overcome. Such cases will occur to baffle the best-suggested and most active treatment of our art; but such cases ought not to dishearten us, for they teach us valuable lessons both in pathology and therapeutics; they demonstrate the morbid changes of structure that disease establishes, and they illustrate and develop the principles upon which such cases are to be successfully treated.

The peculiar delicacy and wax-like character of the complexion of this poor girl have already been noticed. It may seem a trifling matter to remark upon, but her general aspect was so illustrative of the old doctrine of the temperament, that I cannot forbear alluding to it. She possessed all the external characteristics of the so-called sanguine temperament, and to which especial susceptibility to acute inflammatory disease was attached. Light flowing auburn hair, fair and alabaster-like complexion, florid cheeks, a symmetrical form, full and early developed, with a mind vivacious and intelligent, and her disease the very concentration of inflammatory intensity. Without meaning to revive or discuss the obsolete question of the temperament, you may, nevertheless, remark, and be prepared to find, that among the youthful who present such characteristics as have been here described, there is a remarkable tendency, and almost special proneness, to acute inflammatory disease; and that when such subjects are attacked by inflammation, it is intense in its degree, often unmanageable, and speedily tends to a fatal termination.

THE LAW OF THE MORPHOLOGY OR METAMORPHOSIS OF THE TEXTURES OF THE HUMAN BODY.

(Fourth Series of Experimental Researches.)

By WILLIAM ADDISON, M.D., F.R.S., Malvern.

(Continued from page 315.)

XIV. INFLAMMATION CONSIDERED MORPHOLOGICALLY.

Before proceeding to substantiate the truth of these conclusions by a microscopical demonstration of the visible changes produced by inflammation, I shall remark upon certain questions which are considered doubtful with respect to the process of nutrition. According to physiologists generally, the lymph, or as I have termed it, the protoplasm of blood, is of the nature of a cyto-blastema, exuding through the interstices of the walls of the nutrient or capillary vessels, somewhat like water through a sieve, and giving origin to cells after its exudation; and upon this hypothesis they explain the origin of pus-cells.

VOGEL even attributes a developmental capacity,—i.e., a metamorphic power, not only to coagulable, but to coagulated lymph. The fibrinous fluid of a dropsy, he says, is capable of organization, and “it is indifferent whether the fibrin is in a fluid or coagulated state, as in either case it acts equally well as a cyto-blastema, and its capacity is unlimited.” “There may

be evolved from the fibrin,” he goes on to say, and he is speaking of fibrinous dropsy, “the most different forms of tissue, either normal, as cellular tissue, simple muscular fibre, cartilage, bone, vessel, nervous fibre; or pathological, as pus, granular cells, cancer, tubercle, concretions, &c.”*

Speaking of the formation of pus, he says,† “the formation of pus is dependent on two very distinct circumstances. In the first place a fluid *must* be secreted or separated, to act as a cyto-blastema; and, secondly, the pus-corpuscles *must* be formed in and from this cyto-blastema, which is always the fibrinous fluid, which has already been described in our observations on fibrinous dropsy, consequently the formation of pus *must* invariably be preceded by the exudation of a modified blood-plasma.”‡

Again, in another place, “The fibrin may coagulate, and thus give rise to false hydatids, apparent serous dropsy, induration of the affected organ, &c. Then follow the great number of changes which arise from the further development of the fibrin,—suppuration in the widest sense of the word, with all its modifications and forms, the formation of granular cells, and ulceration, epigenesis ‘neubildungen’ of the most varying kind, tumours, hypertrophies, concretions, changes of colour, softening, induration, &c.”§

Dr. J. H. Bennett adopts, if he may not be considered the author of, the views and sentiments expressed by Vogel. “The term exudation,” he says, “has been introduced into pathology not only to express the act of the liquor sanguinis (or lymph) passing through the vascular walls, but the fibrinous portion of the liquor sanguinis itself when it has coagulated.”

“In every case the exudation constitutes a blastema for the growth of nucleated corpuscles, which differ in form, size, constitution, and power of further development. The various kinds of development of the exudation may be grouped under the following heads”; and here follow sixteen different forms, normal and abnormal, amongst which are enumerated “pus-cells,” “carcinoma,” “muscular tissue” “epidermis and epithelium.”||

I have carefully perused Dr. BENNETT’s original treatise, and VOGEL’s *Pathological Anatomy*; and I can find in them no proof whatever that coagulated fibrin acts as a cyto-blastema,—no demonstration of its evolving muscular fibres, nervous fibres, granular cells, or pus. Vogel indeed, states that these things are shewn in numerous parts of his work, and advances this as a special reason for

* “Pathological Anatomy,” p. 55.—Ed. 1847.

† *Loc. cit.* p. 144.

‡ The italics in the above quoted passage are mine, and inserted to fix the reader’s attention upon the kind of demonstration on which the “unlimited” formation of cells in coagulated fibrin is based.

