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A XANTHIC
OXIDE CALCULUS

From the Kidney.

BY ✓

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OF BRIDGEPORT, CONN.

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A XANTHIC OXIDE CALCULUS
FROM THE KIDNEY.

BY GEO. L. PORTER, M. D., OF BRIDGE-
PORT, CONN.

THE patient was a young lady of eighteen, in manner refined, in temper serene, in disposition gentle. Never robust, at times she had suffered from transient pains in the back, yet had been in fair health until she was seventeen, when she lost strength so rapidly, that, unable to endure the work of the school room, she had interested herself in household affairs and enjoyed the society of many friends. The father, a studious clergyman, of unusual intellectual ability, of good constitutional powers, had in 1875 and 1881 two severe attacks of nephralgia; the mother has been of delicate health from her youth; the daughter was a blonde, tall, thin, anæmic. From early life she has had occasional local pains, severe but of brief duration, which were not satisfactorily accounted for; during 1880 had several violent paroxysms in left lumbar region—a very severe one after salt water bathing. In August, 1880, as Miss B. was losing ground, without any recognized organic trouble, but with increasing lassitude and failing strength, she visited friends in England; Sept. 12th, a week after landing, she was seized with severe pain in left kidney and was seriously ill for ten days. During this time there was extensive hemorrhage, supposed to be from the kidney, and much pus mixed with the urine. She was attended by W. S. Eccles, M. D., who thought the discharge proceeded from an abscess in the kidney, caused by a renal calculus.

She returned to Bridgeport, Conn., in November, 1880, and since then has been under the care of Dr. Robert Hubbard and myself. She was not confined to the house, although she still had tenderness, and frequent pain in the left lumbar region and general debility.

Regular examinations of the urine were

made by Dr. Wright with quite uniform results. December 6th, 1880,—after standing six hours, specific gravity 1012; reaction, acid; color, pale yellow; faint trace of albumen; sediment, white and flocculent. Microscope shows pus corpuscles, and occasionally an epithelial cell from bladder. (Pus coheres in masses but does not adhere to side of vessel).

December 16th.—Specific gravity 1024; cloudy urine; pus corpuscles not quite so abundant. During January and February, 1881, had two attacks similar to the one in England, but not nearly as severe.

March 14 and 15, had nausea, restlessness, fever, severe pain over left kidney, only relieved by strong hypodermic doses of morphine, and retention of urine which required catheterization. Upon the night of the 15th there was marked relief. Examination of urine the next morning found specific gravity 1012; white turbid appearance; microscope revealed a much larger number of pus corpuscles than usual, with very many peculiar nucleated oval bodies, "granular exudation corpuscles,"* and considerable albumen.

March 19th.—Specific gravity 1020; albumen less; smaller number of pus corpuscles and none of the oval bodies. From this time the character of the urine improved but it was never entirely free from pus corpuscles. The general health was much better. During the summer spent some time at Dryden, N. Y., where she had one severe attack lasting however but a short time; no microscopical examination was then made. She gained in flesh, strength and color, but would occasionally have a feeling of weight, sometimes even a dull pain, over left kidney, and could endure no prolonged exertion.

There was no return of these attacks until October 16th, and then the attack was not especially painful, not the severe agonizing suffering of the attack in England, and of the three or four of the previous winter. From this one, however,

* Basham on Kidney, Plate x, page 279.

there was no complete relief, but for three weeks there was constant uneasiness, tenderness upon the left side, dull pain, distress. She graphically expresses her condition: "From the 16th of October, I was very miserable; my left side about the hip was drawn down so that I was quite deformed and was lame; during this period every time that I coughed, or gaped I experienced a sharp pain through my kidney, and almost constantly a dull ache."

