Thesis
On the Urine

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On the Urine.

True, it is, that, man is fearfully and wonderfully made. His body has by many writers been compared to various pieces of mechanism, but the beauty of this machine both as a whole and as regards its separate and distinct organs far surpasses anything that the ingenuity of man could have devised. The analogy between the body and many pieces of machinery holds good thus far that both from time undergo waste or decay and both consequently require to be renovated or supplied with something to take the place of that which has been cast off and destroyed by use. A piece of machinery cannot be kept constantly working that is we cannot have perpetual motion in the human body made up of a number of wonderfully constructed organs also cannot be kept living forever. Both in their due time yield and are counted among the things that were.

The body since undergoes waste and so demands renovation to stave off this decay. That long been known that the elements entering into the composition of our body at the time have within a certain period disappear and others take their place.
The question naturally arises to every thinking mind in what manner of way do the constituents of our body disappear and in what way do other similar elements take their position. The different textures of the body after having served the purposes for which they were intended become decomposed and are carried out of the system by various channels or ducts. Some by the skin, other by the lungs, but the greater proportion by the kidneys and it is to this most important organ that I have had my attention drawn in the fixing of a subject for a treatise. But the body is dissolved as well as wasted; its parts consist in the wasting of substances having a resemblance to the constituents of the blood from which all the textures are dissolved. Such substances having entered the system by means of the mouth undergo various and curious changes according to its composition which it would be out of place to mention here. Such parts as are useful for nourishment are retained while the rest are carried out of the body. Considering the amount of waste that is constantly going on and the great importance of this decomposed matter which is no longer of any use to the economy being carried out of the system without any structure, it will appear clear that the subject of excretion is one of the most...
moment and interest. As has been mentioned, there are various channels through which the different decaying textures can be extruded, but perhaps the Kidneys are the means by which most of them are dissipated. The Urine therefore which is the secretion of the Kidneys, and which contains the different textures, how it is true in a state of decomposition may well be the subject of a dissertation. This secretion, considering its importance, perhaps has not received as much attention at the hands of Physicians as it ought. When its physiology has been better understood, we shall then be better able to cope with the various diseased states to which it is liable.

The Urine of different classes of animals varies much in quantity, and in the nature and proportion of its ingredients. The quantity passed daily varies much according to circumstances. In health, the most important of these is the state of the Skin; the state of the liver is also intimately associated with that of the Kidney, and contrary growth, of the Urine. The quantity will be diminished if the secretion of the Skin be much increased by warmth, exercise, sweating, &c. and much increased if the function of the Skin be impeded or suspended. Not only does the quantity of Urine differ according to circumstances, but its ingredients also differ.
The Griffiths Institute on Common Deposits. — Professor Christians has never taken a higher standard. According to the latter, neither the average daily

strength, passed is 3.5 times 7½ or 10.29. Of a healthy young adult

in vigorous exercise

Thus three varieties of urine have been distinguished. I that precede after drinking and which contains, a
small quantity of the solid ingredients called urine
Purus II that which occurs after the completion of
defecation called urine Chyle III containing a large quantity
of solid matter III that which is passed in the
morning and which is secreted from the blood but im-
mediately affected by diuretics called urine Sangüinco.
This may be looked on as the pure neural secretion. And
be it remarked that these three kinds of urine however
different from each other are all consistent with health.

In Man it is a complex fluid holding in
solution many animal compounds characterized by
having a large amount of Nitrogen without Composition
and derived in part at least it must appear from the waste
of the tissues. Saline substances and adventitious matters
are also present. Urine made up of these
different ingredients is acted on by the Kidneys and is
passed off daily in the Quantity of about 30 ounces.
The specific gravity ranging from 1.01 to 1.030. It is slightly
acid in its reaction and contains Acids and Alkaloids.
Its Composition chemically has been made differently
by various Authors but the following seems near
the truth.

*
Thus according to Bergelius the solid matter in average brine amounts to 67.1 per 1000.
According to Griffith it only amounts 28.3 per 1000. I believe, being too high and the other too low. May be allowed to make reference to the other determinations made by myself at this point, which sufficiently prove my mind that Bergelius is too high and Griffith too low in their calculations.

<table>
<thead>
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<th>Density</th>
<th>Quantity (grams)</th>
<th>Amount of Solid in 1000</th>
<th>1020</th>
<th>3.65</th>
<th>34.56</th>
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<td>2.33</td>
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<tr>
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<td>69.70</td>
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excited it is evident that any disease or mechanical obstruction to this secretion must produce serious consequences to the general system. In diseases more alarming than those affecting this secretion, what is done dangerous than complete suppression of urinary evacuation and life is great and makes it if again sooncaused to flow death is inevitable.

The kidneys are the organs which act a part in the secretion of urine. For long it was considered that the constituents of the urine were formed in or by the organs, but however, the opinion that the kidneys merely separate the urine from the blood is generally received. This is the most feasible opinion, since especially as the greater number of those matters found in the urine can also be detected in the blood. Moreover, when the minute structure of the kidney is considered, it can easily be conceived how they separate the different substances which make up the urine from the blood although it could be an easy matter to explain by what process the kidneys could form these urine acids.

The kidneys then serve as an aid to evolve from the animal organism these disintegrating elements which cannot serve any useful process in the economy and the retention of which would act as a violent poison to the
The system, and its of importance to observe, that these elements cannot be voided from the system by any other way. They also separate from the circulation all excess of fluid which may have entered it, as well as many abnormal elements which may enter the blood after an imperfectly digested meal. In all diseases consequently the function of the kidneys must be strictly attended to.

Before we can understand the direct state of the urine, we must be acquainted with the physiology of that secretion which is so complex. We have seen that urine when chemically examined consists of a number of substances, and to the consideration of these separate functions proceed.

