ART. XIII.—*An Account of Tubercles in the Air-cells of a Bird, and some Observations on Tubercles in general.* By ROBERT HARRISON, M. D., Professor of Anatomy and Physiology in the Royal College of Surgeons in Ireland, and one of the Surgeons of the City of Dublin Hospital, &c. &c.

No one subject in medical science has of late years excited more interest than the characters of that train of morbid action, known by the name of "*tuberculous deposit*;" and as no unimportant addition to our knowledge has been derived from the investigation of this disease in the lower classes of animals, I have considered that it may not be uninteresting to present a brief statement of this morbid occurrence, in a member of that class in whom it has not been commonly observed.

Tubercle is well known to be frequent among many of the mammalia. To the quadrumana brought to these countries, it has proved the most frequent cause of death; and all the phenomena previous to this result, as well as those observed on "post-mortem examination," have been in most respects similar, nay, identical with phthisis in the human subject. Tubercle has been detected in the lion, horse, dog, goat, pig, hare, rabbit, porpoise, and numerous others; I have seen several examples of it in the cat.

warm bath; also to bleed the patient, if of a full or robust habit. The diet to be at first low, then middle, but seldom to reach the grade of *full*, unless in debilitated habits.

3rd. To use the warm bath, antimonials, and purgatives, occasionally, during the course.

4th. To insist on confinement, except when exercise in the open air is enjoined in *asthenic* cases as a part of the *treatment*, instead of being *permitted* as a relaxation.

5th. To discontinue mercury temporarily, on the occurrence of any *doubt* as to its operation.

To the above must be added, (in those cases of secondary syphilis where it has been abundantly used,) the discontinuance of mercury, and the administration of the substitutes for it.

In domestic and other animals, whose mode of living has been subjected for any length of time to any great alteration in their natural habits, either as regards exercise or diet, its occurrence may be expected ; thus, the dairy cows at Paris, who pass their time in absolute rest, become tuberculous : in rabbits confined in cold, damp, and dark situations, and who are compelled to live on food not suited to their taste, or general organization, the disease may be, artificially as it were, produced ; the monkey too, in whom it is so common and so frequent, may, from the mode of life to which he is condemned in these countries, be considered as a sort of analogous experiment. When we consider the great similarity that prevails throughout the whole division of mammalia, both as regards the minute structure of their component tissues, as well as the apparatuses for the great vital functions, it ceases to be a matter of surprise that under similar exciting causes, similar morbid results should ensue.

Tubercular disease, however, is not confined to mammals ; it has been detected in birds, though, I believe but rarely ; something very like to it has been seen in some of the reptile family ; I am not aware of its having been seen in fish. I have never met with any example of it in this tribe, although I have paid some attention to the anatomy of this interesting class ; and have found that they are very liable to be infested with entozoa and other parasitical animals. Mr. Newport believes he has detected tuberculous deposit in some of the insect tribe ; in the larva of the sphinx ligustri, or privet moth, also in the ground beetle and others ; and it is worthy of remark, that in some of these instances the food had been stale and of a deteriorated quality. It is more than probable, that the same causes which give rise to it in one animal, may be capable of producing it in all.

Whether tuberculous disease is equally frequent in animals, when left in the full enjoyment of their natural liberty and propensities, as in those who become domesticated, or subjected to artificial treatment, is a question which would require very ex-

tended observation to solve ; as far, however, as our experience extends, it may be answered in the negative ; and it may be added, that among these, just as in the human race, too refined attempts to change the natural habits, by altered diet, strict regimen, or confined, and we might add, luxurious and effeminate habits, may render them also more liable to degeneration, and to morbid action, than when left to the unrestrained exercise of the natural dictates of instinct.

As the study of comparative anatomy has extended and confirmed our knowledge of human anatomy and physiology, and has thus enlarged and secured the basis on which the science of medicine rests, so comparative pathology opens a wide and interesting field for inquiry, one which, as yet, has been little cultivated. The morbid action and structural changes which occur in the lower animals, are interesting and important to understand. The narcotic influence of the poison distilled from the duct beneath the serpent's tooth ; the equally fatal, though in effect less rapid, virus contained in the saliva of the rabid feline genus, and which can be conveyed from one animal to another, almost *ad infinitum*, involving all in one irremediable fate ; the secretion discharged from the nose and eyes of the glandered horse, and which is found capable of infecting man, and inducing in him the same fatal result, are awful facts to arouse attention to the diseased conditions of the inferior animals ; while again, a more interesting and agreeable example may be cited with the same view, in the discharge from the unhealthy ulcer on the nipples of the cow ; and which, through the unwearied exertions of the immortal Jenner, has been made the providential instrument of almost extirpating a most loathsome pestilence, or at all events, of depriving a painful and serious disease of more than half its terrors.

