

**THE EXAMINATION OF URINE,
CHEMICAL AND
MICROSCOPICAL: FOR
CLINICAL PURPOSES, PP. 17-66**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649323647

The Examination of Urine, Chemical and Microscopical: For Clinical Purposes, pp. 17-66 by
Lawrence Wolff

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LAWRENCE WOLFF

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EXAMINATION OF URINE,

CHEMICAL AND MICROSCOPICAL,

FOR

CLINICAL PURPOSES.

ARRANGED IN THE FORM OF

QUESTIONS AND ANSWERS.

BY

LAWRENCE WOLFF, M. D.,

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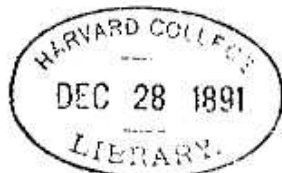
2
COLORED PLATE,
3
AND NUMEROUS ILLUSTRATIONS.

3
PHILADELPHIA:
W. B. SAUNDERS,
912 WALNUT STREET.

LONDON: HENRY KENSALW. MELBOURNE: GEORGE ROBERTSON & Co.
1890.

Chem 118890

~~V 4125~~



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Cambridge*

Entered according to Act of Congress, in the year 1890, by

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In the Office of the Librarian of Congress, at Washington, D. C.

P R E F A C E .

The favorable reception accorded to my little book on "The Essentials of Medical Chemistry," together with a wish expressed by many of its readers that it should also contain a special part on urinology and urinalysis, have caused the preparation of this little volume on "The Examination of Urine, Chemical and Microscopical, for Clinical Purposes."

As its scope has a more clinical than purely chemical bearing, it was thought best to present it in separate form rather than as part of a work on medical chemistry. It is intended as an aid for the student in his *studies* on this subject, more so than as a manual for his laboratory practice in chemistry.

The author trusts that as such it will be a welcome friend to the student and help him to master the essentials of this branch of medical science, which is of such great importance in the study of disease.

L. W.

Philadelphia, Pa.,
333 South Twelfth St.,
February, 1890.

THE EXAMINATION OF THE URINE.

Which are the objective points in the examination of urine for clinical purposes?

The quantity, appearance, color, odor, reaction, specific gravity, increase or decrease of normal ingredients and presence or absence of abnormal or adventitious substances.

When should the specimen be obtained for examination?

For qualitative purposes the specimen may be taken at any time of the day, the morning urine in preference. For quantitative examination a specimen of the total urine in 24 hours must be used.

How is the total urine of the 24 hours to be collected?

The urine passed at a certain hour is to be thrown away, all subsequently passed up to the same hour of the next day is to be collected in a clean glass jar or bottle and the amount measured.

How soon thereafter should the urine be examined, and why?

Shortly after the specimen is obtained, as putrescence will rapidly set in, which will change the character of some of the ingredients.

What is the average daily quantity voided under normal conditions?

1200 to 1500 c.c., or about 40-50 fluidounces.

Under which normal conditions is this increased or diminished?

Copious drinking increases the quantity; also, a lower temperature or great humidity of the atmosphere; free sweating, purgation or emesis will diminish it.

Which pathological conditions increase the quantity and which diminish it?

Diabetes insipidus and diabetes mellitus largely increase the quan-

tity, acute febrile affections diminish it. It is also increased in certain nervous affections and diminished in hydropic conditions and some renal diseases.

In which way is the appearance of the urine to be noted?

If clear, turbid, or containing a sediment.

Which are the principal causes of turbidity or sedimentation in the urine?

The presence of mucus, precipitation of the earthy phosphates from alkaline reaction, separation of urates by lower temperature, and pathologically the presence of pus or fat in minute subdivision, the latter causing a layer to rise to the surface.

What is the normal color of urine, and how are the variations expressed?

The normal color of urine is yellow, the variations being expressed by Vogel's scale, which contains three yellow, three red and three brown tints, termed respectively pale yellow, light yellow, yellow, reddish-yellow, yellowish-red, red, brownish-red, reddish-brown, brownish-black. (See Frontispiece.)

Which are the normal urinary coloring bodies?

