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NOTES

ON

FETID BRONCHITIS,

AND OTHER

LUNG-DISEASES WITH FETID BREATH.

BY

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NOTES

ON

FETID BRONCHITIS, ETC.

I OBSERVE in the March number of the Edinburgh Medical Journal a paper on the chemical composition of the sputa in cases of fetid bronchitis and pulmonary gangrene. The conclusions drawn seem to me to indicate that the writer has not observed a case of fetid bronchitis, nor even mastered the literature of the subject. And in reference to my own humble researches, I may say that I do not hold the views which he seems to attribute to me, probably from misapprehension or ignorance of what I think on the matter. I will therefore beg leave to occupy your pages with some elucidatory notes on fetid bronchitis and other pulmonary diseases with fœtor of the breath.

My first observations were made twenty-eight years ago, and were published in the London Medical Gazette for December 1837.¹ In that paper I compared a well-marked case of fetid bronchitis with another of pulmonary gangrene (both which I had carefully observed), with especially reference to the origin, nature, and significance of the fœtor in certain kinds of bronchitis. As to these points, I am not aware that anything of moment has been added to what I then wrote, except in my Clinical Lecture, published nearly eight years ago,² and in which the results of a chemical examination of the sputa were published for the first time. The lecture attracted attention and remarks both in France and Germany; and I think I am now able to throw some additional light on this group of pulmonary diseases.

There are three kinds of pulmonary affection in which there is fœtor *sui generis* of the breath, and which is mistaken for that of pulmonary gangrene.

¹ Two Cases of Pulmonary Disease, with Remarks, by T. Laycock.

² Medical Times and Gazette, May 1857.

I. Affections in which there is no *cognisable* lung-disease, and no fetid sputa.

II. Affections in which there is a fetid bronchitis, bronchorrhœa, or broncho-pneumonia, with or without dilated bronchi.

III. Affections resembling a consumption, in which there is a fetid cavity, abscess, or vomica, lined with a pyogenic membrane, and situated in a portion of lung which has undergone fibroid degeneration or condensation.

I shall consider these three kinds in succession.

I. *Pulmonary Fetor of the Breath, without Cognisable Lung-Disease.*

I have observed that there may be pulmonary fetor of the breath without *cognisable* lung-disease. In cases of this kind it is necessary to determine that the breath-fetor is really of pulmonary origin; for it is often caused by morbid conditions of the nostrils, mouth, and throat. Of this kind are ozæna, caries of the teeth, gangrene of the mouth, and certain diseases of the tonsils and glands of the pharynx. The pulmonary halitus in a state of health seems to be rather of an agreeable odour than otherwise. It is changed, however, into one more or less disagreeable under various constitutional changes, as habitual constipation, pregnancy, scorbutus, alcoholism, or even from long abstinence from food. In these and other instances we recognise the pulmonary origin of the fetor, partly from the history of the case, partly from the character of the odour, but chiefly from a careful examination of the nostrils, mouth, and throat, including the pharynx.

Now, according to my experience, pulmonary breath-fetor, closely resembling that which characterizes fetid bronchitis, may occur without any manifest pulmonary disease whatever, and be a source of great misery and loss. A middle-aged lady (a governess) consulted me for an odour of the breath, which excluded her from society, and incapacitated her from following her profession, in which she stood high. I recognised the peculiar character of the odour, but was surprised to find no pulmonary signs or symptoms whatever. The tonsils sometimes are diseased in such a way that their crypts contain a cheesy fluid, having a very bad smell, which closely resembles that of fetid bronchitis, but is less fecal in character, and in this way the breath is tainted. In these cases the fetid stuff can be squeezed from the tonsils by pressure upon them. There is also a chronic morbid condition of the pharynx, in which a sort of fetid purulent stuff exudes, and renders the breath offensive. In the case of this lady I could find nothing the matter in these respects. The nostrils, teeth, and gums had been already carefully attended to. I could only conclude, therefore, that the fetid halitus was pulmonary in its origin, yet without any cognisable pulmonary lesion or symptom. The patient was dyspeptic and cachectic-looking, and had very much the complexion of

persons with chronic rheumatism. No drugs she had tried had afforded more than a temporary relief from the fetor; but I was in hopes that a course of the Vichy alkaline waters would be beneficial. Since my attention was directed, by this case, to the fact that the peculiar odour of fetid bronchitis might be evolved from the lungs without structural disease either of the bronchi or parenchyma, I have noted other cases,—of a less decisive character, however, because of the less intensity of the fetor. The conclusion is supported indirectly by what I have observed in cases of undoubted lung-affections with the peculiar odour; and I use the phrase “peculiar odour” advisedly, for it seems necessary to state explicitly that it is *sui generis*, as compared with other pulmonary fetors.

II. *Fetid Bronchitis, Bronchorrhœa, or Broncho-Pneumonia, with or without Dilated Bronchi.*

There are cases of fetid pulmonary affections in which the cause of the fetor and of the fetid sputa is in the bronchial exudations or excretions. As compared with the next class they are of little gravity, although apt to become suddenly serious, and even fatal. In some there is only a bronchorrhœa; in others a chronic bronchitis; and in others an acute or subacute bronchitis, or bronchorrhœa, with a localized affection of the lung-tissue—a broncho-pneumonia of a peculiar kind. Such was my first-recorded case, in which the bronchorrhœa was so copious that forty ounces of sputa were expectorated in a few hours.¹ These cases have attracted much attention, because of the discrepancy between the apparent gravity of the symptoms and the course and termination. Van Swieten observed some such cases, for he declares, in opposition to the opinions of “various illustrious and ancient authors,” that he has seen persons who expectorated the most fetid sputa, and yet lived long, and were able to transact their ordinary business. He mentions especially the case of a youth who, as the sequel to an illness, began to expectorate sputa so stinking that he (Van Swieten) could hardly endure the stench, although by no means delicate in such matters. The expectoration continued for two years, without the general health being affected, when it suddenly increased in quantity, the patient became emaciated, and death quickly followed.² Several of our best modern observers have confirmed this observation of Van Swieten; of these the illustrious discoverer of mediate auscultation was the first, to be followed by Elliotson, Andral, Briquet, Stokes, and others. Laennec observes that the expectoration in chronic mucous catarrh sometimes becomes more or less fetid, and occasionally approaches the gangrenous odour. In discussing “gangrenous eschar,” he mentions that in two

¹ I reprint this case in an Appendix (Case I.), page 19.

² Comment. apud Boerhaave; 2d Ed. Leyden: tom. iv. p. 72.

or three cases in which there was a gangrenous fœtor, he found after death nothing which could account for it, unless it were the rapidity with which the body generally, and the mucous membrane of the lungs more particularly, ran into putrefaction. From the result of several cases of recovery, he was "tempted to believe" that the odour had its origin in the mucous secretion of the bronchi.¹ Dr Elliotson notices the same kind of affection. He says he has seen persons with such a fetid expectoration that their sisters could not bear to sleep with them, and yet no sign of danger whatever presented itself, and the patients did exceedingly well. They were going about without any particular ailment, except that they had a copious expectoration. In colour it was sometimes bluish, sometimes black, yellow, green, brown, and even reddish, from having a little blood in it. Then as to quantity, it may vary from a few ounces to two or three pints in the twenty-four hours.²

The anatomical changes in the bronchial mucous membrane are those of the so-called chronic bronchitis. It is thickened, swollen, and of a dull red colour. This conclusion I draw from recorded dissections. Andral relates the case of a man-cook, who was admitted to the hospital La Charité, coughing much and expectorating a great quantity of *very fetid* greenish sputa, which flowed out in one sheet when the vessel was tilted. One would have thought that the liquid came from a pleuritic sac or a vast tubercular cavity. The patient said he had had a similar expectoration for several years. The chest sounded well everywhere on percussion. He died with œdema of the brain and lungs. The lungs were found to be melanotic and firm at points; the large bronchi (full of a fluid like that expectorated as to its extreme fœtor) were white on their inner surface; but the smaller bronchi (also full of the fetid fluid) had the mucous membrane of a deep red. These were therefore the source of the sputum; there were no cavities.³ The coincidence of the melanotic firm lung with the bronchial change is noteworthy. Cruveilhier records a somewhat similar case. He states that he attended a youth who, for two years previously, had expectorated every morning a "verre" of horribly fetid pus, and who died of serous effusion into the ventricles of the brain. On making a *post-mortem* examination, no pulmonary abscess or cavity was found, but the bronchi of the upper lobe of the *left* lung were observed to be full of pus, and their mucous membrane very red, and much thickened. The lobe itself was softened and infiltrated, and had none of the characters of pulmonary tissue.⁴ In this case there was manifestly an etiological con-

¹ A Treatise on Diseases of the Chest, etc. Translated by John Forbes, M.D. 3d Ed., p. 231.

² Lectures on the Theory and Practice of Medicine. Edited by Drs Cook and Thompson. P. 487.

³ Clinique Médicale, 1824, tom. ii. p. 52.

⁴ Anatomie Pathol. : Maladies du Poumon, tom. i. liv. 3, p. 6.

nexion between the condition of the bronchi and the lung with which they were connected.

