

THE

# BOSTON MEDICAL AND SURGICAL JOURNAL.

---

VOL. LXIV.

THURSDAY, JUNE 20, 1861.

No. 20.

---

## SILICEOUS URINARY CALCULI.

BY JOHN BACON, M.D.

[Read before the Boston Society for Medical Improvement, June 10th, 1861, and communicated for the Boston Medical and Surgical Journal.]

SILICIC acid is widely distributed in the various vegetable substances used for food by man and animals, and is a constituent of nearly all potable waters. From these sources it is introduced into the blood and other fluids of the organism, as well as the solid tissues. In human blood, the proportion is extremely minute; in the hair, one or two tenths of 1 per cent are found. The blood and hair of the ox and other herbivorous animals are a little richer in silica; and in the feathers of some birds it reaches nearly 4 per cent. Silica also occurs normally in the urine of man and various animals, but only in an infinitesimal amount. Its existence in urinary concretions is regarded as extremely rare: very few cases are on record among the several thousands of analyses of calculi published by various chemists since the nature of these bodies was first successfully investigated towards the close of the last century. Few large collections of calculi are destitute of specimens of quartzose pebbles and other siliceous minerals, asserted by patients to have been passed from their bladders; but the mineralogical and chemical characters of these substances are almost always sufficient to prove their extraneous origin. Chemists are occasionally called upon to analyze siliceous sand and gravel, and even sizable pebbles, purporting to have been voided with the urine. Several such cases have occurred in my own experience. These foreign bodies may actually be introduced into the urethra or bladder, and require a surgical operation for their extraction.

Among the specimens of calculi from the urinary organs of herbivorous animals which I have analyzed within a few years, four proved to be siliceous. Two of these are in the Cabinet of the Boston Society for Medical Improvement, and two in the Warren

VOL. LXIV.—No. 20

Museum at the Massachusetts Medical College. They are of undoubted genuineness. In the present paper are brought together for comparison all the cases which I have been able to find recorded, of the occurrence of silica in urinary calculi, either of man or the inferior animals. A sketch is given of each case in which a noticeable amount was found, with a reference to the original account in nearly every instance. Those calculi are first described which contain the largest proportions of silicic acid.

I.—A calculus from the urethra of a lamb, analyzed by Lasaigne. It had the form of a slender cylinder slightly tapering towards the ends, and measured a little over half an inch in length and one seventh of an inch in diameter. It was very friable, and consisted of slightly adhering concentric layers. Color white, with a slight red tint. On ignition, it left a white, pulverulent residue, forming about eight tenths of the calculus, and having all the properties of silicic acid. A trace of peroxide of iron was also detected. The remainder of the calculus was animal matter.—*Annales de Chimie et de Physique*, 1830, t. xlv., p. 420. This calculus is incorrectly described by Dr. Golding Bird and some other authors as composed of pure silica.

II.—A calculus from the urethra of an ox, killed on account of retention of urine caused by it. The specimen is in the Cabinet of this Society, and a small fragment was analyzed by myself in 1857. The analysis is published in the *Extracts from the Records of the Boston Society for Medical Improvement*, vol. iii., p. 150. Also, in the *Boston Medical and Surgical Journal*, 1857, vol. lvii., p. 301. Recently, I have divided the calculus through the centre, and determined the per centage of silica by a new analysis. The specimen is nearly spherical, with a rough and tuberculated surface, and measures four lines in diameter. Its original weight was about seven grains. In general appearance it resembles a mulberry calculus, and has a yellowish grey color. On section, a number of irregular layers are seen, enclosing a small nucleus of the same character as the surrounding laminae. The proportion of silica was determined by treating a weighed portion (about one and a half grains), in small fragments, with concentrated nitric acid at a boiling heat, to remove the saline and organic matters. The fragments became translucent, but retained their shape and hardness. After thorough washing with hot water, the fragments were dried in vacuo over sulphuric acid until they ceased to lose weight: then ignited in a platinum crucible and again weighed. By this process, it was ascertained that the silica occurs, partly at least, as a hydrate. The loss on ignition, amounting to 6.4 per cent. of the weight of the silicic acid, undoubtedly represents only a part of the combined water. Since the hydrates of silica lose some water at ordinary temperatures, the amount originally in combination cannot be ascertained. On applying heat, there was a transient darkening, showing that a trace of organic matter remained, but

