On

The absence of the Chlorides
from
The Urine
during Inflammatory diseases

Almeric Walter Seymour

March 31st 1855.
The immense progress that Organic Chemistry has made within the last few years, and its consequent application to the analysis of the different injuries and diseases of the human body, has not a little tended to the advance of Modern Pathology, but more especially to the pathology of the secretion; foremost among these secretions is the urine. The urine stands conspicuous as being the natural channel through which life is carried to the body and some secretions of the body escape in the urine. The importance of attending to its changes during disease has been long recognised. Indeed, those who practice medicine among nations in a low state of civilization have come from their own observation to understand the importance of attending to the state of the urine. And a considerable portion of their scanty medical literature is devoted to an enquiring upon its different moral appearances, capable of the senses, & they (The Authors)
regularly require the patient to forward a speci

cimen of it... owing to an ignorance of the various
constituents of this fluid. These changes have not
all recently been rightly understood; it was re-
tained for T. Quant to lay the foundation of all
our modern knowledge concerning these changes
and the labours of Sir R. Jones, F. C. Simmson
and many other distinguished chemists have
just completed the investigations and advanced
the knowledge he so happily began.

The alteration of this fluid, so characteristic
in health, undergoes when the constitution is
changed. Incredibly, it excites the attention of the
most unobservant, and a knowledge of its
day may frequently indicate to the physicians
the very nature of the disorder under which the
patient labours. As for instance, the presence
of albumen, low specific gravity, pale colour,
concealed to other signs, are all indicative of dis-
ease of the kidney... The presence of sugar,
high specific gravity, increased secretion, may
lead the physician to enquire into other symptoms
indicative of diabetes insipidus... The change from
its invariably acid reaction to one of alkalinity
(when fresh prepared) with deposition of the
Phosphates, may be indicative of disorders of
the nervous systems, or disease of an adynamic
type, or state of disease of the mucous membrane
of the bladder. All these instances tend to
show how of what extreme importance it is to be
strongly acquainted with the various mortel
alterations of this fluid.

It is not my intention to enter upon all the
changes of the urine during disease; but to confine
myself to the question of the appearance or
absence from one of its constituents during
disease, inflammatory disorders, I more particu-
larly do desire pneumonia. This constituent
is the element Chlorine, which here, as in all the
other fluids of the body, exists in notable quanti-
ties. It is combined in one of three ways, or in all
three, viz. as Chloride of ammonium, Chloride
of soda, and Chloride of potassium, but
chiefly as Chloride of soda, which forms the
largest proportion of the saline constituents of this
fluid.

In all the later chemical works, it has been stated
that during the course of inflammatory disease
there is a remarkable diminution of the fixed
salts in the urine, and more especially so of chloride
of Sodium. This has not received much attention
until within the last 10 or 15 years, as the only
method known of separating the chlorides of Sodium
was by crystallization, but in consequence of the well-
known discovery of Liebig of a method for quantit-
atively estimating urea, and by it, Chloride
of Sodium, this has now become a comparatively
simple matter.

In the year 1857, Dr. Moltenbacher published
a paper stating that in 50 cases of Pneumonia
he found the urine was free from Chloride of Sodium, and
that this salt disappeared from it about the Period
of Deposition of the lung. He ascertained the urine
with citric acid, and then added a drop of the solution
of ‘Hydriate of Silver,’ and judged from the character of
the resulting precipitate, the absence or presence of
“Chloride of Sodium.” Dr. Neale of London then
instituted a set of experiments upon Pneumonic
urine, and considering that the occasionally large
amount of “Chloride of Ammonium” present in such
urine, would by its precipitating silver according to
Dr. Moltenbacher’s method of testing, deceive the experim-
enters as to the absence or presence of Chloride
of Sodium, wishing also to obtain quantitative
results, tested the urine in the following manner:
The evaporated 1000 gms over a water bath, and dried. The residue fell to a very slight weight at 200°C, decarbonized. The ash, dissolving the residue in distilled water, and testing as in inorganic analysis, obtained the amount of chloride of sodium actually present.

In December 1853, while I was clinical clerk in the Royal Infirmary of St. Luke's, a Patient, labouring under a well-marked and uncomplicated meningitis, was admitted under the care of Mr. Bennett. Dr. Cartwright, a pleasant man attending the Clinical wards, and who was the first to show the attention of medical men in Edinburgh to the facts, requested me to test the wine for acetic and other acids, according to Dr. Redtenbacher's method.

It was on the 3rd day of the disease, and the following was the result. The acetic acid, which was very strong, produced a turbidity in the wine, a drop of the solution of chlorate of silver (10 grains to the ounce) then added, produced no change. The wine exhibited a totally different reaction to that which healthy wine did when tested in the same way. The experiment was repeated on the following day in the presence of Professor Bennett, the late Dr. Alexander Munthe, and Dr. David Christison, and with the same result. At the request of Professor Bennett...
Then proceeded to test, in this way, the urine of every patient that was in the ward, at that time, and of every one that was admitted for the next two months—very few cases of pneumonia were admitted during that time, more that disease appearing to be more prevalent during the spring and summer months, than in the middle of winter.

I did not after that time pay any more attention to the subject, as I considered it settled, but finding that there were some grounds to believe that this method of testing was faulty, and that the disappearance of the chlorides from the urine was by no means confined to pneumonia, returned to the subject in the beginning of this year.

For the sake of uniformity in my experiments, I always used the same method of testing in every urine, keeping this in view, that, if the fact of the absence of chloride of sodium (or rather the chlorides) was to be of the slightest practical service at the bedside, some means must be used to test for them as quickly and as easily as we are now—every day in the habit of using in testing for albumen.

