Exactly what interval elapses between the invasion of the lung and the development of a positive test cannot be determined in human beings owing to the uncertainty of the date of infection. Since, however, pulmonary tuberculosis is as a rule a disease of gradual onset, the blood, generally speaking, reacts positively by the time symptoms are present. In a few cases in which the onset is more sudden—as, for instance, with an haemoptysis or pleurisy without any history of previous ill health—it is necessary, when such a case gives a negative result, to repeat the test after an interval of two or three months before definitely excluding tuberculosis.

Meaning of a Positive Result.—The presence of pulmonary symptoms with a positive test must be regarded as an indication of active pulmonary tuberculosis.

Duration of a Positive Reaction after Arrest of the Disease.—How long the test remains positive after arrest of the disease it is impossible to say, as there is no method of determining accurately the exact date at which the lesion has become arrested. Two of the cases in the above series offer evidence that the test does become negative after the disease is arrested. Both these cases had been free from symptoms for about a year. One case when seen in 1920 had a pleurisy with effusion from which 10 c.cm. were aspirated. He was sent to a sanatorium, where he remained for seven weeks. He brought up a pint of blood shortly after leaving the sanatorium, and entered another sanatorium for fourteen weeks. Since then for a period of sixteen months he has felt quite fit, and is now two and a half stone heavier than when seen on his first visit to the hospital. The clinical condition agrees with the negative test in these two cases, and we regard them both as arrested cases. A temporary freedom from symptoms does not, of course, necessarily indicate complete arrest of the disease. This is well illustrated by one of the cases in which the test was positive three times over a period of twelve months. In this case the patient was at one time during this period entirely free from symptoms, but later the symptoms returned and eventually tubercle bacilli were found in her sputum. We are collecting evidence bearing on this point of the duration of a positive reaction after arrest of the disease, but it must of necessity be slow in accumulating; so far it would appear that the period may not be more than twelve months.

The Value of Early Diagnosis.—It is generally accepted that early diagnosis is the key to successful treatment. All the 50 cases here published were treated as cases of active tuberculosis of the lung or pleura. Though the results are far from satisfactory, it is possible that some of the cases have been prevented by early treatment from progressing to "open" tuberculosis.

The Question of Latency.—The above considerations lead to the question of latency; 98.5 per cent. of our control cases gave a negative result to the test. All *post-mortem* evidence goes to show that in a certain number of these cases, variously estimated as from 10 to 97 per cent., old tuberculous foci existed. In what proportion of these old foci living tubercle bacilli would have been found we have no evidence upon which to form a definite opinion, but it may be said that they would have been found in a certain number. The explanation that we have to offer of the negative result to the test although tubercle bacilli may be present in the body is that, the formation of the complement-fixing substances being in all probability a property of the cells of the body, they are only formed when the focus which contains the bacilli is not shut off from the general circulation. In these old foci the bacilli when present may be entirely shut off from the general circulation by fibrous tissue resulting from chronic inflammatory processes, and so no complement-fixing substances are formed. We have shown that a positive reaction when the lesion is active does not mean a positive reaction ever after, as stated by others. In this lies the greater value of the test, and, taken in conjunction with the symptoms, it is an almost infallible guide to the presence or not of active tuberculosis.

We are again indebted to the lady almoner of the hospital, to whom we wish to express our gratitude for her valuable assistance in tracing the patients and asking them to attend.

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THE PATHOLOGY OF FOETAL MACERATION.*

A STUDY OF 24 CASES.

BY

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IN the first 100 examples of stillbirth examined there were 24 cases of foetal maceration; it is the results of the examination of these that it is proposed to discuss in this communication. Various grades and degrees of the condition were seen, from mere laxness of the limbs to an almost pulpy state of the foetus, with the skin almost entirely denuded and the cranial bones loose inside the scalp. In passing it may be noted that, as 24 cases were macerated and 52 asphyxiated, in 76 per cent. of the first 100 cases of stillbirth the evident condition present on examination was either maceration or asphyxia.

Of the 24 cases 22 were premature, ranging from twenty-four to thirty-six weeks. This is only what one would expect from a general consideration of the subject. The two cases born at full time were only slightly macerated, and labour came on in these cases at or about the expected date. Both these latter cases were eclamptic. The associated conditions in the 24 cases were:

Maternal albuminuria	10 cases
Syphilis	6 ,,
Maternal eclampsia	4 ,,
Extensive placental infarction ...	4 ,,

External Maceration.