the fragments quickly became quite white. This residue weighed exactly 80 per cent. of the original amount, and had the properties of pure silicic acid. Besides the common tests, its purity was proved by fusing one grain with carbonate of soda, and separating the silica in the usual mode by adding hydrochloric acid and evaporating to dryness. The separated silica, being thoroughly washed and ignited, weighed 0.985 grains. The loss is no greater than is usual in operating on so small a quantity, especially as traces of silica are always taken up on dissolving the saline residue after evaporation to dryness. No other substance was found in this solution. Besides 80 per cent. of silica, the calculus contains carbonate and phosphate of lime, water, and a little animal matter. Accompanying the remaining half of the calculus is a tube-vial containing a part of the silica obtained from it.

III.—A collection of more than six hundred little spherical calculi taken by Dr. John B. S. Jackson from an ox-bladder. They are mostly smooth, and of a yellowish-white color. In size, they are tolerably uniform; the largest ones measure a line in diameter, and a few are very minute. Some exhibit indistinct concentric layers, but no crystalline structure occurs in any. They are sufficiently hard to scratch flint glass. After boiling in nitric acid and ignition, they become quite white; anhydrous silica being left, which retains the original form and hardness of the calculi. They were analyzed by myself in 1857, and are now in the Warren Anatomical Museum. In a tube-vial accompanying the calculi are specimens which have been boiled in nitric acid and ignited. Since this analysis was published in the *Extracts from the Records* of this Society, vol. iii., p. 105, I have determined the proportion of anhydrous silicic acid, which amounts to 78 per cent. In the calculi, it appears to be combined with water as a hydrate; and is accompanied by a little animal matter, with a very little chloride of potassium and traces of sulphates and other salts of potash and soda. Hydrochloric acid takes up no salt of lime or magnesia, nor is any appreciable amount of silica removed by hydrochloric or nitric acid.

Small spherical calculi, resembling these specimens in general appearance, but composed essentially of carbonate of lime instead of silica, are occasionally found in great numbers in the bladder of the ox. They are often as large as peas, and frequently present a pearly or metallic lustre. There are many such specimens in the Museum of the College of Surgeons at London.

IV.—A calculus analyzed by Fourcroy and Vauquelin about the year 1798, and stated to be from the human bladder. It was made up of five layers, surrounding a nucleus of a yellowish-fawn color. The nucleus and two inner layers were very hard; and resembled a rough mulberry calculus, except in color, which was paler and more yellow. This portion of the calculus contained about two thirds of its weight of silicic acid. It was associated with animal

matter and a trace of phosphate of lime. The next layer consisted of uric acid; and the two exterior ones of urate of ammonia and phosphate of lime. No silica occurred in the three outer layers.—*Mémoires de l'Institut. Sci. Math. et Phys.*, 1802, t. iv., p. 135. This calculus and another from the human bladder containing an almost inappreciable amount, were the only siliceous ones in more than 600 analyzed by Fourcroy and Vauquelin.—See *Annales du Muséum D'Histoire Naturelle*, t. i., p. 108.

