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Original Communications.

ADIPOCERE.

Read before the Massachusetts Medical Society, at the Annual Meeting, 1872,

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ADIPOCERE is comparatively of rare occurrence. As most commonly found, it is the product of a spontaneous conversion of dead animal tissue into a saponaceous or fat-like substance, resembling spermaceti.

It may be produced by artificial means; and possibly also by morbid causes in the living subject, both human and brute.

In the order corresponding to these modes of its production, namely, the *spontaneous*, the *artificial* and the *morbid*, it is proposed to arrange the facts collated in the present paper.

The *spontaneous*, chemical change into adipocere is most frequently met with in the disinterment of human bodies, long buried. It occurs under various, and apparently dissimilar conditions. Certain degrees of humidity and temperature are, perhaps, the conditions most common in all reported cases. But these are obviously only accidental, or at most auxiliary, causes. Out of a large number of bodies buried under apparently precisely similar conditions, only one, or even a portion of one, may be found to have undergone this metamorphosis.

The essential cause, then, is the problem which yet remains to be solved. Accumulation of facts may ultimately lead to the discovery of the occult cause of this singular transformation; but up to the present time, scattered contributions to this common stock comprise all the results thus far reached.

Eighty-three years ago, Fourcroy, who may be regarded as the scientific discoverer of this peculiar substance, read the first memoir on the subject before the Royal Academy of Sciences; and to his researches and experiments we are largely indebted,

even at this day, for any accurate knowledge of adipocere. Since that time, other observers have added to the record important facts.

The specimen here exhibited is one of this singular *post-mortem* spontaneous change. It was obtained by the writer on the 31st day of May, 1864. A gentleman from Leicester was engaged on that day, in superintending the removal of seven bodies from the old burial-ground on the summit of the hill in the village of Rutland, in Worcester county, to the family lot in the new cemetery. He was struck with the remarkable peculiarity presented by one of the bodies, and supposed it might be a petrification. He very kindly informed me of his discovery, and I accompanied him to an examination of the body and its surroundings. The remains of each of the several bodies—consisting principally of the skulls, larger bones, fragments of the smaller bones and those portions which had undergone complete disorganization—had been carefully collected and placed in separate boxes. The body in question, however, presented a marked difference from the others. From the margin of the ribs down to the instep, this body had preserved the complete size and contour of the original form. The right arm and fore-arm, which were separated from the trunk, and in a semi-flexed position, were also in the same state of preservation. These portions, as has been stated, had preserved their normal size; indeed, the size appeared to be augmented beyond that of a body dead of a wasting, attenuating disease. The limbs were round, full and plump; the pelvis large, broad and full. The surface was black as if it had been charred. The remaining portions of this body were in the same state of disorganization with the other bodies—more or less crumbled to pieces.

Upon further inspection, it was at once evident that the change was not that of petrification, but the very rare one into adipocere. This adipocirous substance occupied the place of the original soft parts, and formed a crust or hollow investment,

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within which were loosely contained the partially decomposed bones and other substances. This crust was black in both external and internal aspects, dry, and easily fractured like hard cheese—the fractured surface having a dull white color. The specimen exhibited is a portion of the abdominal walls, and has considerably diminished by keeping eight years. It is easily melted, requiring rather more heat than spermaceti, and flowing like that substance. There is a small residuum which, on further application of heat, becomes crisped and charred like ordinary animal tissues. This is the only test which has been applied.

The history of this case before death, as furnished by a surviving sister, contained nothing remarkable. The body, which had been interred fifty-one years, was that of a female, 19 years of age, who had died of consumption of six months' duration. There was the emaciation usually occurring in this disease.

The grave was distant from the others five or six feet, and in no way perceptibly differed from them, except that it was found somewhat drier. The sub-soil is a mixture of gravel and clay, and is usually very wet—so wet that, at some seasons of the year, when graves have been excavated, it has been necessary to bail out the water, before placing the coffins therein. It was principally for this reason that this burying-ground was abandoned.

The coffin containing this body was in a state of much better preservation than any of the others, although one of the others had been buried only fifteen years. The top of the coffin had fallen in, so as to rest upon the body; but in other respects it was sufficiently intact to perfectly preserve its form. In all the other cases, there were only fragments of rotten wood, mingled confusedly with the dead bodies. With the single exception of the more recent interment named above, all the other bodies had been buried nearly the same length of time.

Numerous disinterments have, from time to time, been made in this burying-ground, within the last twenty-five years, but in no other instance has the same phenomenon been observed.

