

ART. XVIII.—*Remarks on the Uses of the Globules in Relation to Absorption, Secretion, and Morbid Deposition.* By THOMAS HODGSON WATTS, M.D.

[Continued from No. LVI. p. 270.]

THE globules seen on observing tubercle by the microscope will now occupy our attention. We will endeavour to place the complex forms which we detect in it, in such a manner as to make their various distinctions appear proper to the several modifications of the morbid product. It is, perhaps, just to hope, that our observations may help to quell some contests of opinion regarding tubercle, which have been too common in all times; and they may possibly add new zest to the inquiries of the physician on an object so mournfully interesting to mankind. However, we are sensible of the difficulty in determining upon the specific character of microscopic forms seen in the tissues of the body, where so many influences are at work after life has ended; and we will accompany the special relation of appearances with our reasonable doubts.

The grey granulation of the lungs, separated carefully from all surrounding tissue, and pressed between two plates of glass, so as to bruise it completely, mixing the softer parts with the fluid, this latter presents to the view a granular appearance, whilst the rest of the body lies between the glasses, like a greyish-white mass. Innumerable corpuscles are suspended in the water, giving it the aspect of being full of dark points; but on bringing any of those points slightly into the focus, they seem bright silvery white, somewhat transparent, bodies of the most minute globular coinage. The great mass of them, however, give the stream a dark look, owing probably to their different relations to the focus. (See PLATE, *fig.* 1, *a.*) The whiter and softer form of the grey granulation, when treated in the same way, affords also these corpuscles, together with some few small globules, like transparent bodies of a greyish hue, or about the colour of the fluid they swim in. This constitutes a sort

of transition to the appearance presented by the yellow tubercle. (See PLATE, *fig. 1, b.*)

We have found the grey granulations of the spleen in scrofulous children, affording the same appearances, with the exception of the more recent and transparent, almost colourless ones, which appeared, after compression, alike to a very plastic, pliant, and compressible matter, more or less translucent, of a somewhat granular surface seen through the microscope, but grey and smooth as mucus viewed with the bare eye. Still a solitary corpuscle was here and there observable; and by moistening such granulations with liquid ammonia before compressing them the plasticity was exchanged for streams of innumerable corpuscles. If we do not separate the granulations carefully from surrounding tissue, and bathe them well in distilled water, we may also have abundance of blood globules in addition thereto. (See PLATE, *fig. 1, c.*)

The yellow tubercle of the lung, compressed together with a little distilled water, in the same manner as described for the grey granulation, mingles in the liquid, besides a great quantity of the corpuscles, already alluded to, also innumerable globules or transparent globular bodies, very nearly of the colour of the fluid they swim in; or warmish grey, or tinged lightly with yellow. They vary much and widely in volume, but there is a medium which is the general size. They may be seen at times almost as small as the more remarkable corpuscles, or large as the pus globules, and even considerably larger still. The great bulk of them, however, extend from the size of the blood globules, to that of a laburnum seed. Their form is inconstant or varied, but they tend always more or less to approach the spherical, although they very often are merely rounded, and in some degree flattened. They possess a considerable degree of elasticity, resembling that of a solid body. When casually covered with corpuscles, they become proportionably less transparent, and form grey globules bearing some resemblance to pus; but this appearance is lost in the stream.

They are also often united one to another, forming composite globules, or irregular masses of various volumes, but as perfectly transparent as any one of them taken singly. However, the intensity of colour is somewhat enhanced by this composition, and it may even approach the aspect of amber. (See PLATE, *fig.* 2.)

The pultaceous chalky white matter encysted in tubercular lungs, pressed between the plates of glass, has presented to us one mass of small globules of an almost uniform size, although containing others smaller and larger than the medium. They range from the volume of the largest corpuscles almost to that of the seed of the turnip. They are transparent, with a well-marked margin, and never appear to unite in any number into a composite globule of a larger dimension. They sail in streams among themselves when the glass is compressed, so as to put them in quick motion ; and they seem to have no remarkable attraction of adhesion to one another. The compact globules at rest have a shade of sienna colour, which is the more remarkable, as the mass appears white on the glasses to the naked eye. (See PLATE, *fig.* 3.)

We will now subjoin such considerations concerning the essential character of those minute bodies visible in tubercle by means of the microscope, which naturally present themselves to the mind at first sight. Here the question arises, are they properly tubercle and the elementary forms it assumes? We confess ourselves not to be quite decided on every bearing of this query, and we will develop our doubts a little.

Regarding the minute corpuscles, and small, silvery, spherical globules of the grey granulation, and of chalky white pultaceous matter, and also in some measure of the yellow tubercle, we must either allow them to be the primitive forms of tubercle, or as common to this and some other morbid formations, or else, look upon them as infusories of a highly animalized fluid. There is much which argues in favour of either supposition, but we incline more and more daily to draw in suspicion their mere tubercular character. We find them, in the first place, in the

tubercle taken from the corpse ; and it might very well be urged that they may be the products of the animal liquids in the dead body. We see them also, or others most similar to them, in purulent expectoration, and it may be fitly foreseen, the probability of their being common to liquid animal matter, as well such as is found in tubercle as in pus, under a series of circumstances, if not also elsewhere. They are, however, most numerous in the sputa of far advanced phthisis. We have also observed bodies very much alike to them in the white, semi-lucent, spherical carcinoma of the liver, but they are so minute, that if there are differences of structure they have remained unperceived by us. But again, they are not absolutely the product of the dead body, since we have observed them equally, or even more plentifully, in the matter taken during life from softening tubercle of the glands of the axilla with the forceps, which we examined after a very short interval.

If, however, the accidental nature of the corpuscles and minute spherical globules be denied, one of two things must then be allowed : either that they are the minutest states of the true tubercle globules, or else one of a series of appearances that the matter of tubercle puts on. But there is a marked difference of character between them and the gum-like globule of yellow tubercle ; and we have not seldom seen the latter possessing the entire of their peculiarities, when even as small as the most grown of the spherical forms spoken of. We have not been able to satisfy ourselves upon the authority of experience hitherto, so as to induce us to adopt the one or other of these for an invariable opinion ; and we will leave it to time and ingenuity to unveil these mysteries of observation.

