the year 1864, I exhibited one of these cases at the Pathological Society, as a case of bronzed skin disease simulating the discoloration of Addison's disease. Such cases, however, though they undoubtedly present some appearances of Addison's disease, may be easily distinguished from it. In my patient, a woman, aged 65, the skin was extensively bronzed, especially over the abdomen, chest, and back; but the discoloration, when carefully examined, was totally different from the bronzing of Addison's disease. It was seated in the superficial instead of in the deeper layers of the epidermis. It was paler instead of deeper in the face, hands, and other parts, which are naturally the seats of most pigment. These small, isolated, dark spots were all on the pale instead of on the discolored parts of the skin. Moreover, the darkened cuticle was not soft and smooth, but in many parts raised and rough. Such constitutional symptoms as were present—debility, languor, and a sense of sinking at the epigastrium—were referable to apparent causes, and were soon removed by tonic treatment, and an ample supply of food. I should add that, by the use of alkaline warm baths and soap, the discoloration was greatly diminished, though the skin did not regain its normal hue.

Again, it is well known that pityriasis versicolor is attended by discolorations of the skin, and cases of this kind have been adduced to disprove the connection between bronzed skin and disease of the suprarenal capsules; but the nature and the distribution of these discolorations, as well as their modes of development and disappearance, are widely different from the two characters of the discoloration of skin in Addison's disease. The dark patches are more upon the trunk and limbs than upon the face. They have abrupt margins and convex borders, and are interspersed with spaces of normal coloured skin; they appear and disappear rapidly: and no asthenia or other constitutional symptoms are associated with them.

Syphilitic eruptions, also, notoriously cause more or less permanent stains on the skin; but, although their coppery hue and spotty character distinguish them clearly enough from the bronzing of Addison's disease, they are sometimes confounded with it, for two such cases have been sent to me in private practice, on the supposition that they were cases of Addison's disease.

There are, however, various kinds of discoloration of the skin which bear a somewhat more real resemblance to the bronzing of Addison's disease, in so far that the skin remains soft and smooth, and the pigment is deposited in the same layers of the epidermis, though not in the same quantity, nor usually to the same extent, nor in the same characteristic seats. Such discolorations are well known to be produced occasionally by diseases peculiar to women, by tropical and malarious fevers, by hepatic disease, and by very chronic phthisis. Of this last class of cases I have seen several remarkable examples since my attention has been directed to the subject. A woman, aged 26, who died under my care in the Middlesex Hospital of chronic phthisis in 1871, presented precisely the appearance of Addison's disease in an early stage, the face having the same peculiar duskiness, and the forehead, except where covered by the hair, being of a distinct brown colour; the skin was soft and smooth. Another phthisical patient, a man, aged 50, was sent to me in 1872 by my colleague Mr. Nixon, with abnormal pigmentation of the tongue, exactly resembling that seen in Addison's disease. My colleague Dr. Thompson asked me some time ago to examine a man, aged 55, who was suffering from bronchitis and emphysema, and, it was suspected, long-standing phthisis. He exhibited several brown patches, corresponding to the extent of superficial injuries received from a fall about a year before; and on the lower part of the sternum was a transverse irregular white cicatrix an inch and a half long and a quarter of an inch wide, encircled by a dark brown ring nearly half an inch in width, fading off into the normal hue. The skin of the groins was also slightly dusky. These partial discolorations strikingly resembled those found in similar situations in Addison's disease, but they neither deepened, nor spread over the general surface during the subsequent illness of the patients, nor did these latter show any symptoms but those of pulmonary disease. In all these cases, the suprarenal capsules proved to be perfectly healthy. The observation of these and similar cases has convinced me, that no partial discolorations of skin are to be relied on as diagnostic of Addison's disease, unless found in conjunction with the characteristic constitutional symptoms.

ROYAL COLLEGE OF SURGEONS.—Mr. John Hilton, F.R.S., who was elected a member of the Court of Examiners of the Royal College of Surgeons in 1865, has resigned his appointment which he has so long and so honourably filled. The Council, of which he was elected a member in 1854, will still retain the benefit of his experience. A special meeting of the Council will be held on Wednesday next, the 17th instant, for the election of a Fellow of the College, to fill his vacant chair.