Indican and urobilin; others frequently described are modifications of the latter.

How is urobilin derived?

From the blood; the hæmoglobin changing to hæmatin, this to bilirubin, which by taking up hydrogen is changed to hydro-bilirubin, identical with urobilin.

What is indican, and how derived?

This is sometimes called uroxanthin, and is chemically potassium indoxyl-sulphate, a normal component of the urine, varying in quantities, and derived from disturbances of intestinal digestion and consequent absorption of the indol of the fæces.

How is the presence of indican in the urine demonstrated, and how determined?

Indican can be demonstrated by mixing urine with about $\frac{1}{2}$ quantity of HCl, when, upon standing 24 hours, a red, purple, or blue color will appear, which if shaken out with chloroform and the sepa-

rated solution compared with a standard solution of indigo in chloroform diluted to the same tint, may be expressed in the quantity of indigo it represents.

What is the color of urine in icterus, and by what produced ?

The urine in this condition is of a yellow or greenish, or even greenish-black color, caused by the presence of biliary coloring matter.

How may the presence of blood in the urine affect its color ?

It will cause a change of color from light red to brown and almost black.

Do medicinal agents change the color of the urine ?

Many of them do : Thus, it is turned brown or black after ingestion of carbolic acid and gallic acid, yellow after santonin, rhubarb (changed to red by addition of ammonia), also, after senna, logwood, etc.

What pathological condition gives rise to a dark brown or blackish color of urine, and why ?

Melanotic tumors, owing to the elimination by the kidneys of uromelanin, a black coloring body corresponding to the choroidal pigment.

Describe the odor of fresh normal urine.

Fresh normal urine has a specific, not disagreeable, aromatic odor, due to the organic acids of the aromatic series.

How does this change on standing ?

The urine turns alkaline in reaction, and then ammoniacal decomposition takes place, giving rise to a disagreeable ammoniacal odor. This may take place already within the bladder in cystitis.

In what conditions and by which medicines or food is the odor of the urine modified ?

In diabetes the urine has often a fruity odor, due to acetone. Asparagus gives it a disagreeable odor. Spirits of turpentine an odor not unlike violets. Copaiba, cubebs, balsam of tolu and oil of sandalwood give it an aromatic odor.

What is the effect of mineral acids, and what of fixed alkalies on the normal odor of the urine ?

Mineral acids interfere with the normal odor, fixed alkalies make it aromatic.

Has the urine containing blood a special odor?

It has a slightly putrid odor, resembling that of high game.

What is the reaction of normal urine? What due to?

It is normally slightly acid, due to the presence of acid sodium phosphate. The acid reaction is greatest in the urine of the night, less in that voided after meals.

How is the reaction of the urine ascertained?

If blue litmus paper is touched with a drop of acid urine it will be turned to a red color; if the urine is alkaline, it will turn red litmus paper blue. If, upon exposure in the latter case until dry the red color is restored, this alkalinity is due to ammonia.

In which way is the degree of acidity of urine determined?

By acidimetry, *i. e.*, titration with a decinormal solution of potassium hydrate, expressing the result in the corresponding amount of oxalic acid.

What is the relation of the acidity of urine to disease?

Many diseases show a direct relation with it. Thus, in typhoid fever the acidity is in direct ratio with the fever, in rheumatism with the pain, while in pneumonia, pleurisy, emphysema, etc., the urine is very acid.

Which systemic conditions may cause an alkaline reaction of the urine?

Fear, nervous affections, etc., may bring about alkalinity. Irrespective of food, it is associated with anæmia, debility, etc. This alkalinity is due to fixed alkalies.

Under what local conditions may the urine become alkaline?

In cystitis the urea is decomposed into ammonium carbonate, which renders it alkaline, with ammoniacal odor.

What effect has the alkaline reaction on the urine?

The alkalinity from fixed alkalies causes the precipitation of the earthy phosphates, rendering it of white color. Ammoniacal alkalies brings about the formation of triple-phosphate.

How do medicinal agents influence the reaction of the urine?

Mineral acids do not directly influence its reaction; alkaline hydrates and carbonates render it less acid or alkaline; the salts of the