

BULKLEY (L.D.)

THE  
RELATIONS OF THE URINE  
TO  
DISEASES OF THE SKIN

BY

L. DUNCAN BULKLEY, A.M. M.D.

PHYSICIAN TO THE SKIN DEPARTMENT, DEMILT DISPENSARY, NEW YORK ;  
FELLOW OF THE NEW YORK ACADEMY OF MEDICINE ; MEMBER OF  
THE NEW YORK COUNTY MEDICAL AND DERMATOLOGICAL  
SOCIETY, ETC.

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“We want a critical investigation of skin diseases in their relation with diseases of other organs. Are diseases of the kidney or of the liver frequently productive of them? and if so, what are the peculiarities of such. Which are in special relation with the nervous system? Are diseases of the intestinal or pulmonary mucous membranes frequently associated with those of the skin? \* \* \* \* We earnestly beg of our specialists in this department that they will abandon all useless controversy as to nomenclature, orthography, and classification, and betake themselves to the earnest study of the causes of the maladies which come under their care.”—*British Medical Journal*, Jan. 22, 1870.

FEW fields of scientific research in practical medicine present greater attractions, and yet at first sight greater difficulties, than that of chemical physiology and pathology, and but few lines of investigation and applied science have been more neglected by the profession, both in the teachings of the schools and in practice at the bedside. That this is unnecessary, and that exact chemical science can be applied to the study and treatment of disease, the names of Prout, Bird, Bence Jones, Thudicum, Garrod, Murchison and others, in the English school alone, well testify.

The aim of the present paper is to contribute somewhat to this branch of study as far as relates to the changes observed in the urine in diseases of the skin, and to endeavor to draw therefrom some practical considerations and therapeutical suggestions.

As is well known, many of the diseases of the skin are sup-

\* Read before the New York Academy of Medicine, April 15, 1875.

posed to be entirely local in their origin, as the parasitic affections, lupus, epithelioma, etc. ; others, again, to be purely nervous, as herpes zoster, and perhaps others ; still others to be due to dyscrasiæ, as syphilis and leprosy. How far all these are dependent upon deranged blood-states such as appear to be measurably demonstrated in other affections, it is at present impossible to determine, but it is highly probable that such derangements not only favor the inception and development of all skin diseases, but, during their continuance, greatly retard their cure and aggravate their symptoms. While therefore my studies and my remarks apply more particularly to such diseases as eczema, acne, psoriasis, urticaria, and the like, I consider that the condition of the urine is one well worthy of investigation in reference to all maladies affecting the integument, for we can never know how much a systemic disorder has to do with the local manifestations of the syphilitic or other poison, or in preparing the way even for parasitic diseases.

It will be understood, of course, when I speak of the changes in the urine I take them only as indications of the blood state and of assimilation and nutrition as influenced in various ways, the urine being the secretion of all others which indicates most quickly and surely a disordered blood-current. The presence of sugar in the urine after a hearty meal of sugar or starch, the appearance of albumen after certain other ingesta, as also the quick and ready recognition of iodide of potassium and other drugs in the urine, all point to it as a valuable sign of the condition of the all-nourishing blood. The further fact of the urine being discharged, as a rule, very soon after its secretion, added to the ease of its collection and examination, renders it a valuable aid to the physician in studying disease.

I am well aware that the constitutional origin and nature of skin diseases of the kind to which more especial attention is directed, in the present paper, is not a new matter ; it has, indeed, occupied very largely the attention of many for a long time. To the French school chiefly do we owe the literature relating to the arthritic diathesis, and to their writers would I give full credit for the persistency with which they have adhered to and promulgated their views on the subject, although continually slighted or ridiculed by others having ample opportunities of observation and practice. In the present paper, while vindicating in a measure, the diathetic origin of many skin diseases, I would not be understood by any means as supporting *in toto* the arthritic, herpetic or darrtrous diatheses, which, I think, certain dermatologists, notably the French, have insisted upon further even than many of their own scholars are willing to accept and follow ; I desire however, to direct very serious attention to the existence of a morbid blood state as a predisposing cause of many of the ailments affecting the skin, my studies and analyses convincing me that assimilative errors, as indicated very frequently and largely by the state of the urine, are at the base of a considerable share of cutaneous affections.

I cannot better enter on my subject than by recalling certain experiments of Gigot-Suard,\* illustrative of the effect to the circulation in the blood of some of the excrementitious elements from the urine, although I can hardly accede to the verity of some of his deductions.

He administered 2.3 grains of uric acid to a medium sized dog, morning and evening, for two months: great itching ensued in about eight days, also scaliness. Its two pups exhibited eczema, the mother also showed some vesicles. Another dog, of three years, medium size, took 3 grains of uric acid daily for two months, with the effect of calling out a pruriginous eruption of papules and vesicles which remained after the administration of the acid was stopped, and six months later the animal presented, as Gigot-Suard says, a veritable psoriasis, in the scales of which he found on chemical and microscopic examination very numerous crystals of urate of soda and some of oxalate of lime. He likewise gave uric acid internally to some patients, with similar results, which I will not here detail. He further administered 4.5 grains of oxalic acid daily for a month to certain patients, with the effect of provoking rheumatic pains, severe pruritus, and, in one case, erythema and urticaria. Hippuric acid, in doses of 4.6 grains morning and night, caused itching, with the subsequent development of papules, an erythematous redness and many groups of vesicles resembling zona, about the waist of a woman aged 45, who had never had any cutaneous affection previously. Urea, given to the amount of 7.7 grains daily for 15 days to a boy 11 years old, produced coryza and a vesicular eruption at the external nares and on the lips. A man, aged 30, after taking 154 grains of urea, in ten days, had a coryza, then an angina and bronchitis, and a slight erythematous condition about the nostrils. He had also intercostal pains and a pruritus of various parts of the body, but no eruption.

Now we know well of the presence of uric acid in the blood in gout, as Garrod † has demonstrated, and that uric acid may be found in the fluid contained in blisters produced on gouty subjects. Gigot-Suard ‡ discovered it also in the contents of the vesicles of a case of eczema of the hands in a man 45 years of age, who had, however, gouty pains and deposits as well. The same observer likewise found urate of soda, uric acid, phosphate of soda and phosphate of lime crystallized from the fluid of some pemphigoid bullæ occurring in a patient with psoriasis. He further analyzed the scales from a patient who had had psoriasis 15 years, and who never had rheumatism, and found uric acid in one experiment, in another he developed the murexide, and in the third, crystals of urate of soda and some of urate of ammonia. He states that he has repeated these researches, and has frequently found uric acid in the pathological products of the skin. Dr. Beale § examined the

\* *L'Herpétisme; pathogénie, manifestations, etc.* Paris, 1870—pp. 21—38. and pp. 447—459

† Reynolds' system of Medicine, Vol. I, p. 825.

‡ *L'Herpétisme, etc.* Paris 1870, p. 15.

§ *Archives of Medicine* Vol. I, p. 316.

scales from two psoriatic patients and found sulphate and phosphate of lime, but did not appear to have searched for urea or uric acid.

Again, urea exists to a very small degree as a constituent of the normal perspiration, and may be increased very largely in certain pathological conditions, and when there is deficient elimination by the kidneys.\* Garrod † mentions the case of a patient suffering from a very decided attack of gout, who went into a Turkish bath and made preparations which enabled him to save a considerable amount of perspiration. This, on proper analysis, yielded a notable amount of urea but no uric acid. A remarkable case has recently been given by Dr. Taylor ‡ where urea was largely secreted by the skin. The patient died with symptoms of uræmic intoxication, following granular degeneration of the kidneys. Two days before death her face appeared as if sprinkled with flour, and the deposit, which was moderately adherent to the skin, was found to be composed of urea; somewhat the same appeared on the hands. Other similar cases have been recorded.

The relations of the kidney secretion to the skin may be further illustrated by the experiments which have been made as to the urinary changes occurring under the use of baths. I will mention but a few of the more recent investigations. Kirejeff § submitted two healthy soldiers to the action of daily baths, at a fixed time, and concludes, that while the total daily quantity and the reaction of the urine is unaltered thereby, its specific gravity and *daily quantity of solids* are increased. Urea and uric acid are both excreted in large quantity, the ash of the urine in one instance exceeded the normal by one-half. Much the same results were obtained from the daily use of cold sitz-baths, and he believes that exchange of material and metamorphosis of tissue are promoted by both cold and warm sitz-baths. Dr. Clemens || found that, during the first 15 minutes of a bath, the quantity of urine, as compared to that of the preceding 15 minutes, was doubled, chloride of sodium and urea were slightly increased and the phosphates and other non-volatile saline matters were quadrupled. This effect gradually diminished during the next 30 minutes, but on the addition of a decoction of spruce it was renewed in a higher degree than before, especially as to the phosphates, the excess of which was now nearly 5 times that before the bath. The addition of saline solutions to the bath, instead of the decoction of spruce, gave the same results. Clemens also found that all baths diminish the specific gravity of the urine passed during or just after the bath, and that the urine passed for several hours after is rich in phosphates and poor in uric acid and water. ¶

\* Flint's Physiology, Vol. III. p. 142. † Reynolds, Vol. I. p. 825.