Therefore chose Dr. Hackett's mode, which is the same as Simon indicates in his valuable work upon Animal Chemistry, and as a rough method had.
Great reason to be satisfied with it, adding this, that the resulting precipitate of urine was one, should be insoluble in nitric acid. For these reasons, 1st. the chloride of silver is insoluble in nitric acid. 2nd. Under certain circumstances, nitric acid of itself produces a precipitate, which is soluble in excess. Now, as in the first instance only enough nitric acid was added to saturate the urine, the chloride of silver, urine often resulted in turbidity, which was easily disposed of when more acid was added. It was afterwards suggested to add ammonia. And for some reason I know not why, this liquid was used and the nitric acid exploded. 

Now the adding of ammonia, unless the afterwards added acid to see if the ammonia in the ammoniacal phosphate is like, is utterly useless. Ammonia dissolves every salt of silver, with the exception of the phosphate and selenide. The latter one we are not likely to meet with and the former cannot be formed when we consider that the urine has been previously strongly acidified with nitric acid. But as soon as the ammonia has dissolved the silver salt, the further addition of it will neutralize the acid, and finally throw down a flocculent precipitate, which if examined under the microscope, will be found to consist of the beautiful greenish precipitate of the Am-
Monocaco-magnesian Phosphate. In adding it
cariously, this takes place so rapidly, that it appears
actually to be the silver salt merely changed, but if
this is carefully performed, and the whole reaction
attentively watched, it will be seen that the first
action of the ammonium is to dissolve the silver precipitate
if there be one, then to neutralize the acid & finally to
throw down the above mentioned precipitate.
In fact it is but the usual method of testing for the
presence of phosphates, and I have dwelt upon it here
as much in attention to these facts lead to some
curious mistakes, such as assuming that a silver salt
has been formed insoluble in Ammonium.
I have repeatedly proved by experiment, that the
silver salt, whatever it is formed in the highly acidified
water, is totally & entirely soluble in Ammonium.
I have said that I used Mr. Nonnenbacher's method
of testing in all the cases that I experimented on in
December 1853, and January 1854, and may
say here that in three cases distinctly I have put
down an absence of Chloride from the urine. I
then had no precipitate or if had it was soluble
in Ammonia & insoluble in Citric acid.
Which I think is quite enough to prove that
no Chloride could be present, at least in the
In a small quantity that was put into a test tube, yet objections were raised, resulting from the apparent obscurity that overhung the reactions that took place in the urine, under certain conditions, and also from the fact that Indicating of Silver Precipitate later many more things in the urine than chloride. This will make it necessary, to briefly point out the effects of nitric acid, and indicate of silver on healthy and diseased urine.

Healthy human urine is a fluid of a pale straw-yellow colour, of a density varying from 1016 to 1025, contains a large proportion of water in 1000 parts and certain salts, of which chloride of sodium is one, which exists in the proportion of from 3 to 4.5 per 1000 parts, the latter being its most normal amount) and also a certain amount of organic matter. Now—on urine of this kind, nitric acid produces no change, beyond occasional effervescence and change of colour, and when Indicating of silver is added, a very heavy precipitate is formed, sinking quickly to the bottom of the glass, breaking up into granules and quickly assuming a violet-blue tint. Is this fine chloride of silver? That it is a chloride
I have frequently, though it was not necessary to do so, reduced the silver, and evolved the chlorine. But I am satisfied it is not a pure chloride in the strict sense, part of it, but a very small part, in these conditions of the wine being organic, as will be easily seen if the precipitate is collected, dried, and burnt. In testing frequently, even apparently healthy wine, I have seen the chloride of silver lying at the bottom of the test tube and in the supernatant liquid a light flocculent one, soluble in distilled water, and very insoluble in alcohol. But not however common in healthy wine, and in exceedingly small.

If distilled water is added to the wine, to dilute it to three or even 4 times its bulk, and nitric acid, and nitrate of silver, then added, a beautiful fat, first know white, precipitate of chloride of silver takes place.

In inflammable substances, we have the wine, high coloured, of a density never below 10.20, clarity in quantity, dry deficient in water, always deficient in salt, some being even absent, and the organic constituents very much increased. The proportion therefore between the organic and inorganic constituents being
very materially altered state. It is always either of a black or dark colour, and containing no sediment, or containing a very dense sediment under the former circumstances. It is intensely acid, under the latter. If its density very much increased and it slowly becomes alkaline. In the sediment (after the brine has stood a bit) under the microscope, we often see the Prismatic crystals of Phosphate in all varieties of position, usually called the Wheelbarrow Phosphate, mixed up with Iron, and Buret of Ammonia.

By adding Nitric Acid to inflammable brine, if the colour is heightened, a yellowish sediment, a Precipitate is formed, soluble in excess of the reagent. This is based on a series of experiments observed by Wm. Hyatt, which in this kind of brine in proportion to the water, in very much increased. If the brine is very turbid the effect of nitric acid is little. If there is a small amount of water present, to render it more to but excess of the Acid will effectually clear it, too great an excess, however, may rep precipitate the salt. The other experiments besides this show Nitric Acid to be in large quantity.
Occasionally, if the urine of the horse is very deficient and our acid is strong, we shall have hydrate of urea, speedily formell on adding our reagent. In one case of Pneumonia, while the inflammation was at its height, and during very cold weather, and in one case of Acute Bronchitis, the addition of citric acid to the urine caused crystals of hydrate of urea to form in the short space of two minutes.