Fourcroy's cases are mostly those of spontaneous conversion, and were principally furnished by the occasion of exhuming a large number of bodies from the Cemetery of Innocents in Paris. At the time of clearing this ancient burying-place, "the remains of the human bodies, immersed in this mass of putrescence, were found in

three different states, according to the time they had been buried, the place they occupied, and their relative situations in regard to each other. The most ancient were simply portions of bones, irregularly disposed in the soil which had frequently been disturbed. A second state, in certain bodies which had always been insulated, exhibited the skin, the muscles, the tendons and aponeuroses, dry, brittle, hard, more or less gray, and similar to what are called mummies in certain caverns where this change has been observed. * * * The third and most singular state of these soft parts, was observed in bodies which filled the common graves or repositories." In those large graves which had been closed fifteen years, the coffins were found in good preservation. "When the covers of several were taken off, the bodies were observed at the bottom, leaving a considerable distance between their surface and the cover, and flattened as if they had suffered a strong compression." The bones were environed on all sides by a soft, ductile matter, which resembled common white cheese, yielding to the touch and becoming soft when rubbed for a time between the fingers. "With water, this fatty matter exhibited all the appearances of soap, and afforded a strong lather. The dried substance did not form the same saponaceous combination with the same facility or perfection as that which was recent."

It will be observed that in this description of Fourcroy's cases, which is a brief digest from his memoir, there appears a difference, in one respect at least, from the Rutland case. Instead of an expansion in bulk, here was evidently a contraction—a flattening as if from a "strong compression."

It is, perhaps, not easy to explain this seeming discrepancy. But if we admit as correct, some of the speculations indulged in by Fourcroy, and particularly his theory of a saponification, it may be suggested in explanation, that the conversion of tissue into the waxy matter, or true adipocere, is the primary stage in the metamorphosis, and is marked by increased bulk. Subsequently—and especially in situations so favorable for its elimination as that of Fourcroy's observations—ammonia may be formed by the combination of azote—an abundant principle in animal matters—with hydrogen. In the further process of change, the adipocirous matter is saponified by uniting with the ammonia, is *lessened* in bulk, and then presents the physical properties described in the memoir.

Another marked difference distinguishes

these two typical cases, namely, the character of the earth in which the interments had been made. In our rural burying-grounds, each object is surrounded by a portion of the virgin soil; and is so far isolated from others as to be uninfluenced thereby. In the other case, it was the burying-ground of a large district, wherein successive generations of its inhabitants had been deposited for upwards of three centuries; the soil was overloaded and reeking with bodies abandoned to the putrefactive process. Yet under conditions so utterly dissimilar, we find the same peculiar disorganization which destroys the original texture, and produces from its elements, a new and most permanent state of combination.

No less striking is the difference as it regards warmth and moisture. Dr. Samuel Akerly, of New York (Ed. Notes—Hooper's Med. Dict.—Art. Adipocere), states that a barrel of meat, which had undergone a change and become adipocere, was raised from the British Frigate Hussar, sunk near Hell Gate, during the Revolutionary War, where it had remained in eight or ten fathoms of salt water near fifty years. * * * A box of candles, taken from a sunken wreck on the coast of Brazil, was changed in appearance and consistence, and had become a mass of adipocere. The bones of a huge cetaceous animal were dug up in the low grounds about New Orleans; when they were exhibited as a show in New York in 1828, adipocere was discovered in the cells of the spongy part of the jaw-bone."

In strong contrast with these instances is the one related by the same writer, where "the body of a female, consisting of a solid mass of adipocere, was dug up in dry ground, near the City Hall in New York."

Dr. Draper says in his Human Physiology (p. 247) that "the change in question does not altogether depend on the condition of the earth of the grave as respects moisture or other such physical state;" that he has had "the opportunity of verifying [this fact] in the case of a subject which had been disinterred in a condition of perfect preservation so far as exterior appearance went, but which had been wholly converted into adipocere. Yet, from the same burying-ground, many other bodies were disinterred, but none had undergone a like change."

The same transformation has been observed from long exposure to the air only. Poulletier suspended a piece of the human liver in his laboratory for more than ten

years. At the expiration of this time, it was found to be changed into an imperfect adipocere.

The artificial production of adipocere is accomplished by three methods.

"Muscular fibre, *macerated in dilute nitric acid* and afterwards well washed in warm water; affords pure adipocere, of a light yellow color, nearly of the consistence of tallow, of a homogeneous texture, and, of course, free from ammonia. This is the mode in which it is now commonly procured for chemical experiments." (Hooper.) Dr. Gibbes, of Oxford, "took three lean pieces of mutton and poured on each a quantity of the three common mineral acids. At the end of three days, each was much changed; that in the nitric acid was very soft, and converted into the fatty matter; that in the muriatic acid was not at that time so much altered; the sulphuric acid had turned the other black." (Ibid.)

Immersion in running water very speedily converts muscular fibre into adipocere. Dr. Akerly states that he has "seen a piece of meat raised out of a well, by pumping, into which it had fallen, and where it was completely changed into adipocere." Dr. Gibbes also "found that lean beef secured in a running stream was converted into this fatty matter at the end of a month."

The *third* method of artificial production, namely, by long exposure to the action of the air only, is suggested by the experiment of Poulletier, already alluded to.