THE GOULSTONIAN LECTURES ON PUERPERAL FEVER.

Delivered at the Royal College of Physicians, London.

By ROBERT J. LEE, M.D., F.R.C.P.,

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LECTURE III.

THE only point on which I now feel some hesitation is, whether this explanation of the origin of puerperal fever, and its contagious nature, is so generally admitted as to allow us to proceed in our inquiry without interruption by objections to it. Our students are generally told in the text-books that puerperal fever is "a continued fever communicable by contagion, occurring in connection with childbirth, and often associated with extensive local lesions, especially of the uterine system". (Aitken.)

There is no doubt that a considerable number of experienced practitioners believe in epidemic influences, and are quite ready to allow that there is strong evidence to make them conceive that in certain cases the fever has been communicated from one person to another. It is only a short time since that one of our leading journals, in remarking on a case of manslaughter which has excited attention very properly on the question of contagion, observed: "Is it certain that puerperal fever is contagious?" It seems to me a very important matter indeed that there should be no mistake on this question, at least as a practical one; for, whether we believe or disbelieve the theory of contagion, we must regulate our practice by the opinions of those of the greatest experience and knowledge.

Supposing even that we cannot demonstrate the perfect truth of the theory, and that we cannot explain certain apparent exceptions to it, it is necessary to remember that it is sufficient, if the proof can be carried so far as to obtain consent to the probability of the theory being true. In this case, "probability is the very guide of life"; and the rules laid down by an able writer, on the extent to which we ought to be satisfied with the evidence of such probability, are so much to the purpose, that I shall take advantage of them to express the opinion, which I think we shall agree in supporting, in respect of this matter.

"From these things, it follows", says that able logician Bishop Butler, "in questions of difficulty, or such as are thought so, where more satisfactory evidence cannot be had, or is not seen, if the result of examination be, that there appears, upon the whole, the lowest presumption on one side, though in the lowest degree greater, this determines the question even in matters of speculation, and, in matters of practice, will lay us under an absolute and formal obligation, in point of prudence and of interest, to act upon that presumption or low probability, though it be so low as to leave the mind in very great doubt which is the truth. For surely a man is as really bound in prudence to do what, upon the whole, appears according to the best of his judgment to be for his happiness as what he certainly knows to be so." (Butler, Introduction to *Anal. Relig.*) It is quite easy to perceive what a great difference must exist between the views entertained by one who believes thoroughly in the contagious theory and those of one who does not believe in or is doubtful of it. By the former, epidemics of the fever are not admitted; symptoms are all referred to the influence of a poison circulating in the system, which accumulates in tissues and produces general disturbance as well as local pathological changes. Variations in the pulse and temperature are explained by the same cause, and the remedies which appear most rational depend upon the principle of opposing the poisonous influence, while the fear of conveying septic matter from one case to another will always suggest precautions which would be disregarded by one who doubted such a possibility. In regard to the question of lying-in institutions, and in his views of the dangerous proximity of the *post mortem* room, he would hold only one opinion. In many other ways which need not be mentioned, his professional conduct would be regulated in regard to various cases which might occur in his practice of those diseases which are also the source of the infecting poison. If he engage in discussion on these practical questions, he carefully declines to argue on the meaning of the term contagion. If it be stated that puerperal fever, in a large number of instances, cannot be traced to any source of infection, he replies that his theory does not involve such a necessity; that the symptoms may arise from the decomposition of organic matter in the patient's

own person; and he does not allow the limited meaning of the term contagion as used in such diseases as scarlatina, variola, and others, to be adopted in the case of puerperal fever; and, so far as such diseases occurring in the puerperal state are more serious than under other circumstances, he would either assert that he doubted the fact, or that, if it be occasionally true, he would still adhere to the opinion, that such increase in the severity of symptoms might be explained upon the principle of septic infection.