The warm grey or yellow bodies seen in and composing almost the whole substance of yellow tubercle, seem to us to be the more characteristic elementary form of the matter of scrofula. Resembling in some degree the colour and volume of blood globules, a suspicion of their being such, in a modified condition, struck us momentarily ; but upon testing them with suitable re-agents we

soon satisfied ourselves of their specific kind. The globules of the blood are instantaneously dissolved by distilled water ; but the globules of yellow tubercle are not changed at all thereby ; besides these are not soluble by boiling tubercle in a test tube of water over a spirit lamp.

The ultimate constitution of these bodies is difficult to decide upon ; and as far as sight and motion, and their individual contact point out to us, they must either be somewhat fluid saccular or else solid globules. The irregularity of their forms in the firmer tubercle of the lung would decidedly incline the observer to look upon them as consistent matter of definite volumes, and more or less globular in form ; and the nearest analogy we could give of their aspect would be to compare them to rounded tears of gum arabic somewhat softened in water, and swimming in a liquid of nearly equal specific gravity. This would represent their irregular and softened margin under the microscope, and still better the colour and transparency of them, which only admits of good description by comparison with things perfectly familiar to the naked eye.

These globules, however, as they appear in the softer tubercle of the spleen and of the glands of the lymphatic system, and also in the riper form of this matter in the lungs, would seem to have a finer constitution, are fuller and more regularly spherical, and liken secular globules more completely. They seem to vary something in colour and rotundity of form in different specimens, just as the tuberculous matter itself wears a varied appearance to simple vision. But, under all circumstances, they retain marks of peculiarity more than sufficient to point them out as tubercular. Thus, it has been hitherto impossible for us to determine whether they are a species of solid globular crystallizations of an animal matter, or saccular globules enclosing a more fluid material. We doubt either of these opinions taken exclusively, but suspect sometimes both views are in part correct, inclining, however, to consider the evidence for their solidity as, in comparison, more satisfactory.

We have employed an instrument of Vincent Chevalier with selected lenses, and have made our observations with the reflected light on the simple mirror. The magnifying power which we have found most convenient is five hundred or thereabout; and we have described the appearances as they fell under our view thus enlarged. It seems well to notice these circumstances, because of the difference of microscopes, and the deceptions that might possibly arise from the application of a variety of powers of enlargement and styles of illumination.

Tubercle is, in our opinion, truly meant for existence out of the current of the circulation, as a product of abnormal vitality, and the morbid alteration of the capillary affinities, wherever it is formed from the elements of blood in the scrofulous cachexia. We will not deny, however, that the circulating mass does actually partake of the ill habit of tubercle in some fashion; on the contrary, we desire to think so; but confess total inability to detect in it any other signs of primary change, than the frequency of preceding pallidness common to the cachectic, and allied to diminution in number of the blood globules. If such alteration in the constitution of the blood is a sequel of chemical change, and the presence of certain salts or bases, disproportionate to the conditions of health, must remain a question for the chemist to solve, as it concerns proportions and not vital forms. Discoveries of this kind are perhaps needed to fill up the train of causation in the phenomena of tuberculization; but we would not lay too much weight on the value of such anticipations, as the grand problem will still remain for solution, concerning the originating causes of such changes, and also the mass of their accompanying phenomena, and not of a few only. It may be urged, that tubercle might be readily expelled from the blood fully formed; but there is a fallacy in this kind of argument, which assumes the prior existence of it in form amid the constituents of the mass in circulation, where it is only found by accident in the advanced stages of the disease, and as the probable sequel of a local morbid process. It is difficult

also to suppose its regular separation in this manner, so constant and perfect as to evacuate it completely from the vascular system, without more marked embarrassment of function than commonly attends tubercular affections. Besides the analogy of the matters of physiological secretion opposes strongly such a supposition, which we consider untenable, until we have satisfactory proof of its presence in the circulating fluid at every period of the cachexia. But the fact is otherwise; and it has been found but seldom in the system of blood-vessels, and under circumstances altogether different from those which are requisite to establish its necessary pre-existence in the blood. Therefore, in regard to the primary site of tubercle, we will endeavour to arrange in suitable order a few principle facts relating to its development.

It is tangible to observation, first of all as a product of secretion, whether on secreting surfaces, or in the cellular structures of tissues, or in the parenchyma of organs in the pathological state.

The vital affinities of the capillaries in the parts where tubercle is to be voided from the circulation, compose it in the quality of embryonal liquor, by the accumulation of its elements from the blood.

It is therewith separated, for the most part, out of the vascular system by a process of secretion, to which the accumulative affinities of the capillaries, membranous imbibition, the impulsion of the circulation, and the assumption of the form of tubercle externally, contribute respectively, in an analogous manner, as happens in the secretions of health.

It is more than probable, however, that another condition of the capillaries obtains in tubercular secretion, distinct from that of the physiological state, which may contribute greatly to the deposition of the morbid matter.

We do not desire, however, to invalidate in the least, by those principles, the value of the observations of several great masters in morbid anatomy, that have detected tubercles within

the vascular system. It seems to us only, that conclusions not strictly logical have been deduced from this circumstance. Notwithstanding, therefore, the primary intention of the economy appears to be, to bestow on tubercle every essential for existence out of the circulation, whether for immediate excretion, or after an interval; yet we acknowledge the truth of the following propositions, respecting its occasional appearance in the absorbent and circulating systems.

It has been found not seldom filling completely the veinules in the exact neighbourhood of tuberculous ulcerations.

It has been sometimes discovered, but rarely, as a plug in some considerable vein in communication with parts already tuberculized. But this is not enough to justify the conclusion as to its formal presence ordinarily in the blood. It might form, in such cases, in a kind of coagula, when the tuberculizing process combines with and succeeds to a transient phlogosis, or else it may follow upon the coagulation of the blood in a vein from whatever cause.

It is sometimes found in the simple coagula of the heart and large vessels in the last event of the malady. Again, this may proceed from more than one source. In such circumstances, it may have gained the general circulation either, possibly, from a tubercle of a vein, or by an open vessel in a tubercular mass; or else, what is most probable, the embryo in liquor may have mingled with the circulating fluids, whilst its accumulation by the tuberculizing affinities of the capillaries was very considerable in certain localities, and the secretion of it outwards not proportionably complete; as may happen in particular in strongly predominant tubercular cachexia, with much local disorganization.

In this case, it may collect apart in the coagula, just as in coagulable lymph, and secreted matters external to the vessels.

