novated epithelial cells, arrested in its development at the earliest dawn of life, before it has assumed the form of a cell, when it is as unlike its destined final form as an egg is to a chicken. They seem to show that in this state it may be thrown directly off by the epithelium being broken, or it may pass into the substance of the epithelium. In either case it does not part with the low degree of life it has acquired; but neither does it acquire a higher degree; it goes on propagating, but nothing more.

FIG. 3.

FIG. 4.

(After Rindfleisch.)

Both Buhl's and Rindfleisch's observations seem also to prove that pus-globules are not produced, or at least not produced only, by the degeneration of existing cells; they are not tissue retrograding into a lower form of life like fatty, amyloid, and similar morbid matter. Buhl's drawings especially exhibit the nucleus of the epithelial cell intact along with the newly-formed pus-globule. They differ, however, in one particular, that whereas according to Buhl the first pus globule produced free in the cell increases itself by division, Rindfleisch assumes a splitting up of the whole contents of the cell according to the analogy of the egg-yolk. As Buhl's observations are made upon epithelium alone and Rindfleisch's upon areolar tissue also, and in one case the epithelium remained perfect and in the other was broken up, I can see no inconsistency in allowing both to be correct, and to represent the different behaviour of growing matter under different circumstances.

A very ingenious place has been selected by Junge* for the investigation of the growth of pus—viz., the tunic of the aqueous humour in the eye. He caused inflammation by the application of a hot wire to the cornea of an animal; and was thus able to see what went on in the deeper parts of the eye without exposing the affected tissue to the air or any other extraneous agency. He was thus able to see the active proliferation of globules by division and subdivision so far as the formation of large masses.

As the secretion on the surface of mucous membranes becomes more opaque or "purulent," so the globules are more and more regular in size, rounder, and more like one another. In transparent mucus most of them are oval, with nuclei indistinct and various in number, while there are often lumps on their sides distorting the form. In creamy pus they are nearly all of a size, and present two or three well-marked nuclei. This is easily accounted for, if we admit that they are multiplied on the surface of the membrane. When first formed, they appear under violent and varying circumstances, different in degree every moment, and therefore are different in form; but when once separated they may go on multiplying under favour of nutriment and heat for several generations. Thus, like wild races of animals, they lose individual differences, and become more and more similar and uniform in characteristics.

The formation of pus in deep-seated parts is, of course, not so easy to trace as on surfaces, and experimenters seem deterred by the difficulty of the subject. In all tissues where pus is found, its optical characteristics are the same as the fully formed pus of mucous membranes: it presents globules all nearly of the same size, and with a pretty even amount of nuclei. This is its complete condition; but what it is like im-

mediately on its separation we do not know. We cannot trace it through a stage analogous to mucus.

Of its previous condition, however, we may form a shrewd conjecture. The same elementary substance which appears on, or rather in, integumentary tissues as the common material of the various kinds of epithelium, appears also as granular nuclei in other tissues—in the ganglia of nerves, in the brain, in the parenchyma of the liver, in the spleen, thyroid and thymus, &c. The same bodies occur also in the blood, where they have been termed "chyle-corpuscles" and "white cells." They are found in largest quantities in the most recently formed, most quickly growing, and most actively renewed component parts of the animal frame. In short, the most rational interpretation of this form of organic matter is that which represents it as the common material of all tissues in its earliest state of elementary life. And as that which was to have formed epithelium is cast off as the basis of the mucus and pus globule, so that which was to have formed hepatic parenchyma, nerve, or areolar tissue becomes pus, perhaps through some unsuspected transitional stage.

In this account of organic forms in pus and mucus I have endeavoured to harmonize the contributions of several observers. I have done this mainly by omitting points of observation and deductions in which they differ from one another, and putting together those on which they agree. Their harmony also has been much assisted by translating into a common language the various terms in which they express the laws of life which their observations appear to exhibit. It is curious how often plain English reconciles difficulties; and I cannot but think the proverb which assigns "*longa verba longis auribus*" quite as applicable to physiology as to social life.

CAVITY IN THE LUNG, WITH EMPYEMA;

OPERATION OF PARACENTESIS THORACIS; RECOVERY.