If the subject of adipocere has any clinical value to the physician, it must be in its possible production by *morbid causes* in the living subject. The recorded facts, however, which suggest such an inference are meagre; and, perhaps, insufficient to warrant assuming disease to be one class of the agents concerned in its production. Without, however, espousing any hypothesis of this kind, it is sufficient for the present purpose to arrange under this assumed division such phenomena as look in this direction.

While making a very limited examination of authorities on this subject, it was observed that most writers pass very readily from the discussion of adipocere, as formed by chemical change of the dead animal tissues, to a consideration of those fatty degenerations which occur through a morbid process in the living body. The connected consideration of these kindred substances seems a very natural one, although there may be a radical difference in their chemical properties, as well as manner of production.

Ambergris, which is occasionally found in immense quantities in the lower intestines of the spermaceti whale, is the result of a diseased process. It is found "to contain adipocere in large quantity, rather more than half of it being of this substance." According to the analysis of Boillon la Grange, 3820 parts of ambergris, consist of adipocere 2016 parts, a resinous substance 1167, benzoic acid 425 and coal 212.—(Hooper.)

The same substance was extracted from the rectum of a living woman in Perthshire, England, a description and analysis of which was published by Dr. Ure in a London medical journal in Sept., 1817.

Dr. Gross, in his *Elements of Pathology* (p. 267), describes a form of intestinal concretions, mostly observed in dyspeptic subjects, as being, "in some instances, of an irregular shape, of the consistence of inspissated tallow, slightly translucent and of a grayish-drab color; in others, they are of a globular form, nearly or quite opaque, of an adipocirous or waxy character, and of a pale yellowish, whitish or cineritious hue."

An interesting case of fatty discharges from the bowels, with the autopsic condition, communicated by Dr. J. B. S. Jackson, of Boston, is related by the same writer, in which was discharged a quantity amounting, "on an average in twenty-four hours, to about eight ounces, during more than four months, * * * * of a fatty matter in a liquid form, resembling, when cold, yellowish tallow." (Ibid. pp. 269 and 270.)

"There is a case communicated by Dr. Babington, of fat formed in the intestines of a girl, 4½ years of age, and passing off by stool." (Hooper.)

Closely allied to the various substances which have been named, is another of much practical interest, and which is much more frequently met with, namely, cholesterine. This peculiar substance which, Dr. Prout tells us, is the product of some modification of the oleaginous principle, exists in a state of solution in healthy bile; but which, in some morbid conditions of that fluid, being released from its solvent, assumes its proper crystalline form. It then becomes the basis of the ordinary biliary calculus, has a white, sometimes yellow or greenish color, and when broken, presents crystalline plates or striæ, brilliant like mica, and having a soft, greasy feel. It is soluble in pure alkalis, and the solution has all the properties of a soap. It bears a strong resemblance to spermaceti, and, like that substance, melts with the appearance of oil, and is in-

flammable. "Fourcroy called it adipocere." (Ibid.)

Rutland, June, 1872.

RECOVERY AFTER FOUR YEARS' PARALYSIS FOLLOWING RAILROAD INJURY.

By S. G. WEBBER, M.D., Boston.

IN the latter part of July, 1867, the patient was crossing the track of the Eastern R. R. in Chelsea, riding with his sister in a wagon. The wagon was struck by the locomotive of a passing train; Mr. M. was thrown about twenty feet, had several ribs broken and was severely bruised. His sister was less severely injured and shortly recovered.

Dr. Torrey, of Beverly, has kindly given me, from memory, the following account of his condition soon after the accident: "I find on my book that I first saw him in consultation with Drs. Shackford and Forsyth, in Chelsea, near the Caryville Station, where he received his hurts, about ten days or a fortnight before, on the 14th of August, 1867. At that time he was suffering with pain, if I remember rightly, in the lower dorsal and lumbar spine, with loss of mobility and sensation in the parts below, and extinction of voice above a low whisper, although conscious and intelligent apparently. On the 28th of that month he was removed to Beverly, and from that time came under my care. He suffered greatly in the removal, and was for a few days delirious, with great febrile excitement and intense pain in the head, complained of as the delirium subsided. Extreme constipation, relieved only by active cathartics followed by injections, retention of urine requiring the daily use of the catheter, excruciating pain in the right groin, passing thence to the lower dorsal vertebræ, and total inability to move or turn himself in bed, loss of voice, with occasional aberrations of mind, were the principal features of his condition for a long time after he came under my observation. I think it was a month or more before he could move the left leg—it was many months before he could begin to move the right limb in the least degree. Sense of feeling was entirely lost on this side, and had not returned fully up to the time of his leaving Beverly for Boston."

Mr. M. has given me rather fuller particulars in regard to time, &c. He was confined to his bed about a year and a half. He had no pains in his legs; did not recover his voice fully for nine or ten months. During that time he had headaches, mostly occipital; the pain darted down the spine to the lumbar region, but was worse in the