It is also observed not seldom in the lymphatics which lead from a tubercular gland; there are two probable sources whereby

it might gain access to this site, either through the open mouths of vessels already broken into by the destruction of the texture of the gland itself, or else it may be taken up by the process of absorption in place of normal matter.

We have ascribed one of the principal agents in the local deposition of tubercle to a change in the vital affinities of the capillaries; those manipulators of the raw material of the blood into so many forms, which are subject still to modifications by disordered health and diseases. It appears to us highly proper to uphold the exclusive and special characters of the tuberculizing affinities, because we can obtain little of what is satisfactory, in referring them to derangements of one or other of the kinds normal with health. The subject is, however, not uninteresting as a matter of simple speculation; for it is difficult to conceive a special institution of forces to destroy untimely the animal frame, where so many are designed for its preservation and growth. We gain nothing, however, in looking at the tuberculizing affinities, as being a modification of those of plasticity forming coagulable lymph; yet there are considerations which remove it out of the limit of absurdity to think so. Tubercle is very durable, whilst it is far less so than the material of plasticity. Organized lymph assumes a vascular and reproductive life, although still subject to gradual waste in comparison to primary tissues. The attachment of tubercle to mucous surfaces, and inflammatory growth everywhere, also seems to hint toward some such irregular application of normal forces otherwise designed for the purposes of healthful operations. Besides there are men and families of our kind, free from the taint of tubercle, and almost certain to remain so by obeying the laws of prevention dictated by experience; and how could this be, it might be argued, were there a special creation of tuberculizing affinities, as their operation ought then to be general? But this would be cavilling the word, for we only wish to consider the changes of vitality in the capilla-

of health. Examined by the microscope, such glands are, however, found choked with tubercle, occupying every space in the mesh of tissue. It is our conviction in this case, that the gland swollen with engorged vessels becomes readily subject to the tubercular diathesis; and the capillaries, which hitherto exuded serosity from the blood and the matters needful for its nutrition, are possessed by the tuberculizing affinities, separate from the current in circulation the elements of the embryo of tubercle, which having once assumed its form continues to grow by the addition of material secreted, until by its accumulation it deforms the organ beyond repair. The separation of tubercle from the vessels now proceeds until the circulation is wholly stopped. The gland if not removed, or removable, must derive every supply for further development of the morbid matter from the surrounding membrane, now become a cyst to a tuberculous mass, or else the tubercle, ceasing to exist, gives way to chemical decomposition, and its soluble matters are removed by absorption. The membranous envelope then embraces the residue of insoluble salts, and becomes thickened by the gradual addition of more plastic matter organized around it, sometimes to undergo the change into cartilage or bone. Such is the course of tubercalization in engorged glands; but as this morbid process may succeed to engorgement of any portion of the frame, we will do well to anticipate the fact by a few remarks. So long as it pursues its course thus in a detached part, not indispensably bound to the great functional centres, the progress of the secretion and growth of the tubercle proceeds with so great a calm, as to be scarce observed except by the deformity it causes. But when it pursues its course with engorgement of portions of brain or lungs, the constitutional symptoms may sometimes be considerable, especially if it is a very central part in the nervous system, or large extent of the organ of hematose; and so with other noble divisions of the economy.

Tuberculization along with the plastic process is, perhaps, the most common form in which this morbid condition pro-

gresses in the animal frame. It is for a certainty independent of inflammation, although this may frequently conjoin with it at one period or another in such cases. The inflammatory phenomena may either precede, accompany, or follow the plastic tuberculizing process, or fail to appear altogether. We will take, for example, tuberculization of the lining sack of the belly; and we have often seen tubercle of remarkable thickness covering its walls, and solidifying the great omentum entirely, yet during life, the patient never scarce complained of pain, nor acute tenderness, nor was oppressed at any time with inflammatory fever. The whole of the symptoms were generally referrible to the cachectic habit in the first instance, and next to emaciation and hectic; whilst the abdomen swelled, grew tense and uneven, losing its suppleness and softness to the compressing hand. There is also the tuberculizing process which proceeds in common with the infiltration of organizable lymph in the neighbourhood of abscesses, which presents no signs of vital movement deserving of being called inflammation. It often happens, that glandular bodies and the paranchyma of organs are attacked by infiltration of coagulable lymph, independent of the true symptoms of inflammation; and, in these instances, the embryo of tubercle may also be secreted together with it. In the one case, as in the other, the constitutional symptoms are very little removed from the ordinary appearance of the scrofulous habit, or an aggravated cachexia. But no indication of functional reaction necessarily marks in a glaring manner the onset of the local deposition. Although the combination of the tuberculizing process with that of plasticity may be said to embrace all cases of the pathological condition, when lymph is secreted into the textures of the body, yet there are other instances where this union is more simple and void of further complication. We will include in this category all cases of tuberculization in common with the plastic process, or following upon it, in which pain in the locality, or inflammatory fever are wholly wanting. There is no doubt of this particular union being thus free from

complicating disease, no more than of the fact, that the action of they ital affinities, whereby organizable lymph is separated from the blood in circulation, is very frequently a pure change of the vitality of the part where the phenomenon is manifest, independent of phlegmon. The occurrence of induration of the lungs and as well of the parenchyma of other organs and tissues by a plastic process, in which the symptoms of inflammation fail entirely, is now well ascertained ; and we have seen cases where hepatization of the lungs proceeded without pain and without fever. But, in such cases, where death followed, the hepatization has been found every way perfect as a process of plasticity.

Tuberculization, together with inflammation and the plastic process, is a most ordinary appearance. Whatever part inflammation attacks in the ill habit of scrofula, is liable to grow tubercular, provided the inflammatory action gives way to the plastic process, without passing into pus to form an abscess. The capillaries of the inflamed part separate the embryo of the tubercle as well as coagulable lymph, and the secretion goes on into the parenchyma of the organ. The only needful condition for these phenomena would appear to be the occurrence of phlogistic action in an individual whose constitution partakes strongly of scrofula, with the cachexia already predominating. Perhaps one of the best examples of it is, the inflammatory tubercle of the lungs ; in the midst of consumption the poor sufferer is attacked by circumscribed pneumonia, and dies. The part is found hepatized, but in a peculiar manner, which characterizes complication with the tuberculizing process. This part of the substance of the lung is solid and fleshy, and deprived wholly of air ; the whole parenchyma, in short, is filled with blood in the vessel, and a plastic matter infiltrated largely into the texture. It is more elastic than pure hepatization, and by no means as friable, but rather tough between the fingers. The surface, when divided by a sharp knife, is brighter and ruddier, rather than liver-coloured, or obscure red ; and on

