ON THE CHEMICAL CONSTITUTION
OF
CALCAREOUS
TUMOURS OF THE UTERUS,
AND OTHER PARTS.

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It is well known that various parts of the body are liable to have deposits formed in them of an earthy or bony matter. These are sometimes found occupying the natural cavities, while, at other times, they are attached to the interstices of membranes, or the coats of vessels: they have been found, in short, in almost all the different structures which compose the animal frame. These bodies have, in a few instances, been made the subject of experiment, and have been found generally to be composed of the phosphate of lime, combined with a small proportion of the carbonate, cemented together by a quantity of animal matter. Fourcroy informs us, that he analyzed a calculus from the duct of the salivary gland, and also some calculi that had been discharged from the lungs, and that he found them to be composed of phosphate of lime and animal matter*.

* System, by Nicholson, Vol. IX. pp. 448 and 467.

Dr. Thomson * obtained the same results from salivary calculi; and M. Breschet states, that both the salivary calculi and those from the uterus are principally composed of phosphate of lime †. It appears also that the small earthy bodies which are occasionally found in the coats of the veins, and which have been termed phlebolites, possess the same chemical constitution ‡; and I may add, that my own experience coincides with the above statements. I had an opportunity, many years ago, of examining a salivary calculus, which I found to be composed of phosphate of lime, with a little animal matter §, and more lately I found nearly the same constituents in a pulmonary calculus, and in two concretions from the ovaries. We have indeed an account of a salivary calculus by M. Lassaigne, where the usual order was reversed; 86 per cent. of the substance being carbonate of lime, and 3 per cent. phosphate ||.

I am indebted to the kindness of Dr. Robert Lee

* System of Chemistry, Vol. IV. p. 572.

† Dict. de Méd., Art. "Calcul." Tom. IV. p. 52, 3, and 85, et seq.; see also Biett, in Dict. Sc. Méd., Tom. III. p. 466-8.

‡ See the analysis of Mr. Kemp, Ed. Med. Journ. Vol. XLIII. p. 23, and of Gmelin, p. 311; also the Article, "Diseases of the Veins", in the Cyclop. of Med., by Dr. Lee, where we are informed that Dr. Prout has obtained the same results.

§ Nicholson's Journ. Vol. XIII. p. 374, 5.

|| Ed. Med. Journ. Vol. XL. pp. 486, 7.

for the opportunity of examining seven of these bodies, and I propose to lay the result of my examination before the Society.

The first of these was described as "calculi discharged from the uterus during life." They consisted of a number of small bodies, from the bulk of a pin's head to about three times that size; their form was completely irregular, and in some parts they appeared as if they had been corroded, resembling a decayed tooth. They were of a yellowish white colour, like bone or ivory, and were so hard as not to be cut with a knife. Some of them were single, while others were connected by a membranous substance: the membranous substance had a few dark brown bodies, of the size of a mustard seed, attached to it. The whole, when dried at the temperature of 200° , weighed 6.2 grs.

A portion of the substance was subjected to a red heat; it burned slowly, with a dull flame, and lost about one-fourth of its weight. The residue was treated with dilute muriatic acid, and, with the exception of a few black particles, was quickly dissolved.

Another portion of the substance, weighing two grains, was digested for half an hour in boiling water: no visible effect was produced, except the extrication of a few air-bubbles; it was softened, but its form was not sensibly altered. The fluid was poured off, and examined; the appropriate re-agents did not

indicate the presence of either albumen or gelatine; there was an indication of a very minute quantity of the animal matter, which exists in the serosity of the blood, and a trace of common salt. The substance, being again dried, had not lost any appreciable weight. It was then digested in diluted muriatic acid; a quantity of gas was extricated, and a considerable part of the substance was dissolved; the residue, when dried, weighed $\cdot 45$ gr.; it appeared to consist of a number of thin films, with the dark brown bodies mentioned above. One of each of these was digested in caustic potash; the brown body was slowly dissolved, but the membranous film remained, for a considerable length of time, without being acted on; it was, however, softened, and assumed the appearance of a small bladder or cyst, with a rounded aperture at one of its extremities. I am disposed to think that the brown bodies were clots of blood; with respect to the nature or origin of the cysts, I am unable to form any opinion. The muriatic solution was now examined, and was found to contain a considerable quantity of the phosphate of lime, with a small quantity of the carbonate.