From these figures it appears that, in our experience, albuminuria is the condition most commonly associated with maceration of the foetus; further, syphilis was present in only 6 (25 per cent.) of the cases. Now in the cases of syphilis previously considered maceration was found present in only 6 out of 14 (43 per cent.); therefore considering both these sets of figures we come to the conclusion that maceration alone is no index of foetal syphilis and is much more likely to be associated with albuminuria.

In this series all grades of maceration were present, allowing the various stages of the process to be studied. The first change observable after the death of the foetus was solution and disappearance of the vernix caseosa; in the very slightly macerated cases vernix was present in the flexures of the groins and knees, where it had, for the time being, been shielded more than in the more exposed parts from the solvent action of the liquor amnii.

There can be little doubt that the first action of the liquor amnii on the dead foetus is to dissolve the vernix caseosa; in life it acts as a coat of armour against such action; this is aided by the fact that in life the vernix is continually being secreted and renewed by the glands of the skin, an action which, of course, stops at death. Later on the superficial layers of the skin become waterlogged and the connexion of the epidermis with the deeper layers becomes loosened, so that on rubbing, or even at the merest touch, flakes of epidermis peel off, exposing the reddened and shiny underlying corium. In time this also becomes affected, and in the more advanced cases the skin looks as though eroded in patches, the underlying tissues being exposed here and there.

These changes are most marked in the abdominal wall, scrotum, and limbs, and least on the head and scalp; indeed it is only in the most advanced examples of maceration that any desquamation at all is present in the scalp.

Internal Maceration.

Contemporaneously with these external changes the internal organs are also undergoing changes—internal maceration—which in general terms may be described as consisting of tissue lysis resulting from the uncontrolled action of enzymes on the parenchyma of the various organs, the whole process being aseptic.

In the skeletal muscles such action is recognized at the very earliest stage, even before desquamation is evident; general slackness and limpness of the body and limbs result, allowing the macerated foetus to be bent and twisted in any direction. In the brain the earliest naked-eye change consists of a brown staining of the dura mater, which is often slightly thickened and feels oedematous. The surface of the

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cerebral hemispheres also becomes stained brown from a diffusion of haemoglobin due to lysis of the red blood cells. Later the cerebral tissue becomes soft and easily lacerable, and later still quite diffluent, so that the brain now appears as a semifluid, grumous, brownish mass in which no differentiation between grey and white matter is possible and which cannot be removed intact. In the most extreme cases solution of the cranial sutures occurs, allowing the cerebral matter to run out and infiltrate the scalp, while in one of the specimens the scalp had become eroded at one point at the vertex and the fluid brain matter had escaped externally.

There is a great tendency in these cases to extravasation of blood-stained fluid into any body cavity or loose tissue space, and so the pleurae, pericardium, peritoneum, scrotum, and subcutaneous tissue, especially over the vertex of the scalp, were, in a well-marked case, almost invariably the seat of haemorrhagic effusion due to lysis of capillaries and of red blood cells, thus allowing the haemoglobin-stained fluid to be passively effused.

In all the other organs two changes were found: (1) softening of various degrees, and (2) a uniform brown staining, reducing all the organs to a uniform colour and obliterating the difference between cortex and medulla in each case.

1. This was present in all degrees corresponding to the degree of maceration; it was, however, always present to some degree and was demonstrated on attempting removal of the organs, when they would tear in the fingers unless very carefully handled. In a case of moderate degree softening would be least marked in the heart and lungs and most evident in the brain and liver.

2. The more advanced the maceration the more marked was this change. The process consists of a haemolysis with diffusion of altered haemoglobin throughout the various organs. This was present in all the organs, even in the intestines, although less marked there than elsewhere.

The Bones in Maceration.