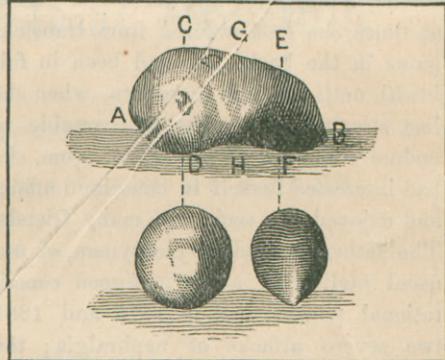
On the 11th of November there was a sudden and complete relief of all of these symptoms, and as it seemed to date from an unusual discharge from the bladder, and as the vessel used at night had been immediately emptied, it was thought that a small calculus might then have passed. In the course of a week the usual symptoms of stone in the bladder were reported and upon the 19th an exploration was made. No stone was felt and the examination was not persevered in; but the urethra was partially dilated. During the early morning of the 22nd she "had two attacks of intense irritation and pain at the neck of the bladder, one of which was just before the final release. The act of passing the stone was absolutely painless." In a few days the bladder was free from any symptom of irritation, and has so remained. Upon December 1st, 1881, the urine was of specific gravity, 1015; reaction, acid; color, light yellow; no albumen; no pus; slight mucous sediment.

The calculus weighed (3.1109 gram.) forty-eight (48) grains. The color was quite uniformly, a light shade of cinnamon brown. The surface was regular, hard, smooth but not polished. The shape was conico-cylindrical, compressed slightly so that a transverse section would not give the outline of a perfect circle; the base, a segment of a sphere, regular and blunt; the apex terminated in a scalene cone with a sharp point; the cylindrical body was zoned with a slight depression near the middle, not at right angles with the long diameter, but commencing towards

the apex and circling the stone, reached the plane of the surface nearer the base.

The stone was carefully divided near G H by a lapidary, but was so frangible that the outer layers of each half were considerably broken.

A cut is here given:



Diameter.	In's.	Centime's.	Circum.	In's.	Centime's.
A B	0.96	2.438	A B	2.40	6.096
C D	0.51	1.295	C D	1.55	3.937
E F	0.45	1.143	E F	1.45	3.683
			G H	1.50	3.810

The structure was dense, hard and brittle; the fractures were irregular; the cut surface assumes a waxy lustre when polished, and also discloses a nucleus with dark brown border, irregularly oval, with a lighter laminated centre, and from the nucleus to the circumference concentric rings of gray and light brown laminæ, so extremely thin that under the magnifying glass more than fifty layers were counted.

The calculus is believed to have formed slowly in the kidney, either occupying one of the Pyramids of Malpighi, whose tubular or medullary portion was gradually broken down forming a chronic abscess; or that forming in one of the depressions of the calyces the nucleus and the apex remained little changed, while the base was gradually increased by deposits from the urine.* The former theory of location has most probability. The zone was evidently moulded by some constriction of tissue.

*The triple phosphate of ammonia and magnesia is rarely deposited in the kidney, but it may form a coating for the other calculi, if lodged for a considerable time in the organ.—*Keyes.—Holmes' Surgery, Vol. II, P. 823.*

The belief that it is a renal calculus is founded upon the results of the chemical and microscopical examination of the urine; upon the long continuance of pain in left lumbar region; upon the absence in the early history of any prominent symptoms of bladder irritation; upon the sharp, almost needle point of the apex, which would not have formed in the free cavity of the bladder, and upon the characteristic discharge, in England, of hemorrhagic urine loaded with pus, following sudden relief of lumbar distress.

Notwithstanding the opening of the abscess, the stone probably remained *in situ*, acting as a local irritant until October 16th; at times, perhaps, with but a small drainage exit, through which the pus might ooze, and again at the time of the more serious attacks, rupturing the mouth of the sac, giving free escape to its contents. The attack of the 16th was occasioned by the bursting of the abscess and release of the calculus, which, free in the infundibula, was washed into the ureter, its transverse diameter conforming to the calibre of the canal; the apex towards the bladder. Filling, if not entirely obstructing the ureter, the apex acted as a wedge; the depressed zone tending to give to the calculus a constant revolution upon its long axis, and the blunt base receiving the pressure of water behind, each part contributing the conditions best calculated to assist progression. The tone of the fibrous and muscular coats was lowered by the same causes, which produced the general lassitude, and slowly yielding to the gentle, constant and most favorably applied mechanical pressure—for the firm stone would hold every position gained by the insinuating water—the ureter might in this way give passage to the calculus with less pain than in any other circumstances.*

* "But what is very remarkable, between the hypertrophied columns, pouches or sacs generally coëxist with *dilated* ureters, both states being produced by the same physical cause. These pouches often contain calculous concretions. In extreme cases ** the Ureters ** are both dilated and tortuous."—*Coulson*, p. 88.