Dilatations of the Bronchi are often concomitants of chronic bronchitis, and have been found after death in bad cases of pulmonary fœtor. M. Briquet of the hospital Charité concluded, twenty-five years ago, that in certain cases of pulmonary fœtor, the extremities of the bronchial tubes became dilated and gangrenous, independently of any other portion of lung-tissue, and that the gangrene was the result of either a general bronchitis, or of a bronchitis limited to the affected bronchi. He ably details two cases he treated in the Hospital Cochin.¹ One of these, in a male, was of the class to be next considered, for the dilated bronchi were complicated with a fetid pyogenic cavity in the left fibroid lung; the other was of a wholly different kind. It was that of a pregnant female who had fetid abscess in the right labium, and a gangrenous (pyæmic?) cavity, with pleurisy of the right lung. This had no communication with the bronchi, and there was no fœtor of the breath or sputa. More recently, M. Lasèque has published an able essay, in which he examines this class of affections, indicating more particularly their recurrent and curable nature, and the need of differentiating them from true pulmonary gangrene. He mentions a case under the care of M. Behier, of a woman who, after an attack of a pernicious intermittent, had for nearly a year frequent paroxysm of violent cough and shortness of breath, with very copious expectoration of a fœtor almost intolerable. She perfectly recovered.² He quotes also a similar case recorded in *The Lancet* for May 1854, and cases by Professor Skoda and Dr Helm. M. Lasèque rightly doubts whether these cases are gangrene of the lung at all, but leans to the opinion expressed by Laennec, that the odour is due to a putrescence of the bronchial secretion. Their catarrhal characters, whether as to the nature of the expectoration, the course, and the termination, are undoubted. Professor Diettrich of Erlangen, connecting the affection with dilated bronchi, as M. Briquet had done already, thinks that the fœtor and fetid sputa are due to the putrescence of the fluids which accumulate therein, and that these irritate the bronchi.³ I need not examine these theories; it is enough to say here, that cases occur without dilated bronchi, and dilated bronchi are very common without any putrescence.

The preceding instances may be held to be chiefly or wholly bronchial; there are others, however, in which the physical signs point to a *localized broncho-pneumonia*. The signs of consolidation are commonly limited to a single lobe, and that usually a lobe of the left lung, and are not unfrequently combined with the signs

¹ Mémoire sur un Mode de Gangrène du Poumon, dependant de la Mortification des Extrémités dilatées des Bronches: Archives Générales, May 1841.

² Des Gangrènes curables du Poumon, par le Dr Ch. Lasèque: Archives Générales, July 1857: p. 26.

³ Ueber Lungenbrand, in Folge von Bronchien Erweiterung: Erlangen, 1850.

and symptoms of a localized pleurisy in the same region. I have subjoined the details of a case of this kind I had under treatment in the Royal Infirmary.¹ At the commencement the disease may be exclusively bronchial; there is no dulness on percussion, and moist sounds only are heard. But if the local or "lobar" pneumonia be not manifested at first, it is subsequently, for the disease advances by recurrent attacks of acute pulmonary affection, cough with pain—sometimes acute and even distressing in the region of the affected lobe—and copious fetid expectoration. These continue for from seven to twenty-one days, when the symptoms abate, the fetor disappears, and a state of comparative health is experienced. With each recurrent attack the signs of consolidation are apt to become more marked, and finally there may be those of a cavity, when the disease, if not fatal, becomes chronic. In this stage it belongs to the next class of cases; still, however, manifesting exacerbations. Dr Stokes has elucidated what I term the fetid broncho-pneumonias in an able monograph.² He describes two cases of a more acute character than mine, in one of which (that of a lady) the physical signs never indicated disease over a space of more than about four fingers in breadth and three in depth in the postero-inferior portion of the *left* lung. The course of the disorder was similar to that of other recorded cases. There were recurrent attacks of high fever, and much constitutional disturbance, with violent cough, localized pain, and extreme fetor of the breath and sputa, continuing for about a week, when the symptoms subsided, the fetor disappeared, and the patient apparently recovered. In the male case there was hæmoptysis—in the case of the lady an expectoration of great quantities of mucopurulent fluid often tinged with blood, and the most agonizing pain in the lower portion of the left side, where, however, there was no stethoscopic indication beyond a slight and diffused mucous râle, but clear percussion. The male patient died at Rome of acute pneumonia; the female fell into a permanently febrile state, in which, however, the remittent character of the local disease continued manifest, and died. Within a few weeks of her death signs of a cavern were noted, the mucous râle having gradually changed into obscure gurgling. The diagnosis of "local gangrenous disease" of the lung in these cases rested chiefly on the fetor, as there was no post-mortem examination. And I think Dr Stokes uses the phrase rather nosologically than pathologically, for it is clear that he thinks there is rather a putrescence of the fluids than a gangrene of the tissues. He thinks the expectoration of fetid stuff is no proof of a cavity, because he has known it to occur so shortly after the operation of the exciting cause, that it is difficult to conceive a cavity could be formed so rapidly. Besides, the sur-

¹ See Case III., in Appendix, p. 23. Also Case I., of S. Battley. Andral reports an example in Clin. Médicale, tom. iii. p. 152.

² Clinical Researches on Gangrene of the Lung; by Wm. Stokes, M.D., etc. etc.; Dublin Quarterly Journal of Medicine, February 1850, p. 1.

face which pours forth the putrid fluid must be extensive, because of the quantity; while physical signs show that the portion of the lung which suffers death must, at the first, be insignificant in extent. And he thinks it almost certain that the fetid fluid is originally poured out in a putrid condition. In short, he looks upon the disease as being, in the first instance, a disorder of the bronchial secretion, and considers that the "local gangrenous disease" with which the case ends is consecutive thereto. It is certain, however, that in some of the cases the bronchitis and pneumonia begin together. There is, in fact, a distinct form of "lobar" broncho-pneumonia not noted by systematic writers, which resembles the fetid kind in all particulars except the odour, and which is by no means rare, although confounded with pneumonias in general.

Hæmoptysis may be as predominant a symptom as fœtor. The most curious example of this kind I find amongst the older writers is recorded by the celebrated Willis, amongst his "Examples of those that spit blood." It is the case of the Rev. Dr Berwick, Dean of St Paul's. "That most reverend divine," Willis says, "fifteen years before he died, laboured with a most obstinate cough, and sometimes with a bloody and salt spittle, with a grievous breath, stinking like hell; by which being made lean by a pining away of the body, he wanted but little of being almost extinguished by a consumption. As often as his spitting of blood intermitted, the rankness of breath and spittle ceased also; afterwards, the return hereof declared constantly that other effect to be presently attendant." He was thrown into prison for political causes, where he drank "meer water instead of ordinary drink," recovered his health, and "so remained indifferently healthful for above ten years' space." He afterwards had a return of the "cough, with the bloody and stinking spittle," and died. On post-mortem examination no cause could be found for the "stinking breath and spittle, for there was no collection of any filthy or stinking and putrid matter, nor any cavity in the lungs made by an ulcer or wound." One lobe, or rather the whole left lung, was, however, found of "stony hardness,"—had undergone fibroid degeneration.¹

III. *Pulmonary Fœtor with a Pyogenic Lung-Cavity ("Fetid Abscess," Fibroid Vomica).*

In the clinical lecture already referred to, I called attention to the case of a man (Edgar) admitted into Ward I. of the Edinburgh Royal Infirmary, in May 1856. He was a carter, aged 66, and affirmed that up to six weeks before admission he had had good health. At that date he was affected with rigors, thirst, feverishness, and slight cough, and shortness of breath. He got thinner, and began to spit up a fetid spit with violent coughing. After admis-

¹ Willis' Works, translated by S. Pordage. Part II. Pharmac. Rationalis, sec. 1, chap. 8.

sion he had recurrent attacks of pain in the chest, spitting of blood, and fetid expectoration, from which he recovered so much that sometimes there was little cough or fetid sputa. He gradually declined in health, however, getting more emaciated and cachectic (his complexion becoming remarkably sallow), until he died at last suddenly from atrophy and softening of the cerebellum, due to atheroma and clot of the left cerebellar artery. Dr Haldane made the post-mortem examination. The *right* lung was found to be œdematous; the *left* presented the characteristic changes of this form of fetid disease. It was adherent to the ribs posteriorly, where the adhesions were firmly cartilaginous and nearly an inch thick. The upper lobe was completely and firmly consolidated with an exudation of a simply fibrous character. No trace existed of cancerous or tubercular disease. In the centre of the affected lobe there was a cavity about the size of a walnut, containing a very fetid thick fluid, reddish in colour.¹ The physical signs corresponded very closely to the pulmonary lesion. In two points this case corresponds with my other cases of pulmonary fetor, classed with broncho-pneumonia, namely, in the periodic recurrence of hæmoptysis, fetid spit, pain and febrile disturbance, and in the physical signs, such as localized dulness on percussion, feeble breathing, increased vocal resonance. As to its anatomy and termination, however, it differs greatly. In these respects it belongs to that form of rheumatic consumption which I have already differentiated from the scrofulous and tubercular, and specially described.² This kind of lung-disease, with fetor, seems to be the same as that termed by Laennec "partial gangrene," and "gangrenous eschar," by Dr Stokes "local gangrenous disease," and generally by more recent writers "circumscribed gangrene" of the lungs. Bayle, I think, describes also this form of phthisis under the term "Ulcerous consumption." The cough from the first, he says, is accompanied by expectoration, and there is almost always a very fetid smell. The disease, he adds, may be distinguished from pleuritic abscess by the greater resonance of the chest on percussion. It is a rare form, for out of 900 cases of consumption, Bayle noted only fourteen of this "ulcerous" kind.

