

highest power that I have been able to obtain (1800 diameters*) the largest granules are most distinctly proved to be *spherules*, and many arguments founded on recent observations, which I shall adduce in other communications, have led me to the conclusion that this material in which all the wonderful actions characteristic of living bodies take place, consists of spherical particles, which are themselves composed of spherical particles, and so on, probably to a degree of minuteness far beyond that which we can possibly realise. Yet the chemical composition of every one of them must be most complex, and each must be the seat of chemical changes, which, there is reason to believe, will never be effected except by the agency of such particles and their descendants.

The form of the mass composed of these spherical particles is determined by numerous complicated conditions. If free to grow in fluid, it is spherical or circular; but it may be oval or stellate, or it may assume other forms, according to the forces which operate upon it. Under favourable circumstances each mass grows—certain of its component particles increase—each of these reaches a certain size and divides—the whole attains a certain definite magnitude, and separates into two, and thus two masses of matter, the greater part of which is in an active state, while the remainder (nuclei and nucleoli in some cases) is capable of assuming it at a later period, are produced. Each of these little masses is invested on its exterior with a structure, the nature and mode of formation of which will be presently considered. Although it is impossible, in the present state of science, and probably will ever remain so, to point out characters which will enable us to distinguish the smallest particle of this granular matter taken from the body of a man, from a particle derived from one of the simplest living beings, it is obvious that these two particles differ very widely from each other in *power*.

A particle of one of the germs of a fungus, certainly less than the one hundred-thousandth of an inch in diameter (and probably particles infinitely smaller than this) is capable of propagating itself; and in the higher animals it is quite certain that very minute particles of some germs possess the same power; but others do not retain their vitality when removed from the part in which they were developed. Since it can be shown most conclusively, that a particle so minute is capable of carrying on an independent existence, and exhibits all the phenomena characteristic of a living being, while no one has proved that an independent living particle much smaller than this does not exist; while, on the contrary, there are many arguments which almost compel me to believe in the existence of living organisms infinitely smaller,—it seems to me that no good purpose would be gained, in the present state of knowledge, by attempting to discuss what is the size of an *ultimate living* particle, or to assign at present an *arbitrary term* like that of *cells*, or any definite substitute for this, to what appears to us as the ultimate anatomical elements into which the textures of living beings can be resolved.

If, however, a portion of any living structure be carefully examined, it will be found to be composed of matter in two distinct states. The one, as I have already said, having in *all living beings* a granular appearance, being soft, exhibiting no definite structure when examined by ordinary magnifying powers, but made up of minute spherical particles, and having the most marvellous power of infinite increase;—the other, *differing* in different beings, and in *different tissues* of the same individual in the most extraordinary degree, in structure, in physical characters, chemical composition, and endowments. It never possesses the power of grow-

ing and multiplying. It may be changed by various circumstances, and destroyed and removed by the growth of other structures, but it is not changed by its own powers. The particles of matter in this state, of which every tissue is formed, have gone through a series of very active changes; they have passed through certain periods of existence, and have possessed the power of animating lifeless particles, but when they become tissue these stages are passed. The living matter has now passed through the last phase of its active state—the object of its existence is fulfilled; it no longer possesses active powers. In some cases it becomes converted into a substance dissolved in fluid, which is devoted to ulterior purposes in the economy, or is at once resolved into simpler chemical compounds. In other instances, it remains for a longer or shorter time as a tissue, having certain physical characters. When soft and yielding, the length of the period during which it preserves these properties depends, to a great extent, upon the composition of the fluid which bathes it. If this be modified, it may soon pass into decay. In other cases, the material is hard and unyielding, and may resist the action of the most destructive agents, and retain its characters unaltered for ages. It can be changed, but it does not change itself. It possesses no longer the inherent power of change, nor is it able to communicate its properties to other particles. White fibrous tissue cannot produce itself, nor can cartilage form cartilage, or the hard tissue of cuticle develop cuticle, but the *particles of soft granular matter*, forming little collections (termed nuclei in some cases, cells in others) in all these and other tissues, may increase in number and give rise to the formation of these tissues infinitely.

