Under what conditions urine is poor in mineral salts we are not in every instance prepared to say. It is known that chlorides are diminished in various gastric disorders, and that in chronic interstitial nephritis the amount of phosphate in urine is below normal. Again, the increase of acidity by internal administration or production of acids may change the character, although it does not decrease the quantity, of the urinary salts.

The pigmentation of the urine is dependent on profound and at present not well-understood metabolic processes, and is derived more or less directly from the pigment of the blood, bile, and perhaps from the suprarenals. It is relatively low in dilute urine and in diabetes, and appears to suffer absolute reduction in other conditions which have not been carefully studied.

A high percentage of uric acid may be (*a*) relative, from the concentrated character of the urine, or (*b*) absolute, from its increased production in the body. The older view that uric acid originates from suboxidation of albuminous constituents of tissues is not supported by experimental or clinical evidence. It is now generally admitted that it is an end product of the destruction in the body of nucleins, either of body cells or perhaps of the food as well. Increase of uric acid, then, results (1) from the administration in undue amounts of nuclein in food, (2) from an increase of those physiological catabolic processes that result in nuclein decompositions, and (3) from pathological catabolic processes that accomplish this result. Uric acid in health appears to come chiefly from foods and from leucocyte destruction incident to the function of these migratory body cells, or at least it seems to be variation in these two sources in the great majority of instances that determines the usual variations in uric-acid excretion. This physiological process is augmented by those pathological states which bring about undue leucocyte activity, as, for example, many acute diseased conditions, leukæmia and certain other blood diseases, malignant growths, and auto-intoxications such as the digestive auto-intoxications that are frequently seen in neurasthenia. Pathological processes in which uric acid is formed from local cell necrosis appear to be the cause of the biurate production in various localities in gout. The urate passes into the blood and ultimately to the urine.

Of these four conditions leading to uric-acid separation, the acidity of urine is probably the most important factor. Uric acid is only slightly soluble in urine. With its continuous production in the body and with so many factors interacting to produce its separation from the urine, it is not surprising that the formation of concretions of this substance is more frequent than that of other forms of urinary stone. Uric-acid crystals have sharp edges and points, and thus tend to be more or less irritating, for which reason it appears that they are especially capable of giving rise to those conditions of irritation of the urinary tract by which the albuminous substances are introduced that we have seen to be essential to the aggregation of the crystallizing material.

Uric-acid calculi vary in size from a grain of sand to a goose egg. The surface is usually smooth, sometimes granular, while the color is yellow or red. They are moderately hard and may be quite irregular in shape, owing both to the shape of the cavity wherein they are contained and to the restricted attrition from motion. They originate in the pelvis of the kidney, but may pass to the bladder, usually causing the violent and paroxysmal pain of renal colic. In the latter cavity they may increase in size by the further accretion of uric acid, or they may enter into the formation of mixed calculi, mention of which will be made below. The formation of uric-acid calculi is most frequent in children and in the aged.

Urates are rarely the principal ingredients of urinary stone, such calculi being observed almost exclusively in children. The urate infarcts of the newly born may form true stones in the substance of the kidney, but most urate calculi are found in the pelvis or the lower part of the urinary tract. They are moderately soft, rarely large, and are grayish yellow in color.

Urates ordinarily separate from urine as a copious deposit, usually amorphous but occasionally crystalline, and are tinted a brick-red color by uroerythrin, their separation being dependent solely on their solubility and not on such a variety of conditions as we have seen to determine uric-acid precipitation. Consequently urate deposits are nearly always observed in concentrated urines. If the urates are increased by systemic conditions which have already been considered in connection with uric acid, the tendency to precipitation is thereby increased. Usually sodium is the base present, perhaps together with small amounts of potassium and ammonium, and even traces of calcium and magnesium. The ammonium salt is much more apt to deposit in urines which have undergone ammoniacal fermentation, separating as spheroidal clumps with projecting spines. The