§ *Loc. cit.*, p. 415.

|| *Monthly Journal of Medical Science*, Jan. and Feb., 1847.

its being unnecessary to enter upon any refutation of the contrary doctrine which I maintain.* But I contend that these things are not shown,—that his book opens with, and is altogether based upon, a broad assumption with respect to exudation, and an unlimited cytogenesis in coagulated fibrin, for which there is no where in it, that I can find, a shadow of proof offered.

Admitting it very possible,—nay, probable, that portions of the lymph or protoplasm of blood may exude through the walls of the capillary vessels, and fibrillate, or form, as Dr. Bennett states, “a coating of granular matter on their exterior,” what proof have we that either the granules or the fibres, or any other element of the exudation, acts in an unlimited manner as a cyto-blastema for all kinds of cells, muscular fibre, pus, and epithelium? None whatever; nor is there any indication of a natural order or law in such an interpretation; for coagulated fibrin can be hypothetically made to produce just what the pathologist may happen to find by an assumed “unlimited” cyto-genesis, while the fact of an increased amount of colourless blood-cells becoming stationary upon the walls of the vessels of irritated textures, is made to appear anomalous and unnecessary. It is true Dr. Bennett states that he has long doubted the truth of the asserted fact of the colourless cells of blood accumulating in unusual numbers in irritated vessels, and that he thinks “the observers who have stated these circumstances to have occurred, have mistaken the nuclei of the epidermic cells in the web of the frog’s foot for these structures.” The “*Narrative of Experiments*,” published at the end of the third series of my *Experimental Researches*, nay, the short extracts quoted by Dr. Bennett† himself, prove conclusively that the mistake he supposes did not occur either to Dr. Williams or myself. The question Dr. Bennett here raises is simply one of fact, and as such I leave it to be determined by future observers, making, however, this remark, that Dr. Williams mentions Mr. Toynbee as having drawn his attention to the phenomenon.

But, to return,—the metamorphosis of lymph may be watched in progress in the lymph of newly drawn blood, and fibres are seen forming in it so abundantly as to render the materials coherent and solid, but there are no appearances indicating a cell-genesis; and it is contrary to all analogy to assume that the same fluid matter can form indifferently either cells or fibres. In the lymph of newly-drawn blood, and in recent healthy pus, we see with the microscope multitudes of well-formed cells, and free molecules and granules, similar to those seen within the cells, but we do not see a corresponding number of transitional forms or young cells, nor has any evidence been

afforded to show that the molecules or granules are cell-germs.

Again, a great deal has been asserted respecting, and many important functions have been attributed to, certain particles seen in the interior of cells, termed *nuclei*; but the fact that similar particles may be produced by chemical re-agents, and may be seen forming in consequence of their application, by the corrugation of the interior contents of the cells has been neglected. Nothing has been more common during my researches, than for me to see in pus, in mucus, and in lymph, corpuscles, or cells, filled with active molecules, uniformly distributed throughout the cell, and to observe, on the application of a dilute acid or other extraneous matter, the molecular material shrink up into two or three small rounded or oval particles, leaving the space between them and the cell-wall clear and perfectly transparent.* It can scarcely be supposed that such particles or spurious nuclei when set free by the subsequent rupture or dissolution of the cell-wall, possess the property of a cell-genesis, and microscopical observers have given no discriminating rule by which to distinguish the chemically-formed and inert nuclei from those natural ones to which they attribute such varied functions. It is upon these grounds I adhere to the conclusion *that the colourless cells of lymph and pus are unmetamorphosed blood-cells*. Divested of its technicalities the inquiry is simply whether the colourless cells so abundantly excreted by healing and ulcerating, or inflamed and suppurating textures, are non-metamorphosing colourless blood-cells, or whether they are the molecules, granules, or nuclei of the exudation grown into cells. The exudative theory answers the latter alternative of the question in the affirmative, and assumes a cito-genesis in lymph and coagulated fibrin.

The advocates for this theory concede that coagulated fibrin, to be the subject of a cell-multiplication or suppuration, so as to discharge or excrete an abundance of pus cells, must become vascular—be permeated by currents of blood. Now, as blood contains abundantly colourless cells, which may be seen withdrawn from the red circulating current, and become stationary in the protoplasmic space, so the weight of evidence is therefore, I conceive, in favour of my conclusion.

Finally, it appears to me from my investigations, that the law or order of Nature is, universally in all living structures, that incoherent cells precede the coherent, cellular, and fibrous textures. Therefore for fibres, fibrous textures, fibrin in solution, or fibrin coagulated, to act as a cyto-blastema and be metamorphosed *backward* into cells, would be an anomaly or exception to be adopted only upon proof.

The fibrinous and all the other constituents of the

* *Loc. cit.*, p. 287.