The relation of these two different forms of matter to each other is constant. The last is always *external* to the former. It is *formed* from it, and its properties depend upon the powers of the living particles which produced it. Of the outer *formed material*, the *oldest* portion is that which is most distant from the soft granular matter, and the *most recent* that which is nearest to it.

Matter in the first state is undergoing changes which cannot be explained by physical laws, and possesses powers which it has inherited from pre-existing matter which manifested the same powers. As it is concerned in the production of tissue, and as the germs of all embryonic and adult tissues are alike composed of it, I propose to call matter in this state of change, or capacity for change, *germinal matter*.

The *formed material* external to it is the result of changes occurring in the germinal matter by virtue of its inherent powers above referred to. The hard matter of horn, and hair, and cuticle, the fibrous tissue of tendon, the fibre of muscle and nerve, the so-called *cell-wall* of epithelium, and indeed in all cases the investment of the so-called *cell-contents*, be it hard or soft, were, at an earlier period of their existence, in the state of *germinal matter*.

[To be continued.]

REMARKS ON OBSTRUCTION OF THE BOWELS: WITH CASES.

By EDWARD COPEMAN, M.D., M.R.C.P., F.R.C.S., Physician to the Norfolk and Norwich Hospital.

[Continued from page 36.]

CASE XVII. *Impaction: Recovery.* Mrs. W., aged about 30, of a weak and delicate constitution, was confined three weeks ago; labour rapid, child healthy. She suffered from obstinate constipation throughout her pregnancy; and since her labour has had trouble with the bowels acting irregularly, and stools lumpy with nausea, faintness and general debility; but in other respects she has been doing well. This morning (Oct. 25th, 1852) I found her faint and suffering from tenes-

* The 1-26th of an inch, magnifying with the low eye-piece 1800 diameters, made by Messrs. Powell and Lealand.

ness, having passed one lumpy motion and wanting to pass more. Pulse 100. Abdomen not swollen, but uneasy and tender on pressure. Several injections and doses of aperient medicine had been given since her confinement, and she always felt better after the bowels had been relieved. It was evident that something was impeding her recovery, and her surgeon was anxious to give her the benefit of a consultation. We prescribed turpentine fomentations to the abdomen, and a common enema: a draught of a drachm of spirits of turpentine, three drachms of castor oil, and half an ounce of peppermint water, was ordered to be taken immediately, and a little ammonia and lavender in water occasionally during the day.

9 P.M. After she had had two fomentations and two turpentine draughts, we found the bowels had acted freely twice. Pulse 80, less faint, abdomen less tender. She has taken some beef-tea, and is altogether better.

Oct. 26th. She had another relief in the night, and slept at intervals. Abdomen flaccid and scarcely at all tender; but she still complains of uneasiness in the rectum as if there was something more to come away, and I advised another turpentine draught. Pulse 70. Tongue furred; inclined to be sick. I ordered a mixture containing aromatic spirits of ammonia, tincture of calumba, and camphor mixture.

9 P.M. The bowels acted three times, after which she seemed very comfortable, and remained so till four in the afternoon, when she again had painful sensations in the rectum, with tenesmus; causing her to make several attempts at stool, with no other result than the expulsion of a little watery mucus; apparently indicating that at last the bowels had been fully emptied, and that irritation of the mucous membrane was now the sole cause of her uneasy sensations. At about 7 o'clock, she had a slight feverish attack, probably from the frequent disturbance; for at nine she was quiet, with a pulse at 84, and a moist tongue. There was no tenderness in the abdomen; she was less faint, and complained of little besides uneasiness in the rectum. She was ordered starch and opium enema, and a dose of chalk mixture and laudanum after each motion should there be any purging; also a pledget of flannel sprinkled with tincture of opium, to be applied to the epigastrium.