On sectioning the long bones the main naked-eye changes were found at the extremities. Here the epiphyseal cartilage had lost its normal bluish-white glistening appearance and had become dull and opaque, with a tendency to brownish discoloration, which, however, was never so marked as in the case of the internal organs. But at the junction of the osseous tissue of the shaft and the cartilage of the epiphysis the line of demarcation was not as sharply defined as usual; it appeared as though the osseous tissue had become slightly eroded or digested along this junction, and it was easy in any case to separate the epiphysis from the shaft, the junction being softened. Now, this irregularity of the epiphyseal line is present in some cases of syphilis—chondro-epiphysitis—but here it is due to irregular *ante-mortem* growth of spicules of bony tissue into the cartilage, and close inspection will show the difference between the two conditions. The point to be emphasized is that a condition superficially resembling the chondro-epiphysitis of syphilis is to be found in the vast majority of foetal bones macerated from any cause, and that unless care be exercised in differentiating this condition from true chondro-epiphysitis a large number of cases will be wrongly regarded as syphilitic. In only one of the cases of syphilis was true chondro-epiphysitis well marked. In two cases — both premature — blood-stained effusion was present in joints; in one case the knee and in the other the hip was affected. In every case the ligaments were weakened and softened, sometimes markedly so.

The Placenta in Maceration.

Examination of the placenta was of the utmost value in deciding the cause of the foetal death. In eclamptic placentae large areas of intra-placental haemorrhage with extensive red and white infarctions were present in every case of this series. In albuminuria also similar appearances, but usually not so extensive or advanced in degree, were present, and in both of these conditions there were in a large proportion of cases old or recent haemorrhages on the uterine surface of the placenta.

These utero-placental haemorrhages constituted a marked feature in this class of case, and in one example there was a large cup like depression excavated from the uterine surface and full of clot. In these cases it was usual for the intra-placental haemorrhage in infarction to be in that part of the placenta related to the surface haemorrhage. In a third class of case large white and red placental infarctions were also present, but in these cases there was no maternal albuminuria; here also in several examples retroplacental haemorrhage and clots were present.

Now, placental infarctions have been shown by Eden, Williams, and others to be normally present towards the end of pregnancy, and, indeed, to form one of the changes preparatory to the placenta separating itself from the uterus. Eden regards infarctions as signs of senility in a short-lived organ, and is of opinion that they begin to form as early as the seventh month of gestation. But in the cases under consideration (1) the infarcts were very large, and *en masse* must have occupied a considerable area of the placental tissue available for foetal nutrition; (2) intra- and retro-placental haemorrhage cannot be looked on as normal changes; and (3) these changes were in almost every case well advanced by the seventh month, and not merely starting to appear then.

For these reasons, then, extensive infarction and haemorrhage in a premature placenta is to be regarded as a pathological condition and likely to be associated with the death and subsequent maceration of the foetus.

In the syphilitic placenta the appearances were quite different. In all these cases the placentae were thick and pale and usually of an even and solid texture. *In no syphilitic placenta was any infarction or haemorrhage present.* This is a most important differential point in seeking for the cause of the intrauterine death. The syphilitic placentae examined tended also to be larger and heavier in relation to the foetus than normal; this was never so marked in the cases under consideration as some authorities have found, but the presence of these features in association with pallor and increased thickness, which were constant features, strengthened the diagnosis of syphilis.

There is another naked-eye appearance to be noted, and it is common to all macerated placentae whatever be the cause of the foetal death prior to maceration; this consists of a greenish, slimy appearance of the amniotic surface of the placenta and membranes, and would appear to be due to continued contact with altered amniotic fluid. This also is described by some writers as being associated especially with syphilitic maceration, but in this series it was quite as well marked in the non-syphilitic cases.

The umbilical cord showed slackness; this was the first change noted, the normal spiral twisting having become undone and straightened out. Later on swelling, oedema, and congestion, as shown by a uniform dull red coloration, became evident, and this change was more marked at the foetal end of the cord.

Microscopic Findings.

On microscopical examination of the various organs the first change seen was a failure of the cell nuclei to stain properly; the outline became blurred and the chromosomes disappeared. The cell cytoplasm then became affected and in its turn stained irregularly, but this change appeared subsequently to the nuclear changes described. This cloudy or granular degeneration progressed so that in time the nuclei became invisible, while the cell showed irregular outline and stained very faintly indeed; in later stages still the microscopic field showed a mass of irregularly stained tissue in which the cell bodies were differentiated from the intercellular material only with difficulty. This was the appearance seen, for example, in albuminuric cases. In syphilitic cases—and in these maceration was seldom so advanced as in the others—the pericellular cirrhoses, as described in the section of the report dealing with syphilis, were seen, and in these cases cell degeneration was not so far advanced for the degree of maceration as in the other varieties of cases.