† *Loc. cit.*

* See the Experiments, p. 12, *Second Series of Researches*, and observations thereon, pp. 20 to 23.

interior matter of blood-cells contribute to the elaborating function of the cell, and to the sum of the product which the cell may ultimately deliver up, whether new cells, a fibrillating matter, or a fluid secretion; but that coagulated fibrine, or any of the molecules, particles, or nuclei, inclosed among the fibres, are capable of again becoming elaborating cells, multiplying cellular forms, and giving rise to suppuration "in the widest sense of the word," is a question much too important to be concluded by inferences opposed to general laws. To be adopted it ought to be proved demonstratively. But, let it be granted, or let us assume, that cells of sundry kinds, muscular fibres, and epithelium, do spring from "an unlimited cytogenesis" in coagulable or coagulated fibrin or lymph, and the application of the law and doctrines of morphology to the phenomena of inflammation and scrofulous diseases is not thereby affected; for, if, as occurs in inflammation, the normal elements of an osseous, cartilaginous, or fibrous texture, be permeated by an increased number of blood-currents, and fettered or hindered in their function by an unwonted accumulation of abnormal cells and protoplasm, the metamorphosis is irregular; and if, in the manner granted, these textures become transformed, as they do in scrofulous diseases, into red and vascular textures, copiously excreting the cellular forms, denominated pus, the metamorphosis is retrograde.

The following case will, I think, put the matter in a clear and intelligible point of view, and furnish rational grounds of distinction between inflammation and scrofulous disease.

(To be continued.)

CASE OF TRAUMATIC TETANUS: INHALATION OF ÆTHER.

By DAVID CHALMERS, Esq., Surgeon to the North Dispensary, Liverpool.

On Friday, the 23rd of April, I met Mr. Owen in consultation on a case of tetanus. The patient was a strong, muscular, young man, named — Nolan, aged 20, a brickmaker.

Mr. Owen first saw the case on Saturday, the 17th, and found the patient then-complaining of stiffness of neck and difficulty of swallowing. A few ounces of blood were taken from his arm at his mother's urgent request, and five grains of calomel, to be followed by a black draught in the morning, prescribed.

On Monday, the 19th, he was reported by his mother as nearly well; but on Wednesday, the 21st, Mr. Owen was again sent for at 11 o'clock at night, and found him labouring under all the well-marked symptoms of tetanus. Pulse 110; abdomen very hard. Sixty drops of laudanum were prescribed, and fifty drops more to be given during the night. On Thursday, 8 a.m., Mr. Owen found him better, he had slept well during the night; the spasms were not so severe;

perspiration profuse; limbs rigid; pulse 98. He was ordered forty drops of laudanum. At six, p.m., he was still easier; the perspiration and countenance natural; bowels open; motions dark, and offensive. Fifty drops of laudanum were directed.

Friday 23rd, 11 o'clock, a.m., (the first time I saw him.) Complaints of having had a very bad night; severe trismus; difficulty of swallowing; violent spasms of the muscles of the neck, chest, abdomen, and limbs, with constipation and profuse perspirations; head much drawn back; great toes strongly drawn towards the soles of the feet; body very rigid, and spasms occurring about every half minute; pulse 105. He states that about six weeks since, as nearly as he can recollect, in raising some bars of iron, he injured the last phalanx of the middle finger of the right hand. The wound is now all but healed. Nail loose, so that in handling it it came away in my hand.

R. Calomel., Pil. Opii, utr., gr. j. Fiat pilula omni hora sumenda.

3, p.m. Expresses himself as easier; has had some sleep. We administered the sulphuric æther for three or four minutes at a time, repeating it at short intervals. Under its influence the patient became quiet and tranquil; breathing natural, with diminution both in frequency and strength of spasms, and with a disposition to sleep. Continue the pills.

6, p.m. Has slept ever since, and the spasms nearly as frequent, still they do not entirely rouse him. Perspirations still profuse; æther repeated with the same effect. Continue the pills.

9, p.m. The same. We repeated the æther with the effect of reducing the tension of the muscles generally, those of the chest and abdomen especially. Marked diminution of strength and frequency of spasms; perspiration not so profuse; pulse 104, reduced by the æther to 98, this was probably owing altogether to the relief from the spasms; bowels constipated.

R. Ol. Ricini, et Ol. Terebenth, utr., oz. j., in forma enematis. Pills every second hour.

24th, 9 a.m. A tolerable night; spasms still frequent but not severe; muscles of chest less affected than those of the abdomen or limbs. Repeat the æther. Bowels not moved.

R. Ol. Ricini, oz. j.; Ol. Tiglii, gtt. j. M. Sumat statim.

12.m. Repeated the æther.

3 p.m. Æther repeated, bowels still constipated. R. Extr. Colocynt, Co., gr. iv.; Ol. Tiglii, gtt. j. M. in forma pilulæ; sumat j. quaque secunda hora.

9 p.m. Bowels freely opened after taking three pills; has had during the day much greater hardness and spasm of the abdomen, but is now altogether much relieved. Repeated the æther, and ordered cocoa and milk; hot gin and water freely. Continue the pills every second hour.

25th, 9 a.m. Spasms in abdomen and lower limbs very severe, forcing flatulence from the bowels with great noise; upper half of the body as before. Has eaten a bit of mutton chop. Repeated the æther.

9 p.m. Spasm has been more severe to-day in the abdomen, but not so frequent. Repeated the æther.