Oct. 27th. Bowels not moved; but she had not a comfortable night. Abdomen still uneasy, but not so much tenesmus. Passed a large quantity of urine, and the bladder is rather irritable, perhaps from the turpentine. Complaints of being very weak. Body not tender nor tympanitic. Pulse under 70 when quiet, but is easily quickened by talking or moving. Tongue furred. Complaints of faintness and nausea. Diet to consist of broth and milk: to take a grain of quinine three times a day. Poppy fomentation to the abdomen.

Oct. 28th. No further relief from the bowels. Still complains of a feeling of fulness in the rectum, but is better than yesterday. Abdomen flaccid and not tender. Pulse 72. Slept much more comfortably. Tongue cleaning. Slight reappearance of lochia yesterday, of a healthy character.

In the middle of the day, she had a return of distress in the rectum and bladder, accompanied with hysteria; and I thought it right to examine both the uterus and the rectum. The former I found perfectly healthy and right as to position; but the rectum was extremely capacious and flabby, and, plastered upon its posterior wall, corresponding with the hollow of the sacrum, was a large mass of lumpy faecal matter, the cause, no doubt, of the uneasy feelings. This I broke up as well as I could with the finger, and then injected a pint of warm water, with directions to retain it as long as possible. On our visit in the evening this had not passed away; but there was much less uneasiness, and the patient's mind was considerably relieved of apprehension by the assurance we were enabled to give that the cause of her

illness was of a much more simple nature than was previously imagined.

Oct. 29th. No motion yet, the injection not having come away. Pulse quiet, tongue cleaner. I ordered rhubarb and tartrate of potash in a draught to be taken immediately, and repeated in six hours, if necessary.

Oct. 30th. Two of the draughts not having operated when Mr. — visited her last evening, he gave another injection; and she had several motions in the night, the first being composed of several large lumps, part of what had been felt and broken up in the rectum. No nausea; tongue cleaner. Pulse 76. The quina was continued.

Oct. 31st. She had again some irritation in the rectum, for which she took a dose of castor oil, which operated several times and occasioned faintness. She had an opiate at night.

Nov. 1st. Better again this morning; but still complains of soreness in the body, and some tenesmus. Took a compound chalk draught.

Nov. 2nd. Better; but she says she is sure there is something yet in the rectum to come away, but which she is unable to expel. On examining the rectum again, I found several large, hard lumps of faeces, some of them enveloped in folds of the loose capacious rectum. A large enema was administered, and, soon after, a considerable quantity of faecal matter was expelled.

Nov. 5th. She has each day since last report had several lumpy evacuations from injections, and is much better. She takes a dinner pill of aloes and rhubarb daily, and goes on with the tonic.

Nov. 18th. She has been going on well, with the exception of occasional uneasiness from accumulation in the rectum, to which there is a very remarkable tendency. The quantity of hard faeces that has passed during her illness is almost incredible.

By persevering with the treatment, the patient gradually recovered, and has remained well up to the present time.

This case at one time excited a good deal of apprehension lest some latent puerperal mischief was about to manifest itself; and this probably might have been the case had not the bowels been satisfactorily unloaded. When the bowels had been apparently well relieved, and nevertheless, the tenesmus kept recurring, it was supposed the rectum might have been irritated by the turpentine; but the sole cause of the difficulty was the enormous impaction of the bowels by hard lumpy matter, which seemed almost endless in quantity, and was probably the accumulation of a considerable portion of her term of pregnancy, during the whole of which she had the greatest difficulty in procuring any satisfactory evacuations.