‡ Guy's Hosp. Rep., Vol. XIX, 1874. Am. Jour. Med. Sci. Jan., 1875, p.

209.

§ Virchow, Vol. XXII. p. 496. Syd. Soc. Year Book, 1862, p. 422.

|| Med. Centr. Ztg. Vol. XXX., Nos. 53 & 59. Syd. Year Book, 1862, p.

424.

¶ Froriep's Notiz. 1860, Vol. II., No. 2. Syd. Year Book, 1861, p. 102.



Muller\* as the result of experiments on animals, determined that ice-cold packing and ice-cold showers increased very notably the *rate* of urinary secretion, while similar use of *hot* water markedly diminished the rate of secretion of the urine, the greatest increase being from 30 drops per minute to 41, and the greatest diminution from 26 to 5 drops per minute. The wonderfully intimate relations between these two great secreting organs is thus shown, the relief to the kidneys by free action of the skin being here exhibited to its fullest extent. The same is shown where the skin takes on unnaturally free action as in a curious case of general sweating recorded by Dr. Gibb.† A man, aged 25 years, had had profuse and very general hyperidrosis for 4 years. The urine was of a full amber color, clear on passing, and feebly acid, with a specific gravity of 1.028. In a few hours it turned opaque and muddy from a considerable deposit of pink urate of soda, readily dissolved by heat. The usual salts were present, also a large amount of chlorides. There was no albumen, no sugar, no hippuric acid. Oxalate of lime and cystine were found microscopically.

In this same line of thought and argument, I may allude to the effects of arresting completely the perspiration, and its effect upon the kidneys. Socoloff found albumen in the urine of animals very soon after varnishing the skin, and in every case in which the experiment was tried a parenchymatous inflammation of the kidneys resulted. Lang found, an hour or two after death by varnishing the surface, crystals of triple phosphate in various parts of the body which he regarded as resulting from the decomposition of the urea; he thought the deaths resulted from uræmia.‡

Remembering, then, the physiological connections of the skin and kidneys, and bearing also in mind the pathological relations constantly exhibited in daily practice, such as the dry harsh skin in chronic kidney disease, and conversely the occasional occurrence of kidney congestion and urinary derangement from a chilling of the cutaneous surface, and considering further what has been premised as to the effect of retained and circulating excreta, as urea, uric acid, etc., we might well expect in diseases of the integument to find some alterations in the secretion of the kidneys.

The urinary changes in diseases of the skin have been but little studied hitherto, and the observations bearing on the point are few and scattered, most of the standard works on cutaneous medicine ignoring the matter almost entirely. My experience, however, though limited as yet, has taught me the very close and important relations existing between the kidney secretion, on the one hand, and the state of the skin on the other, and that much may be learned of the latter by a careful attention to the former, and much done to relieve the skin by rectifying the disorders found in the urine.

\* Archiv für Exper. Pathol.; Phil. Med. Times, 1874; Am. Jour. Syph. & Derm., July, 1874.

† Beale's Archives of Medicine. Vol. II., p. 280.

‡ Am. Jour. Med. Sciences, April, 1873, p. 527.

My recorded urinary examinations date back to January, 1867, since which time I have notes of 605 examinations, all made by myself, except those during the past year and a half, which were observed and recorded by my assistants, Dr. Lewis and Dr. Robert Campbell, under my immediate supervision. These 605 examinations relate to 191 patients, but, as many of the earlier ones were from the practice of the late Dr. H. D. Bulkley, only about one half pertain to patients affected with diseases of the skin, and these latter alone I shall speak of and analyze on the present occasion. My personal observations, therefore, in the relations of urinary derangements to diseases of the skin are based on 323 recorded examinations, relating to 109 patients, further verified by numerous recorded statements of patients and also of physicians with whom I have been in consultation, as to former disorders of this kind, and confirmed also by clinical observations on the action of remedies and measures calculated to affect the kidney secretion.

These examinations, which have been confined almost exclusively to patients in private practice, and made solely in the ordinary run of business to assist in treatment, relate to 46 patients with eczema, mostly chronic, 22 patients with acne, 14 with psoriasis, 6 with pruritus, 5 with erythema, and 16 with miscellaneous cutaneous affections.

For completeness I shall first make brief mention of the observations of others as to the urinary changes observed during the febrile affections of the skin, although I would by no means attach the same importance to the state of the urine in those that I do in the chronic diseases of the skin. I am well aware that the question arises, whether these alterations are not altogether independent of the cutaneous lesion and due solely to the febrile state, for we know that the urine is disordered in other fevers where the skin is not at all affected. The question cannot yet be answered, for our knowledge of the pathology of fever is far too small to assert that the blood derangement and consequent urinary alterations are certainly secondary and have nothing to do with the skin lesions, nor do we know how many of the phenomena of all febrile diseases are due to deficient cutaneous action. The same urinary changes occur also in states where there is no fever whatever, as in lithæmia from indigestion, and in functional derangements of the liver, as also in certain "structural diseases of the liver, and particularly in those which are characterized by an increased amount of blood in the organ, such as inflammation, cirrhosis, cancer and simple hyperæmia, whether mechanical or active."\* If, however, further research should establish certain differences between the urines passed during the different exanthemata the presumption would be strong in favor of a relation between the state of the kidney secretion and that of

\* Murchison, on Functional Derangements of the Liver.—New York, 1875, p. 65.



the skin; the number of recorded observations is as yet too few to prove this, but in the light of the above arguments I feel warranted in including, in our present consideration, the changes of the urine occurring during the febrile diseases of the skin.

I. **Erysipelas.**—Schönlein\* states that in Erysipelas the urine is frequently loaded with bile pigment, and is of a reddish brown or red color. At the urinary crisis fawn-colored precipitates occur, and the urine becomes clear. Becquerel † made two quantitative analyses of the urine of a man, 39 years of age, with erysipelas of the face. The first specimen passed on the fourth day was of a deep yellowish-red color, and clear, specific gravity, 1.021. The second specimen from the 6th day, appeared almost black, threw down a reddish sediment of uric acid, and had a specific gravity of 1.023. The analyses are as follows, Becquerel's analysis of healthy urine being placed for comparison in a third column:—

	ANAL. I.	ANAL. II.	HEALTH. ‡
Ounces of urine in 24 hours....	27.0	30.8	45.0
Specific gravity.....	1.021	1.023	1.017
Water.....	965.5	961.9	972.0
Solid constituents.....	34.5	38.1	28.0
Urea.....	12.5	12.7	12.1
Uric acid.....	1.2	1.3	0.4
Fixed salts.....		8.2	6.9
Extractive matter.....		15.9	8.6

In a woman, aged 45, with erysipelas of the head, Simon found the urine very scanty, of a dark brown color, strongly acid, specific gravity 1.023, and depositing a yellow sediment. It contained

Water.....	961.7
Solid constituents.....	38.3
Urea.....	11.7
Uric acid.....	1.3
Fixed salts.....	9.2
Extractive matter.....	15.7

Reynolds § states that albumen appears in the urine in many cases; it may make its appearance from the 4th to the 8th day, or even later in relapse; also that the quantity of urea is increased, while that of the chlorides is diminished. Parkes || says that the excretion of chloride of sodium by the urine in erysipelas is so far diminished, that even when taken in 2 drachm doses it does not pass off by the urine in two days, showing most decided retention.

In the only case of erysipelas in which I have examined the

\* Simon's Animal Chemistry, Syd. Transl., Vol. II., p. 278.

† *Ib.*

‡ This differs somewhat from that given by Flint (Physiology, Vol. III., p. 193), but is here quoted in full because those in disease are by the same writer.

§ A System of Medicine, Vol. I., p. 684.

|| The composition of the urine, London, 1860.

urine, I found the specific gravity of the morning and night specimens to be both 1.020, the reaction acid, the color of a reddish yellow, and absolutely nothing microscopically, even after standing 24 and 36 hours.

II. **Measles.**—During the eruptive period, the urine is dark red, rich in uric acid and urates,\* followed by abundant diuresis when this stage is passed.† Albumen is extremely common in some epidemics, and appears simultaneously with the eruption: blood in small quantities is also common. In the Leith epidemic of 1854, the recoveries were most speedy when the albuminuria was the greatest.‡

III. **Scarlet Fever.**—Dr. Gee, § after careful study, states of the urine in this disease, that: 1. The water is diminished in quantity; 2, the quantity of urea excreted is not necessarily increased during the pyrexia; 3, chloride of sodium is more or less diminished, sometimes very greatly, sometimes very little; 4, phosphoric acid is diminished for several days after the first five days of the eruption; 5, uric acid, in one case, was almost entirely suppressed on the second and third days, normal on the fourth, in great excess on the fifth and last day of the pyrexia, and normal thereafter. Sediments of uric acid and urates he states to be common. Simon || examined the urine of a boy, aged 5 years, at the acme of septic scarlatina. The urine was of a dark yellow color, had an alkaline reaction, a very disagreeable ammoniacal odor, and deposited earthy phosphates and urates of ammonia and soda. The specific gravity was 1.022, and about 16 ounces were discharged in 24 hours. There were contained in 1000 parts—

Water .....	943.60
Solid constituents.....	56.40
Urea .....	19.35
Uric acid.....	1.69

The urine was afterwards examined again and possessed similar characters; the sediment being more copious.

