XXI. *On the effects produced upon the Air Cells of the Lungs when the pulmonary circulation is too much encreased.* By *Sir* EVERARD HOME, *Bart. V. P. R. S.*

Read May 31, 1827.

WHILE Mr. BAUER was engaged in making the microscopical observations contained in a former paper on the structure of the human lungs, he compared the appearances with those in the lungs of other animals, and found in the quadruped the principal difference to be, the more minute branches of the bronchiæ have imperfect cartilaginous rings to a greater extent towards the air cells than in the human lungs.

In cold blooded animals, as the turtle, the bronchiæ do not in their ramifications diminish as in the quadruped, but remain of a considerable size, and the lateral branches degenerate into a trellis work, which is only bounded by the circumference of the organ.

The cells of the human lungs are not dilatations of the bronchial tubes, but are regular cells in which the tubes terminate. The animals Mr. BAUER examined were the hare, the sheep and the turtle. In the human lungs and those of the hare the superficial cells are larger than the interior. In examining the air cells of a hare that had been coursed, he found the superficial large cells filled with colourless coagulable lymph, forming white specks, and the smaller more interior ones filled with coagula of red blood. No such appearance was met with in a hare that had been snared, or one that had been shot.

To determine whether this effect had been produced by the animal's over exertion, I procured two hares which had had an unusually long run; and this appearance was conspicuous in the lungs of both of them, but more extensively in the one than in the other, most probably from that hare having been more pressed by the greyhounds. This appearance, which gives us the exact form of the large superficial cells, is represented in the annexed drawing.

Never having been present at a coursing party, I applied to the gamekeeper of Richmond Park, where they course regularly during the season twice a week to supply the King's table. Mr. SAWYER informed me that a run of fifteen minutes with greyhounds was rarely exceeded, and when a hare is pressed for so long a time, it often sinks from exhaustion and dies, although the dogs have not reached it; the greyhounds themselves after so long a run are so blown as to be often unable to seize the hare with their teeth, although within their reach. He considers a run of a quarter of an hour with greyhounds, to press the hare equally with a run with harriers in hunting for three hours; and in both cases the animal frequently dies from over exertion.

That the natural state of the air cells in the lungs in which the white specks were so abundant, while the more interior were filled with extravasated red blood, might be ascertained, I got Mr. RUSSELL, whose name is mentioned in the former communication, to pour quicksilver into some of the bronchiæ, and fill the air cells, that they might be distended to the utmost, and then immerse the portion of lung so injected into rectified spirit, to prevent them from afterwards collapsing. This was very effectually done, and Mr. RUSSELL

remarked that the quicksilver did not pass so quickly into the cells as in his former attempts to fill those of the human lungs.

Mr. BAUER some days after examined the internal structure in the microscope, magnifying the parts 20 diameters. He found not only the cells full of mercury, but the branches of the bronchiæ which terminated in them also distended with it, which was not the case in the human lungs; the terminations of the bronchiæ being composed of elastic membrane, had squeezed out the quicksilver.

This difference of structure of the more minute branches of the bronchiæ, may be a provision of nature to give a ready admission of air into the cells at the time the animal is hard run, while in the human lungs, the elastic membranous structure admits of the volume of air being varied according to circumstances, as we find it is in the act of singing, and in playing on wind instruments, which I understand is often attended with bad consequences in such individuals whose lungs are of a delicate texture; and when long persevered in has even proved fatal, from producing probably the same effect as in animals that are hard run. The white specks that have been described appear to be portions of coagulable lymph, separated from the circulating blood, in consequence of the disturbed state of that fluid in its passage through the branches of the pulmonary artery, and afterwards deposited in the larger and superficial air cells, in the same manner as coagulable lymph is deposited on the internal membrane of veins during a state of inflammation of these canals. That such a separation frequently takes place while the blood is in a fluid state, both in the body and when drawn from the

arm, I have upon another occasion given several illustrations.

Every thing that is valuable in the pursuits of comparative anatomy arises from its making us better acquainted with the structure of the human body, and the uses of its different organs, respecting which we have no other mode of acquiring information. What works can we consult for the improvement of anatomy and physiology, from which knowledge we are to derive our rudiments in the treatment of diseases so as to relieve the miseries of mankind, than those of the Great and all wise Author to whom we owe our being; and who has spread before us the whole animal creation, not only for the purposes of affording food and raiment, but also to make us better acquainted with the mechanism of our own bodies?

