1856
Charles A. Reed
Edinburgh

S. Henderson

THESIS.
The healthy and morbid ingredients of the urinary secretion.

The study of the urinary secretion as a means of diagnosing important disease advancing in the system is of very recent date. For many ages, this branch of medical inquiry lay completely overlooked and neglected. Physicians have long availed themselves of the knowledge to be derived from an examination of the other excretions of the economy, in forming their opinions as to the cause, nature, and cure of the various diseases which came under their notice, but they were to a very great extent ignorant of the great and invaluable source of information to be drawn from a careful study of that secretion, which in these modern times is receiving a measure of attention more worthy of its paramount importance.

The value of a thorough acquaintance
With the constituents of the urine in health and in disease must be apparent to every well educated medical man, when he considers that the kidney is the most important excretory part of the body. Constantly engaged in separating the effects and poisonous matters from the blood, it is evident, that any interference by whatever cause, with the due performance of its functions, must inevitably entail a train of most disastrous consequences on the system generally.

I have chosen the urine as the subject for my thesis, not from any idea that I am in a position to throw any farther light on its pathological bearings, but merely because I believe I cannot devote any attention to a subject of more importance and interest, bearing as it does, so strongly on the everyday practice of the medical man. I shall endeavour, in the following pages, to make a few remarks, in the first place, on the characteristics of ordinary healthy urine, and then some observations on the physical and chemical condition...
of that fluid as secreted by disease.

In the higher class of animals the urine is secreted by a new complication organ, essentially consisting of new excretae tubes plentifully furnished with blood-vessels. These tubes converging to the pelvis of the kidney, empty their contents into the expansive extremity of the urerter, by which duct the urine is ultimately conducted into the muscular vesica preparata for its reception.

This hollow organ, the bladder, is inculcement with the power of preserving unchangeable the contained fluid, a power dependent seemingly on the integrity of the spinal and sympathetic system of nerves, as an injury of these organs is followed at no long interval by decomposition of the urine. The urine flows slowly into the bladder, drop by drop, and is expelled with great force when the painful sensation produced by the increasing distension prompts the individual to evacuate the organ.

In the lower orders of animals a fluid analogous to that of the higher vertebrata is generally
generally found, secreting by an arrangement of a more simple construction. Insects are formed furnished with long connective tubes opening into the intestinal canal below that dilated portion believed to be the stomach. That these serve to eliminate the elements of a urinary secretion is shown by the fact that they contain uric acid, a constant ingredient of that secretion.

Dr. Mollusca for distinct urinary apparatus can be made out, with the exception of certain glandular sacs in which urine acid can be detected.

Consistently with health, considerable deviations from the perfectly normal transparency of the urine may exist. The true-yellow colour of recently passed urine, once before its temperature has diminished much, may be noticed to be a pale amber. In these circumstances, also, it has an agreeable, faint, aromatic colour, which, however, on the urine cooling, is superseded by the peculiar pungent one known familiarly as the urinous. This after an interval of
clap give place to the fother odour, pro-
cuced by active decomposition and per-
refaction of the fliocese. In the state of
health, when the fliocese is voiceless, it
is perfectly limpid, and should present
no turbidity until it has coagulated. When
opacity is perceived during its evacuation
at the temperature of 95° or 100°, disease
of more or less gravity is to be presumed.
The taste of the normal secretion is
rather bitter once tasted, and not at all
agreeable.

In carnivorous animals, the urine has
a decidedly acetic reaction when first
passed. It is only when the development of
ammonia has been brought about by
decomposition, that an alkaline character
is to be observed. In herbivora, on the other
hand, the secretion is distinctly alkaline
from the first; a fact, according to,
accounting to M. Bernard, by the peculiarities
in the diet of the two classes of anim
als. In support of this doctrine, he adduces
experiments which show, that carnivorous
animals when fed on vegetable exhibit
(alkalinity)
alkalinity of urine, and that acidity of the secretion is produced in herbivora.
when restricted to an animal diet.

There are two very distinct samples of urine to be distinguished, namely,
the "urina sanguinica" and "urina Potis."
The former corresponding to that secretion after an interval of fasting, the latter
after the reception of a meal. The former
is that best accepted, from its uniformity,
in clinical observation and experiment.