The occurrence of albuminaria in scarlet fever, and the attendant kidney changes are familiar to all, and need not occupy us here, except in a general way, as indicating the connection between the kidneys and the skin, for it is during the desquamative stage, when the skin as a secreting organ is especially damaged that this serious complication generally appears.

IV. **Small pox.**—In the beginning of this disease, according to Simon, ¶ the urine is decreased in quantity and increased in specific gravity; its color is deep and red, it is frequently turbid and often contains a small amount of albumen. In the eruptive

\* Vogel, Diseases of Children, 2d. Edit., New York, 1871, p. 486.

† Steiner, Diseases of Children, New York, 1875, p. 346.

‡ Aitken, Science & Practice of Med., Phila., 1866, Vol. I., p. 297.

§ Reynolds' System of Medicine, Vol. I., p. 339.

|| Animal Chemistry, Syd. Transl., Vol. II., p. 269

¶ Ib. p. 282.

stage, as ascertained by Becquerel, in five cases in which the symptoms were severe, the urinary secretion was diminished and amounted on the average to only 23.5 ounces in 24 hours. The specific gravity had not, however, increased as much as might have been expected, being only 1.020,6. It frequently threw down uric acid precipitates, either spontaneously or on the addition of nitric acid, and in one case albumen was observed. Curschman\* states that the chlorides are usually diminished, sometimes to a minimum.

We may now pass to some of the diseases more commonly reckoned as affections of the skin, and will take first those nearly allied to the exanthemata, namely urticaria and erythema.

V. **Urticaria.**—Dr. Graves † was one of the first to mention the occurrence of urticaria supervening upon an acute jaundice in rheumatic subjects, and established very clearly the connection between those states. And I may here, for the present purpose, consider the jaundice itself as a skin disease quite as much as the urticaria, for with the discoloration of the skin we have often an intolerable itching, lasting generally till the cause is removed. Now the gross characters of icteric urine are familiar to all; an analysis of it is given by Simon, ‡ who found the urea much below the normal average, and the uric acid much increased, the fixed salts also diminished, except the phosphates, which were also increased. He also gives an analysis by Scherer of the urine in urticaria tuberculosa, the patient being a young man who likewise suffered from rheumatism. The urine was discharged in very small quantity, often not more than five or six ounces in 48 hours. It was clear, of a brownish red color, very acid and with a specific gravity of 1.028. The urea appears to be in great excess and the uric acid somewhat more abundant than in health. The difference between this and the preceding and following analyses is perhaps explained by the great concentration of the urine, or possibly by the co-existence of disturbing elements. In a case of urticaria where the urine was analyzed by Dr. Maclagan of Edinburgh, § its composition was found to be as follows, in one thousand parts :

Water and organic matter.....	981.01
Urea.....	6.91
Uric acid.....	0.05
Inorganic matter.....	12.03

The urine was distinctly acid, specific gravity 1.010, of a pale straw color and clear, with no deposit.

The chief peculiarity was a deficiency in the ordinary characteristic ingredients of the urine, the urea and uric acid. This could not arise from mere excess of water, first, because the urine was not excessive in quantity; second, because the inorganic salts were above the normal standard, whereas had the water been in excess

\* Ziemssen, *Cyclopædia of the Practice of Med.*, Vol. II., p. 348.

† *Clinical Lectures*, Second Amer. Edit., Phil., 1842, p. 122.

‡ *Animal Chemistry*, Syd. Transl., Vol. II., p. 314.

§ *London Lancet* (Amer. reprint), Oct. 1846, p. 366.

they ought to have indicated a diluted condition of the urine. Dr. Maclagan ventured, therefore, to propose as a pathological view of the case that the defect was merely a deficiency in urea and uric acid, in short, a want of what modern chemists call the products of the transformation of the tissues, and that the retention thus in the system of matters which ought to be eliminated, might be the cause of the cutaneous irritation, especially, occurring as it did after meals. The patient was given colchicum, and the specific gravity of the urine was found to have risen to 1.029, and the urea to have decidedly increased in quantity, an analysis yielding :

Water and organic matter . . . . .	966.42
Urea . . . . .	20.36
Uric acid . . . . .	0.50
Inorganic salts . . . . .	12.72

The urea was thus tripled in amount and raised above its normal standard, and the uric acid augmented ten-fold; the urticaria improved and finally disappeared under the use of the colchicum.

His conclusions were, 1. That urticaria is intimately connected with a deficiency of the organic salts of the urine, and their probable retention in the system; 2. That colchicum has an action capable of restoring the deficient salts and thus curing the disease; 3. Rheumatism and urticaria, and purpura and urticaria are frequently found together.

Dr. Murchison\* mentions the case of a boy, aged 9, with urticaria tuberosa and purpura urticans complicated with hemorrhages from the bowels, kidneys and urinary passage, and with the discharge of much lithic acid in the urine. Dr. Tilbury Fox † recognizes deficient urinary secretion as a cause of urticaria. Dr. Wilson Fox ‡ alludes to urticaria and herpes as complications of acute gastric catarrh, when the urine is usually scanty, high colored and loaded with lithates; and Scudamore § refers to erythema and urticaria shortly preceding a paroxysm of gout, when, as we know the urinary secretion presents changes similar to those cited. Dr. Murchison || also records a curious case of a gentleman, aged 42, who suffered from several symptoms of liver derangement until he had a severe attack of urticaria, when they ceased, and he had thereafter only occasional attacks of gout.

I may, finally, mention that urticaria sometimes occurs during or just following other diseases, in which we know the urinary secretion to be deranged, as in scarlatina, of which I have lately seen a striking case.

In one case of urticaria in which I examined the urine four times, I found it rather high colored and very acid, the specific gravity of the four specimens averaged 1.027½, the lowest being

\* Functional derangements of the liver, New York, 1875, p. 142.

† Skin Diseases, 3d Edit. London, 1873, pp. 120, 126.

‡ Diseases of the Stomach, 3d Edit., London, 1872 p. 105.

§ A treatise on the nature of Gout and Rheumatism, 1st Amer. Edit., Phil., 1819, pp. 51, 226.

|| Loc. Cit., pp. 129, 130.

1.024, when under treatment, the highest being 1.030, passed the previous night. Microscopically there were amorphous urates and oxalate of lime.

VI. **Erythema.**—I have incidentally mentioned this disease as occurring in the same state as urticaria. The connection of erythema with rheumatism is now well established, especially those forms known as erythema nodosum and erythema papulatum, and in these cases we would expect to find urinary derangements. Wilson\* mentions a case of erythema tuberosum where the patient, a young woman aged 22, had copious deposits in her urine, with dysuria.

In a very annoying and rebellious case of erythema, of which I have six observations on the urine, it was strongly and persistently acid, except when under strictest regimen and severe alkaline treatment. The specific gravity was not above normal, it varying between 1.012 and 1.022, with an average of 1.018. Every specimen contained abnormal crystalline deposits, sometimes the urates, sometimes oxalate of lime; occasionally both. In another equally distressing case of erythema of the face, the urine stood at 1.030 with an abundant pinkish deposit of amorphous urates with oxalate of lime. I also have record of the examination of the urine from a case of erythema urticatum, in which both morning and night specimens were very acid, of a specific gravity of 1.015 and 1.020 respectively, and both contained oxalate of lime. The urine from a patient with erythema papulatum gave almost exactly the same results.

Gintraç † says, "In erythema nodosum the urine is more or less colored."

VII. **Eczema.**—Passing now to the protean disease eczema, we find that the recorded observations all show derangement of the important excretion, the urine.

Bence Jones ‡ gives the following case: W. S., aged 64, dyspeptic, has, for 12 years, had dry and moist eczema. For the past two years has had at times frequent calls to urinate, but the quantity of urine often varied much from day to day. Thus:

On Feb. 13, he passed	On Feb. 14, he passed
oz.	oz.
At 2 A. M. . . 4	At 7 A. M. . . 8
" 3.30 " . . 5	" 8 " Breakfast
" 7.30 " . . 6	" 10 " . . 2
" 8.30 " . . 6	" 2 P. M. . . 4
" 10 Breakfast	" Dinner
" 12 noon . . 7	" 5.30 P. M. 4
" 2 P. M. . . 4	" 8 " . . 2½
" 4.15 " . . 4	" 12 " . . 2½
" 6 Dinner .	—
" 8 P. M. . . 4	23 oz. Sp. gr. 1.026
" 12 night . 4	
—	
44oz. Sp. gr. 1.015	

\* Diseases of the skin. London, 1871, p. 239.

