the same combination of symptoms, similar temperaments, etc., and each get equally favorable results, so far as the simple relief of those symptoms was concerned, while it might be that neither was the curative action of the drug, or one the curative and the other a transferring action, and both be equally earnest and candid in the declaration of a cure. Then if both are equally prominent in the profession, the results of each go into the books as *cures*, when one certainly cannot be. In this way, with low potencies often repeated to the great injury of the patient, and in violation of Hahnemann's most solemn warnings, both our materia medica, and therapeutics, are rapidly being run into an interminable confusion, that will require a vast amount of labor to clear up, and which never can be properly understood unless we pursue a very different course in this matter from what we have up to this time.

In conclusion, I will say, if any shall ask how to avoid the transferring effect of drugs until the necessary knowledge can be obtained to prevent it, I would answer that I do not yet know of any way so good as to give high potencies in single doses, at as great a length of interval as the urgency of the symptoms will possibly allow; and if asked if this is safe treatment, I have to say that, I have treated many cases of dysentery, and never yet lost one, either with low or high potencies, but have invariably found the latter, at long intervals, to have by far the best action; and that they are seldom or never followed by chronic maladies as a result of their transferring the acute disease.

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THE CAUSE OF TUBERCULOSIS.

[Nature, when undisturbed in her purposes, is ever perfect in all she does. Of the constituents of the blood, of which there are seven, in the general classification that is made of these, she has so nicely adjusted the proportions of each to that of all the others, that the health she seeks to bestow must result from its action. A loss, then, of a portion of any one of these constituents from the blood, leaves all the remaining ones in a relative excess in the blood-vessels, and hence the results which Nature seeks are defeated; these excesses becoming sources of physical derangement from the moment the healthy proportions of the blood are destroyed. Upon this proposition, the investigations which follow are based.]

(*Continued from page 102.*)

We next come to consider the fibro-cartilaginous stage of tubercle which is mentioned by authors generally, upon this subject, and referred to by Gross in the quotation from him in our last issue. This is undoubtedly brought about in the following manner:

While the changed corpuscles are being deposited in the capillaries of a part, a greater or less portion of the excess of fibrin, which is left in the blood by the same loss of albumen that left the corpuscles in excess, is poured out into, or among the tissues of the same part, to get rid of it from the circulation, and here it organizes and gives the fibrous character

to this stage of tubercle. This is the last stage of growth of a tuberculous mass, and from this point on, the changes in it are of a destructive character, belonging either to absorption and cretification—which are destructive to the tubercle as a tubercle, and a relief to the tissues in which it was embedded—or suppuration, which is destructive to both the tubercle and the parts in which it was deposited.

Proof of a most remarkable character, considering that it is given to establish an entirely different view of the cause, origin, and production of tubercle, from the one we are here advocating, may be drawn from the following, from Virchow's Cellular Pathology, page 522. He says:

"This structure, which in its development is comparatively most nearly related to pus, inasmuch as it has the smallest nuclei, and relatively the smallest cells, is distinguished from all the more highly organized forms of cancer, cancroid and sarcoma, by the circumstance that these contain large, voluminous, nay often gigantic, corpuscles, with highly developed nuclei and nucleoli. Tubercle, on the contrary, is always a pitiful production, a new formation, from its very outset miserable. From its very commencement it is, like other new formations, not unfrequently pervaded by vessels, but when it enlarges, its many little cells throng so closely together, that the vessels gradually become completely impervious, and only the larger ones, which merely traverse the tubercle, remain intact. Generally fatty degeneration sets in very early in the centre of the knot (granule) where the oldest cells lie, but usually does not become complete. Then every trace of fluid disappears, the corpuscles begin to shrivel, the centre becomes yellow and opaque, and a yellowish spot is seen in the middle of the grey translucent granule. This is the commencement of the *cheesy metamorphosis* which subsequently characterizes the tubercle. This change advances from cell to cell farther and farther outwards, and it not unfrequently happens that the whole granule is gradually involved in it.

"Now, the reason why I think that the name of tubercle must be especially retained for this formation, as being extremely characteristic of it, is this—that the tubercle-granule never attains any considerable size, and that a tuber never arises out of it. Those which are wont to be termed large tubercles, and attain the size of a walnut or a Borsdorf apple, as for example, in the brain—those are not simple tubercles. You will generally find the tubercles in the brain described as being solitary, but they are not simple bodies; every such mass (tuber) which is as large as an apple, or even not larger than a walnut, contains many thousands of tubercles; it is quite a nest of them which enlarges, not by the growth of the original focus (granule), but rather by the continual formation and adjunction of new foci (granules) at its circumference. If we examine one of these perfectly yellowish white, dry, cheesy tubera, we find immediately surrounding it a soft, vascular layer which marks it off from the adjoining cerebral substance—a closely investing areola of connective tissue and vessels. In this layer lie the small, young granules, now in greater, now in less number. They establish themselves externally (to the previously existing ones) and the large tuber grows by the continual apposition of new granules (tubercles), of which every one singly becomes cheesy; the whole mass, therefore, cannot in its entirety be regarded as a simple tubercle.