Even this, however, exhibits so many vari-
ations, modifications that, almost for two
observers an uniformity stating precisely the
same facts regarding it. The deviations are
so excessive that the extremes of specific
gravity have been given at 10.05 and 10.33.
The specific gravity of a secretion like
the urine, obviously, must be liable to
innumerable variations, since every change in
the relative amounts of the solids and
fluids in the diet, must be attended by
corresponding alterations in the density
of that secretion. The temperature of the
surrounding atmosphere, also influence
to a great degree the specific gravity. Hot weather, violent exercise, large meals of pork, froe, and want of sufficient exercise in the day, all contribute to increase the density, while force abounding in liquors, secretory occupations, and close weather diminish it. The latter effect seems to be produced, also, by the use of acids and alcoholic liquors. Grous gives as the average specific gravity 1015 in winter, and 1020 to 1025 in summer. Sirnov, again, state the average as not more than 1012, but that is probably too low. On the whole, Grous's estimate, taking all seasons of the year, at 1020, may be accepted as the most probable. It is shown in females than in males, and that of young men is higher than that of men advanced in years.

The variation in the quantity of the urine, as so manifest, as we have seen those of the specific gravity to be, and these variations depend for the most part on the same causes. The average amount daily excreted, may be taken
at 35 ounces. Curious idiosyncrasies are met with in regard to the amount of fluids secreted daily by individuals. An artisan of Paris is known to have been in the habit of drinking thirty-three pounds of water during the day while he passed thirty-four pounds. Another remarkable case is the record of a woman who drank four pails of water daily, a habit which necessitated almost constant urination. The emotions of fear and anxiety have a remarkable effect in some subjects in producing an increase secretion of urine. As an example in point, May mention the fact that students have been observed to evacuate their bladders five or six times during the hour immediately previous to their presenting themselves before their teachers for examination, a circumstance which the gentlemen in question can only explain by referring to the uncomfortable frame of mind they are in at that particular period in their history.
The urine is a secretion of great complexity, the relative proportion of its ingredients varying, probably, to a very considerable extent. This, along with other causes, arising from the perplexity of the subject, has unavoidably occasioned so many differences in the estimates of the various authors who have turned their attention to the matter, that any statement we may choose to erect of the definite proportions in which these ingredients are to be found, must not be taken as absolute, but merely as an approximation to the truth.

Almost uniformly there will be found in the urine, water, lactic acid, urea, ammonia combined with the lactic acid, carbonic acid, hydro-chlorate, lactate, sulphate, phosphate of lime and magnesia, urine, coloring-matter, lithias, acea, hippuric acid, creatine, and creatinine. Light traces of fluorspar and silicate have also been observed. According to W. Becquerel 1070 parts of urine contain 3.3 per cent of sodium bicarbonate solution by 967 parts
of water. For purpose of reference I here insert the analysis of Becquerel:

<table>
<thead>
<tr>
<th>Substance</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>967</td>
</tr>
<tr>
<td>Urea</td>
<td>14.230</td>
</tr>
<tr>
<td>Uric Acid</td>
<td>2.68</td>
</tr>
<tr>
<td>Mucous and Ext. + Color</td>
<td>10.167</td>
</tr>
<tr>
<td>Sulphate</td>
<td></td>
</tr>
<tr>
<td>Diphosphate</td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td>8.135</td>
</tr>
<tr>
<td>Chloride</td>
<td></td>
</tr>
<tr>
<td>Hippurate of Soda</td>
<td></td>
</tr>
<tr>
<td>Bicarbonate of Potash</td>
<td></td>
</tr>
<tr>
<td>Silica</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000.000</strong></td>
</tr>
</tbody>
</table>

The principal object in ascertaining the specific gravity of the urine is to arrive at a knowledge of the amount of useless thrown out of the system in a given time. This is obviously a matter of great importance, as it furnishes us with literally accurate data upon which to form an opinion as to the manner in which the kidney is fulfilling its proper function. The variations in the specific gravity being generally accompanied by corresponding variations in
the quantity, in the healthy condition, the result is that in different persons in a given time is almost always the same. When a larger quantity of urine is excreted than is absolutely necessary to support the waste of the tissues, a corresponding excess of saline matter is generally found in the urine.