† Cours théor. et clin. de Path. int. Vol. V. p. 112.

‡ Lectures on Pathology and Therapeutics. Lond. 1867, p. 98.



Oxalate of lime existed in the first specimen, free uric acid and the urates in the second.

Dr. Hillier\* saved the urine of a patient aged 19, for six days while an eczema was at its worst, and found the urea and uric acid both below the normal standard. In another case of general eczema of 30 years' standing, the urine was found to deposit lithates and lithic acid very abundantly, also some oxalate of lime.

Dr. Wm. Frank Smith † watched the urine of a large number of cases of inveterate eczema, and in 9 out of 10 he found *indican* present in pathological quantities. The patient was a robust man, aged 47, convalescent from eczema of both legs under alkaline lotions, taking no medicine, having full meat diet, with exercise, and one pint of beer daily. The mean of ten observations, gave, for 24 hours :

Quantity.....	1200 C. c.
Specific gravity.....	1.018
Urea.....	22 grammes.
Chloride of sodium	4 “
Phosphoric acid. . .	4 “
Sulphuric acid....	4 “

The mean also of three analyses from another patient, having eczema of arms and hands, living in his ordinary manner at home and taking no medicine, gave as follows :

Quantity.....	1000 C. c.
Specific gravity.....	1.015
Urea.....	15 grammes.
Chloride of sodium.....	1.5 “
Sulphuric acid.....	2.0 “
Phosphoric acid.....	2.5 “

A third case, aged 27, with eczema of face and neck, gave :

Quantity.....	1200 C. c.
Specific gravity.....	1.020
Urea.....	22.8 grammes.
Chloride of sodium	4.2 “

These analyses indicate an abnormally low excretion of urea, and the chlorides. He regards the urine as furnishing the key to the question as to the cause of the obstinacy of eczema.

Dr. A. T. Thompson ‡ gives a case of eczema where the state of the urine was noted at times for the period of nearly five months, during most of which time it was scanty, high-colored and deposited lithates, its character being somewhat improved occasionally under treatment.

Dr. H. D. Bulkley § gives cases where the same condition of urine was observed with a specific gravity of 1.030 and 1.035 : this

\* Skin Diseases, 2d Edit. Phila. 1870, pp. 120, 121.

† Journal of Cutaneous Medicine, Vol. I., p. 54.

‡ Diseases of the Skin. Lond. 1850, p. 275.

§ New York Medical Times, Vol. III., 1854, pp. 273, 275, 431.



state of the urine was recognized in the treatment followed. Dr. Edward Ballard \* details the case of a female child,  $4\frac{1}{2}$  years old with eczema capitis, in whom there was persistent oxaluria, with a high specific gravity and a deposit, oftentimes, of lithates and phosphates. The oxaluria "plainly fluctated with the progress of the eczema, the quantity of oxalates becoming increased whenever the formation of new vesicles was proceeding, and lessening or disappearing altogether as they died away, or were converted into crusts."

An interesting case of eczema, under the care of Dr. Robt. B. Todd, is given quite fully with analyses by Beale. † The patient, a laboring man of forty, had the whole body affected with a red scaling eczema of six months' duration. He had had two attacks previously. He was apparently healthy, and no cause of the eruption was discovered, except that he had lived almost exclusively on pigs' meat and potatoes. His urine during a month ranged from a density of 1.038 to 1.015, in quantity from 3 pints to 22 ounces, and in appearance from a high colored and turbid fluid, even dark brown, with abundant deposit, to a clear pale color and no deposit. When the urine stood at 1.038, very acid and the quantity 24 ounces in the day, it was analyzed by Dr. Beale, with the following results :

Water . . . . .	926.1	In 100 parts of
Solid Matter . . . . .	73.9	solid matter.
Urea . . . . .	24.030	32.31
Extractive matter . . . . .	27.210	36.82
Vesical mucus and lithic acid . . . . .	.460	.62
Earthy phosphates . . . . .	.970	1.31
Chloride of sodium . . . . .	4.060	5.49
Other salts soluble in water . . . . .	1.170	1.58
Sulphate of potash . . . . .	6.828	9.24
"    "    soda . . . . .	6.169	8.34
Phosphate of soda . . . . .	3.290	4.45

The high specific gravity was due to the sulphates ; this great excretion of the sulphates, independently of muscular exertion, formed an interesting feature in the case. The quantity of urine was below the average amount found in health.

In another case mentioned by Dr. Todd, a boy of 18, with eczema of the legs, scrotum and penis, there were abundant deposits of lithates and oxalates, and an analysis is given which does not possess any great interest.

Dr. Naylor \* recognizes the scanty and loaded state of the urine, with crystals of urate of soda in acute and general eczema, and very wisely remarks, " This latter condition is too often overlooked, and yet no truer guide can be taken, denoting a progressive improvement, or the reverse," which corresponds exactly to what experience has taught me, as will be mentioned later.

\* Provin. Med. Jour., Sept. 8, 1847, p. 490.

† Lond. Med. Times & Gaz. 1852, Vol. II., pp. 890, 559.

‡ Diseases of the Skin, 2nd Edit. Lond. 1874, p. 122

Dr. Parkes\* gives quite fully the elaborate analyses of Beneke in a case of acute impetiginous eczema, covering almost the entire body. I will not quote it in full, but merely state that oxalate of lime was found microscopically, and that the urea was in some excess during the period of severe disease, and that the uric acid exceeded the normal amount during convalescence. The specific gravity was low, 1.014,3 when taking no medicine, but the daily quantity was large, 2023 grammes (80 oz.) These results differ in some respects from others quoted, and from my own, but the discrepancy is explained by the fact that a large share of the secreting surface of the skin was impaired by disease, and when this is the case there must be increased secretion both of urea and water. Thus, Dr. Golding Bird † says, "As a general rule, whenever the functions of the skin are impaired, where a due amount of excretion is not exhaled from the surface, an excess of nitrogen is retained in the blood and ultimately separated by the kidney in the form of urate of ammonia, or perhaps urea or creatine. A person in apparently good health experiences from exposure to a current of cold air a slight check to perspiration, and the next time he empties his bladder he voids urine of a deeper color than is usual with him, and on cooling it becomes turbid from the precipitation of urate of ammonia. The explanation of this phenomenon, with which every one is familiar, is found in the kidneys assuming temporarily a kind of compensating function of the skin."

Dr. Garrod ‡ recognizes the frequent connection of eczema with the gouty habit. Dr. Murchison § states that his experience fully bears out the correctness of the observations of the connection of eczema with the gouty diathesis, but very conclusively and correctly ascribes the disordered blood-state, or lithæmia to functional derangement of the liver. Dr. Golding Bird || says, "I have two or three times been consulted in cases of patients lying bed-ridden from rheumatic gout, one or both legs being covered with an eczematous eruption, and the parts on which the exudation had dried, have been actually frosted over with microscopic crystals of urate of soda. Dr. Tilbury Fox ¶ writes, "All disorders which are connected with the retention of excreta in the system, and their circulation throughout the blood current, may furnish the exciting cause of eczema. This is a clinical fact of very great importance. Given the tendency to eczema, then the transmission of uric acid through the capillaries of the skin will so far derange as to aggravate certainly, and now and again excite an eczematous eruption. This is what is meant by gouty eczema; and by securing the absence of the uric acid from the circulation,

\* The Composition of the Urine. Lond. 1860, p. 298.

† Urinary Deposits, 2d Amer. Edit. Phila. 1851, p. 116.

‡ Reynolds' System of Medicine, Vol. I., p. 824.

§ Functional Derangements of the Liver, New York, 1875, p. 140.

|| Urinary Deposits, 2d Amer. Edit., Phil., 1851, p. 117.

¶ Skin Diseases. 3d Edit., Lond., 1873, p. 175.

the eczema will often disappear, and always be more amenable to treatment. \* \* \* In some of these cases of eczema there is, and has been for some time a deficient kidney secretion, and if careful analysis of the urine be made a deficiency in exertion will be observed."

Gigot-Suard\* gives the results of the administration of silicate of soda administered to an eczematous patient for 23 days, in quantities increasing from 30 to 80 centigrammes daily. The specific gravity of the urine was diminished, the quantity increased and the deposit of urates and uric acid ceased.

Dr. Mapother † makes an interesting contribution to the urinary relations of eczema. Patrick M—, aged 50, had had eczema on front of both arms and forearms and thighs for seven weeks; for years he had been subject to acid eructations, and had drunk freely of porter. The urine of each twenty-four hours gave the following record:

DATE.	OUNCES.	SPEC. GR.	REMARKS.	TREATMENT.
Jan. 16	26½	1.028	Very acid—urates	No treatment.
" 17	24½	1.030	do . . . .	
" 18	22½	1.031	do . . . .	
" 19	24	1.031	do . . . .	Fifteen drops of Wine of Colchicum, thrice daily.
" 20	26	1.030	}	Thirty drops of Wine of Colchicum, thrice daily; producing three or four small evacuations from the bowels daily.
" 21	40	1.020		
" 22	37	1.023	} . . . . .	
" 23	20	1.026		
" 24	34	1.030	} Neutral . . . . .	Five grains of citrate of lithia with twenty grains of citrate of potassa, thrice daily.
" 25	49	1.018		
" 26	38	1.028	do . . . . .	
" 27	39	1.029	do . . . . .	
" 28	42	1.025	do . . . . .	