No. 2 was described by Dr. Lee as “a portion of the calculous tumour removed from the body of the female, who had passed portions of the calculi from the uterus during life.” It appeared to consist of a number of irregularly formed masses, of a white and somewhat chalky looking substance, connected together by an animal matter, of a brown colour, and

solid consistence, which had the appearance of inspissated mucus. Portions of the substance were subjected to the same processes as in the former case. The water in which it had been digested was found to contain the same ingredients as before, but in greater quantity; the loss of weight being in the proportion of about .4 gr. to five grains: the mass was broken down into a number of fragments, and the animal matter rendered soft and flexible. Diluted muriatic acid acted powerfully on the substance, with the extrication of a large quantity of gas; of two grains that were employed, .3 gr. were left undissolved. The muriatic solution being then examined, was found to contain a large quantity of carbonate of lime, with a small quantity only of the phosphate, the proportion being nearly as ten to one: it also contained the sulphate of lime, in about the same proportion with the phosphate. The animal matter was digested in caustic potash, and what remained undissolved was afterwards subjected to the action of alcohol, spirit of turpentine, ether, and other re-agents, from the result of which it appeared to be identical with the substance which I described in a paper, formerly read to the Society, under the title of albumino-cerous matter *. From the above experiments we may conclude, that the substance in question consisted of an earthy compound, composed principally of carbonate of lime, united to a small quantity of the phosphate and the sulphate of lime; it was imbedded in or connected with an animal

* Vol. XV. p. 154, et seq.

matter, which appeared to be, for the most part, coagulated albumen, with minute quantities of the peculiar substance found in the serosity of the blood, and of what I have termed albumino-cerous matter. From the aspect and general character of the body in question, I should conceive that there is no organic connexion between the earthy and the animal matter of which it consists.

No. 3 was marked "from the uterus." It was an irregular mass, somewhat resembling No. 1, but with less distinct concretions, the earthy and the animal matter being more intimately mixed together; it weighed, when dried, 3·4 grains. By digestion in water it was partially broken down, and the fluid was found to contain the same ingredients as in the two former cases, but in very minute quantity. Diluted muriatic acid acted powerfully on the substance, with the extrication of gas, and dissolved about five-sixths of the whole; the greatest part of what remained was dissolved by caustic potash, but a small quantity was left, which appeared to be of the same nature with the undissolved residue found in Nos. 1 and 2. The muriatic solution was next examined, and was found to contain a considerable quantity of the phosphate of lime, with small quantities of the carbonate and the sulphate. It appeared therefore that the earthy matter of this substance was nearly similar to that of No. 1, and that it was, in like manner, attached to a portion of an animal matter, which resembled coagulated albumen.

No. 4 was described as "from the arch of the aorta." It consisted of a white matter, imbedded in a hard, semi-transparent substance; when torn or divided, the white matter exhibited somewhat of a fibrous texture: the whole weighed $18\frac{1}{2}$ grains. Portions of it were subjected to the same processes as before; the aqueous infusion differed from the former in containing a minute quantity of albumen, and a trace of gelatine, together with the other ingredients. The loss of weight was, however, small, and scarcely to be appreciated, and the substance, although softened and rendered flexible, had its form scarcely changed. By digestion in diluted muriatic acid, it was broken down into fragments, and lost about one-fifth of its weight; the solution contained a considerable quantity of phosphate of lime, with a little of the carbonate and a trace of the sulphate. It may be considered therefore as consisting essentially of the earth of bone imbedded in a membranous body; the earthy matter being in the form of filaments or thin plates, interspersed through the substance of the animal matter.

No. 5 was marked "calculi from the lungs", presented to Dr. Lee by Dr. Bisset Hawkins; it consisted of three small bodies, of which the largest weighed rather more than four grains, and the two smaller about half a grain each. They had all the same appearance, that of a white granular mass, of an irregular form, of considerable hardness, and an earthy fracture. They were readily acted upon by

diluted muriatic acid, with considerable effervescence, the whole being dissolved, except a few minute films, which were suspended in the fluid. The muriatic solution was found to contain a large quantity of the phosphate of lime, with a small quantity of the carbonate, and a trace of the sulphate.

No. 6 was marked "from the lung after death", and No. 7, "coughed up from the lung"; the former weighed about a grain and a half, the latter about half a grain. Their appearance was precisely similar to each other and to that of No. 5, except that a part of the surface of No. 6 exhibited a brown stain, perhaps produced by a particle of blood being attached to it; their chemical composition also appeared to be similar to that of No. 5, except that they contained a still smaller quantity of the carbonate of lime.

The results of the above analyses confirm the opinion that had been previously entertained respecting the chemical composition of these bodies; that they are, for the most part, composed of the phosphate of lime and animal matter, generally united to a small quantity of carbonate. Out of the eleven concretions which I have examined, the only exception is that which was taken from the uterus. This, both in its physical and chemical characters, differed very materially from the others, while it more nearly resembled the salivary concretion that was analyzed by M. Lassaigne.

Since the above paper was read to the Society, I have had an opportunity of examining three other specimens of uterine concretions, of which I shall subjoin a brief account.

The first was put into my hands by Mr. Howship, accompanied by the following history.

“ The patient, a woman, aged 64 years, had for several years been considered by my friend, Mr. Elsegood, to have disease of the uterus, for a tumour, presumably uterine, might be felt within the abdomen, inducing feelings of weight and bearing down, although unattended with pain. Her death was the consequence of an attack of ileus.