If we add to urine of this kind, "hydrate of silver" and the nitric acid, we shall have an unctuous, opaque, precipitate, formed of a variety of things, hydrate of silver itself being a very delicate test of organic matter; the greater part is soluble in nitric acid. But I have found that occasionally if we add a quarter of a dram quantity of nitric acid, a clear hydrate of silver, that a precipitate is produced, part only of which is chloride. In 1000 grains of urine, nitric acid in large excess was added, hydrate of silver then added, and the whole warmed over a spirit-bath, and allowed to stand for 24 hrs. The precipitate was then thrown upon a filter, washed with spirits, till nothing but the chloride was left. The washing were soluble in ammonia.
The washing was found to consist of some apotpepic
organic salt. But this only takes place in those
wines where the inorganic matters are largely
increased & the water very much decreased.
And in the small quantity of wine used at
the best side, this is nearly perceptible.
If we artificially add water to the wine, this
precipitate does not take place so readily, and
the inconveniences attending the use of the
stronger acid are got rid of. I have
made many tests experiments. Therefore, always instill
the wine in the following way,
1. Add to the wine at least three times its
bulk of distilled water
2. Next a small portion of nitric acid sufficient
to acidulate it thoroughly
3. Add a drop of the solution of nitrate of silver.
And if any chlorine is present, it will immediately
be detected itself.
This method has now been used in many cases
with great success. It is short and easily under-
stood. And if any precipitate however tiny
takes place, there as yet by direct analysis
found it contains Chloride of Silver, though
very small in amount.
Mr. Reale's method, which was used with the view to obtain quantitative results, has this objection: it is very long and tedious, renders considerable drawback; I would take up nearly a week to finish it, thereby rendering the fact entirely worthless at the Red tide. Besides he used it with the view to finding the amount of fixed chloriné that might be present. Now D. Rottenbacher's experiments are as conclusive of the absence of volatile as well as fixed chloriné. For chloriné in the smallest amount will declare itself by uniting with silver to form the characteristic Chloride of Silver, and they often whilst testing according to D. Rottenbacher, I & S. Ammon deide Lindhau. Precipitate whatever is a pretty sure indication of the absence of chloriné in any form. Again during the process ofparation employed by D. Reale, it is very difficult to regulate the heat, as to prevent a certain amount of decomposition and consequent evolution of chloriné from the Chloride of Silver, and Chloride of Sodium at a certain temperature is isolatédjäsöé.

There is one sure method of testing for chlorinés which I think is likely to be eventually the most-
serviceable, inasmuch it will give us with a very little trouble the actual amount of chloride of sodium at least, present in the urine daily. And if we put aside the question of the use that this fact may be in disease, we may eventually find a solution of the question of the relation that evidently exists between chloride of sodium and urine. This liquid present in estimating the quantity of urine in a given portion of urine by means of the solution of mercuric nitrate of mercury. It consists apparently in adding a solution of known strength to the urine, which solution first combines with chloride of sodium and when dry is dispersed of solution down the urine. By this means, E. A. Digel, has averaged at his results concerning the chlorides. Although it has been called the well-known test of Liebig, I searched for it everywhere, but never found it described, and though he tried several experiments with mercuric nitrate of mercury, up to this time he failed in arriving at any results.
In upwards of 50 cases experiment
ed on in December 2 January 1855-56, made
out arbitrarily truly well the absence of the
Chloricides from the urine in 6. 3 of these were
Pneumonia - 1 Small pox - 1. Pneumonia in its
last stage. 1 of Peritonitis.
Case I. - Mr. Donald, a Labourer, 25.
Admitted December 26 1855. Pneumonia.
"The state on which the Chloricides were found to be
absent was the 3rd day of the disease on
The 4th day from the Apex to just below the
Inflexion of the right Lung, there was marked
dullness on Percussion, with increase of the
Vocal Resonance, distinct Respiration.
The Pulse was 120 full & Strong. The urine was
Hypo Chlorous. Op. Gr. 15.20, unaffected by
Heat & Nitric Acid, in decolorizing it thorough-
ly with Silver Nitrate and adding a drop of the
Solution of Nitrate of Silver (10 grains to the
ounce) a Trace of Precipitate was formed.
The Chloricides were absent on the 5th or 6th days
the inflammation steadily advancing away
These days - On the 7th day, there was every
where over the right Lung Chlorine on Percussion.
A Titular Melting, suppuration was complete.
A returning fever of Chloride was to be found
in this wine of this class. The wine was suspiciously
depositing, &c., and grew - on the
5th day. The wine was unluckily thrown away, but
the following evening, the wine was returned to the
place. The Chloride of Silver was added, and the
wine was again tried. The patient remained very
abundantly up to the time of his convalescence.

Case II. - Donaldson. Typhus Fever, Pneumonia.

This patient was admitted with Typhus
Fever, in December, 1834, up to the 11th day
of the disease, the wine was carelessly
administered and found to contain the Chloride.
On the 10th day, it was however properly
in quantity, and on the 11th, 12th, 13th the
cholera was totally absent. During the time
of their absence, he was found to be also
labouring under Pneumonia of the right
lung; on the 14th the Chloride returned
concurrently with the state of the
fever and the inflammation.
Case III. Peter Burns - Injuries - Small Pox.

This man, whose habits were very dilatory, was first admitted into the Clinical Ward under Professor Bennett, January 15, 1852. Suffering from Small Pox and Delirium Tremens. It was impossible from the state of the mind to make out the day of the disease. But the eruption was apparently in the common and constitutional stage. On the 15th his urine was scanty & dark coloured, there was no albumen. On the 16th day, there was a trace of chlorides on addition of the testis. On the 17th, 18th, 19th, 20th, 21st & 22nd of January, a trace of chlorides was to be found in his urine. During the whole time he was under care. The temperature varied from 102.2 - 102.6, though I deplored a continuous reclining position, and the respiration. The Pulse before meals was 120; his chest was frequently stuf-
ful dullness, but not a trace of Pneumonia was to be detected.

Case IV. David Murray - Pneumonia.