It is remarkable that the disease should be so constantly described as "gangrene" of the lung, but it is very obvious that the diagnosis of gangrene, even *post-mortem*, is often as vague as during life, for it is too often established solely from the presence of a fetid sanious fluid contained in a cavity in the lung, as in my case. Now, as the expectoration of such a fluid is not only no proof of a gangrene, but not even of a cavity, so the fetid fluid, which is only a peculiar kind of pus that has undergone a termentation proper to it, is no

¹ This case is detailed at length in the report of my Clinical Lectures, *Medical Times and Gazette*, May 1857; more briefly in Appendix (Case IV.), p. 25.

² See "RHEUMATIC CONSUMPTION," in my Lectures on the Physiognomical Diagnosis of Disease, *Medical Times and Gazette*, 3d May 1862, p. 451.

proof of gangrene. It is only when putrid *tissue* is found in the cavity or in the sputum that we can certainly say that the morbid change is a gangrene.

These fetid pyogenic cavities or vomicæ in a solid fibroid lung may, however, be complicated with cavities constituted by dilated bronchi, or with a truly gangrenous cavern. The case of Dr Haldane, reported by Dr Gamgee, was of this latter kind; a "fetid abscess" was found to be associated with a gangrenous excavation. Andral relates a case of "gangrenous pneumonia," which was evidently a pyogenic cavity or "fetid abscess" in a fibroid lung conjoined with dilated bronchi. The patient, a young man, aged 21, had symptoms of pneumonia eighteen months previously to admission to La Charité; chest-symptoms continued until three weeks previously, when he had a profuse spitting of blood. On admission, febrile disturbance; great emaciation; breathing not perceptibly embarrassed; breath fetid; sputa very profuse, and of a very disagreeable odour. In three weeks a change was observed in the expectoration; it became still more copious and fetid, and contained small grayish clots, exhaling a very fetid odour; the breath also smelt horribly. He died suddenly. The left lung was found to be almost exclusively the seat of disease. There were firm pleural adhesions; the lung itself dry, firm, and resistant, showing, when cut into, an immense number of yellowish granulations and lines of fibrous tissue of a dull white colour, constituted of thickened cellular tissue, and marking out the pulmonary lobules. In the centre of the upper lobe there was an empty cavity, of the size of a large nut, emitting a "gangrenous" odour, and lined with a thin layer of greenish matter, beneath which was the pulmonary tissue, red and hard. Several considerable bronchi opened into it. The bronchial mucous membrane was red; the parietes of several bronchi were evidently hypertrophied, and in some parts dilated into small cavities, which contained a fetid fluid, like the sputa. These were most numerous in the inferior lobe of the lung (left).¹

M. Briquet details a still more illustrative case of this kind in that of Joseph Von Malden, aged 64, professor of music. For three or four years before his admission into the Hospital Cochin, he had had recurrent exacerbations of a bronchitis which was "habitual," characterized by severe violent cough, pain in the lower part of the *left* side, and copious very fetid sputa of a reddish colour. Each attack passed off in a few days. When admitted suffering with the attack which proved fatal, he reported that in the first instance only a portion of the sputa expectorated was fetid, and he had little cough; but the symptoms gradually became more severe, and, in particular, the sputa were so acrid that they burnt his tongue. But as the tongue was gray and moist, the sensation was probably due to a hyperæsthesia of

¹ Andral: Clinique Médicale, tom. ii. p. 299, 64^e Observation.

the organ. He experienced a dull pain in the lower part of the *left* side; and in the *left* postero-inferior region there was dulness on percussion, mucous râles, and bronchophony. He died eight days after admission. The *post-mortem* appearances were similar to those described in Andral's case. The two pleuræ at the lower lobe of the *left* lung were firmly adherent. In the centre of the lobe was a fetid cavity, the size of a fist, containing a fetid pultaceous stuff, more like altered blood than the detritus of tissue. It was lined with a dense false membrane, presenting spots like ecchymoses. The lung around it was indurated, and dilated bronchi opened into it, having their lining membrane thickened, and of a deep red colour. The right lung was strongly adherent at the apex; the bronchi, especially those of the upper lobe, dilated; the middle and lower lobes interspersed with gangrenous cavities, the size of a filbert, and communicating with bronchi.¹

It is generally concluded that these cavities are the result of circumscribed gangrenous sloughing, and that the periodic attacks of febrile disturbance, pain in thorax, cough, and fetid expectoration, are obviously due to the accumulation of gangrenous fluid within them. There is not, however, any solid ground for this opinion. On the contrary, as I showed in 1837,² there is abundant reason to conclude that the fluid comes chiefly from the bronchi. In fact, the quantity is so greatly disproportionate to the size of the cavity, that all who have carefully examined these cases either come to this conclusion or express doubt as to the correctness of the current theory. Dr Stokes discusses this question with his usual clear insight, and in especial shows the difficulty of distinguishing in this respect between "localized gangrene" and "fetid abscess,"³ which is the name given by pathological anatomists to these fetid pyogenic cavities.

In judging of these cases we must take into consideration that they are essentially chronic and really occupy a period of time extending over, at shortest, several months, and sometimes over many years; resembling phthisis in this and other respects, and governed as to their course by similar laws. In the case of Edgar there was a constitutional condition upon which was grafted a localized affection of the left lung. This was probably a lobar broncho-pneumonia in the first instance, like those just described, with pleurisy, the result of which was a cartilaginous degeneration of the pleura and a fibroid degeneration of the lung. We may look upon the fetid cavity, therefore, as consecutive to those fibroid degenerations, just as in ordinary phthisis a vomica is consecutive to tuberculization. And I think that when we find such cavities in a highly fibroid lung, we may reasonably conclude that they are formed like other ulcerous solutions of continuity of tissues in the

¹ Archives Générales, May 1841, p. 9.

² London Medical Gazette, Dec. 1837, p. 459.

³ Opere cit., p. 15.

state of fibroid degeneration, and are to be classed with rodent fibroid ulcers in the skin and cervix uteri or elsewhere. Hence the cavity is the result of rodent fibroid ulceration. In its lining pyogenic membrane there is a tissue analogous to that of the bronchial mucous membrane in cases of chronic bronchitis. Since the structural disease is constitutional, it is fair to conclude that the predisposing causes of the peculiar fetid excretion are constitutional, and are linked etiologically with the fibroid change of tissue. It is a special characteristic of fibroid and cartilaginous ulcerations to be fetid. This is well shown in ozæna, which is a deep ulceration of the fibrous and cartilaginous tissues of the nose, and also in rodent fibroid ulcers in general. The smell of ozæna is, in fact, very similar to that observed in examples of fetid fibroid vomicae; and M. Lasègue correctly remarks the same of the fœtor in fetid bronchitis. Yet it is not otherwise described by observers in general than as "gangrenous." The characters will doubtless differ in different cases, according to the complications,—in one there may be dilated bronchi; in another, a gangrenous cavern; in another, blood may be exuded and decompose in the cavity under the same kind of fermentation as that which modifies the pus and bronchial secretion. The smell might well be termed an ozæna-odour.

The Nature and Origin of the Pulmonary Fœtor in Fetid Bronchitis and Bronchorrhœa.

In the last group of cases I have endeavoured to show that the peculiar fœtor is probably similar in origin to ozæna; but it is not like that odour in all cases; nor will the explanation apply to the fœtor of acute and chronic bronchitis, or of bronchorrhœa, or broncho-pneumonia, for there is no proof of a rodent ulcerous cavity in these. Now, it is to be observed that the odour is *sui generis* in them, as compared with other pulmonary fœtors, and has therefore its own characters. 1. In its typical form, according to my experience, when it comes directly from the lung, it is always more or less fœcal. In the first case that I observed, the breath and sputa rendered a spacious ward odious as a privy, with the stench of fresh *fæces*. As to this fact there can be no mistake. Now this is not the odour of the breath in cases of fetid abscess or ozæna. 2. After the sputa has been exposed to the air for a while, however, it gives off an odour wholly different. In my first case I could only liken it to the delicate scent of a decaying apple.¹ In the case of Oliver S. (reported by my friend Dr Low of King's Lynn, together with my clinical remarks), the breath and sputa were noted as of an odour "rather fœcal than gangrenous;" while that of the sputa became like the scent of the apple or hawthorn blossom.²

¹ See reprint of this case in the Appendix (Case I.).

² See abstract of case in Appendix (Case II.).

And in the case of C. A., the sputum is correctly described as "of a muco-purulent character, with a disagreeable faecal odour, which is most intense when just expectorated, and which, on standing exposed to the air, becomes changed,—sometimes into a wet-mortar smell, but more generally into what simulates apple-blossom very closely."¹ Now, in these characteristics the odour of fetid bronchitis differs essentially from that of fetid abscess and of true pulmonary gangrene. In the case of pulmonary gangrene with which I compared my first example of fetid bronchitis, the breath was so horrible that I was made sick to vomiting when using the stethoscope. It was wholly unlike that of faeces. All writers speak of this dreadful smell in true pulmonary gangrene;² but none ever describe it as faecal except M. Louis. He informed M. Valleix that he had observed exceptions to this horrible putrid smell in certain cases, in which the odour resembled that of faeces, although after death there was nothing more observed in the lung than what is usually found.³ I suspect, however, that these cases were examples of pyogenic cavities, or dilated bronchi, and not gangrene; for it is probable these pyogenic membranes give forth the same purulent stuff as the bronchial mucous membrane in cases of fetid bronchitis. Dr Elliotson remarks incidentally, that in phthisis the expectoration sometimes smells "like faeces." I must express a doubt, however, that these were cases of *tubercular* phthisis, for I have never observed the *faecal* odour in any such cases. Although fetid pus is not uncommon, pulmonary fetor, *sui generis*, is by no means a common symptom. I found it in only two of twelve hundred patients of the York County Hospital, and it can only be expected to occur in the rarer forms of consumption (using the term in its general sense), such as the rheumatic consumption I have described, and the bronchial or "pituitous consumption" of Gilchrist,⁴ in which there is a copious purulent expectoration derived solely from the smaller bronchi, although the lungs themselves are flabby, or emphysematous, or oedematous.