Certain it is that the pain gradually departed from the lumbar region, and shifted to the hip and thigh, to the anatomical points supplied by the external cutaneous branch of the lumbar plexus, and to the region of the left ureter; that the action of the left psoas was hampered; that there was sudden and complete relief, followed in a week by new and unmistakable signs of interference with the escape of urine from the bladder. Generally the passage of gravel causes the characteristic pain of nephritic colic: that of a calculus, requires anodynes and anæsthetics*; but not always.† This stone did not pass without pain, yet did not occasion the usual agony; but it did cause, either by pressure upon the psoas muscle, or by irritating the kidney and upper part of the ureter with the confined urine, the usual symptoms of calculous pyelitis, "lumbar pains sometimes dull and continuous, sometimes pungent and darting; often extended to and becoming fixed at the crest of the ilium, or prolonged to the outside of the thigh, with numbness or some altered sensation in the course of the external crural cutaneous nerve."—*Basham*, p. 266.

In cases cited, *Basham* (*Diseases of Kidney*, p. 276–285) directs attention to the diagnostic importance of the statement of patient that "she had frequently experienced an aching pain at the crest of the ilium of that side, with a feeling of numbness extending down the thigh." Sir Astley Cooper (*Sam. Cooper's Surg. Dict.*, p. 1341) met with a case in which the chief

* The amount of pain varies according to the magnitude of the stone and its character."—*DaCosta Med. Diag.*, p. 592.

† "A small smooth stone may glide down the Ureter imperceptibly."—*Miller's Surgery*, p. 420.

* "A small smooth calculus usually causes little inconvenience."—*Gross, Vol. II*, p. 652.

"If the calculus be smooth and small, its passage down the ureter excites little or no inconvenience."—*Coulson*, p. 243.

"The calculus, if not too large, passes down the ureter into the bladder, with, in some cases, well marked symptoms of an aggravated colic; in others this is not so apparent."—*Basham*, p. 294.

pain was at the ant. sup. spinous process of the ilium. If the calculus passes through the ureter "it is of course small." (*Dorsey*, vol. II, p. 171 :) "the generality of Calculi, however, which leave the kidney are of small size." (*Cooper's Surg. Dict.*, p. 1341): and as to location of cause of pain, "Sir Astley Cooper has remarked, it is at the period when the calculus is passing over the lumbar plexus, that a great deal of pain is felt in the groin and in the course of the anterior crural nerve." If this calculus had been small, there would be no hesitancy in accepting the theory of its origin and descent, but the successful termination of the passage and the comparative freedom from the excessive pain of nephritic colic is remarkable, considering the size of the calculus, which is among the largest, if not the largest that have successfully passed through the ureter.

Dr. Macgregor (*Amer. Jour. Med. Sci.*, January, 1877, p. 120) reports a very interesting case where a calculus cairn was found in the kidney of a woman who had "voided by the ureter upwards of three hundred calculi from the size of a shot (?) to that of a large bean." (?)

Larger stones have escaped by the opening of a renal abscess and have also been found by post mortem examination impacted in the ureter, in the infundibula, or occupying the cavity of a sacciform kidney.

From its clinical history the calculus seemed worthy of honorable mention, but suddenly claimed intrinsic importance from the rarity of its chemical composition. Submitted to State Chemist, S. P. Wheeler, for examination, after an exhaustive investigation, it was pronounced a Xanthic Oxide Calculus, and the characteristic yellow precipitate returned.

DR. G. L. PORTER :

Dear Sir.—The Calculus handed me for examination consists of

Phosphate of Lime,
Phosphate of Magnesia,

Carbonates of Lime and Magnesia traces
Moisture,
Xanthic Oxide.