This man a coal heavener by trade, was admitted with Pneumonia at the Base of the
If the clay on which his disease commenced, but the clay on which the urine was examined was apparently the 5th clay of Aulnoy on this day, the urine was loaded, but the tests beyond The Presence of Boccard being also demonstrated, gave no result. There was Aulnoy on percussion over the affected part with loose repetition on auscultation and with Tubular Breathing, with increase of the vocal resonance on the following day (the 5th). There was a very slight trace of Chlorides in the urine. The lung was now perfectly consolidated; on the 8th day, there was no change for the better in his symptoms, and still only a slight trace of Chlorides in the urine. On the 8th day, there was improvement and no Chlorides were totally absent. On that evening he was seized with remission. He died. The Body was opened. The Death was of the Diagnoses confirmed.

Case V. Jane Beveridge — Phthisis.
This was a poor woman in the Female Ward.
Dying of Phthisis. I examined her urine two days
previously before death. It was colored, &amp; exactly
containing a large quantity of uric acid, Phos-
phates, no Albumen, and no Chlorides. I have
examined the urine of several other Patients
in the last stage of Phthisis, but with the exception
of one Woman, never found the Chlorides ab-
sent; there might have been insipient Chlor-
uria in this case, but I cannot say it was
proved.

She was brought into the Royal Infirmary
suffering Acute Bright's Disease. When I got
the urine, an attack of Reitouritis had super-
vened of which she very soon died. In her urine
no Chlorides were to be found.

The next few cases were experiments made
by my Friends, who took an interest in my
Observations at that time.

Case viii. Burns Oct. 18. Pneumonia, con-
tracted by Dr. Bingle.
"This lad was admitted towards the latter part
"Of January 1854, under the care of Dr. Robt. Sec. Discharge was well marked. Pneumonia. The Chlorides were about the 1st, 5th, 6th, days, and returned on the 7th, when returning perspiration was evident. After that they became very abundant."

Case VIII. — Mr. HK. — Acute nephritis.

"A man had been for some time under the care of Dr. Robertson, for the case of the heart, and in his urine, Chloride of Silver had always been abundantly precipitated on using the tinct. On the night of the 21st of January, he was attacked with acute nephritis. No chlorides could be detected in his urine on the 22nd, but on the 23rd he was better, and the chlorides were present in small quantities. Afterwards, they became as abundant as in our attack of acute rheumatism."

Case IX. — Mr. Philips — Pneumonia.

"He was for some time in the infirmary, treated for acute bronchitis. Was drenched with Pneumonia on Saturday, January 23, on Sunday. The Chlorides were present in very small quantities.

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They were entirely absent on Monday, and re-
ained absent for 36 hours. They afterwards
returned in unusual quantities.

Cases X. - XIV. In different parts of the Infor-
mary were communicated to me by D. David
Christison. One there was but a trace of Chloride
on using the Tests - They were 1. Acute Tubercular
and 4 Malepub. during the Fever.

The three following examples of the absence
of the Chlorides from the urine, are cases
of Pneumonia, that were admitted under the
care of Professor Bennette, during the sum-
mer months of 1854, I reported by him in
the Monthly Journal of Medical Science for
December. I wish to bring together all the
cases in which the absence of the Chlorides has
been observed in the Royal Infirmary, hence
intend to transcribe them from the journals.

Case XV. James Murray, 26, 53. Pneumonia.

This patient was admitted June 30th 1854,
with Pneumonia of the right side, on the 3rd
Day of the Disease. The urine was. Sp. Gr. 1022.
Red bile in colour, containing no albumen, and no chlorides —. The physical signs were as follows: Post =
trichy on the right side there was increased dulness on,
percussion over the lower 2/3 of the lung, and on auscult=
ation, respiration at the base, with tubular breathing
was distinctly audible. Bronchophony above.
There was considerable pain at the base of the lung
particularly on taking a deep inspiration. No
expectoration, every other part of the chest healthy.
On the 9th Day of the Disease, Pulse weaker than on ad=
ministration. Physical signs the same. No chlorides
Present in the urine. 10th day, Chlorides reappeared
in small quantity. Physical signs the same.
On 11th day — The urine contained an abundance of
of Chlorides (no report of the mans chest).

Case XV. James McNaughten — 34, shoemaker. Pneumonia.
Admitted June 30, on the 6th day of Disease —
Signs on percussion were slight dulness on the right
side, anteriorly and inferiorly; posteriorly there
was marked dulness over the inferior three fourths
of both lungs. On auscultation, Str Tubular
Breathing over the dull part, with Bronchophony
and coarse respiration heard on taking a deep in-
spiration. Pulse 120 weak. The urine was of
"A deep cherry red colour, Sp. Gr: 1.070 No cholerae, and no choloides present. July 1st, 2nd, 3rd no choloides. There is no report of feverish during this time. On July 4th, (the 10th day of the illness) the urine presented the same cherry red colour. The choloides were present in very small quantities. Inflation was at that time distinctly audible in the left lung posteriorly. The right lung the same as before. On the 7th of July, the 13th day of disease, the choloides reported as abundant in the urine. Inflation on both sides posteriorly very much increased. It is important to remark as consistent with the absence of the choloides that this patient suffered very much from diarrhoea."

Abundance.

I have copied the following case from the journals of the Clinical wards, not to much report an absence of the chlorides as a diminution and of consequence in this respect, as the fact the patient was suffering from a very mild attack of pneumonia or that the had got over the worst of the complaint before admission, and the state of the chlorides indicated a resolution going on; the latter, although only on the 5th day of the disease I consider the most likely.

Jane Gordon, 58. Admitted Sept. 9th. Pneumonia. She was admitted with pneumonia, of the left lung apparently 4 days old. In the 5th day of the illness, anteriorly on the left side there showed to the extent of three inches below the level of the nipple, two auscultatory areas, distinct respiration with tubular breathing in heacy. Respiration is heard over the whole posterior surface of the left lung. Injection of the scanty danger. The urine scanty, of a dark red colour. Sp. Gr. 1021. Chlorides less than in healthy urine. On the 14th of Sept. Respiration were heard over the whole of the left lung, it was now clear. Sp. Gr. 1016, abounding in chlorides; after this they
The following cases were observed by myself.