Water forms by far the greater bulk of it. Indeed it is much water with various, salts of substances in solution. This ingredient varies much in quantity even in the same individual, the variation often depending on visible causes, thus a person when he drinks much water, the water of the urine increases proportionally in quantity. The quantity of water depends also to a certain extent on the state of the other organs, thus when the proper function of the skin is destroyed there is an increase of the water in the urine. From there and various similar causes the quantity of water in the urine can be increased, and we can trace them one of its origines.
Like all secretions, the urine is directly derived from the blood and to increase the quantity of any of the substances found in it we must increase their quantity in the blood. Thus when water is taken into the stomach in consider-

able quantity it is absorbed and carried into the circulation, and when the blood loaded with this water circulates through the kidneys they by a function which is peculiar to them secrete it from the blood and thus convey it out of the circulation's system. Considering the large amount of water contained in the food which we daily consume we can easily understand that there should be a large amount of the same substance in one or other of the secretions. The different secretions also containing much water must when decomposed yield it to the urine as well as to the fluid and other secretions. The fact that we are able to increase the quantity of urine at will by diet shows that the food and drink we take are one of the sources of watery constituents and that water as well as the other ingredients are formed although a person fasting shows that they arise from some other source which is the decomposition of the textures. This latter is well exemplified in the case of hibernating animals which although for a long time often they do not eat still secrete urine.

The urea which forms about half the quantity of
According to Berzelius, the average quantity of Urn in 1000 parts is $1.30.
The solid part of the urine is a substance the nature and
objects of which has given rise to much discussion.
According to Bequerel the quantity of urine in 1000 parts of
healthy urine of average specific gravity is about 14 parts.
In this way the mean quantity of urine voided by a man in
twenty-four hours will be 227 p. The quantity of urine
however varies, even in health, but generally is within the
range from 12 to 15 parts per 1000. The quantity then voided
in 24 hours may vary from 191 to 233 p. Then pure
urine is perfectly colorless neither acid nor alkaline, containing
nothing but neutralizing bases. It is very soluble in water.
More soluble in hot than cold. It is composed of CO, H, N
and these, acne says the elements, is the same as the hydroxide
of ammonia, the early precipitated salt. The organic
substance however complex in its composition has been formed
in the laboratory and thus Man although it has been
forced him to follow Nature so far as the ability to form
organic structures, either animal or vegetable has by patience
and perseverance and pursuing the study of Chemistry in a
scientific way at least formed the product of organized
bodies. Beyond this it is scarcely possible for man to go.
To form organic structures is beyond the reach of man.
To form substances resembling the products of organized
bodies is now no very difficult task. Such being
the composition of God it will have to be necessary to create.
its physiological origin.

Much discussion has taken place on this point; and as yet, there is great doubt as to the origin of urea, whether as Liebig holds, it be solely formed from the contents of the body, in a decomposed state, or whether it originates partly from the fuel and partly from decomposed textures.

Liebig to whom physicians are indebted for much, as the pathology of many of our common diseases have been beautifully explained by his practical experiments and on account of whose researches the treatment has been placed on more scientific basis and from which also he ascertained the action of the different remedies used in their care, and he to whom also practical as well as theoretical Chemists owe eternal gratitude for his discoveries. When I say we must give due attention to the discussion of this as well as all other subjects touching on chemistry - He has written many works and one of which is entitled “Practical Chemistry,” he takes up the position that the urea is found in the urine, derived from the decomposed textures and from in other sources, and endeavors to support this view by reference to experiments. That such is one of the sources and perhaps the principal one, no one will deny but that it is the principal appears more doubtful. On one of his pages he makes this statement, ‘It is shown that the constituents
of the urine are products of the transformation of the
fluid and of the organised tissues. The elements of
urea, urea and were previously constituent elements of
the living tissues which have lost the condition of life
in the vital force by the action of external causes.
In another place he states that the amount of the
nitrified constituents of the urine is directly pro-
portional to that of the metamorphosed tissues. He
holds that food has nothing to do with the quantity of
nitrified constituents and in support of this he goes
forward and experiments made on dogs. These expe-
riements tended to prove that the urine of dogs fed on
for 3 weeks contained as much of the highly nitrified
constituents as in the normal state. According to this
great chemist view the metamorphosis of the tissues
and consequently the quantity of urea used in the
quantity of Urea used absorbed and on
nothing else. This can scarcely be true, but why consider
for a moment the nature and habits of the Serpent and
Carnivorous Birds and then to compare their movements.
According to the above theory, in one case there
should be little or no area and in the other a very large
quantity. How different is the state of nature. Then
the movements of the sluggish Serpent which takes little
exercise is compared with that of Carnivorous Birds they
are
are found to be much the same. Moreover, if a man taking
the same amount of exercise, sleep well, etc., for 8 days can
during these days alter the quantity of meat and wine
acid in the urine by merely changing a vegetable for
an animal diet, it is clear that the food is also one of
the sources of the urine. No doubt, every day life a
man's body in the enjoyment of good health undergoes a
continual variation in the waste, in as much as the body
experiences a mental exertion, labour, etc., and thus the quantity
of meat and wine acid will also daily alter. But a person
taking the same amount of exercise, being able to change
the quantity of meat and wine acid by changing his diet
sufficiently that these constituents originate from
the food direct as well as from it after it has been converted
into the textures and then decomposed. — On this point
the experiments of Helmholtz are conclusive, they were
performed on his own person and may therefore be relied
on. By a change of diet he altered the quantity of
nitrogenized constituents of the urine.