"The tubercles themselves remain really minute, or, as we are wont to say, *miliary*. Even when on the pleura, by the side of quite small granules, large yellow plates, looking as if they were deposited upon the surface, are met with, these too are not simple tubercles, but masses composed of a large aggregate of originally separate granules."

We see by this, that tubercles are not simple or solitary bodies, as they have usually been described. Each "mass (tuber) which is as large as an apple, or even not larger than a walnut, contains many thousands of tubercles; it is quite a nest of them

which enlarges, *not by the growth of the original focus* (granule), but rather by the continual formation and *adjunction* of new foci (granules) at its *circumference*." Now this is precisely the way a tubercle must grow, by the deposit in the capillaries, of the decolorized blood-corpuscles, as we claim. One, or a few adjoining capillaries are first filled with the corpuscles to the extent which they will hold. These being distended by the congestion, press upon each other, and upon those immediately surrounding them, which obstructs the latter, so that the viscid corpuscles more readily secure a lodgement therein. And so it extends outwardly, from capillary to capillary, and this necessarily involves a growth at and upon the *circumference* of the mass, as Virchow says is the case.

The known diminutive size of the capillary blood-vessel would allow of many thousands of them, each filled with all the corpuscles it would hold, being contained within the size of a walnut or apple, and these constitute the so-called foci, or granules of Virchow. Again, as will be seen by reference to the quotation, he says: "If we examine one of these perfectly yellowish white," (the exact color again of decolorized blood-corpuscles in their shrivelled state) "dry, cheesy tubera, we find, immediately surrounding it, a soft, vascular layer, which marks it off from the adjoining cerebral substance,—a closely investing areola of connective tissue and vessels. In this layer lie the small, young granules, now in greater, now in less number."

Here, again, is accurately described what would happen in the growth of tubercle, by the deposit of surplus blood-corpuscles in the capillaries. The small, *young* granules would necessarily be found at the surface of the mass, in the vascular layer which invests it, for all the capillaries which were within the space occupied by the mass are already filled, and no more of the changed blood-corpuscles can be carried in there, to be deposited, therefore they must be left in the vessels at the surface, if at all. The vascular layer, which marks the mass off from the adjoining substance of an organ, is an adventitious growth of vessels, similar to those frequently, if not always, found existing in or around morbid growths, and affords more capillaries than naturally exist in the parts, to receive the corpuscles, and in this way aid in getting rid of more of their excess than could otherwise be done. This would, perhaps, be more especially the case in parts where the capillaries are naturally farther removed from each other (as in the brain, where Virchow describes this method of growth) than is the case in tissues which contain them in greater abundance, or in which they exist nearer together, as in the lungs. And this would necessitate the growth of the "tuber by the continual *apposition* of new granules," filled capillaries, "of which every one" would "singly become cheesy," and "remain really *minute*, or, as we are wont to say, *miliary*."

Whatever the form in which the tubercle may grow, whether in masses of globular or irregular

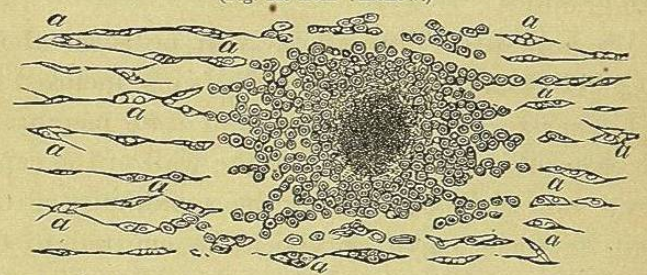
outline, or in plates, the same fact holds good. On the pleura and peritoneum, it would be in plates which would be no thicker than the depth of capillaries in these thin membranes would allow, when filled, and in these cases, too, the tubercle would be "composed of a large aggregate of originally separate granules."

Virchow says nothing, as will be seen, about each individual knot, or granule, being inclosed in, or having for its boundaries, a delicate membrane which would correspond with the wall of the capillary; but that there must be something of the kind, or some partition which he omitted to describe, would appear to be self-evident, in fact absolutely necessary; else how could the small aggregation of corpuscles, which composes each of the various granules, remain separate, and so distinct from each other, and yet be in close contact or apposition, as he says they are? The tubercle, as all must know, *finally* becomes, through absorption of the separating tissues, one homogeneous mass of tuberculous corpuscles, without division in any part, and this would necessarily be the case from the first, were it not that there was some membranous texture, that divided them up into the small collections of corpuscles, which make the knots or granules of which Virchow speaks.