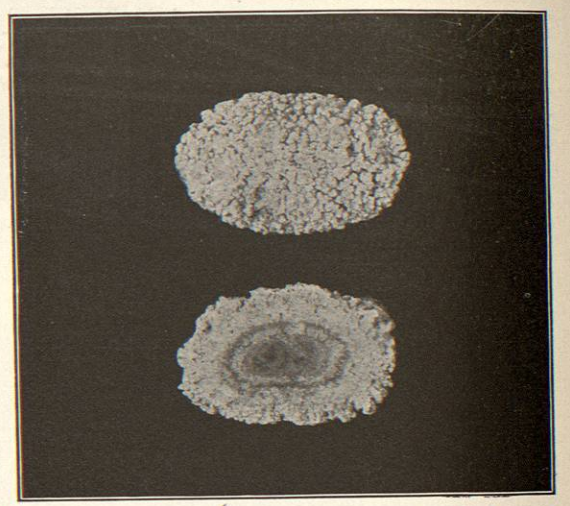

FIG. 1483. — Calculus of Calcium Oxalate. External view and section. (Natural size.)

aggregation of the precipitating urates into calculi is apparently subject to the same conditions as determine the formation from other constituents.

Calcium oxalate forms the hardest of all urinary stones. They are rarely large, are more or less spheroidal in shape if single, facetted if multiple, and have either a rough, tuberculated surface, giving rise to the name of "mulberry" calculi, or less often they are small, rounded, smooth bodies known as "hempseed" calculi. They are usually dark brown or black, but may be light in color and may form in acid urine about a nucleus of epithelium or more commonly uric acid. Amorphous urates and phosphates may be deposited between the tuberculations. They have been found in the secreting substance of the kidney, but are usually formed in the pelvis, from which locality they may pass to the lower urinary tract. They probably never occur excepting in patients with oxaluria, a diathetic condition existing in certain neurotic states, particularly those associated with indigestion, and which, I believe, is always dependent on digestive disturbance. With the exception of the physiological oxaluria following the administration of oxalate in the food, it is probable that oxalic acid is formed in part or wholly from food in alimentation, chiefly from carbohydrates, by bacterial activity. Thus the administration of undue amounts of cane sugar is in certain individuals followed by the appearance of a copious deposit in the urine of crystals of calcium oxalate. It is further noticeable that such individuals are apt to suffer from hyperchlorhydria, an important connection when it is remembered that certain bacteria, including the colon bacillus, which tend to

produce putrefaction of proteid matter in neutral or slightly acid media, direct their activities chiefly or wholly to the fermentation of carbohydrates in more strongly acid solutions.

Phosphatic concretions occur next in frequency to uric-acid calculi. They are composed of calcium phosphate, ammonio-magnesium phosphate, or both; are nearly always vesical in origin, and are usually formed in ammoniacal urine. For this reason they, together with other calculi dependent upon this urinary change for their formation, are spoken of as secondary concretions, in contradistinction to the primary calculi that separate in urine which has not undergone alkaline fermentation.

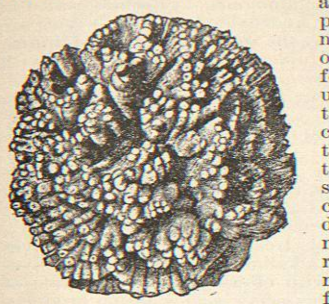

FIG. 1484.—Coral-Shaped Stone from the Bladder, Composed of Oxalate and Phosphate of Calcium. (Natural size.)

Phosphates are normal constituents of urine, in which they exist as soluble salts of the alkalies (about seventy-five per cent.) and salts of the alkali earths, calcium and magnesium; they are soluble only in acid urine. It is this latter portion that tends to separate, not, however, from the presence of an excess of phosphate or of calcium and magnesium, or from a concentrated condition of the urine, but owing to the absence of acidity of this fluid. In cystitis, for example, in which the urine is ammoniacal from decomposition, phosphates of the alkali earths are precipitated; and since this pathological state is so generally associated with vesical irritation, the condition is favorable to the agglutination of the separating phosphate into calculi. From what has been said it is apparent that the introduction of calcium into the body, as in the use of hard drinking-waters, can have no influence on the formation of these urinary concretions, as was at one time supposed to be the case.

The ammonio-magnesium salt, the so-called triple phosphate, is commoner in calculus formation than calcium phosphate, although calculi composed exclusively of the former are uncommon. Those occurring are not as a rule of marked size. Being formed in ammoniacal urine only, they are vesical in origin and frequently complicate cystitis.