minute examination, it appears to have a very fine granular aspect, like pulmonary apoplexy, but very much finer still. There is also a degree of seeming transparency hidden in the opacity of the mass, which is wholly wanting in other forms of hepatization, and very sensible to the familiar eye. There is no pus in the tissue solidified in this manner, and it never passes into suppuration, never becoming grey hepatization. It resembles somewhat the solidification of the lungs in children from lobular pneumonia, which last often goes no farther than a plastic process, to waste ultimately by the pressure of the air from within, and terminate in great dilatation of the grosser bronchial tubes. But the tubercular solidification by the process of phlogosis is, however, characteristically different to the practised observer even in this early stage; and this is still more evident after awhile; for in this case there is no subsequent loss of bulk, nor dilatation of bronchia. There is, on the contrary, an evident progressive enlargement.

We have now approached the subject of the transition of inflammatory growth into tubercle—a real bone of contention for a long period among pathologists. We will not delay to argue a reality, but proceed forthwith to trace the appearances of morbid transition; which we find to occur in a series of conditions in some degree different. Morbid transition may happen as a continuance of previous inflammatory or plastic process, of which it had been a partaker from the beginning; or it may supervene independently on previous inflammatory or other growth. Inflammatory tubercle, however, belongs to the former rule; and in the case of tubercular hepatization, the embryo of the tubercle is separated from the circulation by the tuberculizing affinities of the capillaries, equally with the coagulable lymph of the plastic process allied to inflammation. We are quite of the opinion, of infiltrated tubercle being the direct result of a tubercular hepatization in the lobular, or even the general form; and we will endeavour to show the steps of the change. The solidified part, as it appears immediately on

death from inflammation of the lungs, we have already described ; but in examination of the same lung, or a number of others, we may find solidified parts of the same form in all the various stages, from recent tubercular hepatization into pure infiltrated tubercle. The solid portion of lung gradually parts with the colouring matter of the blood, which it presents soon after the inflammatory process, it becomes slightly reddish, then waxes greyish-red, and rosy-grey, until at last it is found yellowish-grey and whitish-yellow, and finally opaque-yellow. Sometimes we may observe all these several degrees of transition in one lung ; but we have had frequent opportunities of convincing ourselves of this gradual progression, by comparing the product of a great variety of corpses in the dead house of the vast civil hospital of Vienna. On fracture of the solidified portion, from the moment it assumes the yellow appearance characteristic of tubercle, we find the broken surface wears the aspect of the foregone organic arrangement, and most frequently a delicate remnant of a colour of the lightest rose. But this even, and also the last traces of the parenchyma, disappear with the complete growth of the tubercle.

Here two questions start before our mind, as to how the tubercular transition is accomplished, whether it be by the embryo of tubercle mingled in the product of plasticity tainting the whole, altering it, by a sort of ferment, or by procreation, into its own kind ; or whether the tuberculizing affinities predominating and persisting after the inflammatory plastic acts, continue tuberculization even at the cost of the product of phlegmon. The latter is our accepted opinion, appearing to us altogether in agreement with the best ascertained facts ; for were it otherwise, we must thence allow an inborn faculty of generating itself and kind, either in the embryo liquor or perfect tubercle, which is neither probable nor yet sustained by any observations at all well established ; and we are disposed to grant this ability in origin solely to the vital affinities of the diseased locality. Were it even proved in a satisfactory manner, which is not cer-

tainly the case, that the globules of pus possess the property of changing those of the blood into the purulent form by mere contact in the proportion of one to eight ; and were this to happen external to the body within eight or thirty-eight hours, as stated by Gluge, still we could not infer therefrom, that the tubercle globules are endowed with an analogous virtue. We lay aside, therefore, all idea of conversion by ferment, or direct alteration of the elements of the inflammatory plastic product into tubercle, not only as untenable, but as highly improbable on bare consideration.

This transition presupposes two distinct acts, which are worth while considering for a moment, in order to give greater distinctness to our notions of the process of change. The one of them is the continuous development of the tubercle ; and the second is, the removal of the coagulable lymph secreted at the first in common with the embryo of tubercle, as also of the organic structure of the infiltrated part. The presence of foreign matters in the lymph thrown out of the capillaries of the part of late inflamed, must considerably impede its organization, otherwise so often perfect, rendering its durability less permanent, its organizing affinities less effective, and more submissive to those others of the blood and its vessel of circulation, which attract, in common with the lymphatics, the elements of organic decomposition into the current of the vascular system. We have established the probability, that the material of plasticity, in this instance, is more than usually obedient to external influences ; and we will now see how readily its removal can be accomplished, according to the gradual progress of the deposition of tubercle. We have already accepted the truth of the assumption of the persistence of the tuberculizing affinities in the part after inflammation and the plastic action have ceased and we derive from this cause continual addition to the amount of tubercle. The accumulation and growth of the tubercle must overwhelm the product of a more temporary act, for they proceed in considerable force. The pressure to which the

remnant of organized lymph is subjected thereby on every side will hinder its nutrition, and instead of a constant change of substance, there can only happen progressive atrophy. The increasing tension kept up in this manner from within the tissue itself, acts more generally, and with greater efficiency than strap dressings can do on the proud flesh of wounds, or the bandage on the volume of the limb it involves. Nutrition is, at any time, a delicate process in the complicated animal machine ; and a very slight hindrance sometimes suffices to throw an insuperable impediment in its way. Organized lymph, however, is subject to gradual loss in the nutritive change, wastes more rapidly as thus impelled, and can disappear sometimes with amazing quickness in making way for the advancing tubercle. Thus the change of the inflammatory growth is readily understood, without supposing the newly organized lymph in it puts on the tuberculizing action ; and notwithstanding new tissue may undergo a series of morbid influences just as the primitive, yet we are of opinion, in this case of tubercular transition, it is not so ; for it cannot so much as organize perfectly, and maintain itself together with the forcible and rapid growth of tubercle. We must admire the large part the assumption of form acts in the pathological alteration which we have discussed ; and so long as the vital affinities compose the morbid matter, considering its durable qualities, we are not astonished at the result. But after we have generalized the means of transition of diseased texture from inflammatory growth into tubercle, our real progress in positive knowledge has been very little ; for we have but learned in detail a fact evident to most impartial minds in the broad perception of daily events.

