, however, an arguable proposition that such is the case, and certain investigations have been made upon this assumption which are worthy of our consideration.

Effect of Maternal Occupation on the Child.—Adolphe Pinard was for many years an advocate of the view that women engaged in industry who continued at their work during the last three months of pregnancy showed a marked tendency to premature confinement; their infants were

accordingly under-sized and less vigorous than full-time children. He carried out an inquiry as to the weight of the child at birth in different classes of women, with a view to testing the effects on the child of the mother's occupation, and particularly as to the value of cessation of work and admission to the clinique well in advance of the confinement. Investigations on similar lines were made about the same time by Letourner.

This difference between the women who were engaged in hard industrial work up to confinement, and those who had ceased work for at least a month, is represented by an average increase in the weight of the infants of the latter of 575 g. The increase in the children of the women who rested is attributed by Pinard solely to the fact that these women carried their infants to term, while an undue proportion of the others did not.

An independent inquiry was being carried on about the same time in Germany and the results were reported by Fuchs in 1899. His work was done on somewhat different lines and is, perhaps, more convincing than that of Pinard. He rightly thought that in investigating the effects of maternal occupation on the weight of the child the comparison should be made strictly between infants of an equal degree of development, and he accordingly excluded all premature infants from his inquiry. Incidentally, it may be said that he disagreed with Pinard's conclusion that continuance in industrial work tended to result in premature labour.

The main conclusions which appear from Fuchs's observations are (1) that the infants of factory workers are smaller than those of the other classes, (2) that the infants of all classes of patients benefit by a hospital régime during the latter weeks of pregnancy, (3) that especially women who work in factories, and to a less extent town workers generally, benefit more from the hospital régime than do women engaged in outdoor agricultural occupations. These conclusions serve to emphasise the generally accredited view that country women engaged in farm work, who are necessarily of good physique, who are engaged in outdoor occupations, and are well-fed, are the most likely to produce vigorous and well-developed infants. The problem of the weakly infants whose chances of survival are below the average is essentially an urban problem.

Effect of Maternal Privation and Hardship.—Closely linked to the question of fatiguing occupation is the question to what extent privation and hardship endured by the mother during pregnancy can influence the well-being of the child *in utero*. The experience of the central European countries during and immediately after the war has shown us the result of an experiment on a scale far exceeding that which would be possible under any ordinary circumstances. The reports from Germany and Austria were almost unanimous that no appreciable diminution could be detected in the average weight or length of infants born during these years of privation. One authority, Prof.

Klotz, of Lübeck, has, however, noted a point which is worthy of consideration. In the years 1919 and 1920, which were, perhaps, even more difficult for the lower classes in Germany than the actual war period, Klotz found that if a comparison were made between the legitimate and illegitimate infants it was found that while the former showed no difference in weight between pre-war years and these two post-war years, it was not so with the illegitimate infants.

It is to be borne in mind that for a long time before the war the proportion of illegitimate births in Germany was unusually high—viz., between 9 and 10 per cent. of the total births. This already high proportion increased during the war period because the number of legitimate births became reduced at a much greater rate than the illegitimate ones. The stress of hardship and want will naturally fall more heavily on the illegitimate mothers than on others, and it is not unreasonable to suppose from these data that there is a limit beyond which such conditions as privation and hardship would become definitely detrimental to the child *in utero*.

While we are speaking of the effects of war conditions I should like to call attention to a further point—viz., their influence upon the occurrence of stillbirths. The accompanying chart shows the

changes which occurred in the stillbirth-rate in France during the period covered by the war and the two following years. The figures are worked out in their ratio to the total births, and it will be seen that a marked rise in the stillbirth-rate occurred during the years 1916-19. The corresponding figures for our own country are not available. War conditions included so many different varieties of privation and nervous stress that it is impossible to attempt any explanation of their *modus operandi*. We must simply record the fact that there is a point beyond which such conditions are unfavourable to the proper development of the foetus.

(To be concluded.)

The second Duveen lecture in Otology—it is open to medical practitioners—will be given at the University College Medical School by Mr. RICHARD LAKE, F.R.C.S., at 5 P.M. on Tuesday, Dec. 7th. His subject, which will have a special appeal to many of our readers, is otitic intracranial abscess.