The amount of urine is subject to very great variation as well as the state of the system. Temperature, diet, exercise, and other circumstances influence to a degree to produce this variation. In diabetes, an increase in the quantity of urine is evident, along with more abundant proportion of solidifiable matter, while in that affection saline diabetes insipidus, the proportion of saline remaining as in health, the quantity of pure water is immensely augmented. Various glands have the effect of diminishing the quantity of water.
The most characteristic and important element, unquestionably, of the urine, is the urea, a substance which exists in such large amount, that nearly half the weight of the aqueous matter of that secretion is made up of it. At one time it was supposed that it did not exist in the blood, but that it close to is now certain, once that one of the functions of the kidneys is merely to take that poisonous materials out of the blood and throw it from the system along with the other elements of the urinary secretion. Dr. Chisholm has shown that in renal diseases the amount of urea is visibly augmented in the blood, once excretion of the kidneys, causing accumulatation of the poison in the circulating fluid, as once put, beyond doubt the fact, that these organ have nothing to do with the formation of the urea. This substance is derived from the source, and from the disintegration of the animal tissues. It is in general when violent exercise expector it interstitial changes, and in children the quantity is greater than in older men, because in the former the vital processes are going on with greater activity, waste and repair proceed each
with greater velocity. The quantity of urea is influenced, apparently, to a considerable degree by diet; animal food increasing the quantity, while vegetable aliment causes diminution of it. The chemical composition of the substance is C₂N₂O₄H₂, the same as that of Sodium Cyanate of Ammonia. When perfectly pure it is colorless, odorless and with very little taste. It is very soluble and combines with acids without neutralising them. It became give the following statement as to the quantity secreted by men, women and children in a given time. It shows very clearly, that the greatest quantity is secreted by men at middle-age; that women produce less, than children amount less than the former, but considerably more than old men.

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>mean</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Men</td>
<td>337.51</td>
<td>433.13</td>
<td>510.36</td>
</tr>
<tr>
<td>By Women</td>
<td>153.25</td>
<td>295.15</td>
<td>437.06</td>
</tr>
<tr>
<td>By Children</td>
<td>61.08</td>
<td>125.22</td>
<td>245.15</td>
</tr>
<tr>
<td>By Children</td>
<td>161.78</td>
<td>207.89</td>
<td>254.20</td>
</tr>
</tbody>
</table>

In all instances the amount of urea is considerably diminishing in quantity.

Urine in lethal cases the ingredient of most importance in the consideration of the substances found present in healthy urine, i
In combination, generally, with ammonia, although sometimes, the substance is deposited in such large quantities that Clysma, after the pure acetic acid had dissolved, mingled with the mass of the water. It is not so characteristic of the higher forms of mammalia as of the lower. The urine of reptiles, birds, and some insects is often more acid and composed chiefly of urea. The absence of the urea in the urine of the lower animals offers grave for the opinion that the function of the urea in the urine can be performed equally well by the ureic acid. Here an influence of opinion as to the source of this compound. Some observers believe that the cell-cumbersome tissues are the origin of it; others imagine that it is produced by the breaking up of all the nitrogen compounds, both derived from the vegetable and from the disintegration of the tissues of the animal itself. This substance is exceedingly insoluble in water, requiring according to Proust as much as 10,000 times its weight of that fluid for its solution. From a consideration of this fact it is evident, that the acetic reaction of the wine cannot be attributable to the existence of the

(Claric)
uric acid in it. As it is in perfect solution in healthy urine, the acid must be in combination with some base, from which it may readily be detected by the action of another acid. Agassiz has consequently been disposed to what base it is most probable in combination with. Litschau holds the opinion that the uric acid, immediately on being formed, unites with the soda of the blood; Priest on the other hand believes it to be in combination with ammonia, an opinion which seems on the whole the more probable of the two. In Golding-Briot explains, the combination in the following manner. Immediately on its separation from the blood, the acid comes in contact with the double phosphate of soda and ammonia, derived from the force, forms urea of ammonia, setting phosphoric acetic free and thereby suspending the action of the urine. Urease cliches the effect of increasing the amounts of uric acid while vegetative force decreases it, independently of the urea increase or diminution of the quantity of the urine.