Again, in syphilitic cases staining by Levaditi's method usually demonstrated the presence of spirochaetes in the organs, especially in the lung and liver. While this description would apply generally to the various organs, in the individual organs certain special appearances were recognized.

In the *lungs* oedematous infiltration of the interalveolar tissue with desquamation of the alveolar epithelium was seen; along with this generalized capillary dilatation and irregular extravasation of red blood cells into the tissue spaces and also into the alveoli were present.

In the *liver* the changes described were well shown, but along with these the sinusoids were seen to be dilated, and many red blood cells in various stages of degeneration were present, infiltrating the interlobular and intercellular spaces.

In the *kidneys* the earliest changes were found in the glomeruli, which showed cloudy swelling going on, in the later stages, to almost complete disintegration, the glomeruli becoming shrunken masses staining badly and practically structureless. The intertubular connective tissue also showed

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oedema and thickening, while desquamation of the tubular epithelium following granular degeneration was usually present in varying degrees.

In the *skin* the first change observed consisted of a swelling of the superficial layers of epithelium with inability of these cells to take up stains properly. This swelling would appear to indicate infiltration of the cell with fluid, and these changes progressed until the cells lost practically all structure and were cast off, the separation occurring just at the junction of epithelium and corium. In the latter layer the tissue fibres stained irregularly, and were separated by oedematous infiltration, while marked dilatation of capillaries with extrusion of red blood cells was also seen here. The epithelium of the sweat and sebaceous glands, and also of the hair follicles, retained their normal appearance for a surprisingly long time, and in regions where such structures were plentiful—the scalp—the degenerative changes described were never so marked as in skin from other parts of the body.

The *placenta* in syphilitic cases presented the microscopic appearances usually described in this condition: crowding of the field with villi, small intervillous spaces, the absence of blood vessels from the villi, or if present few in number and small, and the structure of the villi consisting of a uniform and loose areolar tissue. In the placentae showing infarctions and haemorrhages changes of two kinds were seen: (1) Fibrinous deposit between the villi, gluing them together as it were and associated with degeneration and disappearance of the Langhans's cells covering the villi. At a later stage the villi appeared as degenerated, light-staining areas embedded in a dark mass of fibrinous deposit. This is the type of infarction described by Eden and Williams as a normal process. (2) In the infarctions associated with utero-placental haemorrhage the first change observed was dilatation of the vessels in the villi, so that this part of the placenta looked red to the naked eye (red infarction); but in some cases this dilatation was so great that actual haemorrhage had occurred (haemorrhagic infarction or placental apoplexy). The primary event is considered to be the utero placental haemorrhage which had suddenly interfered with the nourishment of the placenta and so had inflicted an acute vascular injury the reaction to which was dilatation of the vessels or even a haemorrhage into the substance of the placenta. The villi concerned, being separated from their uterine attachment and deprived of their nourishment, degenerate and are finally replaced by a fibrous scar, which develops from the periphery towards the centre of the involved area. These changes have been fully worked out by Young and others. Space will not permit a full consideration of these placental changes in relation to foetal death; they will be made the subject of a later contribution. Suffice it to say that in these cases intrauterine death followed by maceration is considered to be brought about by (1) the ablation of a certain amount of placental tissue sufficient to interfere with foetal nourishment, and (2) possibly by the absorption into the foetal (as Young has suggested in the case of the maternal circulation) circulation of certain degeneration products from the infarcted and necrosed areas.

In this paper, which is intended merely as a preliminary contribution to the study of this subject, the findings and the deductions from them are stated shortly. It would appear that maceration is brought about by soddening of the unprotected foetal skin by the liquor amnii, accompanied by an autolysis of the internal organs by enzyme action.

CONCLUSIONS.

1. Maceration is the result of retention of the dead foetus *in utero*, whatever be the cause of the death.
2. Maceration alone is no sign of the presence of syphilis.
3. In the investigation of any macerated foetus it is essential to have the placenta for examination also.
4. The bony changes in any macerated foetus bear a superficial resemblance to the chondro-epiphysitis of syphilis and have to be carefully differentiated.
5. The microscopic findings indicate a process of autolysis of the constituent cells of the various organs with oedema of the interstitial tissue and extrusion of red blood cells.
6. In the syphilitic cases the placenta will be thick and pale, while in the other cases haemorrhages and infarctions will often be present.