Although tubercles have been found in some birds, as the parrot and in some domestic poultry, I yet consider their occurrence as extremely rare, and shall, therefore, detail the particulars of a case I had lately an opportunity of examining, in which this

disease was extensively established in some of the great air-cells, and from the clear and open structure of the latter, many of the characters of tubercle were more distinctly seen than in those more complex tissues in which it is so prone to occur in the higher orders of animals.

The subject of these remarks was a very fine male specimen of gannett, (*pelicanus bassanus*), supposed to be young. When brought to Dublin he was in vigorous health, and continued so apparently for a few days, frequently enjoying his favourite practice of plunging and diving in the deep; he also fed very well. He soon, however, began to decline in appearance, gave up bathing, remained listless and languid, lost his flesh and lively looks; his appetite, however, (for fish) continued, but still he daily wasted, and died in about a month from the date of his captivity. For some days previously he was observed to vomit occasionally, that is, if that act of discharging the cervical pouch, so often remarked in the pelican, can be so called, which, however, in the strict sense of the term cannot be so considered. No peculiar affection or impediment in breathing was noticed. I may remark, that I do not believe birds have ever been observed to cough or sneeze; indeed I should apprehend that from the peculiar arrangement of their respiratory apparatus, they are physically incompetent to make either of these convulsive expiratory efforts.

Dissection.—On raising the sternum I was at once struck with the number of yellow, white, or greyish tubercles with which the interior of the great air-cell on the left side was studded. The membrane, as it lines the ribs, (corresponding to pleura,) and thence extends as an imperfect septum between the thoracic and abdominal viscera, was thickly set with them. In size, form, and consistence, they presented every variety; some were small and circular as a pin's head, others as large as a sixpence, some were of an irregular or diffused form, but the circular shape prevailed; many were very firm, and almost dry, others more soft and pulpy to the feel,

and several were semi-fluid about their circumference : in many the centre was depressed, and as it were shrivelled in the form of a dry circular nucleus, while in a few the same part was very prominent and conical, but dry and apparently inorganic or horny. Those of the smallest size were of softest consistence, but even these consisted of the same white or yellowish matter. There were only two spots that presented any resemblance to the grey, semi-transparent tubercle so common on the human lung. Some of this numerous crop of tubercles adhered very closely to the membrane which may be supposed their matrix, others less intimately, and some were so loosely connected that I lost several when passing a gentle stream of water over the surface for the purpose of cleaning the preparation. The softening and separation in all cases extended from the circumference inwards ; the connexion appeared a mere agglutition which a little maceration in water would easily dissolve ; the surface of the subjacent membrane appeared free from any abrasion or abnormal appearance. The subject had been tolerably minutely injected, yet not a trace of blood-vessel could be detected either entering any of these tuberculous masses or connected to their base, and there was no vestige of inflammation, recent or remote. On submitting some of the detached tubercles to aqueous decomposition they soon resolved into the ordinary pasty or cheesy matter. I am unable to add any statement as to their chemical components, but from their general analogy to those in other animals, I should anticipate a corresponding result. There were two small tubercles on the pleura covering the upper part of the left lung, a few also were observed in the cellular tissue in the neck, and two were found on the surface of the base of the brain. I could not detect any in the alimentary canal, or in any part of the glandular system, secreting or lymphatic. I have been thus accurate in noticing all the physical characters of this tuberculous deposit, because in a disease of such importance we cannot be too careful in acquiring a knowledge of all its concomitant circumstances.

I purposely abstain from discussing the conflicting theories as to the true nature of tuberculous deposit, or entering upon the question, whether tubercle is merely a morbid secretion afforded from the blood by the vessels of the part, and induced by a peculiar unhealthy state of the constitution, or whether it is to be regarded as an independent or parasitical being.

My own judgment inclines to adopt the former opinion; many more facts must be adduced before the latter doctrine can be considered as established. I admit that in support of it much ingenious reasoning has been advanced, and analogy in some measure favours the hypothesis; doubtless of late years the labours of Ehrenburgh and others have brought to light most interesting facts concerning what may be regarded as the lowest classes of the animal kingdom; but I cannot reconcile to my mind the idea of an animal without some definite and regular form and structure, or without the possession of some degree of locomotive or contractile power, or destitute of the reproductive faculty. Has it been as yet established that pulmonary tubercles possess these three characters or not? Until this question can be fairly answered in the affirmative, I must adhere to the doctrine of tuberculous deposit being but a morbid secretion, while at the same time I admit that the reasoning and the facts adduced in support of the opposite opinion have sufficient force to allow the question still to remain *sub judice*.