Chemical reactions. Heated before the blowpipe it blackened, and flew to pieces, and gave off an odor not unlike burnt lime and left considerable ash. Heated in a glass tube sealed at one end, it gave off drops of liquid, of an alkaline reaction and contained carb. ammonia. The calculus dissolved in strong hydrochloric acid. When treated with strong nitric acid it dissolved, and left on evaporation to dryness, a lemon yellow residue. A portion of the calculus was dissolved in solution of potash, filtered, and submitted to a stream of carbonic acid gas. A white precipitate was produced, which after washing, and drying, was yellowish, and gave a waxy look by friction. Dissolved in nitric acid, the solution evaporated to dryness, water added, and then potash, it became of a bright red color. Dilute sulphuric acid caused a faint effervescence from which I inferred the presence of carbonates.

The remaining portion of the fragments of the calculus was dissolved in nitric acid, evaporated to dryness, the yellowish residuum ground in an agate mortar, with caustic ammonia, the mixture thrown upon a filter, the liquid which passed through was of a bright yellowish color, and contained Xanthic Oxide in solution. The matter remaining upon the filter, was washed with distilled water and found to be phosphate of lime and magnesia.

The precipitate produced by carbonic acid did not appear to dissolve in alcohol or ether.

The amount of calculus was too small to admit of an ultimate analysis.

Respectfully yours,

S. P. WHEELER,
State Chemist of Conn.

The presence of xanthine was conclusively demonstrated, but, that it might be corroboratively established by another independent examination, it was submitted to Dr. Heineman, who wrote under date of March 24, 1882, the "calculus is a xanthine calculus, and I have examined it with much interest and care." April 12, 1882, "I send you report and have only this to add that each test, as is my habit in doubtful or interesting cases, was repeated two or three and even more times." The

full report of his very careful and satisfactory investigation is as follows :

"The calculus consists of xanthic oxide or xanthine, a large quantity of calcic phosphate, some ammonio-magnesian phosphate, traces of uric acid and calcic oxalate.

The diagnosis of xanthic oxide or xanthine was based upon :

I.—*General appearance of Calculus.*

1st. Uniform reddish cinnamon color.

2d. Its compact texture and peculiar lamination.

3d. Its waxy lustre upon friction.

II.—*Reaction to Blow-pipe.*

Crackled, split up into small pieces, which turned bluish black, and finally leaving a bluish white ash.

Emitting a peculiar nitrogenous odor, accompanied by abundant fumes, which turned red litmus paper blue.

III.—*Chemical Reaction.*

1st. Feebly soluble in hot water, imparting acid reaction.

2d. Dissolved in nitric acid, and heating in a porcelain capsule a lemon yellow residue was obtained, which became yellowish red on the addition of potassic hydrate and reddish on further heating.

3d. Soluble in alkalis.

4th. Soluble in strong hot hydrochloric acid.

IV.—*Microscopic Examination.*

Narrow elongated prismatic crystals of chloride of xanthine, obtained from solution in strong hydrochloric acid.

The presence of urate of ammonia, perhaps, could not have accounted for the abundant alkaline fumes, since the un-mixed test gave only the slightest indication of the presence of uric acid or its compounds.

Nor was there sufficient calcic oxalate or uric acid in the small and particular portions of the calculus used, to account for the decided acid reaction.

(Signed) H. N. HEINEMAN, M. D.,
Instructor in Urinary Analysis in
Laboratory of Alumni Association
of College of Physicians and
Surgeons, New York."

I desire to thank these gentlemen, not only for the care and skill of the examination, but for the professional interest shown in not injuring the contour of the specimens.

This is the eighth xanthine calculus on record ; is thought to be a better specimen than the three fragments in the British museums ; is the only one ever recognized in this country ; is the only one with a detailed clinical and personal history, and the only one, of which there is presumptive evidence that it was wholly formed in the kidney.

Xanthic oxide, whose chemical formula is $C_{10}H_4N_4O_4$ (*Gmelin, Hand'd Organ. Chem. Vol. X., p. 454.*) "would be the mono-basic acid of the radicle whose bibasic acid is uric acid," is thought to be caused by some arrest in the process, which ultimately forms uric acid, and is found :

I. In the tissues and fluids of animal bodies.

II. In Jarvis guano ; and

III. In urinary calculi.

It has been found :—

I.—1st. In the blood : H. Andrea found xanthine and hypo-xanthine in the blood of a chlorotic patient. (*German Periodical Prac. of Med., 1875, No. 29.*)

2d. In the muscles : Demant found xanthine and hypo-xanthine in equal proportions in the muscles of *famished* doves, but failed to discover them in those of the *well nourished*.