<table>
<thead>
<tr>
<th>Diet Type</th>
<th>Quantity of Wine Acid</th>
<th>Urine, 24 hours</th>
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</thead>
<tbody>
<tr>
<td>Exclusive Animal</td>
<td>22.64</td>
<td>8.19</td>
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<tr>
<td>Mixed to Vegetable</td>
<td>18.17</td>
<td>500.5</td>
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<tr>
<td>Exclusive Vegetable</td>
<td>15.7</td>
<td>346.5</td>
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<tr>
<td>Non-nitrogenized</td>
<td>11.24</td>
<td>237.1</td>
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</table>

It will be thus observed that animal protein taken as diet,
increases greatly the amount of Nitrogenised Compound.
And to assist this view we may also adduce the example
of these, old gentlemen who suffer from joint disease,
no doubt in great measure being produced by excess of animal
Diet, and in which decrease in the chronic symptoms is the
large quantity of Urine acid in the Urine. The Urine
themselves supposed derived its nitrogenised elements as well from
the food as the decomposed tissues.

Drugs have also arisen as to the mode in which the
fibres are converted into urine acid. It is self-
apparent, that the exhausted atoms of the muscles cannot
be removed as fibres but that their elements must be rearranged
as to re-enter the circulation and be carried thither again
and ultimately out of the economy. They must undergo nitro-
morphisms and this change takes place under the influence
of the sun but in what manner or way the oxygen is conveyed to
the tissues is not very evident. According to Helv. Water
and Oxygen are conveyed to the tissues the former in the fluid
of the blood the latter in the red particles which enable
the old tissues to be removed and furnish a material
for other important operations. This Author holds that
the Oxygen is conveyed to the capillaries in the blood corpuscles
combined with iron as a Ferric oxide which joins it a
part of the oxygen reaches the tissues fluid as a Potasside.
Miller however takes a different view of the subject, holding
that all the elements of food capable of being converted into albuminous tissue consist of protein \( (C_{24}H_{17}N_4) \) and that two oxides of protein, a tinoxide or trinitride, are formed in the animal economy. He believes that protein reaches the right side of the heart, circulates through the lungs where it combines with oxygen forming the \( \text{myprotein} \). This combination of protein with oxygen reaches the nutrient capillaries and all a part of it is then decomposed by the oxygen being employed for the disorganisation of worn out tissues, and the protein to supply the waste that there takes place. On Liebig’s hypothesis the elements of the tissues are carried into the circulation combined with water and oxygen, a part of these are reaching the glandular structure of the liver is filtered off in the form of bile. The more highly nitrogenised portions of the non-metabolised and the bile are separated by the intestine briefly in the form of urea, uric acid, whilst the carbon in great part is carried off by combustion at the lungs by combining with myprotein. In this way by a wonderful influence of vital chemistry the exhauster fluids are ultimately expelled from the animal economy. Which of these processes is the correct is perhaps somewhat difficult to decide but it has been established beyond all doubt that the decay of the textures takes place under the influence of oxygen.
Aure has thus been shown to be the chief substance by which the nitrogen of decomposed tissues is excreted from the body. To its removal the secretions of urine seem especially provided, and by its retention in the blood the most pernicious effects are produced. That it is derived from two sources (1) from the unassimilated elements of nitrogenous food circulating in the blood, this was shown by the increase which takes place in metabolising an animal for a vegetable diet, (2) that it is derived from the disintegration of the animal tissues, as the urea continues to be formed although no nitrogenous food has been taken. The second conclusion may also be substantiated by the fact that urea is found in the urine of reptiles which may have fasted for months and also in patients who have fasted for days. According to Priest it is derived from the gelatinous textures but he is now that it owes its origin to the nitrogenised tissues appears the most feasible. That urea is merely eliminated from the system by the kidneys is clearly proved by reference to the fact that in many diseases where the functions of the kidneys are destroyed urea is detected in the blood.

The next substance demanding attention is Uric Acid. This body although in much smaller quantity than the preceding is perhaps of even greater importance for as much as diseases of urine connected with excess of uric acid and its compounds are by no means uncommon some of its
Most serious, Nature. Thus it is well known that Stone urinary
Calcium consists of this acid alone, while many, although not
composed entirely of urine acid, owe their origin to this substance,
acting as a nucleus or nucleus around which the other
matters collected. There are few urinary calculi into whose
formation in the shape of another this substance does not
enter. Urinary calculi being a common and most dangerous
disease consequently this urine acid, which has so much
to do with the formation of them, demands considerable
attention.