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RECOVERY OF VISION AFTER INCIPIENT PANOPHTHALMITIS FOLLOWING CATARACT EXTRACTION.

BY

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THE recovery of useful vision in an eye which suffered from an early and virulent pyogenic infection after an operation for senile cataract is sufficiently rare to render it worth while to place the following case on record:

Mr. R., aged 69, was operated upon for senile cataract of the right eye on October 4th, 1921. Combined extraction was performed, the nucleus being easily delivered beneath a "bridge flap" of conjunctiva; the shreddy, shrinking cortex was readily washed out by the irrigator and the iris well replaced.

On the second day the eye was quiet, with a wide, black pupil, and the anterior chamber had re-formed. That night, in spite of having been warned, the patient got up unaided to pass water, and interfered with his dressings in order to see what he was about. Next morning the eye was still quiet, with a wide, black pupil. On the fourth morning a muco-purulent discharge was present, with conjunctival injection and chemosis. Aluminium goggles were substituted for the bandage, silver nitrate drops (0.75 per cent.) were instilled, followed later by argyrol. The chemosis and discharge increased during the day and the lids became greatly swollen. Eye baths of magnesium sulphate lotion (12 per cent.) were now ordered to be used for five minutes every two hours. On the morning of the fifth day, in addition to the swelling of the lids, the chemosis, and the purulent discharge, it was found that the lips of the wound were yellowish and infiltrated, and that the iris was cloudy; atropine was instilled and urotropine, 15 grains every three hours, was ordered. The aqueous became very turbid during the day. On the sixth day the infiltration of the section and the exudation in the anterior chamber had increased, but the purulent discharge and the swelling of the lids had diminished; 1 c.cm. of mixed catarrhal vaccine was injected, pneumococci and staphylococci having been found in the discharge. The intensity of the inflammation subsided from the sixth day, and on the eleventh day the eye was free from swelling and chemosis, but a deep exudate and ciliary congestion remained. Under the influence of hyoscine, etc., the pupil kept moderately dilated, though blocked by the deep inflammatory exudate; during the fifth week, however, contraction of the exudate began and the pupil became gradually drawn up. Some slight congestion persisted during the next two months, but the iris crypts were clear and corneal deposits were absent. Four months after the operation the eye was quiet, the ocular tension subnormal, the iris bombé, and the pupil drawn up and blocked. The projection remained good. An iridotomy after Ziegler's method was performed five months after the extraction and a wide, black pupil was made. The immediate visual result, however, was poor, since there was a considerable amount of opacity in the vitreous; this rapidly cleared after injections of mercury cyanide, and three months later the corrected vision was 6/12.

I have no hesitation in attributing this rather remarkable abortion of panophthalmitis and recovery of the eye very largely to the thorough use of eye baths of magnesium sulphate lotion. This form of treatment for purulent inflammations of the conjunctiva, cornea, and opened eyeball was introduced at the Madras Ophthalmic Hospital some eight years ago, and it has always been found of the greatest use in such cases. Although some surgeons stated, at the meeting of the Ophthalmological Section of the British Medical Association last year, that they had used it with benefit in the treatment of ulcers of the cornea, its great value as a remedy for septic conditions of the conjunctiva, cornea, and opened globe does not appear to be as widely known as it deserves to be. Its action in gonorrhoeal ophthalmia is especially striking. One of the chief dangers in the latter disease, as we all know, is ulceration of the cornea; this is greatly favoured by the intense chemosis or brawny oedema of the bulbar conjunctiva; the magnesium sulphate lotion appears to exercise a powerful osmotic action through the inflamed membrane, and its use is almost always followed by a very marked reduction in the chemosis and by the restoration of a healthy circulation in the conjunctiva.

Since using this treatment in combination with urotropine and vaccines, I have seen no eye lost from gonorrhoeal ophthalmia which had not reached a hopeless condition of corneal ulceration before seeking advice. Major Wright, the present superintendent of the Madras Ophthalmic Hospital, states in the annual report of the institution for the year 1920 that, using this treatment, not a single eye was lost from gonorrhoeal ophthalmia in the course of the year. If is, of course, essential that the lotion should be thoroughly applied, and to ensure this the eye bath should be used with the patient in the reclining position, and he should be instructed to keep opening and shutting his eye in order to maintain the

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