CASE XVIII. *Constipation: Recovery.* Mr. —, aged about 60, began three days ago to feel pain in the body, which gradually increased. I visited him on the 26th of March, 1857, and found the body very tender, principally in the epigastric region. Pulse quiet. No fever. Tongue inclined to be dry. Bowels had been very much confined; abdomen tense and tumid, and colon distended with air. Stomach irritable and disposed to reject its contents. I ordered a powder containing three grains of calomel, three grains of compound antimonial powder, and five grains of Dover's powder, at bed-time; turpentine and laudanum stupes to the abdomen; and a dose of compound infusion of senna and compound decoction of aloes, every four hours.

March 27th. He vomited the second dose of the mixture and could take no more. No relief from the bowels; pain continuing, but not so severe. Complaints of confusion of thought. Tongue dry. Urine high-coloured. He was ordered to continue the fomentations, and to have a grain of calomel, and a quarter of a grain of opium every four hours; a draught of potash with rhubarb; and a common enema.

8 p.m. Two injections have been given since the morning, and both returned without fecal matter. There is less nausea, but the abdomen is very uneasy. The remedies were continued.

March 28th. Passed a more comfortable night, sleeping at intervals. Had a small watery motion this morning. Pulse quiet. Pain and tenderness less, tongue not so dry, but complains of great depression. Three grains of compound extract of colocynth, with extract of henbane, were taken immediately, and compound senna mixture with aromatic spirits of ammonia to be taken every four hours until the bowels are relieved.

March 29th. Bowels copiously relieved of semi-solid feces several times to-day, followed by entire removal of pain, and amendment in every respect.

Nothing further occurred to prevent recovery or to require especial notice, although he must have had a very narrow escape from peritonical or enteric inflammation.

CASE XIX. *Obstinate Constipation: Recovery.* May 29th, 1853. Miss —, aged 18 years, had been a week under treatment for obstinate constipation, first by calomel and purgatives, and afterwards by enemata and opiates. The bowels had long been constipated, sometimes not being relieved for many days together; and for a week past there had been complete obstruction. A small quantity of lumpy, offensive matter had been removed from the rectum by the injections, but there is hardness and tenderness to the right of the navel, and I thought I could feel feces in the *caput coli*. She had neither heat of skin nor anxiety of countenance; but frequently vomited and had a pulse about 90. Tongue but little furred. No peritonitis. We injected three pints of soap and water, but it brought away scarcely anything coloured; and afterwards a little gruel a drachm of laudanum in it to procure a quiet night. The abdomen was ordered to be rubbed with camphor liniment and laudanum.

May 30th. She had a quiet night, but no motion: took coffee and milk two or three times, and has not been sick. Enema to be repeated with the addition of two ounces of castor oil, and she was ordered to take a colocynth and henbane pill at bed-time.

7 P.M. No vomiting during the day, and she has a cheerful countenance. She says the liniment eases the body. The enema returned the colour of pea-soup, with a strong fecal smell, but no scybala. Pulse 90. The enema of soap with castor oil was ordered to be repeated, and afterwards the opiate enema. Has several times during the day complained of soreness in the throat, with a feeling as if something having a very disagreeable smell wanted to come up.

May 31st. She vomited once soon after the enema last night, but not since. The injection came away more coloured, and was very offensive. She is troubled much by piles, which disturbed her night. Pulse quiet; countenance cheerful; abdomen easier, but still hard; and she says she is convinced she cannot get well unless something more is removed. She was ordered to take the colocynth and henbane pill night and morning, and to repeat the enema. She takes coffee and milk, and likes it.

June 1st. She was sick once again after the enema last night, but is very quiet this morning, with a good pulse at 84. More fecal matter, but no lumps, passed with the injection.

June 2nd. A very good night, and no sickness. Pulse 72. Abdomen more supple; but I can still feel feces in the colon. The injection given last night came away deeply coloured and very offensive, and in it were several pieces of undigested rhubarb in which she had taken her pills for the last day or two—cooked rhubarb out of a tart; proving the intestinal canal to be pervious. The enema was repeated; a grain of blue pill

was added to her pill at night. A drachm of laudanum in a little gruel has been injected into the rectum every night.