A man in good health excretes about 8.1 g of urine
acid during the twenty-four hours. It being very insoluble
in water, much doubt has arisen as to the means by which it
is kept in solution in urine. This acid is a crystalline
body composed of C\textsubscript{6}H\textsubscript{2}O\textsubscript{5}, thus containing like sugar a consider-
able quantity of Nitrogen, and derived in all probability from
the same source as the urea. It is sparingly soluble
in water, and still is held in solution in healthy urine. At
15 g requires 1000 parts of water at 60° of solution, whilst in the
urine there is only water in the proportion of 1000 to 1
of urine acid. Hence it is evident, that this acid cannot be pre-
sent in the free state. Various opinions have been given as
the subject, but still there remain far further experiments
and researches. Nothing decisive has yet been attained
however much it has been wished for.
Devic acid could be discovered, be tuned in certain cases, of Medical Calculi; and the number of cases recepturing the operation of lithotomy would be rare. If a complete solvent could be found out, the discovery would perhaps be just as great a son as the human race as Professor Strumon; as due by his discovery of the action of sulphuric. - Dr. Priestley aware that the mate of ammonia is much more soluble in water than pure acid and believed that the greater part of it is combined with ammonia. The mate of ammonia is soluble in about 2180 times its weight of water. The 8.78 oz of pure acid required in the twenty-four hours require only 0.89 oz of ammonia for saturation and the 8.92 oz of mate of ammonia thus formed could be held in solution by less than half a pint of water. This theory advanced by Dr. Priestley is supported by the fact that when healthy urine is slowly evaporated in the vacuum chamber it soon becomes turbid from the settling of minute globules of mate of ammonia. The fact that mate of ammonia is deposited when exposed to cold is sufficient to show that it exists therein in combination with ammonia. - It would appear that pure acid exists in the blood in combination with soda and although under ordinary circumstances we cannot detect it, being partly converted as rapidly as it is formed, still in certain mixed conditions when it is apparently formed in excess it is
acted from the blood in this form as we see in and around the joints of joints. Patients have the compound when exposed to the Falls capable of decomposing it as in the urine. At the moment of its reaction from the kidney it is probably decomposed by aurate of ammonia. If a deficiency of this is formed a quantity of the water of soda like crystals decomposing and appear in the urine. Objections have been stated to this opinion and among others the following viz. that a little dust of nitric acid is sufficient, it precipitates all the boric acid naturally present, and that this could hardly be the case if it were combined with a base. This however is not a valid objection as the quantity of nitric acid in half a pint of Wines 0.2 gr. is small and underrates exactly neutralized by a dust of nitric acid. This theory appears to be a rational one, but that few found by tying perhaps the most likely of the two. Nitric has shown that if boric acid be heated in a solution of tribasic phosphate of soda it dissolves in consequence of combining with part of the soda and setting free part of the phosphoric acid, the fluid forming alkaline and becoming acid. On cooling the phosphoric acid reacts on the base of soda and about half the unacid is distilled in fine prismatic crystals of pure nitric acid but combined with phosphate of soda. When Nitric
acid is added to the fluid decanted from the crystals it causes a deficit of ureic acid. These explanations are sufficient to explain the acidity of the wine and the deficit of ureic acid on cooling. If this theory be correct it must be held that 3.89 gms of ureic acid and the average quantity existing in 1000 gms are dissolved in about 2.5 gms of the tribasic phosphate of soda found in the wine. Dr. Golding Reid believing that the deposits frequently occurring in the wine are not composed of ureic acid alone but of ureic acid combined with ammonia tried to explain the solubility of ureic acid by its action on the double phosphate of soda and ammonia which is always present in the wine. He holds that ureic acid at the moment of separation from the blood meets the double phosphate of soda and ammonia derived from the food and forms mate of soda evolving phosphoric acid which thus produces the natural acid reaction of urine. If the bulk of the wine be ureic acid and ammonia formed (up to about 2700 to 1) the reaction will at the ordinary temperature of the air remain clear but if the bulk of fluid be less an amorphous deposit of the mate will occur. On the other hand if an excess of ureic acid be separated by the kidneys it will act on the phosphate of soda of the double salt and hence on cooling wine will deposit a crystalline sediment of ureic acid.
mixed with amophous mate of soda, the latter usually forming a layer above the crystals which always sink to the bottom of the vessel. It would thus appear that pepper are far from being decided on this important point, two of those quoted holding that it is held in solution by means of the ammonia and one by soda.

The state of solubility of the true acid present in healthy urine having been considered we may now try to trace its source or origin. While discussing this subject we must ever bear in mind the chemical composition of true acid and the relation which its elements bear to those of urine. That true acid as well as urea are derived from the action of oxygen on the tissues of the body has been clearly demonstrated and is now believed by everyone. Uric acid with its unusual cleanness even reduced the unfixed changes which take place in regular equations and hence it may be of advantage to form the following equitation.

c. H. O

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<tr>
<th>Atom</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>H</td>
<td>48.636.14</td>
</tr>
<tr>
<td>O</td>
<td>91</td>
</tr>
<tr>
<td>G</td>
<td>48.636.108</td>
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Equivalent

c. H. O

18.6 0.9 = 1 1/2 At urine acid

33.2 6 6 = 33 Carbonic acid

30.30 = 30 = Water
With a greater supply of oxygen the tone acid is converted into urea and carbonic acid.

1 Atom Uric Acid = 10.4.4.6
4 = Water = 4.4
6 = Oxy gen = 10.4.8.16

c. N. H. O = 2. At. Urea
6 = 12 = 6. Do Carbonic Acid

10.4.8.16

In these tables it will be observed that the change produced in the tissues by the action of oxy gen is beautifully explained, and that tone acid is produced when there is a limited supply of oxy gen. If the oxy gen be increased, the tone acid in tissues are converted into urea and carbonic acid. According to this view there is an equal ratio between the oxy gen consumed by an individual and the consumption of the body; the more oxy gen absorbed the greater the waste of the body. Another deduction may be made that the greater the amount of oxy gen taken in as in Peter's pail the greater the amount of urea and that as the urea increases the tone acid diminishes. That the more oxy gen absorbed into the system the more complete will be the conversion of tone acid into urea and consequently tone acid might be caused to disappear altogether. Unfortunately this theory is borne out by a certain extent by a
a reference to facts. The urine of carnivorous animals varies in most cases in the quantity of urine acid, proportional to the rapidity of the circulation - the quantity diminishing as the rapidity increases. Thus state of matters doubtless find in many cases thus the blood constructurates an enormous quantity of nitrogenised fluid, but being a sluggish animal it takes little, 

Dr. Hare, in the human was little

convert the urine into urine, hence the hemoglobin of this animal consists almost entirely of urine of ammonia. On the other hand the cow & pig which are animals of a more active nature, and although like the serpent carnivorous, their urine from the amount of urine they excrete (the animal excreting contain less urine acid if having been converted into meal). A great variety of the animal textures must be the result of their active habits and not at all any trace of urine acid is found in the urine. Here and other facts might be stated in support of the above theory, but it is unnecessary, as other facts have been brought forward to make the whole of both and this one which has been already mentioned may be stated. That increased absorption of urine does not cause a diminished quantity of urine acid and an increase of urine in the urine is proved by the fact that the excrements of the serpent are of the most sluggish animals alive, and third of the wild carnivorous
Birds which are constantly flying about are much of the same nature. If the above theory held good there ought to be little or no urine and fainter in the excretions of these birds than the proof in point shows the opposite.