Tuberculization of coagula in veins has been occasionally met with in the large trunks ; but this has happened seldom enough to leave the world in considerable doubt, as to the real condition of the coats of the vessel. Dr. Carswell gives us a drawing of a specimen of this kind, in which the tuberculous matter occupied the whole calibre of the portal vein, resembling

very much the colourless coagulum of phlebitis. We are not told whether or no the vein was thickened, opaque, or otherwise changed by the process of plasticity or of phlegmon; and in this obscurity, failing opportunity so rare to satisfy our suspicions, we are left to form an opinion, upon what happens in the veinules bordering on tubercular ulcers, as to the process in larger vessels. The veinules so situated, are exactly in the circumstances most fit to inflame; and in the tuberculous cachexia there are four modes of termination for the coagulum resulting from phlogosis. The blood being arrested by the coagulation caused by the vital affinities of the inflamed coats of the vessel, must either be dissolved again by the quick return to health, or pass into organized fibrine, or into pus, or into tubercle. The vivifying influence of health, glowing from the coats of the vessel, restores the blood to its pristine form of a fluid fit for circulation. This property of the vessel on the blood it contains is but a part of the vital agencies which are everywhere in operation in the economy, to preserve one great harmonious whole amid such a numberless variety of instruments. The vitality of the vascular walls, in health, influences the circulating fluid, as ought to be for the purposes of life; but when this vital condition is altered considerably from this standard so healthful and good, it falls into the sphere of disease, and its action is henceforward followed by morbid effects. If an inflammatory attack on a vein does not give way to a return to health, but gives place merely to a plastic process, the coagulum in the vessel passes shortly into fibrine, which looses the colouring matter, and becomes organized, to undergo the partial union with surrounding textures and gradual atrophy. When, however, inflammation has coagulated the blood in a vessel, and only makes room for the suppurative process, the whole or greatest part of the neighbouring coagulum, instead of undergoing the healthy resolution, or even fibrinous organization, passes into pus; for the vital affinities glow purulency, or the forces composing pus, into the mass. If, on the other hand, an inflammation of a

tubercular character coagulates the blood in the vein of a very cachectic person, and instead of resolving the morbid action immediately abandons it only to the tuberculizing process, then the affinities of tubercular composition glow from the venous coats through the mass, which in place of healthful resolution into fluid blood, or else change into organized fibrine, or into pus, passes into tubercle. We are, therefore, of opinion, the venous tubercle derives the first condition for its formation in an abortive phlogosis of the coats of the vessel, but which soon gives place wholly to the action of another morbid state of the vascular vitality, the affinities of tuberculization. Such imperfect phlebitis we have often had occasion to observe in all cachectic maladies; sometimes it continues for a short period, causing dropsy of a limb below the coagulum, which disappears when the imperfect inflammatory action ceases. When it happens nearer to the period of decease, it may persist also in an abortive form until death, and the autopsy discovers doubtful or very slight phlogistic alteration of the vein, with mere coagulation of the blood in its interior, which has neither experienced the fibrous, purulent, or other changes. This mild form of the phlebitis is particularly frequent in the last period of carcinoma, when the powers of life are almost exhausted, and no more violent vital attacks are consistent with the prolongation of life. It seems as if the system can no longer rally either the nervous or vascular reaction capable of producing an active work of plasticity or of suppuration.

If we throw aside all suspicion of foregone phlegosis in such cases, we are then reduced to the alternative of granting to the tuberculizing act the ability of coagulating blood in the vessels, which has hitherto been considered as special to phlegmon. We cannot well suppose its accumulation by secretion in this place, where there is a constant current of fluid. It is impossible to conceive the entire deposition of it in a like situation, and as it were upon a single point, allowing even the supposition to be true, of its actual presence primarily in the blood. And, notwith

standing, it might well be possible for the power to coagulate the fluids in circulation, to be a part of the process of tuberculization, this is yet scarcely probable. If it were so, tubercle, which is the next common morbid product to pus, ought to be much more frequent in the venous trunks, and in some proportion to the often occurrence of phlebitis. But there is no agreement between the frequency of tuberculization and its seldom localization in larger veins, that may justify us in allowing the power of coagulation to the morbid process simply. If we were to grant this,—it would be but allowing it another feature in common with phlegmon, making their characters less distinctive, and more in unison. But we see it combined so clearly in many other cases with the plastic and inflammatory acts, that the most reasonable view to take of tuberculization of venous coagula appears to be, to look upon it as a similar complication of pathological states.

There appears to us to be possibly two means that might facilitate the transition of venous coagula into tubercle; these are, firstly, the strongly cachectic blood, particularly in the latter days of the malady; and, secondly, the accidental presence of tubercle to a considerable amount in it. By the former circumstance the mass of fluid in circulation must come more readily into the sphere of action of the tuberculizing affinities, being already particularly disposed to partake of the character of the disease. Besides, the presence of tubercle in the blood would be a step in advance, and contribute much to the transition by the direct influences of the morbid product.

Leaving aside the subject of the uses of the globules until another occasion, we will consider for a little the relative qualities of the local change of vitality in tuberculization, which is the next link in the chain of morbid phenomena for analytical research after the product and the act of tuberculization. It is by a formal comparison alone of the peculiarities of the tuberculizing state with those of other morbid conditions, that we may hope to appreciate them truly, whilst we generalize a series of various but similar appearances, to reduce them to ultimate facts. We

will, therefore, single out into so many separate propositions the general phenomena manifested in the economy in the tuberculizing of parts.

1. The tuberculizing affinities can accumulate, and the capillaries give exit to the embryo of tubercle, and the tubercle globules assume their form, devoid of any startling turmoil of the general economy beyond the ill habit of scrofula.

2. These phenomena also often occur with marked increase of the normal secretion and inflammatory fever.

3. The separation of the elements of tubercle proceeds very often, in common with the secretion of coagulable lymph, or some modification of it.