June 3rd. Countenance cheerful. She took some mutton broth yesterday. Tongue red, clean, and inclined to be sore. Had three motions after the enema, containing recent relaxed feces and portions of broken up scybala. Had an egg this morning, and no return of sickness. Still some uneasiness in the abdomen, and evidence of partial impaction of the colon. The enema and pill were repeated.

June 4th. She has had plentiful evacuations of liquid fecal matter, with a few lumps of good colour, and some debris of dark longer-retained substance. Feels languid, but abdomen is much easier. I advised an entire respite from treatment to-day.

June 5th. Much the same. The pill and enema were repeated.

June 6th. She had a good motion last night, and a solid ope to-day, without an injection. There is still a small spot near the navel, which is tender, and to which I ordered turpentine liniment to be applied. She was ordered to take the pill each night, and have the enema the following morning.

June 14th. On visiting her to-day, I found her sitting up, and complaining of nothing beyond weakness. She had had daily copious relief from the bowels; the abdomen was entirely free from tenderness or enlargement; no swelling could now be felt in the spot where it had been so persistent; and there was nothing to prevent perfect recovery.

About a year after the last report, she married, and is at the present time, I believe, in good health.

CASE XX. *Constipation: Severe Vomiting: Recovery.* Mr. D. was attacked on Sunday, March 5th, 1854, with vomiting, after eating some new plum-cake, and taking several glasses of inferior port wine. His bowels had been very costive for some time, seldom acting more than once in two or three days, and then but scantily. Up to Thursday, March 9th, he has had no relief and the vomiting was frequent and distressing. He had been treated with various purgatives, calomel and opium, croton oil, and enemata, but without any effect until this (Thursday) evening, when, after a large gruel injection, a good deal of scybalaous fecal matter came away, without, however, relieving the sickness, which was severe and accompanied with hiccough. His pulse had all the time been quiet, and was about 80. The tongue was covered with a yellowish white fur. No fever. The abdomen was tumid, and but little resonant on percussion, but there was no tenderness or pressure; no peritonitis; no tumour in either groin. The greatest resistance appeared to be in the middle of the transverse colon. The matters vomited were dark and flocculent, containing bits of orange, currants, etc., which had been taken some time before. Countenance anxious; he complained of exhaustion, and of heat about the throat, from the frequent vomiting, with thirst. Hitherto, there had been some difficulty in passing the tube up the bowel; but, on now giving another injection of gruel, turpentine, and castor oil, a long stomach-pump tube was passed almost its whole length with ease. I waited to see whether this injection would bring away any more scybala, but a portion only of it returned, and that not coloured with feces. I then advised a dose of laudanum and ammonia, to be repeated if restless; a turpentine stupe to the abdomen, and another turpentine and oil enema early in the morning. I believed the sickness depended upon impaction of the bowels, and was disappointed at its persistence after the passage of so many scybala; but it was somewhat relieved before I left; and as there were no indications of inflammatory mischief, I hoped he might do well, particularly as some impression had been made upon the mass apparently collected in the bowels.

On the following day, his surgeon wrote as follows: "The last injection remained until this morning, and was then evacuated with a large quantity of feculent matter. The patient is therefore tolerably comfortable."

March 11th. To-day I heard that the sickness and hiccough gradually subsided yesterday; that the bowels had acted very freely; and that the patient was considered out of all danger.

CASE XXI. *Constipation: Peritonitis: Recovery.* On August 29th, 1854, I was called some distance into the country to visit a gentleman, about 40 years of age, who had been suffering from intestinal obstruction for several days, and now had peritoneal inflammation. I found the abdomen very tender, especially about the umbilicus; the pulse sharp and rapid; the tongue furred; the countenance anxious; the skin relaxed; and vomiting frequent. I prescribed calomel and opium, of each a quarter of a grain, every four hours; a large blister to the abdomen; and a full injection of gruel, turpentine, and castor oil; milk and lime-water as a drink.