Nor can it be to explain the above anomalous cases. It appears to be clear proved that the human race in good health can alter the quantity of urine and urine acid according increased diminished exercise. A person confined to the house eating a feeding more and taking no exercise will have the quantity of urine acid is increased. Another person however exposed to the open air and taking a moderate degree of exercise has an increase of urine acid, but the contrary. Clear it is that the tissues acted on by the formula of the source of urine acid but as in the case of meat it is thought that there is another source. The food also has some considerable part to play in the proof and this point may be allowed again. (I refer to the experiments of Dr. Schwan which distinctly prove that while he lived on an animal diet he increased much more urine acid than while living on vegetables. While living on exclusively vegetable diet the quantity of urine acid was extremely small. The statement that the nature of the fire has a decided influence over the composition of the urine and the quantity of urine acid as here with reference)
The secretion of different classes of animals. In herbivorous animals which live wholly on vegetables the urine is alkaline. In carnivorous animals the urine holds fast the urine being acid. This difference not depending on the peculiarity of secretion but in the differences of food on which the animals subsist. This is shown by restricting carnivorous animals to a vegetable diet. When they are so restricted their urine which is naturally acid becomes pale turbid and alkaline like that of herbivorous animals. On the other hand herbivorous animals such as rabbits fed for some time on animal food excrete urine which presents acid reactions and which naturally is alkaline.

(Rowland 1846) In Man also urine acid as has been seen is increased by the use of animal food and decreased by a diminished supply of it. From what has been stated it must appear evident that the urine acid takes its origin from at least two sources, viz: from the disintegration of the tissues and from the food.

The fixed salts now demand attention. These consist of Chloride of Sodium Sulphate of Soda Phosphate of Soda Magnesia and lime. Here we have Chloride, Sulphuric acid and Phosphoric acid combined with traces some of the salts are soluble others insoluble. As regards the origin of these substances there is but to
Much room for doubt as concerning the case. What acid... or... acid... treatment, are we now agreed as to the point, that the principal... Base, such as potash, soda, &c., have entered the organism through the medium of the aliment. The food, as well as drink, which we daily consume, contains these... and other salts, and we have already indicated the different passages or modes by which these can leave the body after having entered it, so to convince ourselves that the view and generally held as to the origin of these salts in the intestine. Just containing a considerable amount of various salts in our bodies and by what channels do they make their exit, they must either be carried off by the feces or the urine. Some of the salts are soluble, while others are not. In general, all the soluble salts are absorbed during the course of their passage through the intestinal tube by the absorbing membrane, and carried into the circulation. It is easily shown that the soluble salts are only carried off by the feces. When the amount of salt, contained in the fluids in the intestines, is larger than that contained in the blood, when however the amount of soluble salts in the feces are equal or inferior to the amount of those contained in the blood, the soluble salts are absorbed into the circulation and are then removed from the body by the urinary organs and channel...
amount of salts contained in the intestinal tube is larger than that contained in the blood a perspirative action is produced.

It requires as very exact set of simple and conclusive experiment to prove the origin of the salts detected in the urine. Since their source is shown by a simple and conclusive experiment. If a person evacuates at the morning a weak solution of common salt beaten by means of a chaser. No second evacuation will take place, the solution is absorbed and the salt found in the urine.

The influence of salts in solution on the action of wine is interesting and at the same time of importance. If a person drinks a considerable amount of fresh pure water a speedy eversion of urine is certain to follow. For glasses of water of from six to eight ounces each containing no more than 1/32 of its amount of salt be drank at short intervals an eversion of urine of the usual colour will after a lapse of ten minutes or less follow the second glass and from eight to nine evacuations will generally occur in the course of an hour and a half. The urine in this experiment emitted in the last evacuation will be clear and colourless like pump water and the amount of salts it contains is little more than is contained in pump water. The case however is different with water possessing an amount of salts.
equal to that of the blood; if even as little as 1/100th part of common salt be added to pumped water and from three to four glasses drunk no evacuation of urine will take place even in two hours after drinking. It is almost impossible to drink more than three glasses of this saline water, for it weighs heavily on the stomach as if the absorbing vessels had no power of taking it up. The process of osmosis never appeared to explain this phenomenon; it apparently arises from the fluid within the channel of circulation i.e. the blood, and the fluid without those elements i.e. the saline water, not exercising any physical action upon one another. If however the quantity of salt be much increased such as sea water we have a different effect, not only in the no uniformity of urine after the abolition of such saline water, but water exudes from the circulating vessels into the intestinal tube and together with the saline solution is carried off through the rectum. Perspiration instantly is produced. Considering that a certain amount of salt is necessary for the proper constitution of the blood it may be inferred from the above experiments that the physical condition of the tissues opposes an obstacle. Any increase or decrease of the amount of salts in the blood and thus that the blood cannot be poorer or richer in salts beyond...
a certain limit. — For what has been stated we are entitled to conclude, that all the salts contained in the urine are accidental constituents of the blood which are excreted and removed from the organism because they no longer form part of the normal constitution of the fluid. — The phosphates contained in the urine were formerly constituents of substances which have undergone decomposition for the vital processes as they existed as constituents of the blood, and when its transformation into living tissues they were not admitted into their composition — they are not required in the latter. — The different organic bases and acids found in the urine enter into the composition of the food of the animal excepting perhaps sulphuric acid which joins them in the organism and which can only appear to be formed by the oxidation of sulphur, and such being the case we have to look for another quarter to explain the origin of the salts of the urine. If the above reasoning be correct it follows as a consequence that the amount of inorganic bases and acids excreted through the urine must be equal to that of the bases and acids supplied to the organism during the same period through the medium of the alimenta.