3d. In the brain : by Prof. Scherer, (*Ann. Ch. Pharm., CVII. p. 314*) ; by Städeler, (*Ann. Ch. Pharm. CXVI. p. 102*).

4th. In the pancreas : Scherer (*Ann. Ch. Pharm., CV. p. 314 ; CXII. p. 276.*)

5th. In the liver : found in the liver of oxen, and in the acute yellow atrophy of liver in man, Scherer (*Ann. Ch. Phar. CV. p. 314*), and Cloëtta (*Ann. Ch. Phar. XCIX. p. 289*).

6th. In the thymous gland : Gorup, Besanez, Scherer, Frerichs and Städeler, (*Ann. Ch. Pharm. CV. p. 314*).

7th. In the spleen : first found by Scherer, (*Ann. Ch. Phar. CVII. p. 314*) ; afterwards recognized by Städeler, (*Ann. Ch. Pharm. CXVI. p. 102*) and Neubauer, (*Jour. Analyt. Chem. Vol. 6, p. 33, 1867.*)

8th. In the urine : discovered in normal urine by Scherer, (*Ann. Ch. Pharm.* CVII. p. 315). Weiske observed a sediment of xanthine in the urine of a chlorotic ram ; (?) after allowing the urine to stand four or five days, there was only uric acid to be found in the sediment, (*Jour. of Biology*, Vol. II. p. 254, 1875). Harley states that "Maclagan (*Edin. Med. Jour.* 1851) believes he found it in the urine of an hysterical girl, and Jackson, (*Arch. d. Pharm.*, 1837,) thinks he met with it in a case of diabetes. Bence Jones, (*Jour. Chem. Soc.*, 1862,) has lately described a case in which a crystalline deposit of xanthine repeatedly appeared in the urine." By consulting Harley, (*Urine and its Derangements*, p. 201) the microscopic appearance of the spontaneous deposit of xanthine, and its crystallization with hydrochloric acid may be seen.

II.—Xanthine may be obtained from Jarvis guano by the action of nitrous acid, (*Watt's Chemistry*, Vol. V. p. 1050).

III.—Urinary Calculus. The extreme rarity of the xanthine calculus is evident from the fact that only seven previous cases have been recorded: 1st, by Marcet ; 2d, by Langenbeck ; 3d, Laugier ; 4th, Dulk ; 5th, Coles : Cooper : Taylor ; 6th, Fleming ; 7th, Gaillard.

It is impossible in our medical libraries to obtain all of the references. They are not to be found in New York, and Dr. Billings writes me from the Surgeon General's office, that "about one-half only of the books to which you wish reference are in the library." To give a satisfactory description of these calculi, I have freely quoted their history, and, where original journals could not be obtained, have used other journals referring to them.

1st. MARCET, (*Chem. History and Med. Treatment of Calculus Disorders*, London, 2d ed. 1819, p. 103 et al.) Before 1817, Dr. Babington, of London, gave to Dr. Alexander Marcet, for examination, a number of calculi, among them one whose weight was only eight (8) grains, and was "of an oblong spheroidal shape. The texture is

compact, hard and laminated, surface smooth. It is of a reddish cinnamon color. Between the red laminae faint whitish lines are perceived. When the blow-pipe is applied it crackles, splits into small pieces. * * The smell it emits is that of an animal substance and is peculiar. * * * It does not at all resemble that of the lithic acid or of the cystic oxide. When exposed to destructive distillation it crackles, splits into scaly fragments, blackens and emits a foetid ammoniacal liquor, from which carbonat of ammonia crystallizes in cooling, and a heavy yellowish oil. * * * Caustic potash dissolves this calculus very readily. * * * When the solution of the new substance in nitric acid is evaporated to dryness the residue assumes a bright lemon color. This yellow residue is partly soluble in water to which it communicates its color. The addition of an acid takes away the yellowness, but if caustic potash be added to the yellow substance, it instantly turns it to a more or less intense red color, according to the degree of dilution, and upon evaporation it assumes a brilliant crimson hue, which however disappears on adding water, the yellow color being reproduced and remaining perfectly transparent. The previous action of nitric acid is necessary for these singular changes. * * It is insoluble in alcohol or ether, * * sparingly soluble in acetic acid, * * insoluble, or nearly so, in oxalic acid, or bicarbonat of potash, or saturated carbonat of ammonia."