But little improvement took place in the eczema until the administration of the lithia and potash on the 24th, but, in four days afterward the disease was largely removed.

My own observations in eczema accord very completely with what has been quoted. Of the 46 patients, of whose urine I have records, it may safely be stated that not in a single instance did that secretion represent a state of perfect health. In one patient it was examined 26 times, in another 9, in another 8, in another 6, and 4 times each in 9 other patients, with almost uniform results, except when under the direct influence of medication. The total number of my recorded urinary observations in eczema amounts to 147.

The changes I have noted in the urine of eczema may be divided into two classes: *First*, those indicating an acid dyspepsia, shown by the presence of oxalate of lime, and occasionally urates, or even uric acid, with an oftentimes greatly varying quantity and specific gravity, as in the case cited above from Bence Jones,

\* L'Herpétisme, etc., Paris, 1874, p. 396.

† Lectures on Skin Diseases. 2d edit. 1875, p. 78.

where on one day 45 ounces, with a specific gravity of 1.015, was discharged, and on the next but 23 ounces, indicating 1.026. I have also noted this variety, with the urine of a pale yellow or straw color, with a specific gravity as low as 1.010, in the morning specimen, passed on rising,\* when that passed by the same patient on retiring stood at 1.028; the extremes I have noted were 1.005 and 1.030: or, there also may be in this dyspeptic variety a persistent abnormal acidity and high specific gravity, as in one case of eczema of the anus, where oxaluria was very obstinate, and the average of 26 examinations gave a specific gravity of over 1.026½, the lowest being 1.020, when under diluents and alkalis, and the highest 1.030; *Second*, where the uric or lithic acid diathesis, or better, perhaps, chronic lithæmia exists, where the urine is also unnaturally acid at almost, if not quite, all times, and deposits a moderate amount of urates or free uric acid. The specific gravity of the urine in this second class of patients does not vary so much, but generally remains rather above the normal, 1.020 to 1.026. The average specific gravity of the urine from patients with various forms of eczema, a few acute, mostly chronic, gave 1.022; in the 46 cases it was not recorded as having an alkaline reaction on passing, or soon after, in a single instance, while many specimens are recorded as "very acid." Two or three specimens it is true, are noted as neutral or alkaline, but I find that the test was made two or more days after the urine was voided, so that the alkaline fermentation had probably set in, and these instances may safely be excluded.

The amorphous urates were not infrequently met with, being noted as found in 26 of the 46, cases; oxalate of lime appeared in 25, and free uric acid was seen in 10. Albumen is rarely found in the urine of eczema, in but two of the cases was it noticed that there was "a trace," the other specimens from these same patients being free, as also all the others. It must be looked upon as a coincident phenomenon; although, conversely, the presence of urea in the blood in chronic albuminuria may sometimes be the exciting cause of a very intractable eczema.

**VIII. Psoriasis.**—Even more than eczema, has this disease been looked upon as a cutaneous manifestation of a gouty state. Sir Henry Holland † says, "I cannot doubt from my own observation that certain of these (skin) disorders occur as effects of the habit in question (gout). I have so often seen psoriasis, for example, occurring in gouty families—sometimes alternating with acute attacks of that disease, sometimes suspended by them, sometimes seeming to prevent them in individuals thus disposed—that it is difficult not to assign the same morbid cause to these results." Dr. Garrod ‡ believes that psoriasis is, perhaps, the most frequent

\* It will be remembered that normal urine "first discharged in the morning is usually dense, highly colored, of a strong acid reaction, and a high specific gravity." Dalton, *Physiology*, Phil. 1866, p. 351.

† *Medical Notes and Reflections*. Phil. 1857, p. 212.

‡ *Reynolds' System of Medicine*. Phil. 1868, Vol. I. p. 824.

form in which the cutaneous (gouty) disease manifests itself, and that there are records of many cases in which the skin and joint-affection are alternated. Sir Thomas Watson,\* speaking of psoriasis and lepra says, "I believe that they sometimes depend upon the presence, or the generation, of an excess of acid in the system; and that they are often cured by alkaline remedies, I am sure." Prout† mentions the alternation of leprous and scaly skin diseases with deposits of phosphate of lime in the urine, in patients who have been subject to gout and rheumatism, the urinary affection becoming better as the cutaneous affection has become worse, and *vice versa*. In these cases the urine has had a low specific gravity.

With reference, however, to direct examination of the urine in psoriasis, I can find but three statements, one by Golding Bird,‡ to the effect that in cases of lepra, psoriasis and ichthyosis, where the excreting functions of the skin have been much impaired, the urine has been much richer in urea than was consistent with health,"; another by Nayler §, who remarks that in cases of psoriasis where the irritation of the skin is excessive it will be well to examine the urine, which will often be found to be high colored, and loaded with the urates; and third, an analysis by Beale.||

This latter observer examined the urine from a very severe case of psoriasis in a girl aged 20, which had recurred for many years, in the spring of the year. About 40 oz. were passed in the 24 hours, with a specific gravity of 1.021. The analysis gave:

Water . . . . .	957.50
Soluble matter . . . . .	42.50
Urea . . . . .	15.00
Other organic matter . . . . .	6.20
Fixed salts . . . . .	21.30
Chlorides . . . . .	13.00

Seven and a half months afterwards the urine was again examined, and the total of 24 hours gave a specific gravity of 1.007, was neutral in reaction and yielded the following analysis:—

Water . . . . .	985.40
Solid matter . . . . .	14.60
Urea . . . . .	5.90
Uric acid . . . . .	.45
Extract and ammoniacal salts . . . . .	.65
Fixed alkaline salts . . . . .	7.31
Earthy phosphates . . . . .	.29
Chlorides . . . . .	5.00
Sulphates . . . . .	.45

Dr. Beale thinks the large amount of the fixed salts to be the most interesting point in these analyses, about double the normal amount of saline matter was found; he also regards that the large amount

\* Practice of Physic. Phil. 1858, p. 1205.

† Stomach and Renal diseases Phil. 1843, p. 221.

‡ Urinary deposits. 2d Am. Edit. Phil. 1851, p. 117.

§ Diseases of the Skin. 2d Edit. London 1874, p. 40.

|| Beale's Archives of Med., Vol. I., p. 316.



of organic matter thrown off by the disease in the scales had caused a diminution of the organic constituents of the urine.

Three weeks later, the patient being much improved, analysis gave :

Water . . . . .	971.3
Solid matter . . . . .	28.7
Urea . . . . .	10.5
Extraction . . . . .	3.6
Salts . . . . .	14.6
Chlorides . . . . .	7.0

My observations of the urine in psoriasis have been comparatively few in number, 36 relating to 14 patients, but they are sufficient to support the view of the assimilative error which either underlies or at least manifests itself during many of the diseases of the skin of constitutional origin. Most of the examinations I have made in psoriatic patients show a hyper-acidity, with crystalline deposits, uric acid, urates and oxalate of lime and in one instance the stellar phosphate of lime; their absence being rather an exception. The specific gravity of psoriatic urine is not necessarily high, but may vary greatly at times. Nor is there any uniformity as to the time of the high or low specific gravity; in one patient six examinations at intervals of about a week between each couple, gave the following:—night, 1.026; morning 1.014; night 1.010; morning, 1.008; night, 1.026; morning, 1.008; in another patient the average of four examinations was almost 1.025.

**IX. Acne.**—I have not been able to find any allusions to the urine in patients affected with *acne*, except a single line by Dr. A. T. Thomson,\* who says of *acne simplex*, “The urine deposits a yellowish or whitish sediment, indicative of indigestion”; and can therefore give only my own observations. Garrod,\* however, states that “*acne* of the face and other parts is sometimes found to be closely dependent on the gouty diathesis, and,” he says, “I have known one case in which the patient could predict the advent of a gouty paroxysm from the appearance of these spots.”

Urinary derangement is very common indeed in patients with *acne simplex*, *indurata* and *rosacea*, also in the simpler forms of *acne sebacea*, or *seborrhœa* and *acne punctata* or *comedo*. Although my recorded examinations are relatively few, I feel confident in asserting that a very large share of the cases of *acne*, which are of any duration, will be found thus associated. In but two out of 61 examinations, relating to 22 patients with *acne*, was the urine recorded as other than acid, and in one of these it was neutral in the night specimen and acid in the morning, in the other case in which it was recorded neutral in one instance, the urine passed three hours afterwards was acid, as also all the other specimens. Very many of the reactions are stated as very acid. The specific gravity of the urines ranged from 1.014 to 1.040, with the average of over 1.023.

\* Diseases of the Skin. 2d Edit. London, 1850, p. 404.

† Reynolds' System of Medicine. Phil. 1868, Vol. I, p. 824.