Regarding the other constituents of the urine viz.: the organic matters little need be said. The puri...
Principal of these are Hippuric acid, Citrator, Ammonia, Extractive Phosphate of Ammonia, Vitiolate of Ammonia. All these from their chemical composition would appear to be the products of the decomposition of the tissues and probably they may also be related to the animal food. Concerning Hippuric acid some doubt has arisen in the minds of some. For long indeed within a few years back on acid was not detected upon evaporation of the urine. Lactic acid was universally believed to be present, however none of the researchers of Liebig lactic acid has been struck off the list and Hippuric acid taken its place. This acid in its composition resembles benzolic acid containing 5% carbon 10% per cent less. The origin of Hippuric acid is obscured to some degree of mystery as the composition of the aliment of man can throw light on the subject. The food contains no benzolic acid from which Hippuric acid could be formed and the urine of Grain is always rich in the substance let their food consist of what it may. The only conclusion that we can come to in the point is that it is a product formed in the organism to the formation of which the elements of the non-organised elements join with.

The Organic acids then of the urine are
Vine acid and Hesperic acid, and another nitrogeneous matter (probably the colouring matter of wine) which latter substance upon the ascent of air resolves itself into acetic acid and a viscous substance.

I have thus attempted to give a short but imperfect account of the general chemistry and physiologic of the common fracture. The subject is wide and one which admits of further investigation. To enter into all the minute microscopical you would be an endless task and would occupy far more of an infinitesimal time than he carewolv expects considering the number of other important subjects with which he must be engaged while attending college.

I have much spoken of the wine as it occurs in health and have taken as notice of the many foreign bodies that have been detected in it. In many diseases there is almost except of some substance which is natural to the wine thus with rheumatism, there is generally greater of tartric acid, in other diseases there are substances detected which bear no resemblance to the natural constituent of the wine. The latter we must leave at of new as they are so numerous and at times so important that they must form another subject for ourselves when we become acquainted with
the general characters of the wine and also the
relation which the different ingredients of this liquor
bear to the composition of the food we are in a position
to understand the theory of the treatment of many
diseases especially, the good effects which are derived
from dietary treatment. The wine is liable to many
diseases and although medicine may be of great
assistance in remedying the evil while let the
patient take what medicine he chooses if no
attention be paid to diet he can obtain no advantage
from the remedies used. Proper medicine and Diet
going hand in hand may do much but if a patient
neglects either to the fires and neglects the latter he
will obtain little to no relief. Thus a person suffering
from gout to give that man colchicum and at the same
time to allow him to drink his Bottle of Wine per diem
and great butcher meat till he was distended would
be foolish practice indeed. Considering the close
relation which exists between the food and the composition
of the wine it is thought that much may be done by
a due regulation of Diet in cases of disease in wine.
It is always to be kept in mind that when the
reaction is in any way abnormal we must not look
upon this as a primary disease but as an indication
of some particular phase of mischief acting upon
in some organ. Thus in a case of Brights disease albumen is found in the urine and here of course the albumen detected is not looked upon as the primary disease but as a consequence of the disease going on in the kidneys. The urine itself does not demand treatment, the kidneys are attended to and as the disease abates the albumen disappears. But moreover we must not always the moment that an abnormal ingredient is observed in the urine conclude that there is disease either of kidneys or any other organ. An excess of animal food is followed by an excess of urine acid. An unusual amount of exercise also causes a change in the urine. Large quantities of water will also cause a change in the uric acid. Now these can hardly be looked upon as diseased states. Many different opinions are held concerning various renal diseases and even the fundamental point whether or not urinary diseases depend on structural change of the kidney organs is still disputed. Thus Crem and held that the diseases could be explained by a reference to the blood and almost exclusively while Alasie tried to make out that the urinary diseases are dependent alone on structural alterations of the urinary organs. It is however now generally held that diseases of urine arise from both causes that is to say that certain abnormal states depend on changes of the blood or
oralment and certain in structural alteration of the kidneys. It is impossible as before mentioned to enter into a minute consideration of all the different diseases which lead to an abnormal state of the urine. However, that no one disease in particular as Diabetes, the treatment of which has so far as success can be based on the above considerations demands notice here, and one or two much enter into a general consideration of the disease with special reference to its treatment by Diet.

The name of Diabetes is given to this disease distinct and different in their nature and pathelogy; the one called Diabetes insipidus, the other Diabetes mellitus, in both the quantity of urine is profusely increased, but in the former the specific gravity is diminished proportionally. In the excess of the quantity, in the latter Dr. Mellitus there is both increase of quantity and specific gravity. In the first named disease the patient has great thirst and in the proportion of the quantity of fluid taken to the quantity of urine increased in that this may be looked upon as a case of Polydipsia. The former rather case is much more favorable than in the latter. Diabetes mellitus is a disease of almost insensible nature and although one of the principal symptoms is the presence of sugar in the urine still it is not to be looked upon as a disease confined to the urine. Since the urine may be said to be in a diseased state or in an abnormal condition but then we must look
for this cause which produces this condition. In many patients who have died from this disease no organic affection could be detected either of the kidneys or other organs. No blame in this way is attachable to the organs which receive the urine and we must therefore in tracing the cause go further back still. Here, our knowledge of the physiology of Digestion and the relation which exists between the Constituents of Aliments and the composition of Urine will assist us much.