Calcium phosphate only occasionally forms unmixed concretions. The structure of the latter may be compact or spongy. Two forms occur: 1. Round or oval, varying in size from a small bean to a hen's egg. They have a white, chalky appearance and break with an amorphous fracture. They are of vesical origin, and are more frequent in elderly people, especially dyspeptics. 2. Irregular, sometimes branched, usually of a grayish-white color, compact in texture, brittle, and with a porcelain-like fracture. They are usually found in cysts and pockets of the urinary tract and seem to be of local origin.

By far the most common phosphatic calculi are those of the mixed variety containing both calcium phosphate and triple phosphate; these calculi often attain a large size. Under the blowpipe they fuse to a black, enamel-like mass, and hence have been termed "fusible calculi." They have a grayish-white color, are friable and somewhat spongy, and are often composed of concentric laminæ. The outside and fracture surfaces may present bright, glistening points, triple phosphate crystals. They usually form about a nucleus of different composition.

Phosphatic calculi are exceptionally formed within the urethra, in which locality they are most frequently observed in infancy and after middle age. Their common seat is in the bulbo-membranous and prostatic regions and in the navicular fossa; they rarely form behind a stricture, but rather in urethral pouches and diverticula. The growth from incrustation is backward. As they increase in length they may be segmented by fracture, eventually forming a row of calculi that articulate with one another. There is usually a constriction at the vesical neck back of which the growth may extend in the bladder in any direction, the calculus eventually becoming mushroom-shaped or taking on the appearance of two nodules connected by a bar.

In pyonephrosis, in which ammoniacal fermentation of urine occurs in the pelvis, there is the same tendency to the formation of phosphatic calculi as when this change occurs, as it more commonly does, in the bladder.

Calcium carbonate calculi, which are so often found in other parts, are rarely found in the urine of man, but occur more frequently in herbivora. When found they have been multiple, small, weighing hardly more that 2 or 3 gm. each, with a smooth surface and resembling somewhat calcium oxalate stones, being hard and lamellar in structure. They are usually round, often translucent, and on section present numerous concentric lines and a multiple nucleus. On crushing they break into sharp fragments.

Cystin calculi occur but seldom. They are of primary formation, have a smooth or rough surface, are white or pale yellow, have a crystalline structure, and vary in size up to that of an egg. They are not very hard, but break with a crystalline fracture. On section they present a radiated surface of yellow color which turns gray on exposure to light. The occurrence of cystin is pathological. There appears to be a peculiar putrefaction within the intestine in cystinuria, leading to the formation of cadaverin and putrescin. Whether this is connected with the formation of cystin is uncertain but probable. During the formation of a cystin calculus, the characteristic hexagonal crystals of cystin are usually found in the urinary sediment. There appears to be a tendency to the formation of cystin calculi in members of the same family.

Indigo concretions have been met with in the urinary passage in one or two instances. The material for such a stone is derived, presumably, from the indican of the urine. This substance, which is indoxyl potassium sulphate, originates from indol, a product of the putrefaction of albuminous matter, usually in the intestines, and on oxidation readily yields indigo. In certain chronic diseased conditions within this organ it is continuously increased in the urine many times the usual amount.

Urostealith calculi consist of fatty matter in an amorphous or crystalline condition. Their occurrence is so exceedingly infrequent that their existence has been questioned: thus, Krukenburg found that what appeared to be a fatty concretion consisted in fact of paraffine derived from a paraffine bougie. That they do exist the writer is prepared to affirm from the fact that in a case in which one was passed he afterward found another at necropsy embedded in the tissue of the cystic kidney. Horbaczewski has recently analyzed one as follows:

Water	2.5 per cent.
Inorganic solids	0.8 "
Organic solids insoluble in ether	11.7 "
Organic solids soluble in ether	85.0* "

* 51.5 per cent. fat acids (stearic, palmitic), 33.5 per cent. neutral fat (myristic), trace of cholesterin.

At the temperature of the body these calculi are soft and elastic, for which reason they do not produce colicky pains when passing through the ureters. At ordinary temperature they are brittle, soft, have an amorphous or glassy fracture, and are translucent.

Xanthin calculi are exceedingly rare, less than a dozen being recorded in the literature. Their occurrence has been confined to young subjects. The calculi observed have been either pure, or mixed with uric acid, which xanthin so closely resembles. The size has varied from a pea to that of a hen's egg, and the color from whitish to dark brown. They have a medium hardness, amorphous fracture, and on rubbing take on a waxy appearance.