There may undoubtedly be some demand upon the imagination for those who find it difficult to conceive of invisible and subtle agents of whose existence there is only the evidence of effects; but, when the mind is educated by acquaintance with many natural phenomena that can only depend on unseen forces or energies, that difficulty diminishes, and a consideration of the extraordinary character of the effects produced by the action of all poisons on the human system will assist in allowing the same method of reasoning to be employed which is pursued in the investigation of the laws which regulate the action of chemical, physical, and other forces. That those who are engaged in other departments of scientific investigation are required to exercise the imagination, when they have arrived at the limits of actual perception, is proved sufficiently by the following remarks of one of the leaders of experimental research in the domain of natural philosophy.

Fig. 1.—Section of Pleural Membrane, with network of Lymph-vessels full of Bacteria. Natural size (Heiberg).

"I would simply draw attention," says Professor Tyndall, "to the fact, that in the atmosphere we have particles which defy both the microscope and the balance, which do not darken the air, and which exist nevertheless in multitudes sufficient to reduce to insignificance the Israelitish hyperbole regarding the sands upon the sea-shore." . . . "It cannot be too distinctly borne in mind that, between the microscope limit and the true molecular limits, there is room for infinite permutations and combinations." (*Microscopical Journal*, vol. x, p. 416, new series.)

Fig. 2.—Section through a Bacterian Embolon in a minute Artery in the Kidney. The patient sank very rapidly after delivery, and the *post mortem* examination led to an explanation of the symptoms in the gangrenous condition of the placental surface, and venous thrombosis in the tissues which correspond to that part. In the lungs and heart, abscesses containing bacteria were found (Heiberg).

It is quite clear that, if the efforts be successful which are now being made to demonstrate the actual existence of organic poisons developed in the process of decomposition, we shall some day be enabled to

account satisfactorily for the different symptoms which they give rise to when introduced into the human system, and for the pathological changes they produce in the different tissues of the body.

This question of the different characters of the products of decomposition is, of course, extremely difficult to decide. We have only to be careful to require that observations should be accurate, and that theories should not be hastily proposed. It might appear quite an easy matter to investigate the results of the decomposition of any particular organic substance, and determine the sensible properties of the minute organisms which are developed in that process; I say it might seem easy to do this; but practical observation soon dispels this idea. The field of the microscope is seen to be crowded with particles of extreme minuteness, of variety of form, reflecting and refracting light in various degrees, and exhibiting movements of more or less complexity. Those movements may be independent of the organisms themselves; that is to say, they may be produced by external forces. Thus, if we employ only our powers of vision, though we may magnify to any extent, as a means to discover their characters, and to distinguish them from one another, we are only using morphological principles as the basis of classification.

This limitation of their powers of analysis with the microscope none are so well aware of as the most experienced observers, and there is but little danger of our being led to erroneous conclusions by them. Those who are least experienced in the difficulty of microscopic research are more likely to exceed the limits of observation, and to indulge in theories which will prove eventually to be only partly true.

It would be difficult to do justice in these lectures to the researches which have lately been made into the interesting and important subject of decomposition. A learned Fellow of this College has fairly stated the general results of the most recent investigations of Continental observers, after verifying them by independent examination, as well as contributing some information of value himself in his recent lectures at Owens College, Manchester (*vide* BRITISH MEDICAL JOURNAL, January 26th, on the "Occurrence of Organic Forms in connection with Contagious and Infectious Diseases"); and his conclusions are more in accordance with all that we know from experience, clinical observation, and experiments, than could be expected from one who, like the distinguished Professor at Jena, has made the study of the different species of organisms, and their development, almost his sole object of inquiry.

Fig. 3.—Canals in the Pyramidal Portion of the Kidney full of Bacteria. Between the canals, the stroma of the kidney contains some fat-globules. The specimen was taken from a patient who died about four weeks after delivery from puerperal infection. Numerous abscesses with which lymphatics communicated were found in the periuterine tissues. Both kidneys were large, pale, and soft, and contained streaks and spots of yellowish colour, and numerous points of ecchymosis. The liver was slightly enlarged, of paler colour than normal, and the divisions of the acini were indistinctly defined. The pericardium was spotted with points of ecchymosis, and its serous cavity contained sanious fluid (Heiberg).