It follows, from these facts, that there are three distinct kinds of pulmonary fetor, namely, that of faeces, that of ozæna, and that of gangrene; and it remains to ascertain how each arises.

The odour of pulmonary gangrene is obviously due to putrescent decomposition of the dead pulmonary tissue; it is the odour of putrefaction. Dr Law has expressed the opinion that the blood

¹ See case in Appendix (Case III.), p. 23.

² Cruveilhier thus describes it, in a case he has delineated:—"Autour de son lit règne une atmosphère horriblement fétide, l'odeur de la macération la plus infecte." And again:—"La colonne d'air qui sortait de sa poitrine était d'une fétidité intolérable,"—even when the patient was only breathing.—Anatomie Pathologique, etc., liv. 3, pl. ii.

³ "Il existait une odeur très forte de matières fécales."—In Valleix, Guide du Médecin praticien, 1853, tom. i. p. 476.

⁴ On the Use of Sea Voyages in Medicine. 2d Ed.

previously effused into the lung putrefies. This may be the case when the lung itself is gangrenous, but blood rarely thus putrefies *per se*—perhaps never—without the action of a septic “ferment.” It is well known that putrid meat will quickly induce putrescence in fresh meat when brought near to it or in contact with it; and it is therefore conceivable that the effused blood in cases of pneumonia and pulmonary apoplexy of a low type may receive a septic “ferment” from without, and thus the putrid fermentation be set up in it. Or it is possible that some of the infusorial organisms which seem to be associated with hospital gangrene and other kinds of infectious putrescence may take effect on the blood or pulmonary tissue. In pulmonary mouldiness (the pneumono-mycosis of Virchow) a parasitic bronchitis seems to result from the irritation of an aspergillus in the bronchi. These have been found also surrounding the margin of a gangrenous cavity in the lung.¹ The pulmonary moulds are not unknown to phthisis, and it seems probable that the sporules may multiply in the bronchi, and be diffused by the breath of the patient, so as to excite a bronchitis in those persons who inhale them who have weak lungs. Hence, perhaps, the widespread belief, that it is not safe to sleep with a phthisical person, and that phthisis is a dangerously infectious complaint, as is the opinion in Italy. The putrescent infusoria, such as the vibrios of hospital gangrene and the bacterides of carbuncular gangrene, have not, I think, been looked for in cases of pulmonary gangrene. The bacterides may, however, be a cause of those kinds in which the gangrenous cavity has no contact with the external air and there is no fœtor, inasmuch as they are abundantly present in the blood in carbuncular gangrene, and which sometimes affects the lungs.

Since Laennec first mooted the opinion, the ozæna-odour in certain forms of bronchorrhœa and bronchitis has been attributed by several observers to a putrescence of the bronchial excretions. Granting this, the inquiry naturally follows, why they become putrescent in the particular class of cases described, amongst the many thousands who suffer from purulent bronchial secretion? Besides, the odour evolved is not at all like that of the fetid pus expectorated in cases of empyema, in which the cavity communicates with a bronchus, so that if the purulent bronchial excretion do undergo change, there must be something in its composition in these cases of a special character. That it does undergo decomposition seems certain; but it does not follow that the change is putrefaction. In ozæna from ulceration of the nasal cartilages, and in rodent fibroid ulcers, there is a most offensive discharge, but the odour is not like the smell of decomposing pus from ordinary ulcers. The pus of fibroid pyogenic cavities and of fetid bronchitis undergoes a similar change. We are therefore led to the conclusion that in all these

¹ Dr Friederich, Virchow's Archiv, vol. x. (1856), p. 570; and Drs Von Dusch and Pagenstecker, *ibid.*, vol. xi. p. 561.

cases there is some special constituent of the morbid products which either undergoes its own peculiar decomposition or acts as a ferment in exciting such in the other constituents. I do not think we need go beyond observed facts for instances as to this point. In so far as anatomical changes have been observed in these fetid pulmonary diseases, they are manifestly those of fibrinous exudation and degeneration,—are, in short, those which are observed in acute and chronic tissue-changes of rheumatic origin. Now, we know that in such changes lactic acid plays an important part, either as a *cause*, if we adopt the conclusions of Dr B. W. Richardson and others, or as a *result* of the morbid tissue-metamorphosis, if the ordinary theory be objected to. And it seems farther probable, according to the physiological chemists, that it is decomposed in the lungs, under ordinary circumstances, into carbonic acid and water. If, then, we suppose that there is an excess of lactic acid in the pulmonary excretions in these cases, or of some other acid of the class, or that the ordinary series of decompositions is interrupted and other products result in virtue of vital changes, an irritant is brought into direct contact with the bronchial mucous membrane. If this be sufficiently powerful, the same consequences will follow as with other powerful irritants (such as the vapours of iodine or chlorine), and thus a bronchitis with a copious muco-purulent discharge be excited. How easily lactic acid or acids or the lactates may be transformed within the capillary bronchi and air-cells, or elsewhere, wherever a suitable ferment is introduced or produced, is shown by the fact that when lactates are left in contact with putrefying matter, at a temperature of 86° to 95°, butyric acid is formed.

That a rheumatic condition is an important element in these cases is shown by collateral evidence, although the morbid product need not necessarily be lactic acid, and certainly is not in all cases of pulmonary fetor. It is incidentally mentioned that in Dr Haldane's case tube-casts of the smaller bronchi were at first mistaken for disintegrating lung-tissue. Now these cases of "plastic bronchitis" run a course almost identical with that of cases of fetid broncho-pneumonia. There is the same frequency of hæmorrhage, violent cough, and other important symptoms, occurring in paroxysms, lasting for a week or two, but sometimes for several weeks, with the same tendency to recur for weeks or years. They also end in a very similar manner, either in a form of phthisis or in a dangerous pulmonary complication,¹ and they are about equally rare. In short, substitute for expectoration of plastic tube-casts a fetid muco-purulent expectoration, and the diseases would be identical,—so that the constitutional conditions are apparently the same. The difference is as to the susceptibility of the morbid pulmonary excretions and exudations to undergo decomposition. These cases of plastic bronchitis shade off also into that special kind of lobar broncho-pneumonia, closely resembling the fetid kind in symptoms and

¹ Dr Peacock's paper in vol. v. of Trans. of Pathol. Society of London.

course, and occurring in rheumatic subjects, to which I have already referred. A case of this kind is now under my care in the Infirmary, in which the seat of lesion is (as is most common) in the left lung, with persistent pain there, and tingling in the palm of the left hand. The patient (a man) has had profuse strongly-smelling sweats, like those of the rheumatic, and rheumatic corpuscles in his urine.

Fetor of the breath closely resembling that under consideration is observed in pregnancy, scorbutus, and cachectic states of a rheumatic character; in all these the blood is highly fibrinous and embolism not uncommon. Since the pulmonary artery has been found plugged in cases of pulmonary gangrene and rodent pulmonary ulcer simulating it, the plugging has been usually considered as the cause of the morbid change. There seems to be, however, just as solid ground for the opposite theory, namely, that the plugging is caused by the pulmonary disease. But, however caused, the excess of fibrin is probably a predisposing or exciting cause of the fetor.

These remarks refer chiefly to cases of pulmonary fetor in which changes of structure have been observed. But in one class of these affections there is no cognisable disease, and yet a very characteristic odour (the fæcal) is exhaled. But these cases, when examined, only serve to show more clearly its rheumatic origin. In offensive perspiration of the feet a peculiar cabbage-like stench is given off. It has been roundly asserted that this is due simply to want of cleanliness, just as the stench of fetid bronchitis has been attributed to gangrene; but the theory is certainly not sound. Cases occur in which the most scrupulous cleanliness fails to prevent the smell. Indeed, I know no more intractable malady, for even when the stockings and shoes are changed two or three times a-day and powerful scents used, the morbid stench is still diffused. It seems probable that the perspiration contains an element which undergoes decomposition at a low temperature or on exposure to the air. I have been informed that a surgeon in extensive practice in the north of England committed suicide a few years ago because of this offensive malady. A patient soon infects the air of a large room. In the cases that have come under my observation I could trace distinctly a rheumatic habit, and sometimes rheumatism was a complication. Allied to this is the offensive odour in some forms of rheumatic fever and in cases of acute recurrent attacks of leprous inflammation of the skin, in which the paroxysm terminates by a copious plastic exudation into the cutaneous cellular tissue. The urine sometimes becomes fetid in like manner. Dr Low, of King's Lynn, had communicated to me the particulars of a case of this kind in a pregnant female, and which ceased with delivery.