“ On examination, we found the uterus the seat of disease; its substance occupied by a number of tumours, beneath the peritoneal covering; several the size of an orange, and one very large one, pendulous, and attached to the back part of the fundus uteri, by a short strong peduncle.

“ The os uteri, and part of the cervix, were healthy. Passing a director into the cervix, and dividing the substance of the uterus, to the extent of an inch, (where the cavity terminated,) exposed a very small polypose tumour, attached by a narrow neck to the lining membrane. The uterine appendages were healthy.

“ The deposit of these bony tumours appeared

to have commenced at various points, within the substance of the uterus. It may be assumed, from the appearance of the parts, that they were formed immediately beneath the peritoneal covering; and this assumption would appear to be borne out by the magnitude of the pendent tumour, which seems to have acquired its neck by becoming gradually separated, and detached, first from the substance, then from the surface of the uterus, by an extension of its nutrient vessels, and peritoneal covering. But on the other hand, there is no doubt that the minute arteries of the uterine parenchyma, have the power of secreting bone as rapidly in one part, as in another. In laying open the cavity of a uterus, apparently healthy, (which is in my collection,) minute nuclei of ossific matter were detected in various parts of its substance. Had this person lived a few years longer, these nuclei, in all probability, would have formed tumours; and as they enlarged, by their pressure exciting absorption of the surrounding substance, and also raising the peritoneal covering, they must eventually have presented an appearance very similar to that seen in the present preparation.

“The large pendulous tumour was composed almost entirely of bone, judging from its weight, and hardness. To determine its structure, more precisely, I applied a saw, and with some trouble detached about one-fourth part of the mass. The section of the piece cut off (which piece weighed 3iv.) demonstrated various cavities, and internal spaces, occupied with membranous and fibrinous matter.”

The portion of the calculus which I received from Mr. Howship was obviously compounded of two substances ; a dense and hard body, intermixed with layers, or deposited in the cells of a membranous substance. The exterior surface was irregularly tuberculated, while the interior exhibited a number of cavities of various forms and sizes. The earthy and the animal matter appeared to exist in very different proportions, in different parts of the calculus ; I took ten grains of what appeared to consist of an average proportion of the two, and subjected them to the same mode of analysis, as was employed in the former experiments. The result was, that the ten grains were composed of

Animal Matter . . .	3·2 grains
Phosphate of Lime . .	6·45
Carbonate of do. . .	·35
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	10·00
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The next substance which I examined was given me by Dr. Lee ; it was a part of the tumour from Dr. Chowne's case, for the description of which, I must refer to Dr. Lee's paper. Of this tumour I subjected a portion, weighing five grains, to the ordinary mode of analysis, when the result was, that 2·1 grains were soluble in water at the boiling temperature ; and were found, by the application of the appropriate tests, to consist of jelly, mucus, and extractive matter. Of the 2·9 grains that were left

undissolved, 1·8 grain was soluble in diluted muriatic acid, and was found to contain a considerable quantity of phosphate of lime, with a very minute quantity of carbonate, but with an unusually large proportion of the sulphate. The residue of 1·1 grain consisted of membrane, with a minute quantity of the albumino-cerous matter. The composition of the part which I examined would be as follows; but I may remark, that the proportion of the animal and earthy matter was obviously very different, in different parts of the tumour, and this I suspect to be the case with the calcareous salts.

Jelly, mucus, &c. . . .	2·1
Membrane, &c. . . .	1·1
Phosphate of lime . . .	1·5
Carbonate of do. . . .	0·2
Sulphate of do. . . .	0·1
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	5·0
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The third substance which I examined was marked “portion of a calcareous tumour of the uterus, presented to Dr. Lee by Mr. Kiernan.” It consisted of a number of tubercular or vermicular bodies, forming an irregular concretion, and leaving cavities in the interior, of various forms and sizes. The whole weighed fifty-nine grains.

It was subjected to the usual mode of analysis, with the following results. It was not perceptibly

acted upon by boiling water ; it lost no appreciable weight, nor was its form or consistence affected. It was almost completely soluble in diluted muriatic acid, a few fibres or shreds, forming only about one-sixtieth part of its weight, being left undissolved. A large proportion of the substance was found to be phosphate of lime, with a quantity of the carbonate and a trace of the sulphate. The proportion of the calcareous salts was nearly as follows :

Phosphate of lime . . .	8·5
Carbonate of do. . . .	1·45
Sulphate of do. . . .	0·05
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	10·00
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From these three analyses, taken in connexion with those in the body of the paper, we may conclude, that these earthy concretions, in whatever part of the body they may be deposited, are nearly similar in the nature of their constituents, although with some variation in the proportions ; that in almost all instances, the phosphate of lime is the predominating substance, while, in certain cases, the carbonate would appear to be the principal ingredient.

Upper Bedford Place,
Aug. 19, 1834.