The examination and report exhibit an intelligent, systematic and exhaustive investigation, and the original description of a xanthine calculus by Marcet is the classical standard. The lack of material prevented other experiments, and explains the fact noted by Mr. Taylor, that "no trace of the original calculus discovered by Marcet can now (1868) be found." Coulson (*Dis. of Bladder*, London, p. 327) erroneously gives the weight of this calculus as eight ounces, instead of eight grains. If Marcet accomplished so much with

eight grains, what a quarry for original investigation would eight ounces have presented! As soon as Marcet recognized the new chemical elements of the calculus, he communicated with his friend, and requested its clinical history, but Dr. Babington could not recall, either the name of the patient who furnished the stone, or any other fact concerning it. The statement by Städeler (*Ann. Ch. Pharm.* CXI. p. 28) that "this stone was found * * by Babington in the urinary bladder of a boy" is gratuitously inaccurate. Marcet dubbed the new substance xanthine or xanthic oxide, because of its characteristic yellow color, and not because of its chemical significance, for it is a Uric Oxide.

2nd. LANGENBECK'S.—Removed by this surgeon from the bladder of a Hanovarian peasant boy eight years old; was next to the largest xanthine calculus and weighed "six drachms and a half," *Gross*. Vol. II., p. 707; "339 English grains," *Holmes Surg.*, Vol. II., p. 829; "338 grains," *Coulson*, p. 207; "was the size of a pigeon's egg and may have weighed 18 to 20 grams," (*Ann. Chem. Pharm. Liebig*, XXVI. p. 341). During the operation it was broken into three pieces; the fragments disclosed concentric laminae of brown and light brown shades; the faces being rubbed, assumed the peculiar waxy gloss, and there was a distinct, but chemically homogeneous, nucleus. In this stone xanthine was re-discovered by Stromeyer (*Ann. du Physic.*, B. 41, p. 393) found by Prof. Scherer (*Ann. Ch. Phar.*, CV. p. 314), found also by Wöhler and Liebig, (*Ann. Ch. Phar.*, XXVI. p. 341) and analyzed for the first time by them, (*Hand'd Organ Chem.*, Vol. X., p. 454, et al.).

The results of their analyses are shown in the accompanying table.

	Dried at 100°	Wöhler.	Liebig.
10 C	60	39.48	39.86
4 N	56	36.85	36.72
4 H	4	2.63	2.60
4 O	32	21.05	20.82
<hr/>	<hr/>	<hr/>	<hr/>
C ₁₀ N ₄ H ₄ O ₄	152	100.00	100.00

Harley, p. 201, states generally that "the stone broke in process of extraction, and these portions were presented by Langenbeck to our late Professor of Surgery, Mr. Liston," while another more definite account relates that "Prof. Merz, of Göttingen, sent the fragments of the calculus to Dr. Willis, one of which is in the museum of the Royal College of Surgeons, Edinburgh, and the other is in the Guy Hospital Museum." A chromo-lithographic representation of the fragment in the Royal College Museum is shown in Plate XIII, *Dr. Keyes, Holmes Surg.*, Vol. II., p. 828.

3d. LAUGIER'S.—Some minute specimens, "globular, smooth, and of dark brownish yellow color," containing xanthine have been reported by Laugier, (*Jour. de Chem. Med.*, V. p. 513) but no fragments remain. "Laugier has also examined a xanthic oxide stone." (*Chelius' Surgery*, Vol. II. p. 246).

4th. DULK'S.—"Another Calculus is mentioned by Dulk," (*Coulson*, p. 207) but I have only found this single statement regarding it given without reference.