This affection which appears to be peculiar to the human race is considered as a perversion of the function of assimilation and not dependent on disease of the kidney. This view is supported by the fact that first post mortem examinations of such patients as die of this disease show no organ in particular to be affected. Besides the liver, the mesenteric glands, the prostate gland and one or both kidneys in a state of organic disease have been observed. While in other individuals the state of these organs have been found healthy. Such diversity in the organs affected and in particular the occasional absence of all organic disease prove that the presence of Sugar in the Urine neither is the cause nor consequence of organic disease but that when organic disease does occur it is much a concomitant affection. It is plain therefore that we can derive little or no benefit from Mordanting in fixing in the paper
Treatment of this disease. Patients labouring under Diabetes Mellitus present many characteristic symptoms, the principal of which are Diuresis, Saccharine state of the urine, great thirst, inordinate appetite, and waste of strength & flesh. Diabetes urine is transparent and of a straw colour, its specific gravity considerably above the normal standard, ranging between 1020 to 1025. The quantity passed daily, varying much, but always greatly beyond what is natural. In some cases it exceeds the urine voided in the 24 hours amounting to upwards of 36 pints, and this state of matters continues for weeks and months. In all of course the excreta far exceeding in quantity the ingesta. Although the appetite remains unimpaired still from the enormous quantity of urine passed and from its increased specific gravity the patient loses both strength and flesh and conse-quently is incapable for months as well as bodily exertion. If the disease is allowed to proceed great emaciation and debility take place and the Systems begin in this weakened state to prove to other affections and thus it is that dis-embiguration of some important organs such as the lungs commences. In its simple form however Diabetes may terminate fatally without any complication, the emaciation and debility increasing at last reaches its maximum and then the urine diminishes in quantity and the extremities become edematous and finally after a total depression.
of the reaction the patient becomes comatose in which state he expires.

It is now generally thought that the diseased is not only constitutional but hereditary, and the causes which excite it seem to be the same as produce in other persons very different diseases particularly those of old, wet and miasmatic depredations. Not only is it thus found in the miasmatic but it has also been detected in the homeopathic in 

natural quantity. Thus proving that the disease is strictly one of the function of assimilation. In what fundamental change the disease depends is still doubtful although various opinions have been stated. According some it is supposed that it is a mere increase of the function of absorption all over the body and that this is indicated by the burning of the body, great hunger, pain, and by the milked dryness of the skin in the early stage and by an increased absorption at the lungs which is the fact that the diminution of the weight of the body in a given time is not nearly equal to the difference between the fluids ejected and ingested at that time, and that consequently the urine acid and meagre which are formed by the absorption of portions of matters can only from the food which are not capable of furnishing so much united matter as
load the whole fluid which they supply with urine acid and
urea but furnish in addition to the substances a large quantity
of sugar a substance known to have this remarkable relation
of area that it contains in given weights the same quantity
of Hydrogen and twice as much Oxygen and Carbon and no
azote. According to another it is supposed that the
original change is the tendency of the fluids to form sugar
a tendency which is communicated to the excreta that
the sugar thus formed and taken into the blood being
present in excess of any demands of the system is later acted
as a powerful diuretic and is thrown off by the
kidneys stimulating them to a great increase of watery
excretion and then that the increased absorption a clear
the body and the hunger and thirst consequent on that
increased absorption are to be ascribed to the great
evacuation of the fluids and solids thus effected. Per-
haps the latter opinion is that which is best supported by
experiments and therefore the most likely of the two. The
Sugar present in the urine is not as was supposed by Port
derived from the blood but is present in its usual quantity
and thus cannot give rise to sugar and as none of the
ingredients of the urine which come from sugar are diminished
in this disease it is evident that the sugar is an added
constituent and quite independent of any change of
the normal ingredients of the urine. From Mr.
Mr. George researches it would appear that a small quantity of sugar can be detected in the stomach during digestion, even of those in the enjoyment of good health, that it does not occur to an abnormal extent in the stomach of those suffering from Diabetes. He has also shown that in diabetic patients sugar exists to an abnormal extent in the blood and also that sugar is present in the feces, saliva and urine where it should not be. According to these experiments one would be justified in concluding that the increased flow of urine is a secondary result, the consequence of large quantities of an abnormal amount of sugar circulating in the blood.

If we look for a moment to the composition of the food taken by man we find that a considerable quantity of sugar in carbohydrate matter is daily taken into the body. The quantity of sugar which exists in healthy blood being extremely minute it is evident that the sugar daily consumed must be acted on by the Vital force in some way and that this action results in the conversion of the carbohydrate principles into some of the constituents of the blood. This faculty, a function inherent in the system must be of vast importance, and disarrangement or destruction of it is not fit to be the real source of this disease. As previously mentioned there have been many theories proposed and supported by authors regarding the ultimate
cause a source of this saccharine matter found in the urine of Diabetes. The principal saccharine principle found in the urine of and blood of Diabetes not converted into one or other of the normal elements of the blood. This is a question the solution of which is by no means easy. One view which appears very feasible and which is also supported by the numerous experiments of M. Boucharlat is founded on the physiology of Digestion. The numerous researches of M. Boucharlat, M. J. P. M. Mialhe, and others touching on Digestion, especially the action of the different glands poured into the intestinal canal, or the fluid has done much to explain the pathology of Diabetes. It is established by these experiments that the secretions which the intestinal tube receive have the power of converting fecal or starch into glucose a saccharine principle identical with the diabetic sugar. Various experiments have been made with the view of fixing on the particular secretion which has this power and although these are still much doubt at the point, the conclusion come to by Boucharlat appear to be corroborated. It is supported by the experiments of others. He holds that the conversion of feces into glucose takes place normally in the upper part of the intestine, the duodenum, but in disease as Diabetes the change takes place in the stomach. He considers this peculiarity due to the presence of a mucous
which is absent in the healthy stomach and which is recorded as
a result of a nervous action. Reasoning on this
result, and his experiments he supposed that the
saccharine principle, being formed in the stomach is rapidly absorbed
by the veins and carried into the blood in too great quantity
for assimilation. Being in too great abundance it runs the
caused off and it is as if acting as stimulating the kidneys
to increased secretion and thus causing thirst. But
even admitting these premises they do not explain why
the saccharine principle should be absorbed into the circulat-
ion in the stomach unchanged while in the duodenum
the same principle undergoes a wonderful change before
it circulates in the blood. 