Speculations have naturally arisen as to the immediate origin and composition of the volatile matter which causes the stench; and as the blood is easily impregnated with volatile stuff, it is readily concluded that it comes from the blood. Perhaps it may

be so as to some; but I think it equally probable as to others, that they first become what we find them on exposure to the air in the lungs at a blood-heat, or on the surface of the body, as in cases of fetid perspiration. The change in smell which the fetid sputa undergo on exposure to the air shows how easily decomposition takes place. Possibly the faecal odour may be an excretion, but if it were so in my first observed case, it did not originate in any so-called metastasis, for I noted the state of the faeces as to odour and observed no change. Pus from abscesses in the abdominal parietes has been found to be highly faecal in smell, although the most careful examination failed to detect any connexion between the abscess and the intestines. I have no doubt that sulphur is a predominant, albeit not exclusive constituent of these fetid volatile changes. The odour itself is a sufficient proof, independently of distillations of sputa at a temperature of 230° Fahr.; and I may add that ordinary pulmonary vapour itself, if collected and kept a while, quickly becomes fetid, and even the condensed vapours on the windows of rooms crowded with people smells offensively although the highest temperature cannot exceed 90°. Dr Gamgee has, however, demonstrated, what was already plain enough to all acquainted with the facts, that we can get stinks from any pulmonary excretion whatever, if we subject them to the same chemical torments of distillation, acidification, neutralization, redistillation, and the like. This fact is no ground, however, for the conclusions, that there is nothing special in the odour of fetid bronchitis or its causes, and that we must abandon that term as perplexing, unscientific, and unphilosophical, for the more correct phrase "bronchitis with fetid expectoration." I have, however, subjoined reports of the chemical analysis of the sputum in two cases under my care.

The Treatment.

The treatment of these fetid cases is palliative and curative. The stench is of itself a dreadful infliction on the patient and all about him; then there are, commonly, violent cough and severe localized pain. All the terebinthinate drugs combined with henbane, belladonna, or opium, may be administered in the chronic bronchorrhoeal forms with advantage; as chian turpentine, copaiba, the compound tincture of benzoin, in doses of m. xv., medicinal naphtha, creosote. Inhalations of turpentine, iodine, or chlorine may be used with advantage (but care is necessary), and volatilized iodine diffused through the room. As to the curative treatment, it must have a twofold object in regard to the nervous and rheumatic elements. I have for some time been convinced that in certain kinds of bronchitis and pneumonia the vagus system or the system of the pulmonary sympathetic is chiefly at fault in the first instance, in consequence of which there is defective tissue-metamorphosis

and capillary action in the lung-tissue. In short, these diseases originate as neuroses of nutrition. This, I think, is more especially the case in the fetid forms under consideration, so that they belong (as I showed in my clinical lecture) to the same class of affections as diabetes mellitus, nervous fluxes, and other diseases of nutrition and transformation. This view is not weakened by the fact, that the morbid products belong to the rheumatic class, for I have long taught that the place of election of rheumatic disease is very commonly determined by states of the nerves and nerve-centres in connexion with the part affected. The change of morbid action from one part to another, known as *metastasis*, depends upon this action of the nerves and nerve-centres.¹ The left lung is constantly associated with the heart in certain kinds of rheumatic affections, and the remarkable preference of the left lung to the right in these rheumatic kinds of broncho-pneumonia seems to me to be due, in a certain proportion of cases, to the same cause as that which determines the heart-affection, namely, centric nervous action. Hence, in these fetid cases, I administer bitter drugs, as quinine, strychnine, and bitters generally, together with metallic tonics. As to the rheumatic element, the treatment should have reference both to the state of the blood and the tissues. Attention is now being directed more particularly to the nervous element in rheumatic cases; but the solids and fluids must not be forgotten, and the well-tried methods of treating acute and chronic rheumatism should be adapted to each case. I say nothing of the diagnosis and prognosis of fetid pulmonary affections, having already illustrated these very amply.

APPENDIX.

I subjoin a series of cases which have come under my observation and care, as an appendix to my notes on these pulmonary diseases. They illustrate all the more common forms, as met with in practice.

CASE I.—*Convulsive Cough, having first a Quotidian, then a Tertian Type; Sputa very copious, and of a highly faecal odour. Polydipsia. Recovery.*

Sarah Battley, aged 20 years, wife of Hospital-Sergeant Battley, of the 10th Hussars, was attacked, in January 1837, with a pain under the right scapula, extending round the side to the anterior lateral region of the chest; it was aggravated when she coughed or breathed, catching suddenly. She was relieved by bleeding, and suffered from nothing but a slight cough until 17th April. She was then exposed to cold, and experienced some fatigue and anxiety. The pain now recurred and extended to the right mamma. She had daily pyrexial paroxysms, commencing about noon, and not terminating in sweat. Her cough also became more severe, the expectoration more profuse; and on the 23d she observed the sputa to have a very disagreeable smell, which gradually became more perceptible, and at last highly offensive. The thirst she had suffered from since the commencement of the attack now became excessive. She was

¹ See my Principles and Methods of Medical Observation and Research, second edition, p. 283.

admitted into the York County Hospital on 27th April. The following was her state:—She suckled her first child for twelve months, and weaned it six weeks ago; milk can be squeezed from the nipples. Complains of violent cough, attacking her in paroxysms, which continue from fifteen minutes to two hours, causing great pain in her head and accompanied with a profuse expectoration of a muco-purulent fluid, having a distinctly faecal and highly offensive smell. Her bowels have not been moved for two days; she is pale, and has an anxious expression of countenance. Her friends suppose her to be in a *galloping consumption*. There is bronchophony in each upper and anterior region of the chest, most marked on the right; pulse 80, steady and feeble; tongue clean and moist; appetite impaired and fastidious; thirst excessive, the patient drinking two or three gallons of fluid every day; temper irritable and desponding.

Apply a blister to the upper part of the right side of the chest. To take a dose of calomel and colocynth extract immediately; and every four hours two tablespoonfuls of the following mixture:—*R.* Infusi. digitalis, liq. ammon. acet. $\bar{a} \bar{a}$ \bar{z} iv., mist. camphoræ, \bar{z} viii.—*M.*

27th April, *Evening*.—She is obliged to sit up in bed with her body slightly bent forward. Seeing her in this unusual position, and perceiving a strongly faecal smell, I concluded the purgative was operating, and walked away. I was much surprised, on returning for the purpose of inspecting the evacuations, to be informed that her bowels had not been opened, and that the stench I perceived was caused by the breath and sputa.

28th, *Evening*.—Cough still severe, dyspnoea great; and if she attempt to lie down, is so much increased as to threaten suffocation. Ordered *R.* ext. hyoscyami, ext. conii., $\bar{a} \bar{a}$ gr. iiss., pulv. ipecacu., pulv. scillæ, $\bar{a} \bar{a}$ gr. ss.—*M.*; fiat pil. tales xij. To take a pill with each dose of the mixture, and to have dilute nitric acid for common drink to any extent.

29th, *Morning*.—Breath and sputa have still the faecal odour; the sputa is of a whitish-gray colour, and muco-purulent consistence. Cough relieved; pulse 78, full and steady; tongue clean; thirst excessive,—to allay it she has a gallon pitcher at her bedside, full of water acidulated with nitric acid, of which she constantly drinks; bowels constipated. There is an enlarged and painful gland near the right sterno-clavicular articulation. To have two or three leeches applied to the inflamed gland. Let her continue her remedies, take \mathfrak{D} ij. of the compound powder of senna, and have a solution of chloride of lime about her bed to destroy the offensive smell. *Evening*.—Bowels have been moved once, the faeces of the normal colour and odour; tongue moist, and moderately clean; appetite improved; thirst diminished; pulse 96, round, incompressible; cough much less frequent; sputa in small quantity, and very slightly offensive. To have a senna draught.

30th, *Noon*.—Slept last night, but coughed incessantly, in paroxysms like hooping-cough, from six to half-past eight o'clock this morning, during which period she expectorated two pints and a half of a muco-purulent, dirty gray fluid, having a peculiarly offensive odour, like that of some kinds of discharges from the bowels. Breath not offensive; other symptoms unchanged. *Evening*.—Blister irritable, and ordered to be poulticed. Sputa have the odour of decayed apple, and are in small quantity; no fetor of the breath.

1st May, *Evening*.—Sputa of more faecal odour, but cough and expectoration less.

2d, *Morning*.—Pain in the right anterior and upper portion of the chest; in the same region puerile respiration and pectoriloquy. On the opposite side puerile respiration and bronchophony; *no rattle on either side*; sputa and breath of a more faecal odour; pulse 90, full and steady; tongue clean; appetite good; has slept tolerably well. *Evening*.—Has vomited to-day. Complains of being very weak, and sweats; pulse 104, small and soft; tongue moist and clean; faeces of the natural odour. Has coughed very much to-day, and the sputa are so offensive as to make the ward smell like a foul privy; her breath has a similar smell when she coughs; the sputa are copious, gray,

muco-purulent, and swim on water. Cannot lie supine, or on her right side. Appetite moderately good; pulse 90, steady.

5th, *Evening*.—Better in every respect; pulse 114, soft; sputa much less offensive, and (as she says) of a sweet taste; breath offensive; pectoriloquy on the right side; bronchophony on the left.