The experiment of Lehman illustrates this
effects of diet very satisfactory. He gives the following table showing the quantity of uric acid once and a week in 24 hours under different systems of diet.

<table>
<thead>
<tr>
<th>Diet</th>
<th>Uric acid</th>
<th>Urea</th>
<th>Ratios of two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal</td>
<td>22.64 g</td>
<td>819.2 g</td>
<td>1 : 36</td>
</tr>
<tr>
<td>Mixtures</td>
<td>19.17 g</td>
<td>581.5 g</td>
<td>1 : 27</td>
</tr>
<tr>
<td>Vegetable</td>
<td>15.1 g</td>
<td>346.5 g</td>
<td>1 : 22</td>
</tr>
<tr>
<td>Sugar from lactic acid</td>
<td>11.24 g</td>
<td>235.1 g</td>
<td>1 : 21</td>
</tr>
</tbody>
</table>

Lieber has demonstrated the existence of uric acid in the urine of man. It has long been known to be a normal ingredient of the urine of herbivores. This distinguishes clinicians also detect uric acid among the products of the PUTATION of the latter class of animals.

The statements of Liebig that he have succeeded in discovering lactic acid in the human urine, is denied by Liebig, after a careful repetition of the former gentleman's experiments.

Of saline substances found in the blood the sulphates are the most abundant. The greater portion of the sulphate is in the form of sulphuric acid in combination with the base soda and potash. Most of the azotemia compound...
Compasses used as foils are in combination with sulphur, which undergoing oxidation, within the economy, forms sulphuric acid, and unites with any base it comes in contact with. Sulphur, however, seems to exist in the urine in some peculiar state of combination, as after complete removal of the sulphates, sulphuric acid may be detected by burning the urine with nitric.

The phosphate gives in the urine an abundance in great part from the diet, some part is probably secreted at once from the blood, while another part is derived from the disintegration of the tissues, into the formation of which the phosphate has entered. The osseous system, no doubt, contributes the greater part of this latter. Bache gave 375 of phosphoric acid as the proportional amount in 1000 parts of urine, or about 5.92 grains in the day. But, as in the case of the other elements of the urine, the amount of this substance is liable to a variety of influences arising out of circumstances of diet, and exercise, either bodily or mental. Great mental exertions produce a marked increase in the amount of the phosphate, accounted for...
in all probability by the extraordinary
waste of nervous tissue into the composition
of which phosphorus largely enters.
The phosphate in the urine is an acetic salt, name
by the phosphates of soda, ammonia, lime and
magnesia, are likely attributed to these the
natural acetic reaction of their urine. In the
other portions of the body, the phosphate is al-
kaline. Dr. B. Jones remarks that the earthy phos-
phates are most abundant after a meal, whether
whether of an animal or vegetable character. The
alkaline phosphates are most abundant after
a meal composed chiefly of bread, and do not
seem to be influenced materially by the cir-
cumstances which affect the secretion of the
earthly salts. Of the phosphates from the 1st to 10th
part are combined with alkaline bases, the
remainder with earthy bases.

Hydrochloric acid is formed in the urine
combined with sodium and potassium. The
occurrence of these principles in such large quant-
ities in the aliment or fluids of the body,
seems their presence in the urine easily expla-
nable. The acid in combination with ammonia
has been observed in insane individuals.
The presence of nista in the urine is accidental; it is introduced probably along with the drink.

The nature of the substance which confers the peculiar tint to the urinary secretion is not well made out in accordance with the observation.

In almost all urines some amount of urina can be detected independently of any disease.

Thus a great difference in the rapidity with which matter taken into the circulation may pass into the urine secretion. Vegetative principles of particular kinds seem to take a longer period than other substances. Dissolution of potash may be detected in the urine in two or three minutes after its introduction into the stomach. Most soluble metallic salts pass through the bowels into the urine very rapidly.

From the slight sketch given above of the normal constituents of the urinary secretion, it is evident that its great function is to give the economy of this poisonous nitrogeusic matter, which once this was in the blood, during its course through the various organs and tissues of the body. The most characteristic of these are the liver, once urine acies. The injurious effects
of non-separation of these substances is well
evidenced by the fatal consequences. Effects very
similar to those of nicotine poisoning super-
vene, after extirpation of the kidneys, as was shown
by Dumas. In his experiments death of the an-
imal took place in a period ranging between the
fifth and the ninth day. Frequent accumulations
of ura in the blood in these cases. In fact, the amount of this substance was so
much augmented that the urine secreted by
the lining membrane of the ventricles of the
brain distinctly emitted the characteristic odor
of ura.