I am led to make these remarks in this place, since it appears to me that the specks met with in the lungs of the hare when the velocity of its progressive motion is overstrained, gives us great insight into the disease of the lungs called tubercles, one of the most prevalent, and, I may say, the most destructive to the natives of our climate.

On Tubercles in the Human Lungs.

In proof of our ignorance of the origin of tubercles in the lungs, it will only be necessary to examine Dr. BAILLIE'S valuable account of this disease, both in his verbal description, and the representation he has given of the appearances that tubercles put on. He had opportunities of referring to what the anatomists before him had done on the subject, and, as a teacher, the natural, healthy structure of these organs

was familiar to him. The disease in all its stages must have been constantly under his eye in the numerous dead bodies with which the dissecting room was for twelve years, during which he taught anatomy, regularly supplied, and yet he neither had become acquainted with its origin nor its nature.

He considers it to consist of white specks situated between the pleura and air cells, too small to admit of particular examination.

In his Morbid Anatomy, his words are, "Tubercles consist of rounded bodies of a white colour, interspersed through the substance of the lungs; they are probably formed in the cellular structure which connects the air cells of the lungs together, and are not a morbid affection of glands, as has been frequently imagined. There is no glandular structure in the cellular connecting medium of the lungs; on the inside of the bronchiæ, continued from the trachea, where there are follicles, tubercles have never been seen. They are at first very small, not being larger than the heads of very small pins, and in that case are frequently accumulated in small clusters. The smaller tubercles of a cluster grow probably together and form one large one. The more ordinary size of a tubercle is about that of a garden pea, but they are subject in that respect to great variety; they adhere closely to the substance of the lungs, but have no particular covering, or capsule, and have little or no vascularity; when cut into, they are found to consist of a white smooth substance having a firm texture, and often contain in parts a thick curdly pus." Dr. BAILLIE has given two plates, in each of which there are two figures. In the first, the tubercles

are of a small size, but from that representation no conclusions can be drawn, either as to their origin, or their real situation respecting the healthy structure of the organ.

In the second, which he mentions to be more rarely met with, they are shown both on the convex and concave surfaces close to one another, immediately under the surface, and projecting through the pleura; these have acquired a considerable size, and it is much to be regretted that they were not met with in an earlier stage, and that the history of this particular case has not been registered; but when the appearance, which is shown, and the section of the tubercle is accurately observed, no one can doubt that the origin of this species of tubercle must have been from particles of coagulable lymph deposited in the superficial air cells, similar to those met with in the hare.

EXPLANATION OF PLATE XIII.

Fig. 1. Represents the superficial cells of the lungs of a hare that had been coursed, filled with colourless coagulable lymph; magnified 20 diameters.

Fig. 2. A section of the same lungs, in which the deeper seated cells are exposed; magnified in the same degree.

Fig. 3. A perpendicular section of the superficial cells; in the same degree magnified.

Fig. 4. The bronchial branches and superficial cells of a hare that had been coursed, filled with mercury where not previously occupied by coagulable lymph; magnified 20 diameters.

Fig. 5. A section of another portion of the same lung, in

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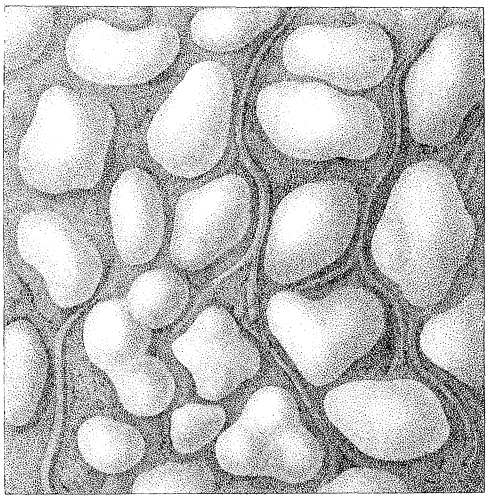

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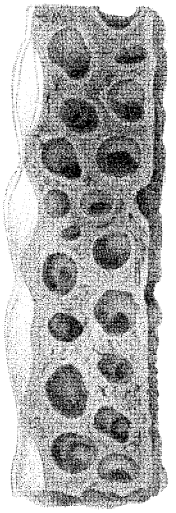