On the following day I was informed that the injection was followed by a very copious relief from the bowels, consisting of both fluid and solid feces; for a day or two afterwards the bowels discharged a very considerable quantity of fecal matter, and he was soon reported convalescent.

CASE XXII. *Impaction: Abdominal Pain, Hiccough, and Vomiting: Recovery.* Mr. —, aged 67, was seized at 2 A.M., October 2nd, 1854, suddenly with pain in the left iliac region, of a sharp cutting character; it soon became fixed, and was accompanied with a feeling that he should get ease if he could get relief from the bowels. I saw him at 3.30, when he had just been sick after drinking some tea; he was sick again whilst I was with him, but his pulse was quite natural and he had no fever. I ordered him two grains of calomel, to be followed by a rhubarb and potash draught; and twelve leeches to the painful part; turpentine fomentations to the abdomen; a turpentine enema; and a pill with calomel and opium, of each a grain and a quarter, every four hours. At 10 in the morning I found him still in great pain, and there had been no relief from the bowels. Pulse quiet; abdomen distended, but not very tender on pressure. The pill and draught were repeated.

2 P.M. Pain still constant, but not so severe. He slept at intervals, and has not been sick again; but has had no relief from the bowels.

October 3rd. He has been sick again to-day; the pain continues; and he is more troubled with hiccough. No fever. No relief from the bowels. The calomel and opium pills were continued, and an oleaginous enema was given.

October 4th. He had three bilious motions to-day after a large injection in the morning. The pain is less severe at its original seat, but is now more diffused over the abdomen. I ordered the abdomen to be covered with a hot bran poultice. The calomel and opium pills were continued.

October 5th. He was feverish last night, with a pulse at 96. Tongue furred; he slept heavily at intervals. Hiccough troublesome, but relieved by chloric ether. He had another injection this morning, followed by a large pulpy evacuation. Pulse now 84. He was ordered to take a pill with four grains of scammony; and a dose of fever-mixture every four hours.

October 6th. He took another scammony pill this morning, but had no motion until after an enema. Pulse 80. Tongue cleaner; abdomen still tender, and the pain in the left iliac region continues, striking into the hip. A turpentine fomentation was ordered.

Oct. 7th. He had a good deal of pain in the night; but I found him much easier this morning after having had an evacuation, consisting of old broken-up fecal matter. Pulse 72. Tongue cleaner. As the abdomen was still

tender, I ordered the calomel and opium pills to be continued with the fever mixture when in pain or restless.

October 8th. He had another large relief to-day, and was better.

October 10th. Since last report there have been two or three evacuations daily, and but little has been done in the way of medical treatment beyond giving an enema of gruel and castor oil, and applying an opiate liniment externally when required. The evacuations from the bowels have been plentiful and bulky, affording strong evidence of considerable previous accumulation. Some tenderness in the situation of the sigmoid flexure of the colon remained until a day or two ago; but he is now able to sit up nearly all day, his appetite is improving, his pulse steady and quiet; and he looks far better than might be expected after so severe and painful an attack.

November, 1860. This gentleman is still alive and well, and has never had any serious return of his complaint, although the bowels have been occasionally irregular in their action, and rather difficult to keep in order.

CASE XXIII. *Constipation: Recovery.* Mr. —, a retired farmer, very corpulent and fat, consulted me on May 17th, 1856, in consequence of pain in the abdomen and obstinate constipation. The tongue was covered with a dark fur; pulse feeble; and respiration hurried and difficult. He had been under treatment several days, and had taken a variety of purgative medicines without effect. I ordered him a pill daily, containing watery extract of aloes and rhubarb; and a mixture consisting of carbonate of potash and infusion of gentian. In a few days he had several very copious motions, and soon got well.