The urinary changes in acne are more commonly those of dyspepsia, oxalate of lime being not an infrequent microscopic deposit, one case presented it very abundantly and persistently; also uric acid and the urates. Another element of the urine of a proportion of acne patients is the presence of an abnormal amount of the phosphates, discovered either by boiling, which causes a pale whitish precipitate, soluble at once by nitric acid, or found microscopically soon after voiding, that is, before the decomposition has taken place which produces the triple phosphates, which latter form may occur in almost any urine.

These recorded examinations, however, form but a portion of my evidence of the urinary derangements in acne. On looking over my many and complete notes of cases I find very abundant testimony from the statements of patients, of changes which they themselves have detected, such as persistent high color at times, with much lateritious deposit, staining the vessel, burning on passing, frequent calls at night to pass water, and great variations in the quantity and color, which they have noticed, from an abundant flow of pale, limpid, straw-colored urine to a scanty, irritating, red or muddy fluid.

I mentioned above that urinary derangements would be found in cases of acne of long duration; this statement should be modified, for when the eruption is provoked or kept up by a reflex uterine disturbance, or by local causes as cosmetics, heat, cold, etc., the kidney secretion may or may not present these changes; but I would here throw out the caution, not to imagine because a patient has uterine difficulty that therefore the acne must be dependent on that, for I have had opportunities of removing acne by a careful attention to the digestive functions, with a small amount of medication, internal and external, long before the uterine disorder which existed had been rectified by the physician having it in charge.

X. *Pruritus*.—In a few cases of *pruritus* in which I examined the urine I found it to be loaded with urates and of a high specific gravity and of much greater acidity than normal; in some cases oxalate of lime was found. In one case of *pruritus* of the vulva repeated examinations failed to detect any sugar in the urine, unless it were a trace on one examination, the urine ranging in specific gravity from 1.014 to 1.038, the average of eight examinations giving 1.026½. After a month or so, my friend Dr. Oscar Simon, of Berlin, to whom I referred the case during her stay in Europe, reported quite an appreciable quantity of sugar, and her pruritic difficulty was very greatly relieved after a visit to one of the mineral springs of Germany and the adoption of an anti-diabetic regimen. In this case there were boils and carbuncles, and I expected to find the glycosuric state, but looked for it in vain. The patient was an elderly lady, and recalls the remark of Trousseau\* that “eczema of the genitals in elderly women will very frequently be found to depend on glycosuria.” The same

\* Trousseau, Syd. Soc. Edit., Vol. III., p 503.

statement is made in substance by Dickinson,\* who also speaks of the boils and carbuncles accompanying diabetes mellitus, though he does not subscribe to Prout's affirmation that diabetes always accompanies carbuncles and malignant boils, or abscesses allied to carbuncles.

In this connection I may allude to a curious statement of Prout, which is important if verified. Speaking of the causation of diabetes mellitus he says; † "Another class of causes, or rather concurrent diseases, are various affections of the cutaneous and cellular tissues. I have seen several instances referable to this class; and were I permitted to draw a general inference from my experience, I should say that diabetes usually *follows* cutaneous affections, and *accompanies* (perhaps *precedes*) the affections of the cellular tissues. Thus, I have several times had patients observe, that they were formerly subject to eruptions in various parts of the body, but that such eruptions disappeared after the diabetic complaint became established; nor do I remember more than two instances in which diabetes actually accompanied a severe cutaneous affection."

To return to pruritus. In another case of pruritus of the vulva I found in both morning and night specimens the specific gravity of the urine high, an acid reaction, and an abundant deposit of urates and some uric acid. In a most obstinate and distressing case of general pruritus, from no recognizable cause, which had lasted three or four years in a lady aged 23, the urine, *which had never before been examined*, was found to vary in density from 1.030 to 1.008, and from a milky opacity, soon after passing, to a pale straw color, without a particle of deposit. The first two examinations, morning and night, were each 1.030, very acid, and with very abundant deposits of urates and uric acid in large crystals; after taking acetate of potassa for two weeks the night urine presented much the same appearance, very acid, specific gravity 1.024, the morning specimens being faintly acid, limpid, of a pale straw color and a density of 1.008.

Dr. Purdon ‡ quotes Dr. Day in a statement "that pruritus is often accompanied (if not preceded) by a diminished secretion of urine," adding that "this may furnish us a hint in reference to treatment." Dr. A. T. Thompson § gives a case of pruritus in a man aged 74, where the urine was scanty and high colored, and after being broken down by the long continued irritation, boils appeared on various parts of the body. The urine became copious under treatment, and, when examined, was found to contain no trace of saccharine matter. Soon after the boils appeared the itching greatly abated, but after a lapse of three years was not yet completely removed. Dr. Murchison || attributes much of the

\* Diseases of the kidney, &c. Part I., Diabetes, London, 1875, p. 92.

† Stomach and Renal diseases. Philadelphia, 1843, p. 51.

‡ Cutaneous Medicine. London, 1875, p. 145.

§ Diseases of the skin. London, 1850, p. 216.

|| Functional Derangements of the Liver. New York, 1875, p 144.

pruritus to hepatic derangement in which we know the urine is often abnormal.

XI. **Herpes Zoster.**—Simon \* gives the analyses of urine by Heller in cases of *herpes zoster*. From them he concludes that “in herpes zoster the chief peculiarities are:

“1. A marked increase of the chlorides and phosphates, and a corresponding diminution of the sulphates. 2. An excess of hydro-chlorate of ammonia. 3. A large amount of fat. 4. A diminution in the amount of uric acid. An increase only occurs when the disease is accompanied with fever. 5. The presence of oxalate of lime may always be suspected in these cases.”

I have the record of the examination of the urine of a lady some time previous to an attack of herpes zoster of the forehead. She was a very dyspeptic subject, the urine was very scanty, acid, specific gravity 1.028, had an abundant rather thick flocculent deposit, which showed oxalate of lime in considerable quantity, and triple phosphate 15 hours after passing, the urine having been kept cool.

XII. **Pemphigus.**—The urine in a case of pemphigus has also been analyzed by Heller †. The patient was a woman aged 40 years. The attack was very severe and proved fatal. The urine deposited a light cloudy sediment, consisting principally of mucus, but also containing fat molecules, urate of ammonia, and a few epithelium scales. It was acid, and its specific gravity was 1.017½. It contained in 1000 parts:

Water.....	955.80
Solid constituent .....	44.20
Urea .....	24.63
Uric acid .....	0.58
Extractive matter .....	11.79
Fixed salts.....	7.20

Of the fixed salts the earthy phosphates were normal, the sulphates much increased, and the chloride of sodium proportionately diminished. The urea was considerably above the normal average.

“In the case of a little boy affected with acute pemphigus, Dr. Marris Wilson found the quantity of urine passed in 24 hours much below the average, namely, about 12 ounces, its specific gravity high, namely, 1.033, and its reaction powerfully acid. It was of a light color, depositing on standing a light flocculent cloud, containing minute crystals of oxalate of lime, and was loaded with urea. In 1000 parts the quantity of solid constituents was 78.89. Bamberger found the urine in pemphigus scanty, acid, of high specific gravity, rich in urea, uric acid, and the earthy phosphates, poor in phosphoric and sulphuric acids, but abundant in ammonia. He also found ammonia in the blood and in the fluid of the bullæ, the blood being poor in solids, especially albumen. Hence he suggests as a proper treatment the use of an

\* Animal Chemistry, Syd. Edit., 1846, Vol. II., p. 320.

† Simon's Animal Chemistry, Syd. Edit., 1846, Vol. II. p. 322.

easily assimilable albuminous diet and hydrochloric acid.”\* It may be here stated, in connection with the great amount of urea in the urine in this disease, that Simon † failed to find any trace of urea in the fluid from the blisters of pemphigus, examined in two attacks at an interval of five years.

**XIII. Purpura.**—In a case of purpura in a girl 20 years old, Simon ‡ found the urine for a fortnight of a dark brown color, of a disagreeable ammoniacal odor, and with alkaline reaction. “It deposited a viscid sediment of earthy phosphates, urate of ammonia, and mucus. The addition of nitric acid indicated the presence of a small quantity of bile-pigment. During her recovery the urine returned to its original state. Heller gives the analyses of urine from two cases, in a girl aged 19, and a boy of 16 years. The specific gravity ranged from 1.012 to 1.021, the reaction was faintly acid, and traces of albumen could always be detected in the urine of the boy till convalescence appeared. Heller observes that the augmentation of the ammonia (in the form of hydrochlorate) and of the uric acid, together with the diminution of the chloride of sodium—characters seemingly associated with this disease—indicate that the blood must be in a state of dissolution. In a case observed by Martin, the secretion was very scanty, about one or two ounces being passed at a time, and the daily amount being from 12–20 ounces. Its reaction was faintly acid, three analyses at intervals of 12 and 22 days, gave a specific gravity of 1.013.40, 1.021.26, and 1.010.31 respectively.