5th. COLES: COOPER: TAYLOR.—The chemical composition of this specimen was discovered by Mr. Thomas Taylor in 1866, and made the subject of a special report to the Pathological Society in 1868. Briefly, "owing to small size of calculus, and its great rarity, I did not feel justified in submitting it to further chemical examination than was sufficient to identify it. This calculus of which the college (Royal College of Surgeons, England,) possesses one-half, the other being probably (?) in the museum of Guy's Hospital, was presented to the college in 1851 by the late Mr. Bransby Cooper * * * to whom it had been given by Mr. Geo. Coles, a surgeon in the service of the East India Company; it was extracted by him from the bladder of a Mussulman child, aged four years." The memorandum, with the stone, stated: "ordinary symptoms; calculus easily detected; operation lasted twenty minutes"; des-

cribed by Cooper, (*Guy's Hospital Reports* 1851) as consisting of a peculiar red tinted uric acid, mixed with urate of ammonia, and containing layers of oxalate of lime, with traces of earthy phosphates." Mr. Taylor, however found that it consisted of nearly pure xanthine, and the general appearance and structure closely resembled the description given of the calculi by their discoverer, the late Dr. Marcet. When entire it weighed ninety grains; it is made up of three concentric layers, closely aggregated, so that its cut surface presents a compact surface; it possesses the peculiar flesh, or reddish, cinnamon tint, which seems to be characteristic of these conerctions. Its nucleus is however of a yellow tint, but I could not detect the presence of uric acid in the nucleus. Since the discovery of this species of calculus in 1817, only two other specimens have been placed on record: namely, that extracted by Prof. Langenbeck and the present specimen. The close similarity in composition, which exists between uric oxide (xanthine) and uric acid would lead to the conclusion that these substances might frequently be found mixed together in the same calculus. I have, however, submitted to careful examination several uric acid calculi, which from their external characters might be supposed to contain xanthine, but hitherto without success."—*Path. Soc. Trans.*, XIX. p. 275.

6th. FLEMING'S.—About October 1864, "a gentleman of middle age, of full athletic frame, suffered for some time from irritability of bladder. At times there was interruption in the current of urine and the perineal discomfort was so great that he could not sit erect on a chair, but was obliged to place himself on its edge. One day in standing up from this position, he heard some solid material drop on the floor, and on searching for it, he found lying near his chair a small, brownish colored substance, about the size and shape of a garden pea. It was solid and rough, and from its resemblance to a urinary cal-

culus, which he had previously seen, the gentleman gave it to me, and asked if it could have escaped from his urethra without his knowledge. At the time he had no additional urinary distress, but subsequently he was free from his former sensations, and has had no return of them since. This body on subsequent examination proved to be a xanthic oxide calculus. The examination was made by Dr. A. H. Hassall. After recounting the usual tests he reports that the only particulars differing from the recorded action of xanthine with reagents, were "its solubility in hot alcohol, and in the aqueous solution of the nitric acid residue furnishing, on evaporation, a brownish yellow, in place of a blood-red or carmine residue, as usually described. Its solution in caustic potash did yield, on evaporation to dryness, a product of a pink or carmine color. The quantity of the calculus now remaining is too small to allow of an ultimate analysis being made." (*Fleming's Injuries and Diseases of the Genito-Urinary Organs*, 1877.) From this closing statement, and from the fact that its present location is not of record, I judge its value as a specimen was destroyed by the examination.

7th. GAILLARD'S.—*Gazette Hebdomadaire*, No. 16, April 18, 1873. Dr. Gaillard removed by perineal section, from a boy of thirteen, a calculus which weighed 22.50 gram., (347.17 grains) and measured five (5) centimeters (about two (2) inches) in its longest diameter. "It had the appearance of a sphere studded with large tubercles, which made it resemble one of those antique hatchets which are depicted upon the panoplies of our museums. Its color was brick-red, resembling that of old mahogany; it broke readily under strong pressure. The forceps employed in drawing it from the bladder, had torn the extremity of its knops. Divided, this calculus disclosed two pieces of a reddish brown, susceptible of a very fine polish, veined with concentric lines, which were quite regular towards the centre, but becoming

sinuous as they approached the periphery, and consequently indicating how this calculus, developing itself asymmetrically had acquired the irregular outline which it presents." Detailing the examination he concludes: "This calculus was therefore composed of xanthine, of which it presents all the reactions. The only regret is that a microscopical examination, and a quantitative analysis were not made in this case." On account of this regret, of a statement regarding the analysis, "its substance reduced to powder"; of the fact that a photograph, and not the stone itself, was shown with the report, and that no mention was made of present location or intended destination, I am inclined to think no specimen of this calculus remains.