4. The tubercular secretion is not seldom combined not only with the plastic process, but also with inflammation.

5. It is sometimes accompanied and often followed by hectic.

The proof of the first of the propositions is of high moment to the practical physician ; for its truth insists most strongly for the promptitude of his aid to restore the cachectic habit of scrofula to the order of health, and for boldness enough on his part to urge his charge and friends, at the risk of incurring the responsibility, to take all needful precautions. It is the more serious on the account of the circumstance, that this work of havoc can go on a considerable way, even in noble organs, in such an insidious manner as not to create a suspicion to the sufferers and those about them, by the reaction either of the vascular or nervous system. It is, therefore, not the tuberculizing of small extent of tissue, and of organic structures of inferior consequence in the animal economy alone, that is unattended by remarkable tumult of the great functions of life. We often perceive pain, heat, swelling, and other phlogistic changes in organic structures of less note, whilst no febrile reaction awakens ; and this indifference of the essential powers of life to the process of inflammation is more evident still sometimes in tuberculization of even important organs. It is not, howe-

ver, an easy matter to produce an example of pure tubercle secreted wholly independent of the plastic process. Since, however, under numerous circumstances, we detect the tubercle globules by the microscope, devoid entirely of any appearances of coagulable lymph, or organized fibrine of abnormal formation; we may safely conclude, that how frequent soever the combination of tuberculization with the plastic process may be, it is frequently wholly independent of it, and even devoid of such complication. The best specimens of pure secreted tubercle seem to us those cases of its accumulation in the bronchia of the cow, whose chest is mobile enough to express the morbid inabsoluble secretion from the air cells and smaller tubes, but whose powers of expectoration are somewhat limited as compared to man and some other animals. It is nevertheless probable, that the plastic process, or even inflammation, combines at one time or other with the tubercular secretion in such cases on various points of the lung; but still the composition of this root-like mass of almost pure tubercle, where there are no old cavities, proves the affection to have been simple secretion of the morbid product, at some period of the malady, and for the greatest part. Also in the human subject, we find a pure mass of secreted tubercle in its broad appearances; and in cases where we have observed tubercle filling the fallopian tubes and uterus; we never detected traces of either the plastic or phlogistic process in the former, and sometimes even no secondary morbid state bearing these qualities in the latter. Besides, the history of the deceased, in such instances, never led to a suspicion of its presence in the uterine organs, and appreciable symptoms of it had failed entirely. There is, again, the instance of tuberculous glands of the lymphatic apparatus; in them, when not enormously enlarged, we often observe the tubercle globules of most various volume crowded everywhere through the substance, devoid entirely of appearance of coagulable lymph, or the organized fibrine of plasticity. We might select other cases in support of our proposition, but we would thereby exceed the limits of our

article, and we will dismiss the subject under promise to return to it on some other occasion in a more practical form. It appears to us, nevertheless, that we have already established the independent secretion of tubercle on localities of cachectic individuals, clear of all remarkable turmoil of the general economy beyond the derangements of the ill habit of body.

This is a fact of chief consideration to establish, since it will constantly avail us in therapeutics, and spare us from numerous errors of the advocates of invariable phlogosis, and of the scholars of Broussais, without throwing a veil over our acquaintance with its often combination with the plastic process and inflammation. This union is, indeed, so frequent as to be almost general; but we must ever keep in mind the universal rule of independent tubercular secretion, however common be its alliance in the manner alluded to. We may establish upon these grounds, that the first principles of cure ought to be directed against the cachexia and the tuberculizing affinities of localities simply; that the second should be, to impede and stop the plastic associate; and that the third must be, to quell instantly accompanying fever or inflammation. There are cases, of course, where antiphlogistics and powerful solvents are not needless alone, but hurtful; and such are those of simple tubercular secretion, when alteratives and tonics are required, and also where the plastic associate is almost a matter of indifference by reason of the locality.

The truth of the second proposition is too evident to require argument; and it is only necessary to refer to what occurs in catarrh and bronchial inflammation, to satisfy every one of the fact, and to clear up the manner of procedure of the like phenomena on other secretory surfaces. The principal practical deduction we can derive from this source would seem to be, the great necessity to lessen the secretion and quell the febrile movement, and guard especially against those pulmonary attacks. It appears, indeed, too clearly proved by observation and experience, that the one and the other of these morbid conditions

but aggravate the activity of the tuberculizing affinities, and aid the fixation of the morbid products which thence results to the membranous surfaces of the air vesicles and tubes on every hand. However this is not always the bare consequence of the increase in the quantity of secretions; the abundant quantity would seem sometimes to act the part of a diluent rather than otherwise.

The third of the series of propositions is of the highest interest, and deserves all its bearings to be pointed out with nicety. We have already given examples of the process of tuberculization along with the exudation of coagulable lymph, and we will restrict our observations in this place to what relates to this combination of maladies in the lobules of the lungs and minute air tubes. We conceive, that the plastic process may conjoin with tubercular secretion in the pulmonary organs in three forms, to wit, by the exudation of lymph in common with tubercle into the substance of several and many lobules; or else into one lobule only; or, lastly, into any number of air tubes as a secretion from the mucous membrane. On another occasion we purpose to discuss fully the subject relating to this form of tuberculization. Without taking into consideration the act of plasticity as an augmentative of the tuberculizing process, we see here at once the danger of the combination. We are of opinion, that tubercle is secreted from the mucous surfaces in a much more general manner than is commonly supposed; and that this may happen also in the lungs without harm, until some union of disorders occurs, such as also the one under consideration, and brings in its rear the local attachment of the tuberculous matter. This is a consideration of some weight, and should serve the physician as a license for effective and bold treatment in doubtful cases.

Our fourth proposition insists upon the operation of the secretory affinities of tubercle together with phlegmon and inflammatory fever; and this complication of diseases is one of the most serious that can occur in the lungs; for extensive por-

tions of them are often thus overwhelmed suddenly with the scrofulous matter, and irreparably lost. The tuberculizing state is quite borne from sight by the violent associate in the part and the turmoil of the general economy. It here becomes the first duty of the physician to quell at once the inflammatory phenomena. If the febrile movement is active, and the circulation under much excitement, general blood-letting is, in such cases, as requisite as in large hæmoptæ. But the local application of the antiphlogistic treatment to the chest, and the administration of calmants for the heart and circulation, should never be omitted, and might be regarded here as the general means of cure.