It is only necessary to select such of these observations as bear directly on the symptoms and pathology of their subject. Those who are unacquainted with the general characters of the minute organisms which are classed under the term bacteria may readily obtain some idea of their dimensions, forms, and other distinguishing features, by the examination of any fluid containing decomposing organic matter. For instance, the secretion in carcinoma uteri may be subjected to microscopical examination with the quarter-inch or half-inch object-glass; and, instead of a simple collection of bacteria, in decomposing we have the cells of tissues with which we are tolerably familiar, to assist us in forming some idea of the extreme minuteness of those organisms. A cancer-cell appears to be capable of containing quite a considerable number of the darkish globular granules, which are now looked upon as special forms possessing active infective pro-

perties. We can readily recognise in such a preparation the staff-shaped bacteria, properly so-called, with their undulating mode of progression, the spirilla with rapid axial rotation, the more obscure movements of the vibrios, and, lastly, the comparatively insignificant globular micrococci. It is the last of these which, under special names, as micrococcus diphtheriticus, micrococcus vaccinæ, and others, which are not so easy to distinguish from one another as to make us quite satisfied of their specific character, that are now engaging the attention of pathologists in relation to the various changes of tissue which are met with in puerperal disease.

There is no difficulty whatever in conceiving it quite possible for even the larger bacteria to traverse the smallest capillaries; for we have only to introduce under the cover of the microscopic slide a few red blood-corpuscles, in order to perceive that three or four staff-shaped bacteria placed side by side could follow a blood-cell in its passage through minute vessels. And, when we observe that a micrococcus is a sphere whose diameter is not equal to that of the staff-shaped bodies, we can imagine it capable of exerting local morbid influence by interruption of the physiological processes, which are constantly taking place in the body.

My object in presenting in this familiar manner the general characters of bacteria is rather to favour the view that, instead of treating them with contempt, we may not only appreciate the fact of such organisms existing, but may give some scope to the imagination when we are considering the question of morbid poisons, and are asked to believe in much that cannot be brought within the range of actual perception. It might be reasonably objected that there is great liability to error in microscopic analysis of the characters of micrococci, and that we might easily mistake other cellular forms for them. This is an objection which is perfectly true, and against which the microscopist has to guard very carefully.

At present, there seems to be one test which may be applied in pathological examination of tissues supposed to contain micrococci, and this is required by the fact, that the minute globules of oil commonly met with in all tissues in certain pathological conditions resemble micrococci so closely as to make it difficult to distinguish between them. This has suggested the immersion of such tissues in strong solution of caustic potash, which is known to have no effect upon the microscopical appearance of a micrococcus.

By these means, Professor Heiberg of Christiania (*Die Puerperalen und Pyämischen Processen*, Leipzig, 1873) has lately succeeded in satisfying those who have had an opportunity of examining his preparations, and who are qualified to form an opinion upon their value, that, in cases of puerperal fever, very many tissues may contain bacteria. He has exhibited specimens in which the lymph-canals of the serous membrane of the liver are seen to contain them in small groups or "colonies"; and they are not confined to the canals, but seem to have permeated their walls and invaded the external tissue. Similar groups are found in the lymph-vessels of the pleural membrane; in the tissue of the cardiac valves, which is rendered slightly opaque and swollen around them; in the arteries and tubes of the kidney; and, among other results of investigations, Professor Heiberg describes them in those lacunæ which exist in the nasal mucous membrane, and communicate by fissures with the surface.

We can easily apply these facts to the explanation of the formation of minute abscesses around arterial embola, and to the different pathological conditions which follow a simple fibrinous coagulum arrested in the circulation, as compared with one containing active micrococci. This is the direction in which pathological investigations will be made by those who support these views of the connection between bacteria and puerperal fever.

The idea of searching for micrococci as Professor Heiberg did was suggested by reflection on the difference between one embolon and another, that is, from a comparison between the state of the tissue surrounding small collections of healthy pus, which had been injected into the veins, and had been arrested in the minute branches of the pulmonary artery, and the much more active changes which resulted from the injection of material containing bacteria.