It has been imagined by some that the elimin-
ation of hippuric acid in the urinary secretion
is a means which nature employs to get rid
of carbon. It may perhaps compensate for the de-
ficient action of the lungs and liver in some dis-
cases.

The relation existing between the kidney on the
one hand, and the skin on the other is of the
closest and most important character. Any in-
terference with the function of one organ is
made up by increase activity of the other.

Upon a knowledge of this fact brings the judicious
Ctreatment
treatment of all or most diseases affecting the organs in question. A gentle and insensible transpiration through the skin and a limpid secretion by the kidneys are the manifestations of a normal balance being kept up by the two organs, a balance which, if interfered with, must produce either of two results, increase or decrease of the activity of one or other organ, or a train of symptoms indicating more or less serious derangement of the system generally.

I shall now proceed to the second division of the subject, namely, the physical and chemical condition of the urine as perturbed by disease.

In a consideration of morbid conditions of the renal secretion, it ought to be borne in mind that any such pathological state is not to be taken as a disease per se, but merely as a link in a chain of symptoms, which if followed up may probably conduct the observer to a comprehension of the cause of the derangement. The colour and transparency of the urine are subjects to infinite change from morbid action. When much dilute, it presents a greenish hue.
as in the hysterical and chlorotic. Yellow tinge in urine is diagnostic of jaundice. Urine of a pale yellow or green color, transparent both when passed once after cooling, and having a sweetish taste gives a strong presumption that the patient is suffering under diabetes. The urine is sometimes so viscous that it may be drawn into threads or when agitated assumes a frothy appearance from the presence of a large quantity of mucin. These appearances with regard to the color and consistence of the urine, furnish valuable diagnostic signs to the practitioner.

The variations mentioned above as liable to be found existing in the quantity and specific gravity of the urine, render great caution necessary in drawing deductions from these circumstances as to the presence or absence of disease. However, the alterations from the normal character of the urine in many diseases are so apparent and obvious on the notice of the physician, that his neglect of them would be perfectly inexcusable.

Hysteria, and nervous affections generally increase the amount of urine and diminish its specific gravity. Various mental emotions also are
forces to produce a similar result. Thus generally one attends by elimination in the amount of urine, with augmentation of the specific gravity. The same effects are produced by copious evacuation from the skin or bowels, by disease of the heart or liver, or by serious functional disorders. The increase of specific gravity in those diseases, although it makes up to a certain extent for the elimination in the quantity of the urine secreted, probably is inadequate wholly to compensate for that decrease, and consequently the eliminating function of the kidneys being imperfectly performed, efforts must accumulate to the system must accumulate.

Generally it may be said that serious mischief is in progress when the morning urine is of a pale, clear, transparent, acide, train of low specific gravity, and if after cooling it become semi-solid. If the morning urine be transparent, pale, acide, and of high specific gravity, the patient in all probability is diabetic. The same consideration may be drawn when the evening urine is opaque, transparent, pale acide, and of great specific gravity. Again,
When the morning urine is of very low specific gravity, lice, and c pies, organic disease of the renal organs is to be feared. Dr. Price gives the following table showing the density of morning and evening urine in different diseases:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Night</th>
<th>Morning</th>
<th>Dian</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1.027</td>
<td>1.022</td>
<td></td>
<td>Mitral Stenosis</td>
</tr>
<tr>
<td>Heparoptysis</td>
<td>1.026</td>
<td>1.022</td>
<td></td>
<td>Tumours</td>
</tr>
<tr>
<td>Gastropepsia</td>
<td>1.026</td>
<td>1.020</td>
<td></td>
<td>Peritonitis</td>
</tr>
<tr>
<td>Peritonitis</td>
<td>1.022</td>
<td>1.010</td>
<td></td>
<td>Patentia</td>
</tr>
<tr>
<td>Oxyuria</td>
<td>1.022</td>
<td>1.019</td>
<td></td>
<td>Heptica</td>
</tr>
<tr>
<td>Hysteria</td>
<td>1.005</td>
<td>1.015</td>
<td></td>
<td>Hysteria</td>
</tr>
</tbody>
</table>

In all menurinuria, the density sometimes ascends to 10.040, and frequently ascends in diabetes to 10.50 or even to 10.60.