UNDER THE CARE OF

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AN Australian gentleman, aged twenty-nine, two of whose uncles and one brother had died of phthisis, having suffered twice from spitting of blood, feeling ill, and having lost flesh for several months, left Sidney in February, 1862; had a return of hæmoptysis at Aden, but went up the Great Pyramid, and returned to Cairo in a high fever; was cupped and leeches in the right hypochondrium for supposed hepatic inflammation, and told that the right lung was pushed up by an enlarged liver; was kept on barley-water for a week, and then put on board ship. Hæmoptysis returned, but ceased under tincture of iron and cod-liver oil. On arrival in London, April 23rd, he was much exhausted; did not think he could have lived three days longer on board ship; was very thin and flushed, perspiring profusely at night; pulse above 100; respiratory movement confined to the left side. Right side behind absolutely dull on percussion below the spine of the scapula; above this slightly resonant; feeble respiratory murmur audible along the spine almost to the base; respiration tubular in the supra-scapular fossa. In front the dulness extended to two inches above the nipple; two inches higher than this it was rather dull, but above this very resonant, with tubular breathing and bronchophony; voice-sounds almost absent in the dull part. Left side posteriorly very resonant; respiration loud and harshly puerile; at the base, and round to the axilla, crepitation at the end of inspiration; expiration at the apex of the left lung of a blowing character, loud and prolonged; vocal resonance increased. Circumference of chest on a level with the nipple, left side, 18½ in.; right, 19½ in.

Under iodide of potassium the circumference of the side diminished half an inch, and the extent of dulness decreased. The pulse fell in one day under ozonized cod-liver oil from 100 to 91. No further diminution occurred in the extent of dulness or degree of mobility of the right side, but a swelling and doughiness of the skin from the lower margin of the ribs to the axilla appeared;* and on May 8th fluctuation became apparent in the eighth intercostal space.

* Ueber Eiterbildung, &c.: Archiv für Path. Anatomie und Physiologie, bd. xxii., heft 1, 2, p. 193.

* There was some hardness and tenderness on the eighth rib, like a node. The patient had been treated for syphilis when in Sydney.

Mr. Henry Smith, being called in consultation, carefully introduced a grooved needle, in a direction obliquely upwards and inwards, about five inches below the nipple, at the point where tenderness and fluctuation were first observed. A drop of pus appearing in the groove, a small trocar and canula was introduced, and about half a pint of thick inoffensive pus, mixed with blood from the wound, escaped. After the operation the patient appeared relieved, and passed a good night. A few drachms of matter escaped from the wound.

During the following week the fluid again collected, the breathing became hurried and difficult, and a second operation was determined upon; but the patient was seized with retching, and coughed up a pint or two of glairy fluid from the stomach. The exhaustion from the coughing was so great that the operation was postponed. The following night a large quantity of serous fluid—at least a quart, probably more—escaped from the puncture in the side: the respiration then became easy, the dulness diminished, and the breath-sounds were audible in front even to the line of puncture, and behind quite to the base of the lung. The breathing was very bronchial in character near the spine. Humid crepitation was audible at the base and beneath the clavicle on the left side. The expectoration was considerable (about one pint per diem) in quantity and very offensive, nummular, and containing large masses of pulmonary elastic tissue. To take quinine and nitric acid; five glasses of sherry (Amontillado), and a plentiful supply of animal food.

Early in July large gurgling crepitation and amphoric breathing were observed below the right scapula in the place of the bronchial breathing previously noticed. A blister applied over this part, and kept open for several weeks with savine ointment and Albespeyre's plaster, gave relief to the cough, and the expectoration diminished to five or six ounces in the twenty-four hours. On several occasions, after two or three days of comparative freedom from cough and expectoration, a mass of glutinous matter, like croupal membrane, was coughed up, followed by a profuse discharge (half a pint or more) of purulent matter, coming evidently from the right side, as indicated by the diminished dulness and increase in gurgling sounds, amphoric voice, and respiration on the side of the spine between the base of the lung and angle of the scapula; breathing all over the left side puerile, except at the apex behind, where it was jerking, almost crepitant. To check the expectoration the potassio-tartrate of iron, and afterwards iron-alum, were prescribed; then cocoa-nut oil was given, but being followed by nausea and sickness it was discontinued after a few days. The acetate of lead was then given in doses of two, and afterwards three grains, twice a day. The expectoration diminished in quantity under this treatment; but constipation with colicky pains occurring, it was discontinued. The urine then became scanty and high-coloured, and the legs cedematous. Under dry cupping, jalap powder, and diuretics, the renal secretion increased; but the legs remained swollen for several days. Quinine and cod-liver oil (half an ounce three times a day) were continued.