The clinical points regarding xanthine are the statements by Dunglison, (*Med. Dict.*, p. 1079) that it is not discovered in healthy urine, although probably bearing

some relation to the yellow coloring matter; by Dürr, (*Jahresb.* 1865, p. 675) that its presence in human urine—where there is naturally about $15\frac{1}{2}$ grains in 600 pounds (*Neubauer*)—is promoted by the use of sulphur baths; by Thudicum, (p. 4) that the lemon yellow color (of urine) some times met with in cholera, or in spinal disease, is due to the presence of an excess of uro-xanthine; by Maclagan, Jackson and Bence Jones, before referred to, relating respectively to its presence in hysteria, diabetes, mollities ossium; of Vogel, (*Harley*, p. 200) that it is much increased in cases of enlarged spleen, and also in acute atrophy of liver, and of Wilson, (*Dis. of Skin*, p. 606) regarding its presence in the xanopathia, lentigo and chloasma. The yellow discoloration of skin by nitric acid might be caused by the xanthic element of the tissues.

N. B. A Tabular Recapitulation of all the recorded Xanthic Oxide Calculi will be found on the following page, folio 354.

TABULAR RECAPITULATION. XANTHIC OXIDE CALCULI.

Name.....	1. Marcet.	2. Langenbeck.	3. Langier.	4. Dulk.	5. Coles: Taylor.	6. Fleming.	7. Gaillard.	8. Porter.
Date.....	1817.	About 1820.	*No Record.	No Record.	1851.	1864.	1873.	1881.
Size.....	Pigeon's egg.....	No record.....	No record.....	No record.....	Garden pea.....	Long diameter..... 5 Centimeters.....	Diameters..... 3.934 Centimeters..... 1.143 4
Weight.....	8 grs..... 0.519 gms.	388. grs . 21.2509 gms.	No record.....	No record.....	90 grs..... 5.083 gms.	No record.....	347.17 grs. 22.50 gms.	48 grs..... 3.1109 gms.
Where Found.....	No record.....	Bladder.....	No record.....	No record.....	Bladder.....	Bladder.....	Bladder.....	Kidney.....
How Obtained.....	No record.....	Operation.....	No record.....	No record.....	Operation.....	Passed without pain.	Operation.....	Passed without pain.
Patient—Sex.....	No record.....	Male.....	No record.....	No record.....	Male.....	Male.....	Male.....	Female.....
Age.....	No record.....	8 years.....	No record.....	No record.....	4 years.....	Adult.....	13 years.....	20 years.....
By whom examined.	Marcet, Wollaston and Prout.	Stromeyer, Wohler & Langier (?). Liebig, Scherer and others.	No record.....	Dulk (?)	Taylor.....	Hassall & Grimshaw Gaillard (?).	Wheler and Heine- man.....
Present Location.....	No record.....	Fragments in Guy's Hospital and Royal College of Surgeons, Edinburgh.	No record.....	No record.....	Fragments in Royal College of Surgeons, England, and perhaps in Guy's Hospital.	No record.....	No record.....	One-half in United States Army Medical Museum, and one- half in Jefferson Col- lege Museum. †

* No Record *only means* that I have found no record. That the two (Nos. 6 and 8), xanthic oxide calculi, the only specimens which passed naturally, occasioned in the urethra *no pain*, may be merely a coincidence, or may have clinical importance, if corroborated by future experience.

† The specimens of this calculus are still in my possession, but will ultimately be given, one to the Army Medical Museum at Washington, and the other to the Museum of Jefferson Medical College, of Philadelphia, my *A. Ina Mater*, where I hope they may be of use to many.

BRIDGEPORT, COXN., April 29, 1882.