Fifthly, we have coupled the tuberculizing state with hectic; and this is the final form of its appearance, and fatal for the most part when the site of the malady is the lung. Just as a feeling of well-being is attached to the right performance of the functions of the frame, so when they act in a morbid way, the sufferer in general perceives some inconvenience, accompanied commonly by irregularities in the broad phenomena of life. So it is in the scrofulous cachexia with ripe tubercle; and we hear the pitiable man complaining of dwindling of force and energy, and of growing disorder insidiously arisen, may be, in the bloom of youth, like the "worm in a bud" consuming it away, to grow fat in its place. The healthful pulse seldom beats again, in giving way to the hurried stroke of hectic; and comforting warmth passes into irregular flushing heat; the palm of the cachectic, when it presses a friend's, burns with new ardour—to grasp a long farewell before the journey to the tomb, hot as the kiss of grief. The periodic fever of the ill habit sets in; the creeping shiver, the oppression of heat and thirst, and profuse sweats in succession, alarm the sufferer at length to his serious position; and seeking the guardianship of the physician, he hears him mutter something: alas! this is irrecoverably ill. He struggles with the disease, dauntless for a time; but growing lean from the beginning, he wastes away to die, after contention with a host of associating evils.

Here, again, we lose sight of the tuberculizing state of the locality in the general symptoms of cachexia, which seems referrible to some higher order of change in the vitality, than the mere general reaction from the local elaboration of tubercle.

There is another peculiarity of tuberculization, to wit, the often punctiform deposition which is worth regarding; but as yet the physician has not been able to draw any inference therefrom for guidance in his treatment. It may be, however, that each remarkable character of disease might conduct in some fashion to more exactness in the cure; and a better knowledge of the local action of medicines may, perhaps, one day avail something in this relationship. This feature of the morbid deposit seems more than accidental.

All we learn by the inquiry into the tuberculizing state is, that it is allied to engorged tissue, increased secretion, the plastic process, or to phlegmon, and is compatible either with fever, or perfect tranquillity of the great functions of life. Besides the tuberculizing affinities appear not alone capable of composing the embryo of the morbid product from the blood in circulation, for secretion from the capillaries, but also of forming entire coagula into the element of tubercle in veinules as well as in larger veins. That, notwithstanding the secretion of tubercle may proceed from the mucous membrane of the lungs unperceived, yet in its permanent localization in them, it is so commonly allied to a plastic bronchial affection, that we might be justified in receiving it as a mere modification of catarrh, whether habitual or febrile, were we not aware of the specific characters of the product, and another fashion for its production in other textures. For all purposes of practical medicine, however, tuberculization of the lungs ought to be viewed as a process of the form of catarrh; and the detection of its kind by medical analysis, must only call forth additional cares for its efficient, and may be the specific cure. There is, therefore, nothing in the act of tuberculization alone, nor any single attendant symptom, that can lead us to its recognition; and we are left to

discover it in its alliances by the voided appearance of the matters, the physical state of the organ, and the features of the ill habit of body.

The tubercular cachexia becomes a study of chief importance to the physician, both with the view to the prevention and cure of the scrofulous malady tending to localization in any part. It is clear, from the history of this disease, that the vital duration of the tubercle globules is limited; wherefore if the cachexia can be overcome in the meantime, and irreparable organic lesion prevented during their decomposition, the cure can readily obtain; now this is very frequently the case. We have seen scrofula primarily as a general, and, secondarily, as a local malady; if, therefore, the ill habit of body can be meliorated before any permanent deposition follows, then the generation of tubercle is harmless; and such cases are far from seldom. These general principles are, therefore, most flattering to the physician, and may justly inspire him with lofty hopes. Although scrofula taken in the universal sense is a most manageable malady, indeed much more so than some others, yet it has particular forms which are often altogether beyond the control of medicinal weapons. We will, therefore, try to single out each set of cases from the assemblage of the whole, to consider them apart.

The tubercular ill habit is most frequently an old family disorder, hereditary since many generations, and, as it were, an inborn peculiarity of the vital existence of its victims.

It is often transmitted from parent to offspring without more remote hereditary origin. This may be the result of the acquisition of a cachectic habit on the part of either father or mother previous to cohabitation, or on the part of the latter during pregnancy, or else from derangements of the function of generation more or less local, which exercises a bad influence on the development of the foetus, and gives birth to a child of sickly constitution.

Again, it may be acquired at any age altogether indepen-

dent of hereditary inclination, either by an ill and imprudent course of life, or the vital disorder caused in the economy by casual disease, or by accidental exposure to the noxious effects of elementary and morbid influences, bad diet, and improper regimen.

These are important distinctions, which ought to be kept in view by the medical practitioner, when he would wish to determine with some degree of certainty, the curability of the affection. There can be no doubt that the third series of cases, if timely treated, are by far the most manageable, provided the patients can be removed beyond the influence of those causes, that, undermining the health, brought on in consequence most serious constitutional disease. If the economy of the individual is not effectually broken down, and the cachexia, without fatal local change, be there alone to treat, the cure may be considered almost certain when properly undertaken, and with the advantages of suitable change of air, a proper course of life, invigorating diet, and corresponding regimen. But, again, not a few of those cases admit of no hope of cure, because tubercle often attacks the lungs and noble organs suddenly, in them, during acute disease, or otherwise seriously by without being anticipated.

The second series of cases is generally of an ill character; and the infant being born, for the most part, in a weak, sickly, or newly predisposed state, often falls a victim to tuberculization in earliest life, and seldom withstands the struggles of infancy, childhood, and youth. But age is in its favour for throwing off entirely the scrofulous disposition; when the constitution once fairly rallies, and all lapse into the sphere of severe disorders is efficaciously opposed. Now this can obtain only by placing the individuals in the circumstances most favourable to recovery from the tubercular cachexia, to the invigoration of the general economy, and to the prevention of the casual maladies to which they are so liable.

The first set of cases are of a very mixed character; and

for this reason they are sometimes the most serious of all, and on other occasions remarkably favourable. This difference depends upon certain peculiarities of family scrofula, which are well worth noticing, and deserve particular attention from the practical physician, on account of their comparative constancy, and value to him for establishing his prognostication. We will next detail some of the most striking of these features.

The cachexia of scrofula has often a family period of development, and not seldom a particular duration of the same stamp.

It has very frequently a family point of localization for the tubercle.

It has sometimes a family character as to its degree of malignancy.