In its physical characters it resembled the urine of Heller’s cases, namely, of an intensely yellowish-brown color, rather turbid and depositing flocks of mucus. The odor, at first ordinary, rapidly became ammoniacal.” A. T. Thompson § gives a case of pemphigus with supervening purpura, where the urine deposited sediment consisting of lithates, had a specific gravity of 1.026 and contained a large excess of urea, phenomena which, as we have just seen, belong rather to the pemphigus than to purpura. Wilson || mentions a case of bullous purpura in a rheumatic and dyspeptic man, aged 42, in whom the urine was scanty, and high colored, with red sediment. The urine in purpura sometimes contains blood, at other times casts of the renal tubes. ¶

In the only case of purpura of which I have made the examination, I found the urine acid, with a specific gravity of 1.025 morning and night, color light, with large crystals of uric acid in the morning urine, 12 hours after passing, and amorphous urates deposited very abundantly in the night specimen, after standing three days.

**XIV. Melano-Sarcoma.**—In a remarkable case of melano-

\* Wilson. Diseases of the Skin. London, 1867, p. 305.

See also—Lafaurie, Pemphigus-Diagnose. Wirzburg, 1856, p. 37.

† Animal Chemistry, Syd. Edit., London, 1846, Vol. II., p. 488.

‡ *Loc. cit.*, p. 259.

§ Skin Diseases. London, 1850, p. 182.

|| Diseases of the Skin. London, 1867, p. 350.

¶ Hillier. Reynolds’ Syst. of Med. Phil., 1868. Vol. I., p. 759

sarcoma of the skin I found the urine very acid, with a specific gravity of 1.020, urates quite abundant and with a moderate amount of oxalate of lime. The color varied from time to time, occasionally being as dark as rather black, clear coffee, then again nearly the color of sherry wine. Sometimes it was quite muddy from the urates, again it would remain clear for a long time. The sediment, which at times was quite abundant, was, besides the urates and oxalates, made up of irregular pigment masses and particles, largely amorphous, but many of them were apparently within epithelial cells, the size of those from the pelvis of the kidney, and many resembling the pigment colloids of Roberts.\* Toward the end of the patient's life, the urine diminished greatly in quantity.

XV. *Elephantiasis Græcorum*.—The urine of *leprosy*, or *elephantiasis græcorum*, has been analyzed by several,† and found to possess certain pathological interest, but the disease being very rare in this country, I need not dwell on it. I will state, however, that albumen is commonly found in it, and a very decided diminution in the quantity of urea, a state akin to Bright's disease, with the with exception of the renal casts.

XVI. *Addison's Disease*.—*Supra-renal melasma*. Certain changes have been observed in the urine passed by patients with the *bronzed skin disease*, the main features being a diminished quantity, generally low specific gravity, and a deficiency in solid constituents: albumen has been found. ‡

XVII. *Ichthyosis*.—I will close this lengthy and perhaps tedious recital of facts by quoting from Mr. Nayler,§ who furnishes us with some very interesting details in regard to the urinary changes in *ichthyosis*. Says he: "The total arrest of all sensible perspiration in general ichthyosis, and its partial secretion only in some of the modified forms of the complaint offer an interesting subject for investigation, with respect to the state of the urine." He carefully determined the urine passed in 24 hours, for several days in succession, by two patients with this disease, and found that the quantity was very great, the specific gravity low, the color of the palest yellow, and the reaction but slightly acid. In a third case, a boy 11 years old, height 52 inches, weight 57½ lbs., in which the scales were numerous and entirely enveloped the trunk, he made very careful analytical investigations, and compared the results with those obtained from three children of nearly the same

\* Urinary and Renal Diseases. Phil., 1866, p. 96.

† Milton—Diseases of the Skin: Lond. 1872, pp. 305-313. Also, Journal of Cutaneous Medicine, etc., Lond. 1870, Vol. IV., p. 178. Also, Moralli-Schmidt's Jahrb., 83, p. 9. Also, Parkes—The Composition of the Urine: 1860, p. 334. Also, Duckworth—St. Barth. Hosp. Rep.: 1874. Also, Renault—The Doctor: May, 1874, p. 95.

‡ Greenhow—Lancet, March 6th, 1865, p. 328.

Also, West—Roy. Med. and Chir. Soc., Nov. 10th, 1874.

Also, Rosenstirn—Virchow's Archiv. Bd. LVI: Reprint, Würzburg Inaug. Abh. Berlin, 1872 pp. 13.

§ Diseases of the Skin: London. 1874, pp. 74-78.



age, etc. He comes to the following conclusions: 1. Notwithstanding the small rate per cent. of urea, the absolute amount in 24 hours is little altered in ichthyosis; and this is somewhat remarkable when we consider that the skin, as a secreting organ, is reduced to the lowest possible limits in this disease. 2. The quantity of sulphuric and phosphoric acids, is hardly, if at all, affected in ichthyosis. 3. No hippuric acid crystals were detected by examination with the microscope. Schlossberger is said to have demonstrated hippuric acid in the scales of ichthyosis. (Neubauer on the Urine, p. 34.) None, however, could be detected in the above case, after a most careful analysis by Dr. Marcet."

In contrast with the large quantity of urine in ichthyosis reported by Nayler, Dr. A. T. Thompson\* mentions a case of ichthyosis covering a large portion of the body, in a boy 15 years old, in whom, when first seen, the urine measured but 3 ounces in 12 hours; it had a specific gravity of 1.030, and was turbid from urates. After four days' treatment he passed 12 ounces in 24 hours, with a specific gravity of 1.016, with further improvement later.

XVIII. *Xeroderma*.—In two cases of *Xeroderma*, a mild form of ichthyosis, in which I observed the urine, I found it as follows: in one case a specimen passed at 11 A.M., and examined 12 hours afterward, was alkaline. There was an abundant deposit, which, when shaken, rendered the fluid milky white, but which dissolved completely on adding nitric acid, and consisted wholly of amorphous phosphates. The urine passed the same night was very acid, specific gravity 1.010, of a yellow color, clear, no sediment, and microscopically a moderate amount of oxalate of lime was found. The specimen passed on rising the next morning was also very acid, specific gravity, 1.018, of a lemon color, with a very slight mucous deposit, and having also an abundance of large crystals of oxalate of lime. In the other case, the night and morning urine had a specific gravity of 1.027 and 1.016 respectively, were of a yellow and pale lemon color, with moderately acid reactions, a normal flocculent deposit in both, and an abundance of small crystals of oxalate of lime in the specimen passed on retiring.

It will not be possible, within the limits of this paper, to analyze perfectly the mass of material which I have here presented, but the urinary alterations which have been recorded are given thus in full, in order to make indelible the impression that the urine is a most important element to consider in the study and practice of Dermatology. In not one of the more than 16 diseases mentioned, where the skin is affected, was the urine found normal, and in many instances the pathological changes are clear and well marked, involving important prognostic and therapeutic considerations.

I may, however, briefly recapitulate the main points in what has preceded, as follows:

1. The urine represents the state of the blood, as well as the

\* London Med. Gaz., July 3, 1846, p. 35.



integrity of the kidneys, and conversely the state of the secretion from the skin, and is therefore of very great importance in the study and treatment of diseases of the skin.

2. The circulation in the blood of excrementitious substances, uric, hippuric and oxalic acids and urea, given experimentally, has been followed by eruptions on the skin.

3. Uric acid is found in the blood of gouty patients, also in blisters raised upon them. It has also been found in the fluid contained in the vesicles of eczema. Urate and phosphate of soda have been recovered from the contents of pemphigoid bullæ in a case of psoriasis, and uric acid has also been discovered in the scales of psoriasis. Hippuric acid has been demonstrated in the scales of ichthyosis.

4. Urea is a normal ingredient of the sweat, has been recovered in notable quantity from the perspiration of a gouty patient in a Turkish bath, and has also been found to be excreted in quantity on the skin in certain fatal cases of chronic kidney disease. Urate of soda has been found crystallized on the skin of eczematous legs, in gouty patients.

5. The rate of secretion of the urine varies greatly with the state of the cutaneous surface, cold applications increasing and warm diminishing it. Daily bathing increases the total solid constituents in the urine, the urea and uric acid being increased. Profuse sweating diminishes the quantity, raises the specific gravity, increases the urates and chlorides. Complete suppression of exhalation by varnishing the skin causes death from uræmia, with albuminuria and the production of triple phosphates in various parts of the body.

6. The urine, during the acute febrile diseases of the skin, presents features such as might be expected from the extensive damage to its secreting powers occurring in these affections.

(a) In *erysipelas* the urea in the urine is increased somewhat, the uric acid augmented three fold, the chloride of sodium diminished, and albumen not unfrequently appears.

(b) In *measles* the urine is rich in uric acid and urates, lower products of metamorphosis, albumen and blood, are not uncommon.

(c) In *scarlet fever* the urea is not necessarily increased; uric acid is almost entirely suppressed at first and largely in excess at the close of the fever; the chloride of sodium is diminished. Sediments of uric acid and urates are common and albumen and epithelium and casts generally appear.