Bouchardat supposed that
the liver had the power of converting glucose into the elements
of the blood but this appears very unlikely. 
In Diabetes
then the saccharine principle is formed in the stomach
while in health it is formed in the duodenum and
remembering the fact that absorption takes place from
the stomach rapidly by the veins while in the duodenum
absorption is carried on by the lacteals we may try to
explain the change which the saccharine matter
undergoes by a reference to the different course it takes
in the two places where it enters the circulation directly
while in the other it circulates through the lacteals
and mesenteric glands. In the former case it cannot
undergo much change while in the latter it may be supposed to undergo a change by which it may be converted into one of the normal ingredients of the fluid. This becomes now then the only difference between diabetic normal assimilation in the following, in the former the glucose is produced in the stomach and is subject to nearly entire absorption, and thus the blood becomes loaded with unassimilated carbohydrate principles. In the latter the glucose is produced in the duodenum and is absorbed by the lacteals where it undergoes a change and nine or at least every single quantity passes unchanged into the circulation.

Having said this much regarding the pathiology of diabetes it will now be necessary to state the mode of treatment which has been found most successful and which like most other remedies is based on a theory founded on the pathiology of the disease. The treatment is principally dietary. The object to be gained is the restoration of the urine to its usual quantity and quality, this however, is not to be obtained by any specific remedy. No specific medicinal remedy is known which exerts a specific action on this disease. Sugar being found in the urine it must be our object to diminish it and finally expel it altogether. We must then fix our attention almost entirely to those substances which cannot be converted into sugar. These, such as arrow root, potatoes &c. which are so easily reducible.
to sugar or a species of it ought to be avoided. But more particularly the patient must abstain from all kinds of saccharine principles either crystallizable from fruits, or not every compound into which can fecundate sugar enters. From what has been stated above it will appear that the Animal Diet must be the most suitable for a person laboring under Diabetes, and consequently for many years past Authors have insisted on the use of Animal Diet exclusively. This in doubt would be the proper Diet if the Intestinal Canal were not a little capricious of what it receives. Firocfood on a patient which is altogether disagreeable would of course increase the Asphyxia and consequently the disease. Moreover from Experiments made on Animals, it is evident that it is impossible to sustain either health or life upon any single alimentary principle. Neither Albumen, a principle of animal flesh, nor starch, oil or fat, when taken alone can nourish the body for any length of time. This would appear to be explained by the fact that the continued use of any single aliment excites such a disgust that preference is given to alteration than to living on this single aliment. For alimentary principles at least must be allowed to alterate the health of the patient. When animal food has been taken for sometime, there is a great craving for
Vegetable food and this craving is such that it would be impossible to refuse by dieting it. However lately a means has been devised by which the want is supplied without injury, viz. the allowing of bread from which the starchy portion has been removed, the gluten or agglutinated matter alone being eaten. By careful restriction of the diet to animal flesh and gluten bread the disease may be kept in abeyance although perhaps never entirely removed. In a case mentioned by Mr. Carpenter a man 72 years of age in whom the disease had lasted a year and in the increase and in whose urine the quantity of albuminous matter was in each quantity as to give it a sweet taste by attention to diet the disease was kept in complete check for more than 13 months. Although it is undeniable that few cases have admitted of permanent cure notwithstanding all due attention and care, still there are few diseases much so much good may be temporarily effected by proper hygiene and dietary regulations. The conclusion therefore has been growing in strength and so now inevitable that while the ultimate cure of Diabetes Mellitus is rarely accomplished, the circumstances which destroy the comfort and shorten the life of the unfortunate patient are capable of being to a great extent modified or controlled. The dietetic treatment which has been so far successful which is based an a knowledge
both of the physiology of digestion and urine. Cauterization in the patient's abstaining from all farinaceous and saccharine materials. Bonchard has given this treatment a trial on an extensive scale and recorded the results of 45 cases—"which are highly satisfactory."

The preceding is the fundamental principle of treatment, but concomitant symptoms must also be attended to. Morbidity and mental debility, slight oedematous oedema, and a tendency to secondary disease generally accompany diabetes and these of course must be guarded against and when present a suitable treatment must be adopted. Thus along with the dietary treatment it is necessary to clothe the patient well in blankets. It is also advisable that he should take suitable exercise, that he use baths, and that he partakes of a certain quantity of wine especially claret which has been found unequal to all others, and also that there be hygienic regulations be assisted by Ipecacuanha, stimulants and diuretics. Various medicines under the name of Specifics have been advised to be used, but it is deemed unnecessary here to refer to any of them, all are alike ineffectual. Some cases require the administration of one or more of the remedies or means mentioned and it is the duty of a well educated practitioner to be able to judge in which cases one or
all are suitable. No distinct rules can be laid down by which a person can empirically use these or other remedies, and it is by the consideration of the symptoms of each individual case and by a proper diagnosis formed on these symptoms that the proper treatment can be adopted. No medicinal agent as yet has been discovered which acts as specific action in this disease and when we consider its pathology it is evident that no agent possessing a power so extensive can exist.

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