6th, *Evening*.—Has had a very severe fit of coughing to-day, with a copious and very offensive expectoration; pulse 108, tongue clean. Left the hospital. I learned a few weeks after this date that she soon and rapidly recovered, and joined her husband at Nottingham in good health and spirits. The tertian type which the disease assumed (a peculiarity I noticed only when copying the case for the press) is not less remarkable than the quantity and fetor of the expectorated matter.—*From the London Medical Gazette for 16th December 1837.*¹

CASE II.—*Broncho-pneumonia of Left Lung; Recurrent Hæmoptysis; Fetid Breath and copious Fetid Expectoration; Polydipsia. Recovery.* (Reported by Dr Low of King's Lynn.)

Oliver S., aged 37, single, residing in the Canongate, admitted, under Dr Laycock, into Ward I. of the Royal Infirmary on 17th February 1857.

Patient is 5 ft. 6 in. in height, well formed and tolerably robust. Has the appearance of having been very stout, but the muscular system is now flabby. Diathesis, lymphatic. Hair dark; features broad and massive; forehead prominent; conjunctivæ anæmic; eyes gray; nose short and thick, alæ nasi expanded; malar bones not prominent; upper lip tumid; mucous membrane of lips and gums pale; teeth small and regular, enamel good. Voice hoarse and whispering; breath gives off a peculiarly fetid odour. Sternal end of left clavicle is higher than the right; manubrium sterni depressed. On left side there is a prominence of the third and fourth ribs at their junction with the cartilages. Abdomen rather large and flabby.

History.—Is one of a large family, seven of whom, viz., four brothers and three sisters, are dead. Does not know of what diseases they died. Patient states that in his youth he was very healthy and temperate. Until the age of twenty-five years he followed the occupations of a tailor and a hawker, which he relinquished at this time for that of a beershop-keeper. For five years subsequently he continued well, and though indulging occasionally in liquor was not, he considers, on the whole intemperate. Being unfortunate in this line of business, he was compelled to sell his house and resume his prior occupation of hawking. Owing to the depression resulting from his misfortunes, he became very intemperate, and five years ago had a severe attack of delirium tremens, for the treatment of which he became an inmate of the Infirmary. After remaining there a month, he was discharged, and he returned at once to his habits of dissipation. Twice subsequently, while in a state of intoxication, he received injuries on the chest, which caused the alterations in its form above noticed. In other respects he continued well until a year since, when he had a second attack of delirium tremens, and was again an inmate of the Infirmary for eight days.

The present illness commenced three months ago, after exposure to severe cold and wet. The first symptom noticed was a troublesome cough, which, however, was unattended by pain or expectoration. This continued until two months ago, when, after repeated exposures to cold and wet, it became more urgent, though still without pain, and with only slight expectoration. Between three weeks and a month before admission, the cough increased in violence; there was severe pain in the left side, and the sputa were streaked with blood. He noticed now, for the first time, that his breath was very offensive. Since that time the cough has continued unabated; the pain in his side is much increased, and the sputa have been occasionally tinged with blood.

He has not been under medical treatment. Has had no feverishness or thirst from the commencement of the present attack, until four days ago. States

¹ The notes of the physical signs are not to be considered as entirely accurate; physical diagnosis was only just coming into general use at this date.

that he has lived well during the past seven years. Feels tolerably well except as to the cough.

Examination on admission.

Respiratory System.—Thoracic expansion is somewhat restricted. The sternal end of the left clavicle is dislocated; manubrium sterni depressed, and the prominence of third and fourth ribs appears to have resulted from an old fracture.

On percussion, anteriorly, the right side of the chest is resonant, as also the upper two-thirds of the left side; the lower third is dull both anteriorly and laterally. On auscultation over right side, inspiration is found to be harsh, expiration prolonged. On the left side, inspiration is sibilant, expiration prolonged, and attended by fine moist crepitation superiorly, but over lower third by loud snoring. Posteriorly, percussion is normal. The respiratory sounds are slightly exaggerated on both sides, and at the base of left lung there is fine crepitus, with expiration. The cough is very troublesome; sputa copious (about a pint in twenty-four hours), muco-purulent, viscid and fetid, but much less so than the breath; some of the masses are tinged with blood. No lung-substance is observable under the microscope; but there are abundant pus-globules.

Circulatory System.—Cardiac dulness two and a half inches transversely at nipple; impulse felt between fifth and sixth ribs. There is a slight blowing murmur at the close of systole, heard at the apex. Pulse 68, full and firm.

Tongue furred and moist. Patient complains of great thirst. There is no hepatic or splenic enlargement observable on percussion. Bowels open. Urine, sp. gr. 1.032; deposit a copious sediment of urate of ammonia and purpurates. Chlorides abundant.

Patient was ordered m.x. of medicinal naphtha, and m.xv. of liquor of muriate of morphia thrice daily. On the 20th February, he complained much of pain in the lower portion of left side; the thirst was excessive; sputa more copious. A blister relieved the pain. On the 23d, crepitus had disappeared from left side, the sputa had increased to two pints (40 oz.) in the twenty-four hours, and exhaled an odour resembling that of the hawthorn blossom. Breath still very fetid; smell rather faecal than gangrenous. On the 25th, there was a return of hæmoptysis; the sputa were deeply covered with blood. Patient had no pain, and expressed himself as feeling well in other respects, but the snoring and crepitus were again heard in left base of thorax. Pulse 60, very feeble. Appetite good; thirst less. Was ordered the tincture of the sesquichloride of iron. On 5th March, began to take gr. $\frac{1}{30}$ of strychnia thrice daily, which was increased on the 9th to gr. $\frac{1}{15}$. Next day, slight return of hæmoptysis, and the cough very urgent, but no pain felt. For several days up to the 2d April, the sputa continued slightly tinged with blood, but rapidly diminished in quantity to 1 oz. daily, and then entirely ceased. On the 19th March, the fragrant scent had entirely disappeared, and the breath had almost lost its fetor.

An examination of the fetid sputa was made at the laboratory of the University, under the superintendence of Professor Gregory, and the subjoined report sent.

Examination of Sputa.—A pint of this fluid was diluted with distilled water, acidulated with sulphuric acid, and then subjected to distillation in a sand-bath. A second pint was treated in like manner, and the products of the two operations, amounting to four ounces, were mixed together. This liquid was distinctly acid, and had a somewhat fetid odour. After being neutralized by carbonate of potash, it was evaporated to dryness. The residuum, which was crystalline, after treatment with alcohol and sulphuric acid, gave off a decided odour of acetic ether, and this after standing for a time was replaced by one of pine-apple.

The original acids, therefore, so far as can be judged by the odour alone, appear to have been acetic, with a trace of butyric and a faint trace, probably, of propylic acid.

The residuum left in the retort, after the first of the above operations, was rendered alkaline by carb. potash. Two ounces of an alkaline fluid were distilled off, and after being neutralized by dilute sulphuric acid, evaporated to dryness. The crystalline residuum, was treated with caustic potash, when a peculiar odour, betwixt that of putrid urine and decomposing fish, was evolved.

The residue of the second pint of sputa, after the first distillation, was next made alkaline by caustic potash, and again subjected to distillation, the vapour being received into water which was slightly acidulated with hydrochloric acid. The product, after being evaporated to dryness, was treated with absolute alcohol at a boiling heat. The alcohol was then poured off, filtered and evaporated. The residuum on the addition of caustic potash gave off a strong odour, which Dr Gregory recognised as that of methylamine.

CASE III.—*Recurrent Broncho-Pneumonia of Left Lung, slight recurrent Hæmoptysis, Fetid Breath and Sputum.* (Reported by Mr Wickwire and Mr Thompson.)

Catherine A., aged 27, married, resident in the Canongate, Edinburgh. Admitted October 12, 1863, under Dr Laycock, into Ward XI., Edinburgh Royal Infirmary.

History.—Patient states that she was quite well until three weeks ago, when one day she had a shivering, which was followed the next day by a severe pain in the left side, which came on suddenly while going up stairs. This pain increased in intensity, and mustard poultices were applied, which did not afford any relief. Four leeches were afterwards applied, which eased the pain greatly; but it has never entirely disappeared. Patient states that she has had a little cough ever since she became ill, which, however, was not bad enough to cause her much trouble; but two or three days ago, she was seized with a violent fit of coughing, and expectorated more than a pint of matter, which, for the first time, she observed had a peculiar disagreeable odour. She has had these coughing fits ever since, several times during the day, at intervals of four or five hours.

State on Admission.—*Respiratory System:* On *percussion*, there is good resonance all over the chest *anteriorly*; *posteriorly* there is dulness over lower one-fourth of both lungs. On *auscultation*, there is feeble breathing at base of left lung *anteriorly*; *posteriorly*, in *left supra-scapular region*, breathing is harsh: in *scapular region*, inspiration is coarse; expiration prolonged; over lower fourth of *left side* there is very feeble, indistinct breathing, and distant crepitation; vocal resonance increased: in *right supra-scapular region*, breathing coarse; vocal resonance increased: in *scapular region* the same. At the base there is feeble breathing, with occasional crepitation.

The patient expectorates profusely, but not frequently. The sputum is of a muco-purulent character, with a disagreeable fæcal odour, which is most intense when the sputum is first expectorated, and which, on its standing exposed to the air, becomes changed, sometimes into a wet-mortar smell, but more generally into what simulates apple-blossom very closely. Tongue covered with a white fur; appetite poor. Systole loud, and prolonged at apex; no murmur. Catamenia regular; no albumen in urine. Dull gnawing pain in left postero-inferior region of chest; sleeps badly; otherwise normal.