On the 6th, after a short febrile attack and rest, he was attended with rigor and unusual febrile symptoms. On the 6th, the day of admission, the complaint of pain in the right, aggravated on taking a breath, at that time no abnormal sound could be detected. He had great sighing over the chest. There was made over the right clavicle a little above the trachea of the right side anteriorly, and over the lower three-fourths of the lung posteriorly. The pericardium formed a small cavity over the clavicle parts, and some increase of the local resonance. Sputum Sputum.

Sputum from 3rd to 10th day, viscous was very turbid, Gpp. 10 2 3, containing no Chlorides on using the injective acid, and Nitrate of Silver as the next. On the following day, the 10th of November, chillsness continued twenty-four hours on right side, and complete absence of respiration, urine red but clear, no Chlorides present. The Chlorides remained absent on the 11th of November, at which time ensuing he died.
The body was examined after death, and as far as the lungs were concerned, the diagnosis was confirmed.

Sodium cyanide cases of pneumonia and pleurisy that were admitted into the clinical wards, I believe the observations were useless, on account of the great impurity both of the nitric acid and of the aque ammonia used, both of which are frequently adulterated with hydrochloric acid, and secondly, I took the urinary for the purpose of experiments on and endeavouring to find out, whether there was not some other way, of testing for the presence of cyanous salt without mixing with the reaction that takes place with our usual test, when the urinary contains it into one, as they sometimes happen to be enormously increased.

Case XX. Harrison. Acute Pneumonia and Delirium. was admitted into the Delirium Syndrome ward. He had been a hard drinker, and had suffered from acute Pneumonia more than once. He was admitted January the 23, 1853, with acute Pneumonia and Delirium Syndrome. The disease began January 23rd, I saw him (January the 25th) the ankles and joints were swollen, feet, and painful. The joints were now fixed, I was told it shifted from one joint.
"In another. A double Fasting was made over the
Pericardial region, the rest of the chest healthy.
Pulse 130. Full and Strong. Sweats were very
lupious. Taking his food well. His urine was
very dark. Of an intensely red colour, looking
drastically like Pulmonary urine. By adding
White acid, Lime acid was seen to exist in large
quantities, with Albumen. Then took a portion
side. Male Test tube, and diluted freely with hot-
filled water, added Nitric acid which pro-
duced no precipitate now, and then added about
of Silver. No effect whatever was produced. Here
the Chlorides were absent. On January 26
Treated his urine the same way, a slight
gypsum precipitate was produced. Insure then to
see if the effect of Silver was so delicate a
test of the presence of Pulmonary matter, as to cause
them to decline it. Then dilute in such a highly dilute
solution as this was, I whether we could say that
Chlorine was absent. Treated a. 1000 pro in the
same way. threw it on a filter, washed well,
with warm the filtered water. Burnt the precipitate
and deducing the weight of the filter. Found that
Chlorine = .27 in 1000.

After this the Chlorides became abundant."
Case XXI. - Talpouret, acute pleurisy, Oct. 21.

This patient was admitted in the early part of December 1853, with obscure signs of abdominal aneurism. He had remained in the infirmary gradually improving till January the 22, 1855, when he was visited with a sharp pain in the right side, with fever, and general feverish symptoms.

On the 24th of January and second section increa-

s the right side of the chest both anteriorly and posteriorly. Pulse was 100. On the 31st day of the pleurisy, testing the urine as in the two previous cases, I found no albumen, p. p. 19, 1851. It was high, colored, and sticky, but a slight trace of chloride.

Having a desire to ascertain whether chlorine in a

volatile form was present in this urine, and also

to see whether there was any fixed chlorine present,

I experimented in the following way. Two portions

A. & B, each 1000 cc. were taken. B was well

diluted with distilled water, precipitated with

nitric acid, and a little of silver, thrown upon

a filter, dried & burned, & weighed.

Chlorine as estimated = .26

B, was evaporated gently over a water bath, trans-

ferred to a sand bath, care being taken that the

heat should be low, finally incinerated in a
Platinum crucible. From the dissolved ash, the chloride of silver was precipitated, and chlorine estimated.

B. Chlorine = .12.
Thus we have portion A. Cl = .26
13 Cl = .12.

And therefore the amount of chlorine volatilised
F. Cl = .14.

On the 4th day of the disease, I observed no precipitate whatsoever on using the tests.
On the 5th day, I obtained an exceedingly small precipitate, and too small when separated to be weighed. — On that day, the physical examination of the ulcer showed the usual signs of complete evacuation. On the 6th day, I again examined the urine, and on the following is the result as estimated quantitatively.

The amount of chlorine volatilised = .13
Fixed = .72.

On the 7th day, the urine was clear, Cu. Cu. 1019. Distilled water, added largely, then nitric acid and a small quantity of silver. Precipitated a very beautiful yellow precipitate of chlorate of silver. Resolution and absorption of the excitation was going. On the 8th day of the disease the urine was again very turbid & dark-coloured,
* I am greatly indebted to the kindness of B. Douglas Macdonan for the use of his laboratory, without which I would not have made these experiments.
Depositing a large quantity of Rincus, Litters & Phosphates, but still containing a very large amount of Chlorides—After this they remained abundant.

CASE XXII. Pneumonia

This was a private patient of R. J. Mackay and whose rerine I obtained on the 6th day of the disease. On this day the inflammation was nearly at its height, expectoration not being quite completed. The pneumonia was confined to one lung; left very loose. Obtaining a precipitate after distilling with distilled water, I added nitric acid and plus the nitrate of silver. Separated it from the permanganate, estimated the total amount of chlorine in 1000 grains.