It was in a case of ulcerative endocarditis occurring in pyæmia that Professor Winge first referred to the existence of micrococci in the pathological changes observed in the endocardial membrane, Professor Virchow having previously described this particular form of ulceration in puerperal fever as of diphtheritic nature. This case of Winge's was followed by another, the details of which were supplied by Professor Heiberg, and was accompanied by a postscript by Virchow, in which he refers the species of micrococcus to the genus *Leptothrix* of Hallier, expressing the necessity of caution in deciding upon this difficult point, as the very minute size of the corpuscula, and the absence of movement in the particles, necessarily make the microscopical examination some-

what uncertain. However, he states very positively that they are parasites, and are related to diphtheria and blood-infection. This is the present state of our knowledge regarding bacteria in their relation to puerperal infection; and, as there seems to be good reason for believing in the facts as far as they go, we might decline to speculate upon the question which presents itself, Whether these micrococci are active agents themselves in producing the effects described, or whether they are only the vehicles of a subtle poison which attaches itself to them as well as to any other particles of matter, whether micrococci or not. Or suppose that we question the specific characters of the micrococcus, and ask whether there may not be others of equally active properties whose presence we cannot detect in the fluids or tissues. When we know how many varieties of bacteria are developed in the process of decomposition, we should feel inclined to doubt whether one and all might not be equally capable of producing poisonous effects when introduced into the system.

ABSTRACT OF THE LUMLEIAN LECTURES ON LIFE, AND ON VITAL ACTION IN HEALTH AND DISEASE.

Delivered at the Royal College of Physicians, London.

By LIONEL S. BEALE, M.B., F.R.S.,
Physician to King's College Hospital.

LECTURE I.

[DR. BEALE began his lecture by referring to the controversies which have taken place as to the nature of life, and commenting on the manner in which they have been carried on. He then proceeded to express the grounds of his dissent from the physical doctrine of life.]

To the doctrines now generally taught and fast becoming very widely diffused, I am and have been strongly opposed. In certain particulars, those doctrines are in conflict with views based upon well observed facts, in relation to the growth and multiplication of every known form of living matter, and the formation of the tissues of living beings. Many observations, though repeated again and again, must be entirely erroneous if the positive statements recently made concerning the phenomena of living beings be true. It may be presumptuous, perhaps, to suggest that the conclusions arrived at by me many years ago, ought not to have been wholly ignored by authorities who have expressed themselves in very confident language concerning the physical nature of life; but people have been informed again and again that all the phenomena of living beings are due to physical changes, although it has been pointed out that phenomena, characteristic of every kind of living matter, cannot be so explained. I have for many years pleaded in vain that, for example, an attempt should be made to explain the movements of an amoeba, or a mucus-corpuscle, by physico-chemical action.

It is right, as it seems to me, now to proceed a step further, and challenge the supporters of the physical theory of life to publicly reply to the objections urged against the statements they have made. For has not the time arrived when the facts and arguments upon both sides might be summed up and judgment given, whether the physical doctrine of life is justified by the scientific knowledge of the time in which we live; or whether, on the other hand, it is not a thoroughly unscientific inference, based only upon the facts of the imagination, and opposed to facts of observation?

In the physical domain, consequence follows its antecedent with unerring certainty. What will happen under certain given circumstances can be stated with exactness and premised beforehand. But it is not so with the living world. It has yet to be proved that every change there is a direct consequence of antecedent physical change. We cannot predicate of vital as we can of physical phenomena. We have not the certainty of physical law. Nevertheless, with amazing confidence, not, however, resulting from knowledge, some declare that the difference is to be easily accounted for by the greater complexity of the circumstances and conditions which obtain, as regards vital phenomena. When, it is affirmed, by further investigation, these circumstances shall have been fully investigated, man, we are assured, will be able to define, with absolute certainty and unerring precision, the particular living form which shall result from the development, under certain given conditions, of a particle of colourless transparent matter which