Different diseases produce remarkable effects in the proportion of urea to be present in the urinary secretion. All circumstances which have the effect of weakening the system generally favor the renal organs in particular dispose to an excess of urea. Mental anxiety, apoplexy, intemperance of various kinds, all tend to the extraordinary development of this substance. It must be borne in mind, however, that various
Diseases, such as fevers, may, by diminishing the quantity of water, produce an absolute increase in the amount of urea, without an actual increase over the other ingredients. The only test for determining the normal proportion of urea is, that the addition of nitric acid at the usual temperature does not cause crystallization until a very considerable concentration of the fluid has been brought about by evaporation. Now, in the case alluded to above, the urine is often so concentrated naturally, that crystallization will occur immediately on the addition of the acid.

There is both an absolute and relative diminution in the amount of urea in cases of anaemia, and in many chronic diseases, in which although the amount of urine secreted in a given time is near the healthy standard, its specific gravity and colour are below it. It seems to be a total cessation of the secretion of urea during a hysterical fit, while the interval between the characteristic by great augmentation of that substance.

Severe fevers and special injuries transform the urea into Carbonate of Ammonia.
The amount of the lactic acid in the renal secretion is subject to very great variation. It is most commonly found in combination with ammonia, and when found free, the conclusion is not to be lightly arrived at, that there is present an excess of the substance. This may be the result merely of the presence of an acid such as the phosphoric or uric acid, or, according to Dr. Prout, the existence of the lactic acid in the free state, may be dependent on the action of the lactic acid. The lactic acid is seldom deposited in the free state before evacuation, but when an excess of it is present in the urine it is precipitated after cooling in the form of crystals of various colours. The presence of the acid is tested by the action of heat and nitric acid on the urine forming a solution which on evaporation leaves a red resinum, which when heated over the flame of ammonia, becomes of a beautiful purple colour. A solution of potash dissolves it easily without the evolution of ammonia. The lactic acid is not dissolved by heat being applied to the urine and acetic and hydrochloric acids have no action on it. The ammonium salt of
the latitude of ammonia give pretty much the same chemical reactions, only they are greatly more soluble in water and give off ammonia when dissolved in potash. These solutions assume all manner of tints, but the principle on the red, yellow, and pink. Much pathological importance cannot be assigned to these compounds. The red sediment is characteristic of high fevers and inflammatory affections, and when the tint is very much pronounced, there is often present serious inflammation of the bladder. That nephritis and disease of the liver are frequently attended by the pink sediments.

Lithic acid diathesis is often brought on once for all, by all kinds of diet persisting in for a length of time. Excess of animal food and intoxicating liquors, indulgent habits, and most inflammatory affections cause excessive deposition of the lithic acid.

The stone of soda is generated in such quantity in gout and rheumatism, that the water of the bladder being unable to keep it in solution, it is deposited round the joints and tendons. There is a deficiency of uric acid.
in all diseases attended by debility, such as Chlorosis, and in many diseases of the nervous system. Convalescence from severe fevers and loss of blood are also characterized by diminution in the proportion of the lactic acid.

There is some difference of opinion as to whether lactic acid may be considered an ordinary ingredient of healthy urine, or not. It is admitted that the urine of healthy persons contains traces of the secretion, but it is not believed that it forms a constituent of the healthy fluid. Fevers, generally show an increase in the amount of this substance, while in anemic cases there is either a total absence of it, or it is found in greatly diminished quantity.

There is perhaps no substance in the composition of the urine so subject to variation as the lactic acid.