Calculi composed of *fibrin, blood,* or *inspissated albumin* are mentioned as having been met with in urine. They have a glassy fracture. Their occurrence must be regarded not only as unusual, but as anomalous.

In the description of the various urinary concretions very little has been said of the formation of mixed calculi. As a matter of fact, calculi are not commonly composed of a single constituent. The location of their formation and growth and the attending conditions upon which their formation depends so change from time to time that different substances enter into their structure, and the result is the formation of mixed calculi. Uric acid and calcium oxalate most frequently form calculi consisting exclusively of one ingredient; on the other hand, calculi composed of separate and alternating layers of these two substances are the most common example of the so-called "alternating" calculus.

The different deposits may be primary, primary and secondary, or secondary. They almost invariably have a central nucleus, while the substance of the calculus, the body, may be surrounded by an external layer or crust which is nearly always phosphatic. The nucleus varies in composition and in size. It may not differ from the body, especially in primary calculi, and on the other hand may even consist of bits of tissue, as blood clots, epithelium, or inspissated mucus. Exceptionally, foreign bodies which have found their way into the bladder become nuclei (Fig. 1485). A calculus was recently observed in which the nucleus was a snake's tail which a patient had been advised to pass into his urethra for the cure of a stiffened right arm. A form of mixed calculus that is very common is the phosphatic concretion that results from ammoniacal urine. A primary calculus, entering the bladder, or exceptionally forming within this organ, there produces such vesical irritation as eventually to give rise to cystitis with ammoniacal fermentation of the urine leading to the deposit of phosphate upon the primary formation.

FIG. 1485.—Pin Forming the Nucleus of a Calculus Composed of Calcium Phosphate, Uric Acid, and Dried Blood. (Natural size.)

EXAMINATION OF URINARY CALCULI.—Before proceeding to the analysis it is always well to record the color, hardness, appearance on section or fracture, and perhaps the specific gravity of the specimen. The appearance of a powdered or fractured portion under the microscope may also be of value. In the case of mixed calculi, each layer should be examined independently. The chemical analysis may be conducted as follows:

Heat a small portion of the powder on porcelain or platinum.

A. The material burns away, leaving little or no residue.

1. It melts, burns with a smoky flame, emitting an aromatic odor. It is soluble in ether, the ether leaving a fatty residue on evaporation. It is soluble in potassium hydroxide. *Urostealith.*

2. It gives off purple-red vapor. The material is soluble in sulphuric acid with the formation of a blue color, the solution showing a band before D in the spectroscope. *Indigo.*

3. It gives the odor of burning feathers. The material responds to tests for proteids: *e.g.,* Millon's, xantho-protein. *Albumin, fibrin, blood.*

4. A fresh portion, when treated with hydrochloric acid, dissolves completely.

(*a*) Also soluble in ammonia. Filtration and evaporation to remove ammonia produce a separation of hexagonal crystals. These may also be obtained by acidifying the ammoniacal solution with acetic acid. *Cystin.*

(*b*) Dissolve a fresh portion in nitric acid, evaporate to dryness in a porcelain dish over a water bath, moisten yellow residue when cool with potassium hydroxide, and an orange-red color is produced which becomes reddish violet when heated. *Xanthin.*

5. A fresh portion, when treated with hydrochloric acid, does not dissolve completely. Filter and test the filtrate as described under 4.

(*c*) After washing the residue on the filter, dissolve in nitric acid and evaporate to dryness. The yellow residue turns red when exposed to the vapor of ammonia, and the addition of potassium hydroxide produces a bluish-violet color which disappears on standing. *Uric acid.*

(*d*) In addition to the test for uric acid, the fresh material gives reactions for ammonia, *e.g.,* when heated in solution with potassium hydroxide, ammonia fumes are given off as recognized by the smell, bluing of red litmus, and production of white fumes with a rod moistened with hydrochloric acid. *Ammonium urate.*

B. The material may or may not blacken and leaves a considerable residue.

6. The original material dissolves completely in hydrochloric acid.

(*e*) With effervescence. The solution made alkaline with ammonia yields a white precipitate on the addition of ammonium oxalate. *Calcium carbonate.*

(*f*) Without effervescence.