V.—A calculus from the kidney of a sheep, analyzed by myself. It has a triangular prismatic form, tapering towards the ends; each face is about three lines broad, and the length is seven lines. It weighs  $7\frac{1}{2}$  grains. One of the three faces is covered by a tuberculated crust, made up of thin translucent laminae. This crust has a pale bronze color, with a semi-metallic or pearly lustre and slight iridescence. One end of the calculus being removed, the interior is seen to be composed of several concentric layers, mostly of a greyish white color, with two or three darker ones; near the surface is a lustrous pearly layer, similar to the external crust. The portion analyzed contains about 50 per cent. of silicic acid; with carbonate of lime, carbonate of magnesia, animal matter and water. A trace of oxide of iron probably occurs, but was not certainly detected. The analysis was reported at the meeting of this Society on February 25th, 1861.—See *Boston Med. & Surg. Journal*, vol. lxiv., p. 211. The specimen is in the Society's Cabinet, with some fragments which have been subjected to the action of nitric acid and intense ignition.

VI.—A calculus from the urethra of an ox, a fragment from the exterior of which was analyzed by myself in 1860. The analysis is reported in the Records of the Boston Society for Medical Improvement, vol. iv., p. 136; and in the *Boston Med. and Surg. Journal*, 1860, vol. lxiii., p. 40. In this instance the animal died from retention of urine occasioned by the calculus, and consequent rupture of the bladder. The specimen has an irregular shape, measuring seven lines by three, and originally weighed  $8\frac{1}{2}$  grains. It is mostly covered by a thin and brittle crust, like a glaze; having a pale bronze color, and a semi-metallic lustre, similar to No. V. This crust is made up of very thin layers. To obtain a sufficient amount for quantitative analysis, I have recently made a section of the calculus, but not through the centre. The interior shows several irregular layers; the inner ones of a dark color, and those next the shining crust, of a yellowish white. The portion removed for analysis, which was a single piece, retained its shape and hardness after treatment by hydrochloric and nitric acids, and ignition. It was then quite white on the surface, but retained a little unburned carbon in the interior. It was fused with carbonate of soda, and the silicic acid determined in the usual way. A part of the silica obtained is preserved in a tube-vial with the specimen. The calculus contains in 100 parts, 43 parts of silica,

29 of carbonate of lime and 5 of carbonate of magnesia. Traces of phosphate of lime and peroxide of iron occur. The other constituents are water and animal matter. In the little fragment formerly analyzed, carbonate of magnesia and oxide of iron were not detected. Some of the thin laminæ of the shining crust consist of carbonate of lime chiefly, with little or no silica. Most of them contain much silica, and after treatment by acids are transparent and colorless, and show on microscopic examination a finely granular texture, but no crystalline structure. They exert no action on polarized light. When heated highly they lose water and become white and opaque. In the four calculi analyzed by myself the silica occurs as a hydrate, and possibly also in some combination with organic matter. The present specimen and the collection of little spherical ones from an ox-bladder (No. III.) are the only siliceous urinary concretions in the Warren Anatomical Museum, which contains 184 urinary calculi that have been analyzed.

VII.—A calculus taken from the urethra of a bull, and analyzed by Wurzer. In shape it resembled a small bean, and weighed about  $6\frac{1}{2}$  grains. Its color was pale brown, and the surface very smooth as if polished. The analysis gave 38.5 per cent. of silica, with 36.3 per cent. of carbonate of lime. The other ingredients were 12.2 per cent. of animal matter (regarded by Wurzer as mucus), water, a little phosphate of lime, and traces of iron and manganese.—*Schweigger's Journal für Chemie und Physik*, 1833, band lxxvii, s. 27.

VIII.—A calculus from the urethra of an ox, whose death it had occasioned. It had the size and shape of a small bird's egg, and a yellowish grey color. Neither nucleus nor layers occurred. This calculus, like the last, was analyzed by Wurzer. It contained 38.2 per cent. of silica, and 36.8 per cent. of carbonate of lime. The other constituents were phosphate of lime, animal matter, water and a little oxide of iron.—*Schweigger's Journal*, 1822, band xxxvi, s. 321.