Certain conditions of the urine may lead to deposits of the phosphates, without the presence of any disease requiring the necessity of their being present in the fluid in abnormal quantity, just as we have seen a deposition of the litter acid from a peculiar acid state of the secretion, not to imply a hyperacidity of that substance.
When phosphates exist in excess in the urine, the urine is generally of low specific gravity, opaque, of an ammoniacal, yellow and very soon become Putrefacce upon subjecting to boiling the urine becomes cloudy from the precipitation of a white precipitate which might be mistaken for albumen or albumin, if the reagent for testing the presence of these substances were not resorted to. The phosphatic deposits consist generally of the phosphat of ammonia and magnesia; sometimes, but rarely, of phosphat of lime. At other times, both together are present. The triple phosphate of ammonia and magnesia seems to depend for its production on a peculiar state of the urine, which is generally present in lameness when the earthy bases and phosphates are in excess. The urine seems in these cases to be more unstable, and is transformed into carbonate of ammonia. The ammonia precipitate the phosphat of lime, and at the same time uniting with the phosphat of magnesia, the triple phosphate is formed. This compound is generally deposited in the form of shining chrysolite. The phosphat of lime, again, is precipitated as an amorphous powder.
Long continuance of base health, disarrangement of the digestive system, especially in children, various clauses operating by depression of nervous energy, as slows injuring the spine and its connected organ, and great fatigue from overexertion of mind or body, tending to produce phosphatic deposits. The urine of old people is often characterized by increase of the phosphates, a fact accounted for probably by the more unstable character of their tissues, rendering them more easy of disintegration. Jones, however, explains what has been called the phosphatic diathesis, by saying that the morbid secretion of the bladder, acting as a ferment on the urine, changes it into carbonate of ammonia, which then precipitates the phosphates. So that, according to his theory, there is no excess of the phosphates in the constitutional condition in question. There is supervenience of the phosphates in the urine in the disease Mollitic ossium, and in various acute diseases of the brain. There is another disease of the skeleton, hyperostosis, in which the phosphate are taken from the blood and deposited in masses around the bone.
so that little or no trace, comparatively, of these compounds is to be found in the urine.

The urinary secretion of pregnant females is often observed to be deficient in the phosphates, doubtless, because a great quantity of osceous matter is requisite for the foetal economy.

An excess of the fucose alkalies, or at least of their combinations, is sometimes present in the urine in certain organic affections of the bladder, as this excess is always accompanied by an increase of the carbonate of ammonia. Deficiency in the amount of the chlorides in the urine is considered by some, as characteristic of Pneumonia. The explanation of this phenomenon seems to be the, that inflammatory effusions containing great abundance of saline matter and particularly chlorides, a diminished quantity of these must of course be present in the renal secretion at the period of such effusions.

When there is great excess of mucus in the bladder, and often of the renal organs, and consequently superabundance of that substance in the urine, serious organic diseases of the bladder or
Kidney is probably the cause.

Bile are a common matter occasionally met with in the urine, which is never present in the state of health, such as bile, blood is particularly met with after fever, and is easily recognized by the tint it assumes on exposure to the urine, and by the green and afterwards purple colour which it acquires when a little of the urine is subjected to the action of sulphuric acid in a test-tube.

Blood may be present in the urine merely in quantity sufficient to give a general reddish tinge to the mass, or again, in such abundance that clots of various sizes may be seen deposited at the bottom of the vessel. The best way, certainly, of ascertaining the nature of the former condition, is to submit a drop of the urine to the microscope, when the well-defined character of the blood-corpuscles will at once explain the cause of the tint. When blood lies under your principal objection before leaving the bladder, during its passage along the urethra it becomes reduced to the calibre of that tube, and ultimately exhibits itself in the form of long, tapering casts.
The causes of the presence of blood in the urine are very various. It may proceed from any or every part of the urinary apparatus, which may have become injurious or diseased. The first stages of Bright's disease are often accompanied by the slightest tinge of blood in the urine, as if nature was endeavouring to relieve the congested state of the renal organs.

One of the most important diagnosticks of severe disease being present in the system is the existence of more or less albumen in the urine. As this is a subject of too wide a nature to treat of here, however, I shall dismiss it, with the remark, that disease of the renal organs is not to be at once concluded from the fact of the existence of a certain amount of albumen in the secretion at any one time. The aid of the microscope must be called in to identify the debris of the disease structure of the organs, before they are pronounced to be in a morbid condition. A series of experiments at different times must also be made, before a conclusion is arrived at. Some persons have coagulable urine after eating certain articles of food, such as cheese. 