(1) The ignition residue, treated with water, dissolves in part to a strongly alkaline solution and dissolves wholly in acetic acid with effervescence. Addition of ammonium oxalate to this acetic-acid solution produces a white precipitate. *Calcium oxalate.*

(2) The ignition residue, treated with water, does not dissolve in part to a strongly alkaline solution. It dissolves in acetic acid without effervescence. If the nitric acid solution of the original material is added to an excess of ammonium molybdate solution in nitric acid a yellow precipitate is formed when the mixture is warmed. *Phosphate.*

The solution in acetic acid obtained above or of the original material yields a white precipitate on the addition of ammonium oxalate. *Calcium phosphate.*

The filtrate from the calcium oxalate yields a precipitate when rendered alkaline with ammonia. The original material, when moistened with potassium hydroxide, does not give reactions for ammonia. *Calcium and magnesium phosphate.*

The above reaction for ammonia is strongly positive and magnesium is present. *Ammonio-magnesium phosphate* (triple phosphate). If calcium is present as well there is an admixture of calcium phosphate.

7. The original material does not dissolve completely in hydrochloric acid.

Uric acid is present and may be tested for in the residue by the murexide test described in 5 (*c*). When a platinum wire is moistened with the hydrochloric acid solution and then introduced into a Bunsen flame, a yellow coloration of the flame is produced owing to the presence of sodium. *Sodium urate.* Traces of potassium urate and even the ammonium, calcium, or magnesium salt may be present.

(Note.—The application of the foregoing scheme to the analysis of mixed calculi may call for such slight modifications of the procedure as will be apparent.)

E. E. Smith.

CONDURANGO.—The bark of *Marsdenia Condurango* Nicholson, syn., *Gonolobus Condurango* Triana (fam. *Asclepiadaceæ*). This plant is a medium-sized, milky-juiced, woody twiner of Ecuador and neighboring parts of South America. The bark was introduced as a specific for cancer, due apparently to the loose application of this term, in South America, to various minor ailments. Its trial resulted in disappointment, notwithstanding that it produces some favorable results as an alterative, in cancerous as in other diseases. Besides containing a considerable amount of resin, *condurangin* has been described as an amorphous, yellowish glucoside. This is now believed to consist of a mixture of two or more glucosides, which are similar in action, producing incoordination and loss of movement. Their therapeutical application has not been demonstrated. They are soluble in both water and alcohol. Condurango is an excellent stomachic, though only mildly bitter. Weak alcohol is the best menstruum. The average dose is 2 gm. (gr. xxx.).

Henry H. Rusby.

CONDYLOMA.—Condyloma is defined by Unna as "a pure acanthoma, appearing isolated around the mucous openings and on moist and seborrhœic areas of skin, and tending to extend superficially." The word is here used in this limited sense, and indicates only those growths known as condyloma acuminatum. It thus becomes the name of a distinct pathological formation. The employment of the same word to designate certain syphilitic lesions (condyloma latum) is to be discouraged, except when it is properly qualified. The careful study of the histogenesis and histology of condylomata has demonstrated the incorrectness of employing papilloma as a synonym for condyloma. The formation is not a papilloma proper, the papillæ being secondarily altered by the proliferating epithelium. In the following description we have adhered quite closely to that given by Unna as representing the results of the most recent and reliable study. The growth begins as a small elevation, which later may become divided by furrows and depressions, giving when extreme a cauliflower appearance. They are usually located upon the external genitalia in either sex, or about the anus, and most often follow a chronic irritation from an inflammation of the urethra, ulcers, decomposition of the preputial secretion, etc. Bumm demonstrated that the previous idea that the gonococcus was the essential etiological agent was incorrect. He showed that they occur without gonococci being present. Kranz had apparently demonstrated the possibility of transferring portions of the lesion or its secretion with a subsequent development of condylomata at the site of introduction. This has been denied by Petters and Güntz, and they have been sustained by the experimental results of E. Bumm. Bumm found that long-continued chemical or mechanical irritation may cause the lesions, but insists upon the necessity of a predisposition being present also. If a specific agent is present, its nature is still unknown. The growth tends to extend locally by direct extension, especially in a serpiginous manner, following the folds where surfaces come in contact. In this way large tumor masses are produced, which show no tendency to become limited or to disappear spontaneously. The skin upon which they develop is usually previously altered by suppuration, eczema, seborrhœa, etc. The color depends upon the tissue where they are found during the early stage. Upon the skin they are yellowish-white, upon mucous membranes red. Later the degree of cornification determines the color, the red condyloma upon a mucous membrane becoming yellow.