Chlorine = .96

I again obtained the urine on the 8th day, but I then learned that it was mingled with menstrual fluid, and as that fluid normally contains chlorine, this experiment must be received with great reservation.

CASE XXIII. Mr. Macdonald—Acute Bronchitis.

This was a slight urine of one of the other wards.
of the Royal Infirmary, who being in a bad state of health, was seized with an attack of acute Bronchitis. During the cold weather in the latter part of January 1865, for 3 days I did not examine the urine on account of its admixture with the intestinal fluid. I carefully watched the case and frequently tried to find Pneumonia, if I was satisfied that it was an attack of Pure Bronchitis, and that if Pneumonia was present at all, the patient was exclusively affected in a small portion of the left lung posteriorly; on the 4th day of the disease the urine was loaded with leukocytes, but no acid, 1 Specific Bowel Alkaline. Mention it largely with distilled water, added hydrochloric acid, 2 Drops Bicarbonate of Soda. Just a trace of Chlorides — on the 5th day of the disease the urine was intensely acid, Sp. Gr. 1030, loaded with leukocytes. Very in excess, threw down crystals of uric acid in 3 minutes. There were no Chlorides present — the Chlorides remained absent. Till the 6th day, when they returned in a small quantity, on this day, heated the urine quantitatively, the

Whole amount of Chloric = 0.189.

On the 7th day, the urine was clear, and containing
An abundance of Chlorides. During the time that the Chlorides were in the urine, this patient was improved. She had a large quantity of the expectoration characteristic of the Bronchitis, which I noted all along for the Chlorides, but I did not obtain a more characteristic Precipitate than in normal Spurtum.

Case XXIV. Margaret Johnson, 20th. 23 Epiploles.
She was admitted in the middle of January 1835.

Case XXV. Pneumonia.
Christina Hutchinson was admitted in Nov. 1832, with Paraplegia. Whilst in the House she was attacked with Pneumonia of the
Left lung. Serous wine was obtained once during the course of progress of the inflammation. No Cholorides were Present. The wine was tested without the addition of distilled water. It was impossible to obtain it oftener than once. It contained Albumen.

Case xxv. - Plaguefoot. Pneumonia.
This patient was admitted into the latter end of January, 1855, into Ward No. I. The day of his disease was with great probability fixed to be the 4th. The inflammation evidently progressing. Urine faintly green-coloured. Spot containing any Albumen. On heating it with Nitric acid & Nitrate of Silver, a Fizzy Precipitate was the result. On heating it with the Tincture of Tannin with Nitric acid and Nitrate of Silver, the same result, but in a less marked degree took place. I analysed the urine quantitatively, 2 estimations,

<table>
<thead>
<tr>
<th>Volatile Albumin</th>
<th>Fixed Albumin</th>
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<tbody>
<tr>
<td>0.092</td>
<td>0.180</td>
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After this being unwell he was removed to the Rhinemic Ward, where at times, he yielded a clear serous fluid. Contaminated recently.
I was unable to obtain any more until the 9th day of his disease—In that day I could not obtain a trace of the chlorides.

Since examining & experimenting on the above reported cases, I have had occasion to test the urine of a case of Peritonitis in which I could not detect the Presence of Chlorine.

I have preferred placing all these cases together, & perusing them in the order in which they were examined, reserving all comments that were necessary, to the Present Time. The first set of cases, 14 in Number as I have before said, were carefully observed by one in the months of December and January, 1853—54, by my Friends at my Cherie. At that time I was under the impression that the absence of the chlorides, of Chloride of Sodium as I assumed it to be, was confined to Pneumonia, and I conceived that that set of Experiments proved it to be by no means the case, and I afterwards found in the modern works of Chemistry, what my own subsequent Experiments have to a certain extent reinferred, that there is a
eference is to the absence of Chloride of Sodium in the urine of all acute inflammatory diseases. Whether they (the chlorides) are in constant eluient in the urine of inflammatory disease, as they are in that of Pneumonia, remains yet to be proved.

Dr. Recltenhaer's method of testing, which is the best acknowledged by Simon & others, I am well satisfied with; although, the heated elustry object that no one has a right to say that a salt is absent from any solution, judging merely by the character of the precipitate. This is true. But this much I am prepared to say, that the precipitate of the Chloride of Silver in the urine, is to be marked, as characteristic, as before described; Practice, to distinguish it easily from the other more susceptible salts of Silver, formed by the Nitrate in the same liquid.

The cases that followed, which filled up the interval between any two acts, were observed to protect by Professor Brucette, and from his reports, I conceive that they were carried on in the same way, with the addition of heating the resulting precipitate with Ammonia. This alteration in the above scale avowed to show in a former part of this paper in readiness.
All the remaining cases, with the exception of the case of Jane Gordon, case XCVIII, which I copied from the report Booth, were observed by myself and I have put none down as which there being no slightest shadow of doubt, I may say here that the wineries of all the cases were those I visited in the morning, and consequently when the patient was fasting. In these cases, I analyzed the urine quantitatively, with the view of seeing the actual amount of chlorine present on the day of return, and in some cases, to see whether it might not be combined in a volatile form, as e.g. chloride of ammonium. For Beller has related a case, where this was very much increased, and Dr. Beale in his papers apparently thanks to from his own experiments as far as they go I am inclined to think is not uncommonly the case. I also analyzed and experimented upon the urine in a variety of ways, for the purpose of ascertaining whether I could not find some test for indicating the presence of chlorine, when the water of the urine was so diminished as to cause some confusing reactions to take place or failing the tests. But to compound a fluid as the urine so I feel certain that the nitric acid & nitrate of silver, is at present
The simplest known method—such is testing for the 
Chlorides, I would always go to work, as it were in 
my last experiments, by to add distilled water to 
The wine, as in the Blood, so in the Wine, the 
water that is diminished, and as the Vapors are in 
flakes in the water, a decrease in the latter will cause a decrease 
in the former. I am not certain but what the ap- 
parent increase of organic matter is merely the result 
of the alteration of the proportion of the relative 
amounts of the wine, due to the decrease of the water & 
the salts which hold them in solution; this deficiency 
therefore causing the precipitation, and consequent 
Decomposition of, which organic matter; forming 
what has been called “critical deposits,” but frequently 
prevailing during the whole course of the inflam- 
ination. These so-called critical deposits disappear 
under the action of a diuretic, particularly one formed 
of the salts of Mercurius, which greatly alter the balance 
of the body’s constituents, and frequently in such 
instances after the action of a diuretic, I have found 
the water & Chlorides reappear.