IX.—A calculus taken from the bladder of a fresh-water turtle, and analyzed by Lassaigne. It was very friable, and consisted of loosely adhering concentric layers. Weight, 262 grains. Color, yellowish-white externally, and white within. The chief constituent was phosphate of lime, amounting to 56 per cent. Water, organic matter, and small amounts of carbonate of lime, carbonate of magnesia and other salts were also present.  $4\frac{1}{2}$  per cent. of silica occurred in transparent grains.—*Comptes Rendus*, 30 Juillet, 1844.

X.—A large, ovoid calculus, removed by lithotomy from the bladder of a man. It was made up of layers, but contained no nucleus. Weight, 870 grains. Color, brown on the exterior; yellowish-white in the interior. It was composed of about  $75\frac{1}{2}$  per cent. of uric acid,  $17\frac{1}{2}$  of phosphate of lime,  $6\frac{1}{2}$  of animal matter, and 1 per cent of silica. The analysis was made by Wurzer.

The Boston Medical and Surgical Journal as published by

—*Gehlen's Journal für Chemie und Physik*, 1806, b. ii., s. 265. Also, *Annales de Chimie*, 1806, t. ix., p. 310.

XI.—A calculus from the human kidney, weighing nearly fifteen ounces avoirdupois. It was irregular in shape, and apparently moulded in the pelvis of the kidney. The principal constituent was triple phosphate, with salts of soda and ammonia, and animal matter. No lime was found. Silica occurred in the proportion of one third of one per cent. It was analyzed by Koninck. The case is reported in a Paris journal, *L'Institut*, for 1836; not the *Memoires* of the French Institute. I have not been able to consult this paper, but a full account is given in *Erdmann's Journal für praktische Chemie*, 1836 (N. F.), b. ix., s. 395.

The following cases are reported of the occurrence of silica in human urinary calculi, in small and not precisely determined proportions. Guéranger\* gives the analysis of a calculus from the bladder of a man, which was made up of concentric layers surrounding a hard nucleus, wholly composed of urate of ammonia. The remainder of the calculus consisted of phosphate of lime, triple phosphate, urate of ammonia, animal matter and some silica. It resembled a mulberry calculus, but contained no oxalate of lime. The patient passed with his urine sand having essentially the same composition as the outer layers of the calculus. In this sediment, the silica occurred in separate granules. I have not seen the original paper, but found an account in the *Annalen der Pharmacie*, 1832, b. ii., s. 107. Magnes reports in the *Journ. de Chim. Méd.* for 1836, the analysis of a human vesical calculus containing silica with phosphate of lime. A case of siliceous gravel is reported by Guibourt in the same *Journal* for 1830. These cases are cited by Robin and Verdeil.†

Traces of silica have been found by several chemists in human urinary calculi; usually accompanying oxalate of lime, and having the appearance of minute grains of sand. Dr. Yelloly‡ found one such specimen among 663 in the Museum of the Norfolk and Norwich Hospital, England, which were analyzed by him. It was a little oxalate of lime calculus from the bladder of a boy. It weighed about five grains, and contained a few minute siliceous granules. Two figures of it are given in the Catalogue of the Calculi in the Museum of the College of Surgeons, London, plate xii., figs. 8 and 9. A similar calculus, cut from the urethra of a physician, is described by Dr. Venables in the *London Medical Gazette* for April 3 and May 29, 1846. It was very rough and tuberculated, and weighed 4½ grains. It consisted of oxalate of lime chiefly, with a little uric acid, and a very minute amount of silica. Wurzer§ states that he has found silica in human vesical calculi, but in extremely small amount. Hopfe|| reports traces of silica

\* *Journal de Chimie Médicale*, 1831, t. vii., p. 225.

† *Chimie Anatomique*, t. iii., pp. 416-418.

‡ *Philosophical Transactions*, 1830, p. 418.

§ *Schweigger's Journal*, b. xxxvi., s. 324.

|| *Journal de Pharmacie*, t. xviii., p. 164.

The Boston Medical and Surgical Journal as published by

The New England Journal of Medicine. Downloaded from nejm.org at SAN DIEGO (UCSD) on July 18, 2016.