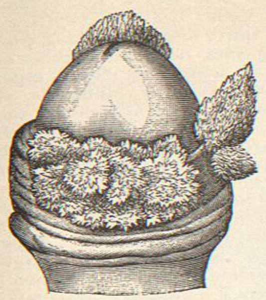

FIG. 1486.—Pointed Condylomata upon the Prepuce and Glans Penis. (After Grünfeld.)

Unna distinguishes two histological stages. In the first there is a patchy thickening of the epithelium, with a depression and flattening of the underlying papillæ. There then becomes apparent, as a very fine point macroscopically, a button-like projection of epithelium. The growing epithelial ridges do not penetrate deeply nor depress the base of the papillary body, but they are rather elevated by the papillary body which becomes more and more swollen. The surface elevation is at first mostly dependent upon swelling of the cutis, but later the epithelium is greatly in excess. While the elevation and growth in size are due in part to changes in the connective tissue, the epithelium alone is active in the formation of the lesion. Differences in resistance at various points in the cutis are factors in determining the form of the growth, but this is only in a passive way. Many minute elevations occurring at the same time cause the surface to appear finely granular.

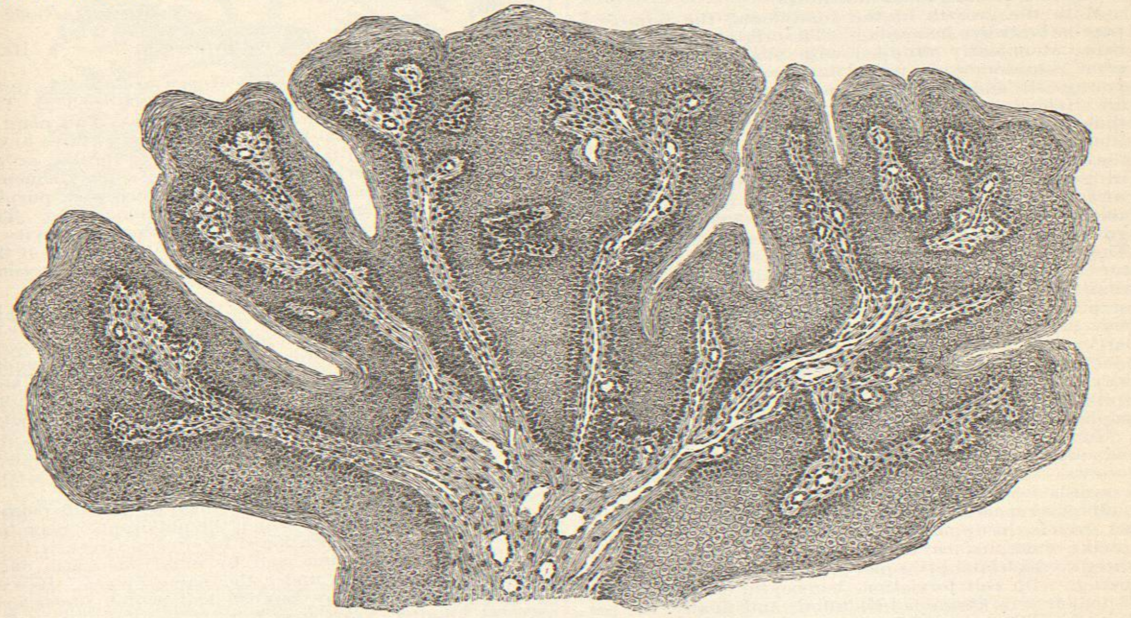

FIG. 1487.—Longitudinal Section of a Non-Specific Condyloma, Consisting of a Primary and Several Secondary Papillæ. The three layers—the horny, the epithelial, and the fibrous with its blood-vessels and lymph channels—are also represented. At the centre of the middle papilla and at the upper extremity of that to its right are seen transverse sections of the fibrous layer of tertiary papillæ arising from them. (From an original drawing by Dr. James M. French. Magnified about four hundred diameters and reduced.)