But of a great many cases of disease, in which the 
wine was examined, I find 28 to have the 
Chlorides absent in 26, and diminished 
they much in 2.
13. Pneumonia.

5. Variola.
1. Acute Rheumatism
2. Acute Phlegm
2. Acute Peritonitis
1. Acute Bright's disease
1. Typhus.
1. Phthis.

In all the cases of Pneumonia, it will be seen from that Chlorides were absent during the outward progress of the disease, and appeared in the urine at or about the period of reabsorption of the lung. (or when the exudation was perfectly complete.) And that as resolution went on, they appeared in unusual quantities. Nothing can be said with certainty as to the day of the disease on which they disappear, and in hospital practice, we are not likely to get the opportunity of seeing. But it does not appear to be sudden, in Pneumonia but gradual. The observation as to the time of reappearance in the urine, I unfortunately made in the majority of cases, and observation of importance in considering as far as this disease is concerned, the reasons of their deficiency. In case IV. David Murray, the Chlorides
Reappeared in the usual very small amount, as soon as the inhalation was complete, but did not increase for the next two days; in fact remained stationary. Resolution was not going on. In his death the diagnosis was confirmed—Dr. Reubenbach, assisted by Dr. Beale says that Chloride of Sodium disappears about the period of deglutitation, and Dr. Beale in many cases makes it afterwards. But unluckily Dr. Beale has not made his experiments, few number of days continuously, and in no one instance does he note the first day of reappearance. The most important fact of all. Besides the method described being long and ill adapted for rendering such a research useful, is unable to test it. In fact during the process of Inhala
tion, it is impossible to prevent some Chlorine from being volatilized.

Next in cases of small fry the chlorides were absent, and this appears to be the case almost as uniformly as in Pneumonia. In the case of Acute Pleurisy which I have reported at some length, we have the same phenomenon occurring as in Pneumonia, viz., reap
appearance of the Chlorides up to the time of complete 
Expiration, then reappearance in small quantities increasing as resolution & absorption go on.
The acute Rheumatism was, when the urine, was examined, accompanied with a distinct pustular rise over the precordial region, but unaccompanied with any delirium. With respect to the case of Dyspepsia which was accompanied with a smart fever, we have shown a great contrast to two other cases that were examined. One case was one of the face, neck, and the other two were cases of Dyspepsia of the leg, and accompanied with fever of a typhoid type.

The Chlorides in these two cases were abundant, in the urine.

The only case of Typhus Fever in which Chlorine was wanting in the urine, was that of the Nurse of Israel.

In every case where the Chlorides were wanting, the pulse was over 100 in a minute, and the urine in the majority of cases, was characteristic in appearance, that I could at least almost tell by merely looking at it, where I expected to find an absence of this element (Chlorine). By a peculiar thick, yellow, density in quantity, in fact the characteristic urine of acute inflammation.

I found the Chlorides present in five nurses, quantitatively, in a variety of diseases, invariably positive.
The conditions of the lungs called 'physiologic panting'.

The put down the latest results upon this subject.
The method used was Liebigs, and the experiments of Alfred Vogel.

1. In Typhoid Fever. The chlorides vary, according to the food taken. The area increases.
2. In Nephritis of both kidneys, the chlorides vary according to the food, a decrease on the decrease of the disease.
3. In rapid absorption of the bowels, the quantity of the blood, and the chlorides, are increased, and the amount of the chlorides varies with the amount of the urine.
4. In Polypysia Gastroenterica. The quantity of the urine, key large. The area of chlorides small.
5. The chlorides are diminished in Pneumonia, as long as the hypopnoea proceeds, increase after resolution.
The universal use of "Chloride of Sodium" as an article of diet amongst all nations shows that it must play an important part in the animal economy. It is taken into the system naturally with the food, and among civilized nations used largely as a condiment. It is talked of in the 'Material Medica' that when this article is withheld, worms are generated in the intestines, and it is said that protoscolic worms are very common among those nations, who do not use the salt, to an extent above civilized races of mankind. It is from this source, in all probability, the hydrochloric acid generated in the stomach during the process of digestion, springs. It is a coherent both of albumen and fibrine, and has the remarkable property of preventing the latter coagulating. It exists naturally in the blood, and in all the fluids of the human body. In the urine, it is most generally the only form in which chlorine exists, if not alone, immeasurably small, though during sickness it may as I have shown to believe from some of my experiments, else otherwise combined. In this liquid, there exists normally, from 3.5 to 4.5 per 1000 parts of chloride of Sodium. It is a curious fact, as pointed out in Vofels' experiments, that the amount of these
and Chlorine, vary in direct ratio. And from Dr. Bischoff’s experiments we learn, that the quantity of salt taken into the body, has a direct influence on the amount of urine, excreted by the urine.

Dr. Bischoff fed a dog upon 1 lb. of beef daily without salt. The dog excreted daily 22.50 grammes of urine; he then added chloride of Sodium (2 ounces) to his drink, and the amount of urine now excreted in the course of one day was 28.34 grammes, showing an increase of 5.84 grammes.