For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

in two calculi. In a single specimen in the Royal Surgical Museum of Copenhagen, Scharling reports traces in the fragments of a calculus chiefly composed of uric acid and urate of ammonia; and states that he has occasionally obtained a few grains of sand on washing calculi with rough and uneven surfaces. He believes that in such instances, the siliceous sand was not deposited from the urine, but conveyed into the bladder fortuitously. One specimen in the Copenhagen Museum, described as a siliceous calculus, is said by Scharling to consist of silica with several laminæ of mica, and to be entirely free from organic matters; leaving no doubt of the correctness of his opinion that the specimen was of mineral origin.—See *Scharling on Calculi*, translated by Dr. Hoskins; p. 81. In a case reported by Dr. Venables,\* of the passage of small siliceous calculi by a woman, there is no doubt that the physician from whom he received a specimen which he describes, was imposed upon by the patient. The other case given in his article, in which a very little siliceous sand was repeatedly passed with the urine of a female patient under his own care, appears to be a genuine one. He states subsequently in a letter to Dr. Yelloly, that the filtered urine, on standing a fortnight in a glass vessel, deposited a few minute crystals of silica on the sides of the vessel, resembling the sand found in the urine when passed.—See Dr. Yelloly's paper referred to above.

In the urinary calculi of animals, a little silica has been detected in a few instances besides those already described in this paper. A very hard concretion taken from the urethra of an ox, was found by Simon† to contain a large proportion of carbonate of lime, with a little phosphate of lime and silica. Simon states that Buchholz found silica in a vesical calculus from a horse. Landerer‡ also detected traces in an urinary calculus from a horse. The Cabinet of this Society formerly contained a little calculus from the kidney of an ox, of the size and shape of an apple-seed, which was analyzed several years since by Mr. Richard Crossley, then an assistant in the laboratory of Dr. Charles T. Jackson. He found it to "consist mostly of carbonate of lime, with a trace of phosphate of lime and peroxide of iron—some animal matter, having the odor of benzoin—also silica, from which glass was made."§ No portion of this specimen is preserved. There are now in the Cabinet three similar calculi which were supposed to have been taken from the kidney of the same ox, although some doubt existed on this point. One has the size of an apple-seed, and the others are much smaller. I have recently analyzed one half of each of these, and find no trace of silica. The analysis, which will be reported to the Society, shows a difference in other

\* London Quarterly Journal of Science, 1829, vol. vi., p. 234.

† Animal Chemistry, Sydenham Society Ed., vol. ii., p. 462.

‡ Annuaire de Millon et Reiset, 1847, p. 707.

§ Quoted from Manuscript Catalogue of Cabinet.

respects from the one examined by Mr. Crossley, and warrants the inference that they were not from the same animal.

The foregoing list might probably be extended by further search, but it includes all the authenticated cases collected from the sources of information within my reach. A few other reported cases remain to be mentioned. Allemain, an Italian apothecary, gives the analysis of an urinary calculus containing twenty per cent. of silica. There is no description of his process, and it is evident from the account of the other constituents found, that his analysis is wholly unreliable.—See “*Calculs urinaires*” in Violette & Archambault’s *Dictionnaire des Analyses Chimiques*. Boussingault\* reports the analysis of a small ferruginous mass, purporting to have been passed from the bladder of a lady. It resembled in appearance bog iron ore; and contained much peroxide of iron, with alumina, silica, lime and water. It was unquestionably an ore of iron. A case is described by Dr. N. Hill,† in which fifteen or sixteen little siliceous fragments, resembling bits of quartz, were passed by a young lady with the urine, and in part through a catheter. The circumstances of the case, and the characters of the alleged calculi, leave no doubt that the physician was deceived by his patient, and that she had herself introduced these bodies into the bladder.