With the growth of tubercles in the manner we have described, the capillaries are, of course, sooner or later rendered impervious to any further circulation, even of serum, through them, hence nutrition is

cut off, and the walls of these vessels, together with all other tissues involved in the tuberculous mass, must ultimately be absorbed, leaving nothing behind but the decolorized and shrivelled blood-corpuscles, and then *cheesy metamorphosis* is said to have taken place.

(Fig. 140 from VIRCHOW.)



This figure, which is an exact copy of one given by Virchow on page 521 of his "Cellular Pathology," and which he says is the "development of tubercle from connective tissue in the pleura," magnified "300 diameters," we give here for two purposes. One is to show how entirely all the organized tissues have been absorbed from the central portions of the tuberculous mass; the other is to show, in what surrounds the central mass at *a*, *a*, *a*, how exactly Virchow has pictured for us the growth of a tubercle, in the manner we claim, viz., by the deposit of decolorized red blood-corpuscles in the capillary blood-vessels, and the distention of these, under the congestion, into "anuerismal pouchings." We could not possibly have drawn a figure that would better have exhibited this fact. In the center of the tubercle we see the tuberculous corpuscles represented as broken up into the *granules* that the blood-corpuscles are composed of, and which they always give when they are broken up by any similar process; then unbroken corpuscles around these; and, finally, outside of, or around all, at *a*, *a*, *a*, *a*, the "knots" of Virchow, which are simply scattered capillaries filled with decolorized blood-corpuscles in the process of extending the tubercle still farther in size, and into the surrounding tissues in which it was embedded. As the figure is magnified 300 diameters, it will be seen that if it should be reduced to, or drawn at its natural size, the little protuberant sacs, distended capillaries, full of corpuscles, would be brought almost into actual contact. But they have not yet reached the point of being sufficiently compacted together to cut off all circulation—not all the capillaries have yet been filled—so that the tissues would be absorbed under the pressure, as has been the case in the center of the mass. Virchow has, of course, given this figure from Nature, and so far it is entirely reliable. As for his assumption that it is a "development of the tubercle from connective tissue," it will be seen by the opening of the next quotation given from him, on page 140, that this is simply his "opinion," a guess, nothing else, without the slightest proof of any kind to sustain it. It may be proper to add that we never saw this figure until long after we had settled, in our own mind, all the details of the cause and growth of tubercles.

Fatty degeneration of tubercle comes about in this way. A portion, more or less, of the excess of

fat left in the blood by loss of albumen, is deposited with the corpuscles, the same as we have stated the excess of fibrin to be, and it remains behind sometimes when the other matters are absorbed; or the matter of the corpuscles, all but the fat which they naturally contain, may be absorbed, leaving the latter in a concentrated mass of fatty matter.

We are fully aware that the claim, that tubercles grow by the deposit of corpuscles *within* the capillaries, is in direct contradiction to all the ideas hitherto held upon this point of our subject. Whatever have been the theories put forth about the cause of tubercles, and their manner of growth, all authors assert with singular unanimity, that these corpuscles are organized *outside* of the blood-vessels. That tubercles grow outside the *larger* blood-vessels is well known, for these are frequently found crossing through the cavities which are left in organs from tuberculous ulceration, and are also found passing through tuberculous masses, or rather, these masses are found organized around the larger blood-vessels. This is all the proof there is to sustain the claim of the growth of tubercles outside of *all* blood-vessels, while there is one of the strongest points of negative proof that could possibly be had to show that all tuberculous corpuscles must have first had their deposit within the capillaries. This proof is as follows: Rokitansky tells us, in his work upon Pathological Anatomy, that tubercles *have never been found in cartilages;* and Virchow tells us there are no blood-

vessels in cartilages. Consequently no decolorized blood-corpuscles could be carried into them and be deposited, to commit their ravages, while we have unlimited evidence that every other part, or tissue, of the whole animal body, into which blood-vessels do enter, are devastated by tubercle. But let us look at this matter from another point of view. There is as much, nay more, space for the deposit of corpuscles *within* the capillaries, than outside of these, in organs most ravaged by tubercles, as the lungs, for instance, and this is another point strongly favoring our position.

Gray, in his Anatomy, page 361, speaking of the size of the capillaries and the spaces between them, says:

> "The number of the capillaries, and the size of the meshes, determine the degree of vascularity of a part. The closest network, and the smallest interspaces, are found in the lungs and in the choroid coat of the eye. In the liver and lung, the interspaces are smaller than the capillary vessels themselves. In the kidney, in the conjunctiva, and in the cutis, the interspaces are from three to four times as large as the capillaries which form them; and from eight to ten times as large as the capillaries of the brain in their long diameter, and from four to six times as large in their transverse diameter. In the cellular coat of the arteries, the width of the meshes is ten times that of the capillary vessels. As a general rule, the more active the function of an organ is, the closer is its capillary net, and the larger its supply of blood; the network being very narrow in all growing parts, in the glands, and in the mucous membranes; wider in bones and ligaments, which are comparatively inactive; and nearly altogether absent in tendons and cartilages, in which very little organic change occurs after their formation."