13th Oct.—Was to-day ordered—*R.* Sodii chloridi, \mathfrak{z} ss.; tr. ferri mur. \mathfrak{z} i.; mist. camph. \mathfrak{z} xij.—*M.* Cochlearia dua ampla tertiis horis.

17th.—Pharynx much congested. Has spat up several mouthfuls of blood during the night, probably from the throat. Pulse 112. There was to-day found well marked signs of consolidation of apex of right lung and base of left. Was ordered—*R.* Naphthæ med. \mathfrak{z} iij.; syrupi papaveris, \mathfrak{z} vj.; misturæ camph. \mathfrak{z} xj.—*M.* Two tablespoonfuls three or four times a-day.

18th.—Pulse 120. Moderate volume, and soft. Slept better last night than for five weeks previously. Has not had a fit of coughing since mid-day yesterday.

19th.—On *auscultation*, *anteriorly* on *right* side, there is at *apex*, loud, harsh, vesicular breathing. In *mammary region*, there is loud vesicular breathing, with sibilus at the end of inspiration; vocal resonance increased. In *supra-mammary region*, the same. In *axillary region*, the sounds are less marked; in *lateral* they are less marked still. In *left subclavian region*, bronchial breathing and bronchophony. In *mammary region*, harsh inspiratory murmur; resonance natural. There is great pain, on percussion, in left supra-mammary and lateral regions. *Posteriorly*, on *percussion*, there is good resonance all down the right side; dulness all down the left side, particularly in lateral region. On *auscultation*, there is coarse inspiration; no moist sounds; and vocal resonance increased in *right supra-scapular region*. In *left supra-scapular region*, there is vesicular breathing, with occasional sibilations at the end of inspiration; vocal resonance increased.

20th.—Patient has not had a fit of coughing since last night at 5 o'clock. Has spat up very little in the meantime. The sputum which is expectorated ordinarily possesses little or none of disagreeable odour.

23d.—Patient thinks that she is rapidly improving. Has not had a fit of violent coughing since the evening of the 19th.

24th.—Has not had an attack of coughing since last report. On *auscultation*, *anteriorly*, there is good vesicular breathing; no moist sounds; vocal resonance not increased. *Posteriorly*, on *right side*, the breathing is good, loud and vesicular. In *left supra-scapular region*, there is a slight blowing; no moist sounds. At the angle of scapula on same side, there is medium crepitation, with inspiration; vocal resonance increased. There is fine crepitation in *postero-lateral region*, diminishing as we pass down the back.

26th.—Had slight paroxysm of cough yesterday, and brought up some bad-smelling sputum—the first since the 19th. Previous mixture to be discontinued, and the following instead:—*R.* Quiniae sulphatis, 3ss.; acidi sulph. dil. 3jss.; liq. morph. mur. 3ij.; infusi rosae acid; mistur. camph. aa f. 3vi.—*M.*; ft. mist. Two tablespoonfuls every three or four hours.

28th.—Had slight hæmoptysis this morning.

11th Nov.—Since last report patient has made great progress. The expectoration is very slight now, and has not the offensive odour it had when she came in; neither is there any blood in it. Patient is up greater part of the day, and does not feel fatigued with the exertion. With the exception of complaining of a slight pain in left base, posteriorly, nothing happened till the 22d, when a feverish attack began; and on the 26th she expectorated dirty, brownish-gray sputum, which has a strong odour, and which, when inhaled, *diluted*, somewhat resembled apple-blossom. The pain at left base still continued.

3d Dec.—On *percussion*, some dulness *in front*, on *left* side, from fourth rib to base of chest. *Behind*, dulness more marked, from spine of scapula down. On *auscultation*, *behind*, there is fine crepitation, with vesicular respiration, over region of dulness. In *front*, the same, but less distinctly heard; respiration, generally, not loud on left side; right side normal.

On 6th Dec. patient was exposed to cold, and had a rigor.

On the morning of the 7th, the cough became troublesome, the sputum was copious and like coffee in appearance, but had no smell. About 11 P.M. the coffee-like appearance ceased, and it became muco-purulent and nummular.

On the evening of the 9th, patient got up, and sat by the fire for about three hours. On going to bed the pain in left side returned; and along with it the sputum began to have a more purulent appearance, and the appleblossom-smell returned. A mustard poultice was applied, which relieved the pain.

When she awoke on the morning of the 10th, she felt very sick. Shortly after waking she got a cup of coffee, which was rejected in about ten minutes. The sickness continued, and about 11 o'clock she tried to take some breakfast, which was immediately rejected. After the first vomiting, the sputum ceased to have the characteristic smell, and what has been spat up since is odourless. Patient feels a "girding pain," or feeling of tightness all round the lower part

of the thorax, which is increased when a long breath is taken. It is also increased on pressure. Previous mixture to be discontinued, and the following instead:—R. Potass. iodid. ʒ ss.; liq. morph. mur. ʒ jss.; inf. quassia, ʒ viij.—M.; ft. mist. Two tablespoonfuls three times daily. Also, ʒ iv. port wine daily.

On 11th, the smell of sputum was scarcely perceptible.

On 13th, while sitting by the fire, the patient shivered. She then went to bed, and coughed a great deal. The sputum was very copious, and very offensive. It was of a dirty-gray colour, tenacious, and in flocculent masses.

On 20th and 21st, had slight hæmoptysis. Was ordered to return to the quinia mixture; to take gutt. xx. ter die vin. ipecac., and to discontinue the iodide of potassium mixture.

Patient continued much in the same state, the expectoration being diminished in quantity, until the 4th January 1864, when, on account of her husband having been killed, she left the hospital.

Dr Gamgee kindly undertook a chemical examination of some of the sputa, and reported to me as subjoined:—

“A few days since I received from Dr Duckworth a stoppered bottle, containing the sputum of a patient in Ward XI. It had a very fetid odour, resembling very closely the smell of rotten cabbage. Although the single analysis which I have made does not enable me to give a very full account of the chemical composition of the fluid, I think the results which I have obtained may not prove uninteresting. The sputum had an alkaline reaction. It was placed in a retort joined to a Liebig's condenser, and the temperature was raised, by means of a chloride-of-calcium bath, to 230° Fahr. By this means a distillate was obtained, which possessed in a concentrated form the smell of the sputum. It had a very decidedly alkaline reaction. After the distillation had been carried on for some time, the substance in the retort had lost all its disagreeable smell. A little water was then added, and then some sulphuric acid, until a strong acid reaction was produced. The retort was then heated to 270°—280° Fahr., when a fluid having a full acid reaction, and a decided odour of butyric acid, distilled over. I compared the fluid with some pure butyric acid which I prepared. The resemblance of smell was very decided. In the distillation from the sputum there was, however, a slight odour superadded to that of butyric acid. In order to obtain the pure acid, I neutralized a portion of the acid distillate with carbonate of soda, and concentrated it. I then added an excess of sulphuric acid, and redistilled, when a fluid having exactly the odour of weak butyric acid was obtained.

“The only acids which could have been obtained from the sputum by the process which I adopted are, as far as I am aware, butyric acid, acetic acid, formic acid, proponic acid. With regard to acetic acid and formic acid, I can state positively that they were not present. The distillate must therefore have contained butyric or proponic acid, or both. The positive evidence is almost conclusive as to the presence of the former.

“What is the composition of the highly fetid volatile substance which had an alkaline reaction? I distilled some of it with sulphuric acid, but found that it passed over unchanged, and still with an alkaline reaction. It is therefore not a butyrate. The only other fact with which I am acquainted with regard to it is, that it is, as one would expect, a sulphur compound.—Dec. 24, 1863.”

CASE IV.—Fetid Bronchitis or Broncho-pneumonia; Recurrent Hæmoptysis; Polydipsia; Death; Fibroid Degeneration of Left Lung, with Fetid Pyogenic Cavity; Arterial Atheroma; Atrophy and Softening of the Left Lobe of the Cerebellum from Emboli.

John Edgar, 66, single, a carter, admitted under my care into the Royal Infirmary, May 28, 1856. The patient enjoyed good health up to the time of present attack, which commenced six weeks ago, with rigors and slight dyspnoea, followed by thirst, feverishness, and cough. Subsequently he lost flesh; the

cough became more violent, and was attended by copious expectoration of fetid matter.

On admission, a bulging was found over the cardiac region. Percussion sounds rather flatter over left apex than right, anteriorly; otherwise normal; at the same point respiration is exaggerated; expiration prolonged. Posteriorly mucous râles are heard at left base and over middle third, on forced inspiration. Expectoration abundant, partly purulent, with very offensive odour. Over the base of the heart a murmur is audible with the diastole; it is heard also at xyphoid cartilage and second right costal cartilage, but faintly at the apex. The arteries at the wrist are very tortuous; the pulsation of the arteries in both arms and forearms, as well as of both carotids, can be distinctly perceived. Pulse 88.