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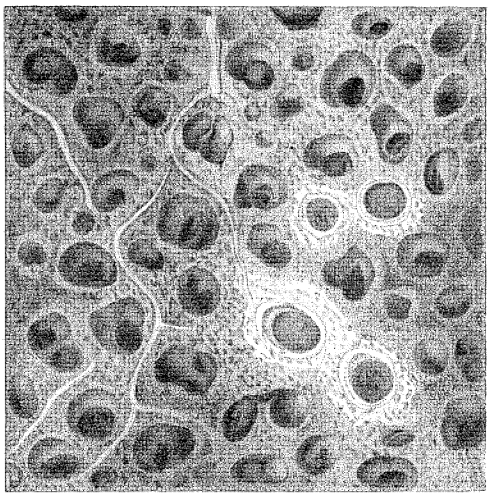

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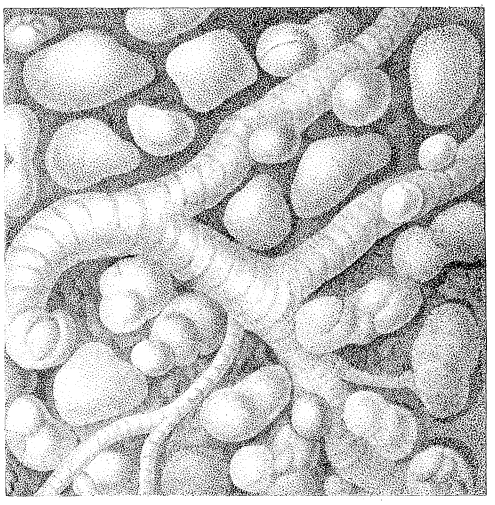

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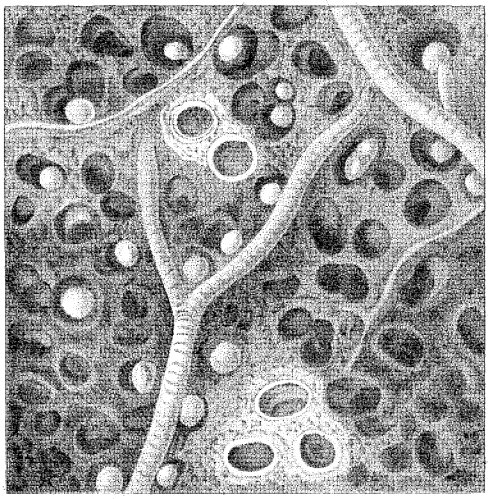

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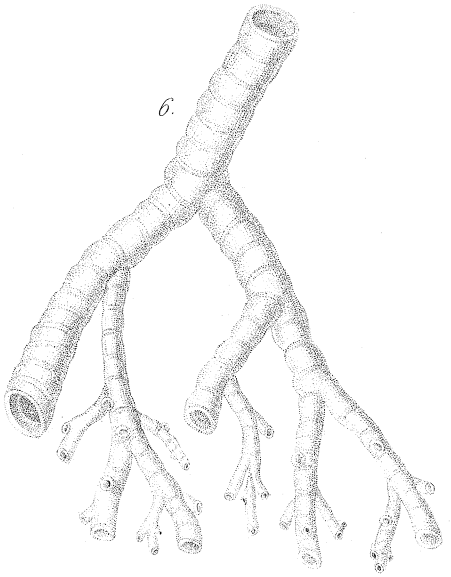

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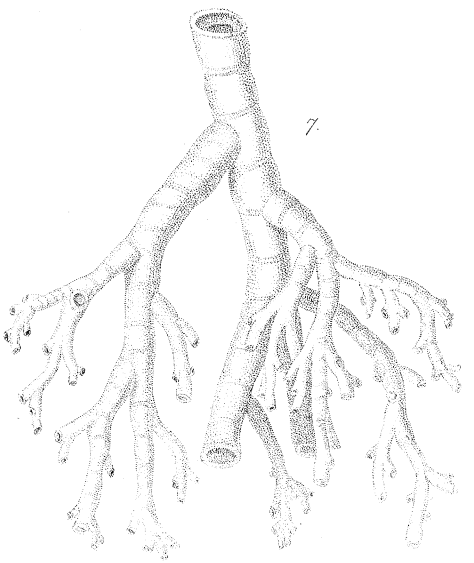

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which the deeper seated cells are filled with mercury; magnified in the same degree.

Fig. 6. The bronchial ramifications traced to their termination at the air cells in the hare; magnified in the same degree.

Fig. 7. A similar portion of the bronchial ramifications in the sheep; equally magnified.