I prefer offering a few remarks as to the ordinary seat of tubercle. Dr. Carswell, in his invaluable essay on tubercle, considers the mucous and serous surfaces, (the latter including the cellular tissue in general,) and the blood itself, as the exclusive seats of tuberculous deposit, but that "its seat of election is the free surface of the mucous membranes." While I gladly avail myself of this opportunity of expressing my great respect for the talents, industry and research of this distinguished pathologist, and gratefully acknowledge the benefits he has conferred upon this department of medical science, I yet feel jus-

tified in dissenting from one part of the foregoing statement, namely, that the free surface of the mucous membranes is the "seat of election" for tuberculous deposit. My own experience is decidedly in favour of the free surface of the serous tissues. In numerous instances of abdominal tubercular disease, I have, for one example of it on the mucous surface, seen several on the serous or peritoneal : indeed, in those cases in which the mucous membrane was engaged, it appeared as if the tubercular deposit had rather commenced in the sub-mucous tissue, or in its follicular or glandular texture, than been deposited on its free surface. In the thorax, how frequently do we find the small semi-transparent tubercle thickly set over the whole surface of the pleura parietalis, as also on the surface of that covering the lung. No doubt it will at once occur as an objection to this statement, that tubercles occur still more frequently in the pulmonary air vesicles, and that these are lined by mucous membrane. To the first part of this proposition I assent, but not to the latter ; that is, I fully admit that tuberculous deposit occurs more frequently in the pulmonary air cells and glands than in any other tissue in the body, but I by no means consider these cells to be lined with a truly mucous membrane. Minute examination of the pulmonary structure, even in man, will evince a marked difference in the organization of the bronchial tubes, even the most minute, and the air cells in which they end ; the former are lined by a soft or villous mucous membrane, which is coated by a thin mucous secretion, and if the organ have been minutely injected, its vascularity will become as obvious as that in other mucous surfaces ; not so with the air cells, their interior appears smooth and glistening, like the free surface of serous or cellular membrane ; and although numerous vessels are distinctly seen in the interlobular and intervesicular texture, yet the interior of the cells themselves is not coloured, and thus presents a remarkable contrast to the mucous lining of the air tubes. If the vessels of the lung be minutely injected, and the bronchial tubes inflated, the clear transparency of the air vesicles on the surface

evinces this deficiency of minute vascularity in their tissue, while it exhibits the numerous vessels ramifying in and around their delicate parietes in the connecting cellular tissue : again, the air vesicles, when carefully examined, are not found to contain any mucous, or any fluid secretion ; the membrane lining the bronchial tubes, therefore, must be the source of the mucus which is occasionally expectorated even in health, while the watery vapour with which the expired breath is always charged, is probably derived principally from the exhalant surface of the air-cells ; and in part from the evaporation of the fluids secreted by the mucous lining of the fauces and air-tubes.

The effects of acute disease also indicate, in some measure, a difference in the membrane lining the air-tubes, and that in the cells ; in bronchitis, the former are found loaded and obstructed with viscid mucus, while the latter, if cut into, will discharge a quantity of frothy, watery, or serous fluid ; the effects of the inflammation in either case being to increase and modify the natural secretion of the respective surface. In pneumonia, the tendency to adhesive inflammation, or to the infiltration of coagulable lymph into the vesicular structure, is only an analogous effect to that which is so common in other serous tissues, and contrary to what occurs upon mucous surfaces ; I might cite other examples of pulmonary disease to support the same position, but I fear to extend too far the limits of this paper.

If I inquire, why it is that the air-cells should be considered as mucous sacs so generally as they are, the answer I receive is simply this : first, because their lining membrane is continuous with that which lines all the air-tubes, which is confessedly of mucous character ; and second, because the cells are not shut cavities, as serous membranes are, but they are open sacs. Let us briefly consider these two reasons : first, is it an established fact that the whole of one continuous surface must be identical in function ? I answer not ; and in support of this assertion, point to the general investing membrane of the body, and the great mucous lining of all the viscera of organic life : these are conti-