4th June.—Patient has not improved much. Complains of thirst, and a little pain in left infra-mammary region. Expectoration more abundant and purulent. Skin hot and dry. *11th.*—"A little improvement;" appetite good; skin cool, that covering the face of a yellow tint; abundant moist râles over whole of left side, posteriorly; vocal resonance increased; percussion equal on both sides. *24th.*—The odour of breath and sputa less offensive; the sputa less abundant, still muco-purulent; appetite much improved. *29th.*—Coughed up a teaspoonful of florid blood; small quantities continued to be expectorated during the day; sputa frothy. *30th.*—The fetor of sputa is gone to-day, and no odour is perceptible in the breath. Dulness on percussion over left apex, anteriorly, extends down to second rib; cardiac dulness cannot be ascertained, that portion of the chest being as resonant as elsewhere; a murmur with the first sound is audible at the apex; also at base over sternum and under both clavicles. On percussion over left lung, posteriorly, the upper two-thirds are found to be duller than on the right side; lower third is resonant; the colour of the face is less sallow, and patient expresses himself as somewhat stronger.

15th July.—The dulness on the left side extends below the nipple, anteriorly and laterally. Respiration over the dull region is tubular; towards the lower part it is faint, and inspiration is attended by a sub-crepitant râle. At the base, friction sounds are audible. Vocal resonance muffled. The sputa abundant; the upper part is frothy and white; in one or two places fawn-coloured; somewhat fetid; the lower part is muco-purulent and tenacious. Second cardiac sound is rough and prolonged; over the sternum both sounds have a metallic character. Pulse 92, full and regular. Patient does not think himself in any way worse, except as regards the cough; skin has a more decidedly icteric tint since last report; conjunctivæ slightly yellow.

21st.—No change in physical signs, except that a cracked-pot sound is elicited, on percussion, over second and third ribs on the left side. Sputa retain their fetor, which is of a faecal character. Patient is gradually getting weaker, though he says there is no change. The yellow tinge of the skin has been diminishing for a few days past, and the lips have acquired an anæmic paleness. He complained in the evening of pain in the left chest, which a blister relieved.

On the *27th July*, a month from last date, blood again appeared with the sputa, and on *7th August* it came up in mouthfuls, of a bright red colour; heart's action was increased, and a diastolic murmur was heard at the base.

8th August.—Got up to stool this morning about 7 o'clock, and was found unable to get back again; was lifted into bed; pulse by no means very weak, 84 per minute. He said he had no pain, and could not tell what was wrong. Had some ammonia and brandy administered to him, but did not improve. In the evening, seemed to be quite sensible, but could not speak distinctly. Pulse full, 96 per minute.

9th.—The pulse somewhat weaker, 104 per minute. At nine in the morning, was apparently sensible, but could not articulate. His tongue lay to the right side in his mouth, but could be moved about easily when he tried. Pulse getting weaker and rather quicker. About five P.M., had a convulsive fit, in which his right side was alone affected, the arm and leg vio-

lently, and the mouth being drawn to the right side, without foaming. He had six similar fits before half-past eight P.M., in all of which the rightside was most affected; but in the last the left was considerably affected also. About nine P.M., he had one, in which the left arm and leg were violently convulsed, and the right hand, but not above the elbow. The mouth was at first drawn to the left, but, during the fit, changed to the right, and continued so until the fit ended. The pulse was almost gone, and he seemed nearly asphyxiated; but whenever the convulsions ceased the pulse began to gain in power, and very soon was nearly at its former strength, and 104 per minute. He had four other fits before midnight, at which time (being unable to swallow) he had brandy and an enema of beef-tea administered. From that time till nine next morning, 10th August, he had sixteen other fits. This morning he lies on his back, breathing with some difficulty. Pulse 120, weaker. At ten A.M., he had a final fit, a very violent one, in which the whole body was convulsed. After this he lay on his back, breathing with difficulty and stertorously, until about 5.30 P.M., when he died quietly.

Sectio Cadaveris, by Dr Haldane, forty-five hours after death.—The body was not emaciated to any great extent. The skin of the face was of a dusky yellowish colour, which did not, however, extend to the integument of any other part of the body. On removing the skull-cap the brain was seen to present a very uniform smooth appearance, owing to an effusion, partly serous, partly gelatinous, on the surface of the hemispheres. The brain itself was somewhat oedematous, and very soft; the lateral ventricles were rather enlarged, and contained about an ounce of fluid. The arteries at the base of the brain were very atheromatous, especially the right middle cerebral and the left inferior cerebellar, which last was completely occluded about an inch from its origin. The left lobe of the cerebellum was both softened and atrophied, and, under the microscope, was seen to be crowded with exudation-corpuscles. The *pericardium* contained a good deal of serous fluid. The *heart* itself was quite healthy, with the exception of a slight incompetency of the aortic valves, caused by a swelling, about the size of a pea, between two of them. The aorta was dilated and rough immediately above the valves, and was, to a slight degree, atheromatous. The *left lung* was adherent to the ribs, especially posteriorly, where the adhesions were quite cartilaginous, and nearly an inch thick. The upper lobe was completely consolidated, with an exudation of a simply fibrous character. No trace existed of either cancerous or tubercular deposit. In the centre of the lung there was a fetid, disintegrating cavity, about the size of a walnut. The *right lung* was very oedematous, especially in the upper lobe, with some pneumonic consolidation and a few emphysematous patches along the anterior border. The *liver* was normal; the *gall-bladder* elongated, with an hour-glass contraction in the middle. *Kidneys* contained a few cysts. *Supra-renal capsules* rather larger than natural, but normal in structure. *Spleen* normal. *Testes* the same. All the arteries in the body, as far as they were examined, presented here and there patches of atheromatous deposits.

CASE V.—*Pneumonia; Pultaceous, Gray, and excessively Fetid Expectoration. Death in twenty-eight days. Gangrene of the Left Lung.*

John Elder, aged 45 years, was admitted into the York County Hospital on the 27th September 1837, with symptoms of pneumonia. He had severe pain in the left side of the chest (as I was informed), violent cough, and gelatinous adhesive expectoration. On the 2d of October, the expectoration suddenly increased in quantity, and became decidedly puriform. On the 5th, there were pectoriloquy and a distinct blowing, as of air into a cavity. The breath and sputa exhaled a highly disagreeable fetor, so that I was nauseated while using the stethoscope; the strength was prostrated, and the patient constantly demanded nourishing diet, which he loathed when offered him.

On the 16th October, all the symptoms, which had gradually increased in severity, became much aggravated; the sputa were very copious, of a yellowish

gray colour, and excessively offensive. Amphoric resonance could be heard over the whole chest, but very loudly over the second and third ribs. The moment the stethoscope touched the ear, and before it was adjusted, the sound could be felt. His strength now rapidly failed. On the 22d, he lay supine, a gray, pultaceous, and horribly stinking fluid flowing from his mouth. On the 24th, he died.

Examination of the Body.—While cutting through the cartilages and intercostal muscles of the ribs mentioned, eighteen or nineteen hours after death, the knife slipped into a cavity in the left lung, and let out a quantity of abominably stinking gas. Raising the sternum, this cavity was found to occupy nearly the whole of the lung. Anteriorly, it was bounded by the ribs and softened intercostal muscles; a portion of the third rib near its cartilage was denuded of its periosteum. The cavity was half-filled by a gray, pulpy, stinking fluid, resembling that expectorated; the lung was of a similar colour, was for the most part softened to the consistence of pap, and when sliced where most solid, the cut surface appeared gray, glairy, and homogeneous. The right lung was dotted with black spots, but in other respects, excepting a few small tubercles, was healthy.

Laennec and Andral give seven cases of gangrene of the lung; in five the left lung was affected, as it was in this case.—*From the London Medical Gazette, 16th December 1837.*

CASE VI.—*Gangrenous Bronchitis (?) and Gangrene of Trachea simulating Pulmonary Gangrene. Tuberculosis. Death.*

—Y., aged about 40, was admitted under my care into Ward I. of the Edinburgh Royal Infirmary, on 14th December 1860. He was extremely prostrated, and coughed much, bringing up a copious muco-purulent grayish sputum. On left side (chiefly), resistant dulness on percussion, tubular whiffling, and cavernous flapping; these signs, together with the character of the sputum, led to the diagnosis that there was a gangrenous cavern in the left lung. His extreme weakness rendered further physical examination unadvisable, and he shortly died.

Examination of the body, by Dr Haldane.—The heart and pericardium were healthy. The lungs were voluminous, more especially the left, which was also very dense. They had a knotty feel, which, on inspection, was found to depend upon small masses of tubercle scattered through their substance. Some had softened and constituted small vomicae, but there was no cavity of any considerable size. The lung tissue was otherwise natural. On examining the bronchi, their lining membrane was found to be of a dirty brownish colour, and to be coated with mucus having a very offensive, almost gangrenous, odour. On examining the neck an abscess filled with most offensive purulent matter was found deep down on the right side. It communicated with an irregular opening in the trachea, about an inch in length. The edges of this opening were in a gangrenous condition, and portions of five or six rings were quite gone, while the ends remaining were left bare. The lining membrane of the trachea both above and below the opening was of a dark brownish-red colour, and was coated with a muco-purulent fluid which had a characteristically gangrenous odour. The larynx was quite healthy. A few scattered masses of tubercle were found in the mucous membrane of the small intestine.

This case is interesting as an example of gangrene of the air-passages. It is also instructive as to another source of fallacy in the diagnosis of pulmonary gangrene, for the flapping tracheal sounds were evidently propagated along the bronchi to the voluminous dense lung, compressed closely against the thoracic wall, and so the signs of a gangrenous cavern were induced; while the bronchial exudation was of a putrescent odour, and the discharges from the necrosed trachea gangrenous.

4 RUTLAND STREET, EDINBURGH, 6th April 1865.