In the catalogues of various large collections of calculi which have fallen under my notice, none containing silica are mentioned, excepting one in the Copenhagen Museum, already referred to, and the one analyzed by Dr. Yelloly, in the museum of the Norfolk and Norwich Hospital. It does not appear that any siliceous calculus has been subsequently added to the collection of that Hospital, which contained, at the end of 1859, the large number of 1524 urinary calculi.‡ The collection of 179 calculi in the Dupuytren Museum at Paris, analyzed by Dr. S. L. Bigelow, afforded none containing silica; one specimen examined by him had been previously reported as siliceous.§ None are reported in the published Catalogue of the Museum of the College of Surgeons, London; in 1845 it contained 649 human urinary calculi, and 57 from the lower animals, including 11 or more from the urinary organs of the ox. 35 of the 57 animal calculi, including all those known to be from the ox, were composed chiefly of the carbonate of lime. Silicic acid is a substance of so strongly-marked chemical characters, that even a trace could not be overlooked in a careful analysis. Judging from its occurrence in large amount in three calculi from the ox, analyzed by myself, it may be a more frequent constituent of animal concretions in this country than in Europe. I believe that more extended analyses will show that siliceous calculi are not so extremely rare as has been hitherto supposed.

\* *Journal de Pharmacie*, t. xi., p. 153.

† *Edinburgh Medical and Surgical Journal*, 1834, vol. xli., p. 127.

‡ *London Lancet*, Sept. 1, 1860.

§ Houel, *Anatomie Pathologique*, p. 437.



In the present paper, I have not referred to the presence of silica in intestinal calculi. Several chemists have found grains of sand in concretions from the alimentary canal, especially of herbivorous animals. Two intestinal calculi from the horse, belonging to the Cabinet of this Society, which were analyzed by myself, afforded a number of white and yellow angular grains of quartzose sand, which I have no doubt had been swallowed with the food. These calculi were chiefly composed of triple phosphate, with some organic matter.—See *Boston Medical and Surgical Journal*, 1859, Vol. LX., p. 383. Besides the accidental mixture of sand with the food or water taken into the stomach of the animal, another source may be the considerable amount of silica contained in the various grasses and cereal grains, the greater part of which passes through the alimentary canal unassimilated.

## PUS CORPUSCLES IN THE AIR!

AN AEROSCOPIC STUDY BY DOCENT DR. THEOPH. EISELT IN PRAG.

[Translated for the *Boston Medical and Surgical Journal*, from the *Wochenblatt der Zeitschrift der k. k. Gesellschaft der Aerzte in Wien*, March 26, 1861, by J. C. WHITE, M.D.]

DURING an epidemic of conjunctival blennorrhœa, which prevailed a short time ago in the Orphan Asylum at Repy, 8 miles distant from Prague, I had opportunity to learn by experience that infection may take place in other ways than by contact. Reserving for future description the particulars of this interesting epidemic, it will be sufficient for my present purpose to show its intensity by a few numerical data. Such foundlings as are given up by their foster-parents are brought to the large and newly-built institution at Repy. Among these 250 foundlings, of whom the majority are between the ages of 6 and 10, there occurred in 1860 from November to December forty-six, and in the period between the 16th and 21st of February, 1861, also forty-six cases of acute conjunctival blennorrhœa. His Excellency, the Governor of Bohemia, Count Forgach, presided personally on the 19th of February at a Council in Repy, at which Prof. Ritter von Hasner, Landesmedizinalrathsubstitut Dr. Hoser, Dr. Biermann, Director of the Hospital, and myself as house-physician, were present. and ordered the perfectly healthy children to be left at Repy, but the diseased and infected to be removed with the greatest haste from the institution. Forty-six children were found unaffected, while the newly attacked and those which exhibited merely an injection of the conjunctiva or papillary structure of the membrane without suppuration, were brought to Prague, and distributed in eight different localities. In the latter place, four fifths, and in Repy all of the children, were under my care.

It will readily be believed that as a physician I took the greatest precautions to protect myself against infection. I was par-

VOL. LXIV.—No. 20A