CASE XXIV. *Impaction: Recovery.* May 23rd, 1856, I was summoned to Mrs. T., aged 33. She had suffered from a blow on the abdomen a few weeks ago, followed by pain and obstinate constipation, for which she had been carefully treated. She now had a swelling above the right groin, tender and painful, somewhat resonant, and when handling it I could feel air disengaged. There was also a swelling to be felt at the upper part of the vagina, and she was supposed to be labouring under uterine disease. I could not, however, discover any, and looked upon the case as one either of intestinal impaction to a considerable amount, or of fecal abscess. We prescribed watery extract of aloes with extract of rhubarb (of each two grains) daily, and Griffith's mixture to support her strength; for she was extremely exhausted and feeble. A few days afterwards I was informed that her bowels had been very plentifully relieved, and that the tumour was almost gone. She slowly recovered, and resumed her usual household duties.

CASE XXV. *Abdominal pain: Vomiting: Constipation: Recovery.* May 20th, 1856, Mr. —, aged about 50, was suddenly attacked after tea, with severe pain in the epigastrium, followed by vomiting, having been previously quite well. He had eaten eggs for breakfast, and thought he did not digest them well, but seemed as well as usual during the day. At tea he ate a few radishes, and the attack came on about an hour afterwards. I was summoned about midnight, when I found him in great pain writhing about in bed, vomiting every now and then with abdomen distended with air, borborygmus to a great extent; but neither headache, heat of skin, furred tongue, nor hurried pulse. I ordered turpentine and mustard to the seat of pain, and gave two doses of laudanum and castor oil, half a drachm of the former and half an ounce of the latter for a dose. These kept down, and I left him easier at 1.30 A.M., having given him twenty drops more laudanum in a little brandy and water. He was also directed to apply twelve leeches to the abdomen in the morning should the pain continue or return.

May 21st, 10 A.M. He had the leeches applied about

an hour ago, as the pain, though lessened, had not ceased. The bowels had been costive for several days, and were not now relieved. No more vomiting. Pulse 72. He feels feverish and complains a little of headache. The leech bites bleed freely. He was ordered to foment the body so as to encourage the bleeding, and to take a seidlitz powder.

May 22nd. He had relief from the bowels yesterday, with decided relief to the pain; but there is still a good deal of fulness of the abdomen, and a feeling of distension causing him to fear a return of pain. I ordered another dose of castor oil and laudanum, and a pill containing a grain of aqueous extract of aloes, every four hours; and the fomentation to be continued.

May 24th. Since last report there have been plentiful evacuations from the bowels, consisting of large quantities of lumpy fecal matter. There is now scarcely any abdominal pain and much less distension. He has not been again sick, but feels exhausted and unwilling to be disturbed. He was ordered to continue the pill twice in the day.

The result of this treatment was that the bowels continued to dislodge their contents; the uneasiness and tension of the abdomen ceased, appetite returned, and the patient speedily recovered.

[To be continued.]

THE HOT-AIR BATH.

By B. W. RICHARDSON, M.A., M.D.*

WE must be unanimous, I think, in feeling that the subject brought before us to night is one not only of professional, but of national interest. We must, too, be unanimous in accepting that the subject admits only of true scientific discussion in a society such as ours, where physiological and practical medical labours so happily and unitedly blend; and lastly, we must agree in the expression that no one could have brought up the question with more acumen and ability than Dr. Thudichum; for, though we have to diverge from him when he trims his subject to too fine a point, and insists with excess of feeling on his own arguments, nevertheless we are bound to admire his shrewd talent and the eloquence and brilliancy with which, like a Prince Rupert in medical campaigning, he takes his positions and deploys his energetic artillery.

The subject which has been brought before us to night, stripped of all the verbiage with which it is surrounded to make it a mere commercial speculation, embraces nothing more nor less than the question, What influence has heated air on the animal body, when applied through the medium of the respiratory and cuticular tracts? and how far does this influence extend, physiologically, therapeutically, and socially? In such remarks as I have to make, I shall consider the subject under these divisions.