The exactness of our third proposition is familiar to the vulgar; and we do not think any observant pathologist will hesitate to allow its truth. It is only necessary to look back upon the circle of acquaintance to satisfy the mind that the same form of scrofula is more severe in some families than in others; and even in the case of the glandular affection alone, we may soon perceive the particular character of it by its ravages, or the traces of them left behind after the cure. We do not regard the circumstance of its special occurrence in the lung in some family, as a fair proof of its malignancy, because the locality is rather the reason of fatality here; but we desire to expose its greater obstinacy and danger in the same forms of local expression. It is thus glandular tubercle is a most serious affection in some families, and trifling in comparison in others. How often do we see every lymphatic and lacteal gland engorged and changed to tuberculous matter, and the sufferers die from rapid increasing cachexia, and its necessary associates, local organic alterations. Sometimes we see whole families of children, with solitary exceptions, die in infantile age from scrofula, generation after generation; and the same form of the disease of a milder character scarcely carries off a single individual of other houses.

Also, in the curable cases, this difference influences very much the success of the physician, owing to the occasional pertinacity of the malady from hereditary character.

The second proposition seems too clear to admit of doubt ; and on reference to histories of cases and families, the fact is still striking amongst all the irregularities of appearance of the malady. It sometimes tends in one house to affect the lungs, in another the lymphatic system in part or in general, in others, the external cellular tissue or the cartilages. Although no fixed law ought to be applied to the onset of a general disease, yet, as a part of the reckoning of probabilities, those features of family history are not uninteresting. They may sometimes enable us to form the prognostication with more certainty.

Lastly, it has often appeared to us of much importance, that in a considerable amount of instances, there is a certain period of life when the members of particular families are most liable to the attack of tuberculization. When we were wont to enter fully into the history of cases, we often found this fact remarkably pourtrayed ; and we have ascertained frequently that the infant age was the tuberculizing period in some houses, manhood with others, and advanced age for not a few. We have met with instances in which whole families, with few exceptions, have been carried off at twenty-six years, or twenty-eight and twenty-nine ; and it is a very common occurrence to hear of parents losing their children by this sad disease at an almost equal age. The broad facts of general statistics are of very little value to the medical practitioner, since it is individual cases he is called upon to overlook ; but family story conveys to him more useful information. However subject to fallacy our anticipations from such previous characters of the malady may be, the knowledge of the peculiarities of the family type may often lead to the exercise of wise precautions, when such measures might otherwise be neglected.

There is another field of pathological speculation, which must ever remain a mystery to the human mind, this is the ori-

ginal site of tubercular cachexia, and the state of existence it may hold. However, many ingenious men have not hesitated to stumble onwards too perseveringly on these grounds, nor to mystify the public by their observations on the way ; but we might as well hope to explain the condition of the soul in immortality, on the happy estate of paradise in heaven, as reveal such vast wisdom. The best dream of the pathologist would be in the end mentionless in inferiority to the poorest conception of a Socrates or a Plato, on the one hand, and of a Milton and a Klopstock on the other ; and any assertion of discoveries would be quackery as worthy of our contempt as the tales of Mahomet. It is not, indeed, strictly speaking, criminal to inquire into hidden causes and incomprehensible attributes of things ; but it is weakness on the part of the physician to amuse his imagination on those of disease. It is an ill regulated mind which will expend the hours of ennobling fantasy on a hideous train, when it may choose for endearment whatever is beautiful and good. And, again, what value is it to the practical physician to bestow an entity on disease ?—none—but a loss ; it may lead him to view that as a whole which he must cure in detail. Does he desire to give it an empire in the blood, or in the vascular organization, or in the nervous system ? it will profit him in nothing more than in the knowledge of its locality. It is the disease *in situ* he must look to, and quell it there, and repel its associates. The fact, once established, of an altered blood in tuberculous cachexia, is no proof of such being the disease ; we could only conclude therefrom the individual is diseased ; and his blood is altered ; so also is his pulse, and some portion of the organic structures more particularly, and so on. If after having for a series of ages looked upon neuralgias as local but peripheral affections of nerves, it was at last discovered some of them were the expression of central disease, we know still no more of the attributes of pain, but have only completed the knowledge of its localities. It was long before the near analogy of the buff of blood produced in the part inflamed, and the coagu-

lable lymph was allowed ; but medical men did not think afterwards seriously of attributing the inflammation to the buff. But let us look for a moment at its phenomena, and compare them with those of tuberculization ; there we have fever, hot pain in some part, or this alone, attended by coagulation of the blood in the capillaries of the same, circulation only in the vessels of a larger diameter, and excessive development of fibrine in the blood ; and sometimes coagulum alone or with pus filling the whole cylinder of a vein, when this is the part inflamed. No one would say such material changes are the malady or germ of the disease, they are but its products. So also in tuberculizing of parts, the accompanying modifications of the blood, and the occasional presence of the scrofulous matter therein, are every bit as bare necessary accompaniments. The old, blind dame cannot travel alone, she is led by her child ; nor yet can a serious tuberculous change run through its whole courses, unless it brings with it some alteration in the circulating fluid of its own stamp ; but these are no essential, they are secondary or casual alterations.

(*To be continued.*)

ART. XIX.—*Account of a Case of Poisoning by Monkshood, which formed the Subject of a Criminal Trial ; with Observations.* By T. G. GEOGHEGAN, M. D., Professor of Medical Jurisprudence, Royal College of Surgeons in Ireland, &c.

THE case which forms the subject of the following observations will probably be found interesting to medical jurists, as exemplifying a class of inquiries of considerable importance in medico-legal practice, though not of usual occurrence, in which the fact of poisoning *in the abstract* is determined, without any *exact* evidence as to the nature of the *special poison* employed.* The substance considered by the medical witnesses as

* The only instances of "general poisoning" I find recorded as having been tried in the United Kingdom, are those of George Thom, for the murder of the

Fig. 1.

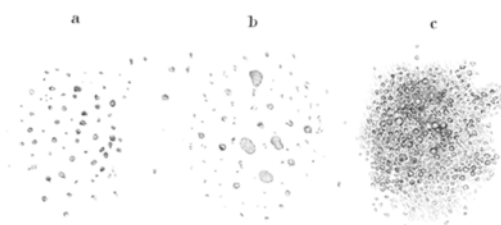


Fig. 2.

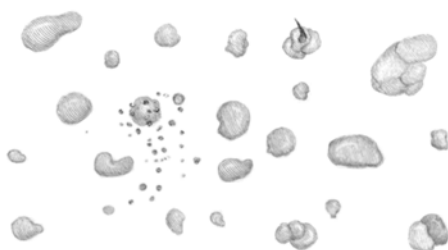


Fig. 3.