Towards the end of October, after a drive,—the patient had taken carriage exercise for several weeks,—catarrhal symptoms set in, followed by oppression in the breathing and wheezing all over the chest. The expectoration, at first frothy, became, after a week, more purulent and pellety, containing lung-tissue, previously absent for weeks; gurgling and tinkling reappeared below the right scapula, and the pulse rose to 84 (from 68). After a few weeks the moist sounds diminished; sometimes they disappeared altogether for two or three days, and the expectoration almost ceased, preceded by slight febrile symptoms, and after a severe coughing a plug of gelatinous matter would be coughed up, and the mouth become filled with offensive matter; the feverishness would then abate, the expectoration gradually lose its fetid odour, and return to its usual amount.

The opening in the side closed permanently about the 1st of February (eight months after the operation), the discharge having been very scanty and gradually diminishing for months. The opening had previously closed temporarily for two or three days. The gurgling sounds and cavernous breathing were now confined to a limited space near the angle of the shoulder-blade. The patient gained flesh, and on March 3rd weighed 11 st. 4½ lb.; being an increase of more than a stone in three months and a fortnight. In the second week of March the expectoration gradually changed in character, and lost its red hue; and about a tablespoonful of frothy mucus, containing scarcely any pus, was spat up. For the first time during his illness the patient was able to lie on either side; and in place of the previous gurgling and amphoric breathing, a distant

"soap-bubbling sound" could alone be detected. In the axilla there was gurgling with succussion on coughing, as though fluid intervened between the lung and ribs. The percussion note was fairly resonant throughout. At the end of March the splash was replaced by an indiarubber-like creak of less extent, and after a few weeks this also ceased. Pulse 64; breath easy; appetite good (e. g., two chops and an egg for breakfast).

He went to Torquay for a fortnight, and on his return (April 20th) he was perfectly well; and, with the exception of a creaking sound heard in the axilla on deep inspiration, the chest-sounds were quite normal.

The preceding case seems to be of sufficient interest to warrant its publication, especially as the physical signs were verified and the progress of the case watched throughout by two competent observers. The patient has, within the last few weeks, been carefully and separately examined by both Dr. Pollock and Dr. Thompson, who have failed to discover anything abnormal in the chest beyond a diminution in circumference of the right side of nearly three-quarters of an inch, and a slight difference in the resonance on percussion on the two sides.

Several questions naturally suggested themselves during the progress of the case:—

1st. Had the pleuritic effusion any connexion with the periosteal affection of the rib, and was it syphilitic in its origin?

2nd. Did the serous fluid which escaped in such large quantities from the aperture in the side, which had previously given egress to pus, come from a different source, or was it secreted in the same cavity as the matter first observed? In other words, was the abscess which pointed beneath the eighth rib, and which was punctured, a limited empyema subsequently communicating with the general pleural cavity, or was it a single cavity secreting at first pus, and then serum?

3rd. What was the character of the pulmonary consolidation which passed through the stages of softening and excavation, and then healed, leaving no trace distinguishable by auscultatory signs?

In the treatment the good effect of blisters kept open constantly for weeks, and of cod-liver oil, which was scarcely intermitted for nine months, was very remarkable. Much must also be attributed to care taken in securing a constant supply of fresh air, and in maintaining a high and sufficiently stimulating diet to support the strength under the constant drain, amounting, for several months, to more than a pint of pus per diem.

The existence of well-marked humid crepitus in the left (opposite) lung, its disappearance, recurrence, and final replacement by healthy respiratory sounds, is very remarkable, and, on the supposition that the case was one of tubercle, is evidence of the possibility of the complete removal of all physical signs of deposit in the lung.

The history, the family predisposition, the hæmoptysis, hectic, and the physical condition of both lungs, may not unfairly be referred to a deposit of tubercle, softening, producing excavation, and terminating in recovery. But it is also possible to account for the case on the supposition of an acute pleuropneumonia producing empyema and consolidation of the lung, with excavation, and that the cavity was a pulmonary abscess. On comparing these two suppositions, that of phthisis is more probable, and is favoured, as above stated, by the condition of the opposite lung. The perfect recovery of health, and the entire disappearance of the physical signs in both lungs, are unusual in either case.

ON A CASE

OF

COMPOUND COMMUNUTED FRACTURE OF THE RIGHT THIGH AND SERIOUS INJURY TO THE LEFT LEG,

THE RESULT OF A TIMBER WAGGON PASSING OVER BOTH LIMBS;
RECOVERY.

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G. L—, aged sixteen, was admitted into the Dorset County Hospital March 18th, 1862, with a compound comminuted fracture of the lower third of the right femur, and a contused wound of the inner side of the left leg and thigh. From the history it appears that, whilst riding upon the front