In consequence of anal-digestion,
The detection of albumen is very simple. Immersing the application of a certain temperature, the flakes become turbid and opaque. The action of nitric aci...the Earth of phosphates.

The presence of sugar in the urine does not always indicate serious disease. A variety of disease which necessarily diminish the usual amount of oxygen conveyed into the system, are often characterized by a certain quantity of saccharin matter in the urinary secretion. Thus chronic bronchitis, asthma, and consumption seem to develop sugar in more or less amount in many instances. The urine of aged persons, also, whose lungs have to a certain extent become atrophied, is sometimes found to contain a considerable proportion of sugar. In all of these instances, the effect on the urine seems to proceed from the deficient supply of oxygen, being unable completely to turn off the starchy matter of the ingesta.

The urine of diabetes is frequently so impregnated with saccharin matter that the sense of taste detects it with ease.

Urine containing sugar is generally abundant
High specific gravity, and easily fermentable. Unnatural formation of the urine has been seen to occur temporarily in diabetes. The anaesthetic condition produced by the inhalation of chloroform has also been attended with the like exhibition of sugar in the renal secretion.

Most if not all, the instances of meek forma in the urine seem to be important facts in the most part by hysterical females. Bile or chylous matter, somewhat resembling actual meek, is formed occasionally in the urine. The substance either settles to the bottom of the vessel, or coagulates in the form of a clot, enclosing the fluid portion in its meshes. Dr. Plowdmore endeavours to account for the chylous matter, by referring to an experiment of his, in which he forms the substance by passing a current of chlorine gas through albumen. He believes that the hydrochloric acide in the system acts on the albuminous compounds in a similar manner.

Dr. Priestly imagines that the chyle passing into the bladder without the usual elaboration, is separated by the kidneys, and finds its way through into the bladder.
Pro will be found in the urine in all inflammatory and supplicative diseases of any part of the genito-urinary apparatus. Diseases opening into any part of the tract may also mingle their pus with the renal secretion. The presence of this substance is readily detected either by the microscope or by chemical reagent. Perhaps one of the best methods to follow is, to add liquor potassae to the urine, by which it is rendered immediately extremely viscous.

The spermatic flora, as might be expected, is frequently to be found in the urine. By means of the microscope, the spermatozoa are rarely discoverable. Some varieties of nervous disease are accompanied by spermatic impregnation of the urine.

Deposits of oxalate of lime in the urine, an indicator of derangement of the digestive process. Urine characterized by the presence of oxalate is common among men immersed in the cares of business. In order to a cure, the patient must be removed from these harassments, his diet must be simplified, his wine cut off, especially the sweet varieties. Poor employees the mineral acids with advantage. Under
the microscope the deposit exhibits octa-
hepta of the most beautiful form. Liver-
has proved that oxalic acide is formed from
urine by means of certain oxidizing agents.
It was formerly considered a matter of great dif-
ficulty to account satisfactorily for the pre-
sence of this substance in the secretion.

Salts of Carbonate of Lime have sometimes
been found. This compound is collected by the
action of any weak acida causing its solution
along with the escape of Carbonic acide gas.
What its connection may be with disease, is
not very precisely known.

The cystic acida is a sediment of extreme
rarity. It forms a pale yellowish precipitate,
soluble in dilute acetic acida, and in
solution of potash. When heated it emits a
very peculiar odour. Its rarity has rendered
its history very little known.

It has been matter of some dispute, whether
the substance described under the
name of Kystein, closely allied to Casein
in composition, is peculiar to the urine of
pregnancy, and ought to be considered diag-
nostic of that condition, or that it is merely
(a
a substance secreted along with the urine in certain states of the system, and not necessarily connected with the pregnant uterus. The question is rendered more difficult from the fact of urea having been observed in the urine of unmarried females and even in that of males. But the great preponderance of evidence seems to support the opinion, that when pregnancy in any doubt ful case is possible, the distinct exhibition of urea in the urine may be taken as almost positive proof that the patient under examination is in that condition.

It will be seen that there are few diseases whose diagnosis may not be materially advanced by a careful observation of the urine. The attention that is now directed to the departments of clinical examination will, doubtless have the beneficial effect of disseminating a proper idea of its great importance in the scientific treatment of disease.