Physiologically, I do not think Dr. Thudichum has done justice to previous inquirers. Long before the Turkish bath engaged attention, I had, for one, followed Fordyce and some of the older inquirers as to the effect of heat on animal life, and had even discussed these points in the Medical Society; and since these baths have been established, I have repursued certain of these labours, and added to them, following up the inquiry in my own experimental way, as a purely experimental pursuit. Thus I have placed various animals in differing temperatures, and at various determinate degrees have sought to learn with precision how long life can be sus-

tained at different degrees of heat, and what differences exist in the products of excretion during the living period.

Without troubling the Society with details, I may state that the effects of an increased temperature on the body, say above the standard of 60° Fahr., are due to the simple fact that what is commonly called the process of oxygenation, but which would be better called the process of calorification, is abnormally increased. For example, if an animal be placed in a closed chamber of such dimensions that the animal will die in two hours at a temperature of 60°, it will be found that another animal of the same kind, placed in another chamber of the same size, will die in a quarter of an hour at a temperature of 120°; and so on in a steadily acting law, which perfect experiment would speedily reduce to absolute formulæ. When, again, we turn to the cause of the death under the circumstances named, we find that it is the same in both cases; we find, *i. e.*, that the cause is a consumption, by the animal, of the oxygen contained in the jar; and that the products of the consumption are the same, in the way of water and carbonic acid. There are, however, limitations to this rule; there are degrees of heat at which, on sudden exposure, death takes place as by an electrical shock, and where no time is given for chemical products; but, within such limits as those which should be supplied in a common hot-air bath, the rule holds good. Again, I find that the exposure of an animal to a high temperature produces other effects characteristic of a rapid oxidation. It makes the vascular parts unduly red; it increases the external or surface heat; it relaxes muscular fibre to such an extent, if it is pushed far enough, that contraction fails utterly; it renders the circulation quicker, with a steadily diminishing power; and it renders venous and arterial blood the same in colour. Again, owing to this rapidity of the chemical life, heat modifies materially the action of many poisons which produce their effects solely by the power they possess, at ordinary temperatures, of stopping the oxidation or calorific process: thus, the effects of the volatile narcotics, Dr. Snow once pointed out to the Society, are moderated by degrees of temperature; and thus such poisons as can only be eliminated from the body either by metamorphosis or rapid direct elimination, are rendered severally poisonous, or less poisonous, in the same doses, at different points of the thermometer.

In regard to the cases to which heat may be applied in the treatment of disease, I believe that in this direction we may, by a discriminating policy, turn our knowledge to a grand account; but we must not be led away by the statements of enthusiasts, who, believing the remedy to be one for all diseases, would push it to any extent. Judging the remedy by its extreme physiological effects, we may pronounce, almost *a priori*, where it will be useful: that it should be useful in cases where there is in the tissues or in the blood a poisonous substance, which being soluble admits of elimination in water, or being volatile admits of elimination as gas, or being oxydisable admits of destruction by metamorphosis. Under these positions we may accept and group many forms of disease. Some zymotic diseases might be brought under treatment; as, for example, scarlet fever, which is always less fatal, and, as I believe, less prevalent in summer; and typhus, which, as Dr. Gooldeen observes very shrewdly, is unknown in tropical heat.

Here, again, may be classed various of the diathetic disorders, in which the prevailing cause of mischief is a product generated in the body itself, which product is eliminable by a copious sweating process; and here, also, we might include the symptoms produced by many direct poisons, such as opium and strychnia.

Practically, in my own hands, I have seen benefit follow the use of heated air. I have known, for

* This paper consists of some remarks made by Dr. Richardson at the last meeting of the Medical Society of London, when the subject of the Turkish or Heated Air-Bath was brought forward by Dr. Thudichum. We give Dr. Richardson's observations in full; as, while they are not absolutely in opposition to the use of the bath, they contain some wholesome cautions. EDITOR.