nuous textures, yet they differ most essentially in their structure and function; again, examine the whole trajet of the great gastro-pulmonary mucous membrane, contrast it in the nasal sinuses and on the spongy bones, in the mouth and fauces, œsophagus and trachea, in the small and in the large intestines, and the greatest difference will be found to exist in the organization, vascularity, sensibility and in the functions of this membrane in these different situations, although, throughout, it is one continuous surface; it is surely then not contrary to analogy, to admit that the mucous lining of the bronchial tubes may cease to be such when it approaches and enters the air-cells; and that in the latter it may present the appearance and perform the functions of serous or cellular membrane. Again, it may be said that mucous and serous membranes are never continuous: in reply, I refer to the open extremities of the Fallopian tubes, through which the everted mucous lining is continuous with the serous membrane of the abdomen. To this, however, it may be objected, it is true, that these tissues are continuous, but the mouths of the Fallopian tubes may be ordinarily so closed as virtually to establish a line of distinct separation between the mucous lining and the serous envelope: this is not improbable, neither is it unlikely that the muscular tissue in the lungs extends along the air-tubes as far as the cells, and at their opening both the mucous and muscular tissue may terminate so that the latter may be capable of exerting a contractile force at the point of communication; a consideration of the functions of the lungs, as well as of certain phenomena in disease, does not suggest any fact repugnant to this idea. Secondly, are serous membranes necessarily shut sacs? I consider not; those in the large cavities are so, with the exception before alluded to of the peritonæum communicating with the mucous surfaces of the Fallopian tubes; such an arrangement in these situations, as also in the joints, is obviously the best, in order to retain the required moisture or secretion, but no further. All admit that the cellular tissue is analogous in all essentials to the serous, yet its cells or serous

sacs are not close, but communicate freely with each other. Comparative anatomy also affords examples of serous membranes being naturally open, and communicating freely either with the external surface, or with the general cellular tissue of the body; thus, in one large family of fish, the peritonæum opens to the surface at either side of the anus, so freely that the water of the ocean can circulate among the abdominal viscera, as far even as the heart; an arrangement which is extremely interesting, and which, probably, allows the animal to alter its specific gravity at will, particularly as this class is deficient in the air or swim bladder; in all these, however, the peritonæum presents all the characters of serous membrane: again, in birds, the fact of an open serous membrane is still more obvious, and serves as a strong analogical support to the opinion now advanced as to the serous nature of the pulmonary air-cells. The respiratory apparatus of birds is one of the most beautiful arrangements in the animal creation; an example scarcely equalled, and certainly not excelled, as exhibiting a series of contrivances, adapted not only to secure all the requisites to the performance of a great vital function, but also to afford such peculiar mechanical advantages as are necessary for the habit, the wants, nay, the very existence of the being. The bronchial tubes open by large oblique orifices into the air-cells, and the latter communicate with the cellular tissue of the bones and intermuscular spaces. The great air-cells are thin and transparent, and although the mucous membrane from the bronchial canals is continued into them to form a delicate lining, yet, a total change of structure exists, and it immediately loses all the characters of a mucous, and assumes the properties of a serous membrane; these cells again communicate by equally distinct openings with the cellular membrane of the limbs and bones; thus, exhibiting a gradual transition from the mucous to the serous, and from the latter to the cellular tissue, and yet, a perfect continuity throughout. From these several facts, then, I think it is an error in anatomical and physiological language to say,

that serous membranes must be shut sacs, or that because the surface of an extended membranous texture is continuous throughout, it must therefore be identical in structure and function in all its parts. From these several considerations, then, I am led to regard the air-cells or the vesicular structure as much more allied to the cellular or serous tissue both in structure and in function, than to the mucous; and when I reflect upon the frequency of tubercular deposit on the free surface of the true serous membranes, and in the air-cells of the lungs, which I consider allied thereto in organization, as also its frequent occurrence in the cellular tissue, in the glandular, and in other systems, I am led to the conclusion, that tubercular deposit is more prone to occur on the free surface of the serous and cellular membranes, while, at the same time, the corresponding surface of the true mucous membranes is by no means exempt from it, more particularly in that portion of it which appertains to the re-productive organs.

ART. XIV.—*On the Treatment of various Diseases by means of Creosote.* By SIR FRANCIS SMITH, M. D., Fellow of the College of Physicians, &c. &c.

[Read at a Meeting of the College of Physicians held on the 18th March, 1837.]

THE announcement of the discovery of creosote, by M. Reichenbach, in 1834, and his strenuous recommendation of it as a therapeutical agent of great value, induced many of the leading medical men of France to experiment upon the subject. Creosote in its pure form, when prepared according to the directions of M. Reichenbach, is a clear, oily, colourless fluid, having a very penetrating smoky odour, and a specific gravity of 1.037. It combines sparingly with water, but in any quantity with acetic acid. It has been recommended in the treat-