At the same time that the chlorides appear to be an excretion from the blood, there is no doubt, that their presence in the urine, fulfills some important office in that fluid. For Dr. Prince Jones has clearly demonstrated that chloride of Sodium helps to keep ions in solution, and if urine is which there is cleared, chronic disease, there is a marked increase of Chlorides, the tested. Chlorides of Sodium will be found to be very much chlorine in the blood.

Now if the fact of the disappearance of the chlorides from the urine, was merely confined to Pneumonia, the pathology would be very difficult to establish. But the fact that this phenomenon is exhibited in the urine of other inflammatory disease, sufficiently justify the Action theory.
Why are they absent during the course of inflammatory disease? The first answer to this question might apparently be, because none is taken into the system. And to a certain extent there must be some truth in this, but it is not sufficient to account for their total absence. And moreover it may be said that they are present during the course of other diseases, where the patients have taken quite as little food, as during the inflammatory disease.

Considering that the presence of chlorine in the wine indicates that there is an excess of the blood over and above what is required for the use of the system, we are led to inquire whether there is any corresponding diminution in the blood of inflammations, to account for its total absence from the urine. If we take the experiment of Pieron and Herpin, this question to a certain extent must be answered in the negative. These eminent chemists estimate chlorine of sodium as 3.1 to 4.1 per 1000 parts of blood. And the mean results of their analyses of 1060 parts of blood in a number of cases of well-marked inflammations were, males, NaCl = 3.1

Female — 3.0
The mean results of eight cases of Acute Mononchis, four of which were males and 4 females.

Chloride of Sodium in Males = 3.2 per 1000
Females = 3.3.

Of 5 women who were bled twice in Pneumonia, average result was, 1st Resection,
Chloride of Sodium = 3.2
2nd Resection
Chloride of Sodium = 3.1

In one case of Acute Pneumonia, Chloride of Sodium = 3.0

We have however the authority of Wapé & Scher, to say, that the salts generally speaking are deficient in the Blood during inflammatory diseases. I still conceive that the experiments of Becquerel & Bodin go to prove, that this cannot be in any large quantity, or to be marked as to account for total absence from the urine.

That there should be some deficiency in the Blood, is not unnatural, for the water of the Blood under these circumstances is diminished, and it is in the water that the salts are held. But while the deficiency is not great, and therefore it comes to be asked why it is that the Chlorides are retained in the Blood? The answer, I apprehend is, because there is an absence of those matters which requires the aid of the Chlorides.
To render them susceptible—and of all these matters fibrine is the one most increased in the blood during inflammatory disease—Chloride of Sodium, and indeed any salt of Chlorine renders fibrine soluble prevents its coagulating.

There is not the slightest doubt, that the fibrine is most deficient in the Cholicles, during Pneumonia. This deficiency is not corresponding to their speedy recovery, or any male deficiency in the blood, and yet it is in the Blood of Pneumonia, that fibrine is very largely increased. The fibrine may be said of the other diseases, as acute Hepatitis, Acute Rheumatism, etc. One of the reasons therefore of the deficiency of Cholicles in the urine—having acute inflammatory disease, is the increase of fibrine in the blood while requires them to prevent it coagulating or rather to hold it in solution.

I have heard it suggested, that probably the presence of Albumen in the urine had something to do with the absence of the Chlorides, but to this I must be very strongly objected, that the presence of Albumen is by no means common. The 12 cases of Pneumonia reported in this paper, the urine was decidedly not Albuminuous. And though it is stated in Broths that the urine of Pneumonia is frequently Albuminuous,
I can only say, that during the 30s I have been about the Reformatory, I've observed the urine was invariably salted for it, and it was very rarely present. Intestineacid will produce undoubtedly on one portion, and heat on another, but the two together will generally leave the urine as it was.

It is chiefly in diseases accompanied with large evolutions that the Chlorides are deficient in the urine. I have observed in all my experiences, that they diminish as the evacuation proceeds, become finally absent, that when the evacuation is complete, they return, I become very abundant as the absorption goes on. This is in accordance with what Dr. Alfred Vogel, who as I have stated in a former part, says, "The Chlorides are largely increased in the urine, during the rapid absorption of severe evolutions." It must at once be conceived, that the Chlorides are forced out along with the evolutions. And S. Beale has shown in his paper, that (as far as Pneumonia is concerned), this is actually the case; and sometimes instead of disappearing in the urine, they actually appear to have been expectorated - In these evolutions, when once the breaking up has begun, these Chlorides, by their solubil power, aid
very materially in the absorption. If therefore, as it has been in these cases satisfactorily proved, there is an abundance of Cholurics in the excretion, then when these excretions are large, we must have a diminution of the Cholurics in the urine. In fact, we have as it were another temporary channel for their excretion. Also if there be copious perspirations, or urine evacuations, there are other channels for the excretion of Cholurics and must have some weight in reasoning as their absence from the urine during disease.

The only result at present to which I have come is that the Cholurics are absent from the urine, in all those diseases, in which there is an increase of Chloric in the blood. With the respect to the advantage of the phenomenon, either in diagnosis or treatment of disease, little at present can be said, but as far as the diagnosis is concerned, I think it may be of some advantage, especially in Pneumonia and Neurasty. It may be used to diagnose between Deposition and Spleenisation, but I suspect it is of very little importance when we consider the other aids that the advancing state of medical science has furnished us with. But I hope especially that future
Investigations into this subject may lead to the discovery of some still ununderstood changes in the urine during disease, and to clear up the evident relations that exist between urea and chlorine.

In conclusion, I must apologize for this paper's deficiency. It was not originally my intention to have made it the subject of my thesis, and the time I have requisite to carry out chemical experiments, especially those about, were carried on with a view to obtaining quantitative results. Conjoined with other duties, have rendered me unable to finish the investigation to the extent that I could have wished.

Almeric W. Seymore

March 21st, 1855.