(d) In *small pox* the quantity of urine is diminished and its specific gravity not proportionately increased; uric acid is precipitated and the chlorides are diminished. Albumen is sometimes seen.

7. In the chronic diseases of the skin the urine exhibits alterations of two kinds: *first*, those due to assimilative disorder, corresponding to those known to accompany derangement of the liver,

dyspepsia and alterations due to hereditary disposition, a diathetic state closely allied to gout and phthisis ; and, *second*, those due to interference in the functions of the skin, as in extensive ichthyosis and xeroderma, or in eczema or psoriasis covering much of the body, where the urinary changes may be regarded in a measure as secondary to the skin lesion.

- (a) *Urticaria* is associated with a diminution of the urea and the organic salts in the urine and their probable retention in the system. The quantity of urine is small, the specific gravity high, urates and oxalates abound.
- (b) *Erythema*. Here the urine is persistently acid with either an abundant deposit of urates or oxalate of lime.
- (c) *Eczema* patients seldom pass large amounts of urine, the tendency is to scanty secretion, almost always unnaturally acid, with a specific gravity averaging above normal. Free uric acid, the urates and oxalate of lime abound, sometimes oxaluria is very persistent. Albumen is rarely seen. The urea and uric acid are often below the normal standard, although they may be in excess when a large portion of the integument is affected ; indican has been found in pathological quantities ; when the specific gravity is high it may be due to an increase in the sulphates. Chlorides are diminished.
- (d) *Psoriasis* sometimes alternates with phosphatic urinary deposits in gouty subjects. Where the excretory functions of the skin are much impaired the urea is above normal. The fixed salts are increased. The urine shows generally a hyper-acidity with deposits of uric acid, urates and oxalate of lime, the contrary being rather the exception. The specific gravity is liable to great and unaccountable variations.
- (e) *Acne*. Urinary derangements are very common in acne, generally those of dyspepsia, the quantity and the specific gravity varying greatly. Generally over acid, the urine deposits oxalate of lime, urates and uric acid. It is not uncommon to find the phosphates increased.
- (f) *Pruritus* often gives very abundant uratic deposit, and sugar is sometimes present. In the aged, pruritus is often accompanied or preceded by diminished secretion of urine. The specific gravity may vary greatly.
- (g) *Herpes zoster*. The chlorides and phosphates are increased, and the sulphates diminished ; oxalate of lime present.
- (h) *Pemphigus*. The sulphates and earthy phosphates are increased, chlorides diminished. Urea greatly above normal ; oxalate of lime occurs. The quantity is small, specific gravity high and reaction very acid.
- (i) *Purpura*. Albumen, blood and casts are sometimes found. The earthy phosphates, ammonia and uric acid are increased, chloride of sodium diminished. The

urine is scanty, with a low specific gravity and faintly acid reaction, giving traces of bile pigment.

- (j) *Melano-sarcoma*. The urine brown, often of a dark copper color, at times depositing urates abundantly. The deep color due to pigment particles alone or enclosed in epithelial cells. The urine very acid, specific gravity about normal and towards the end of life the quantity of urine is much diminished.
- (k) *Elephantiasis Græcorum*. Albumen is common, and the urea is diminished in the urine.
- (l) *Addison's disease*. Bronzed-skin disease. Quantity of urine small, specific gravity generally low, solid constituents deficient: albumen sometimes.
- (m) *Ichthyosis*. The quantity of urine is large and the specific gravity low, but the urea, though giving a small percentage, is unaltered in its total daily quantity. In one case the quantity of urine was greatly diminished, the specific gravity high and urates were deposited.
- (n) *Xeroderma*. Urine diminished in quantity, varying in reaction, alkaline and acid, depositing, when alkaline, a large quantity of amorphous phosphates; or, clear and acid with oxalate of lime.

In order to determine how far this urinary disorder is really connected with the disease of the skin, we may refer to such investigations as those of Dr. Balman,\* who examined the urine of a large number of patients with different chronic diseases. The highest proportion of disturbance was found in those with marked evidence of scrofula, as enlarged glands, and 74 per cent. of these cases gave oxalate of lime in the urine. Skin diseases came next, yielding 66 per cent., whereas the highest of other diseases was phthisis, in which 47 per cent. of the examinations showed oxalate of lime; rheumatism gave only 12 per cent.

The urinary alterations which have been recorded may largely be classed as those indicating imperfect systemic action, whereby excrementitious substances fail of their complete evolution into elements ready for excretion. The urea has been notably absent in many of the analyses we have quoted, while lower grades of metamorphosed tissue have taken its place, albumen, the urates or lithates and oxalate of lime, most prominently. In many instances the amount of urine has been far below the normal quantity, while the specific gravity, which should be high in such a case, is often low. Many times, however, we have quoted the specific gravity as abnormally high, but here the greater density is due to the *inorganic and earthy salts*, as especially exemplified in Todd's case of general eczema, with the analyses by Beale. In the case of urticaria it was shown that with the increase of urea and uric acid in the urine, under colchicum, the disease disappeared.

We cannot here enter upon special inquiry as to where this ma

\* London Medical Gazette, Nov. 8, 1850.

assimilation and faulty disintegration takes place, other than to refer to the very high authority of Dr. Murchison, who has so clearly brought it home to the liver, that one is almost tempted to accredit that organ with every fault of nutrition. In our mind, however, a larger pathological idea prevails, and other organs, perchance the whole system, oftentimes, must bear a share. Recognizing fully the glyco-genic, and depurative, and calorific functions of this great organ, the liver, I still see a cause of mal-assimilation and faulty disintegration in the possible derangement of the functions of the stomach, skin, kidneys, possibly also of the lesser organs, pancreas, etc., a disorder of any one of which, and the throwing of its work upon other organs, may cause chronic disease. Thus, much of the systemic disturbance resulting in gout or skin disease is traceable to primary indigestion, that is, to failure in the stomach to properly prepare the ingesta for the action of the other organs. Or, as a chilling of the cutaneous surface can produce internal disorder, manifested by a deposit of lithates in the urine, so chronic inactivity of the skin may have the same result; how constantly is the skin harsh and dry in the states of albuminuria, glycosuria and polyuria, and I have already shown urinary derangements to be common in cases where the skin is disabled, as in xeroderma, very general eczema or psoriasis, etc., and we know, moreover, that the action of the skin is apt to be very imperfect, even in cases of localized cutaneous disease.

We come now to the practical bearing of our study of the relations of the urine to diseases of the skin, namely:—

**Therapeutical considerations.** First we will take the matter of diet, hygiene and exercise. The variations in the urine both in connection with normal alimentation and the ingestion of injurious food have been very conclusively demonstrated by others, and it were well to regard these physiological considerations in the treatment of skin diseases. When the urine exhibits deposits of uric acid, urates, and oxalate of lime, there is evidence of imperfect action of the system, a sub-oxidation, whereby, in place of the complete combustion of the food, and the perfect elaboration of the products of dis-assimilation into urea, carbonic acid, water, and other elements fails, and oxalic acid represents, in the main, this failure in respect to starchy and saccharine food, and uric acid and the urates the same for nitrogenous elements; (though it is true that this is not absolutely the fact in every instance, oxalic acid being also derivable from albuminous compounds.) These changes in the urine, then, which we have shown to be so very common in patients with affections of the skin, show the latter to be more connected with assimilative disorder than is granted by some, or apt to be thought of by most practitioners. I cannot here enter further on the subject of the animal chemistry of these changes, but will merely state the practical lessons I have learned from them, without even stopping to give credit to the sources of my knowledge.

Over eating is not at all uncommon in skin patients, by this

means undue amounts of alimentary substances are taken into the blood and the urinary disorder is but an indication of this, an effort of nature to rid the system of unneeded supply; nature, as it were, considers it unnecessary, or is unable, to fully oxydize this waste matter, and throws it off partially disintegrated. Or, there may be over eating in one particular direction, one patient takes more sugar and starch than is needed, another more meat, a proper regulation in this respect conduces to health and consequently to recovery from skin diseases. Or, again, the amount taken at any one time may be greater than the organs can care for, some of the proximate elements enter partially elaborated and must pass off in the same manner; the remedy for this is frequent and small supplies of proper food, rightly prepared. But these urinary abnormalities, though often beneficial provisions of nature, cannot continue long without evils attending them, as we saw that experimentally the circulation of excrementitious substances caused disease.

Other elements in the production of urinary disorders are also such as induce skin disease, thus the use of fermented wines and ales often are the cause of both, or want of proper and sufficient air and exercise. No one of the elements which tend to good or bad health should be overlooked in treating skin diseases.

When speaking of the relations between the skin and kidney-functions, the alterations in the urine attending the use of baths was spoken of. This is a point too often neglected in Dermatological practice. We found that daily bathing augmented the total solid constituents of the urine, the urea and uric acid being increased, and frequent bathing, especially in baths slightly alkaline, and proper subsequent friction to the skin, will do much in removing cutaneous disease, both by accelerating the assimilative processes and keeping the pores of the skin in a condition to do their work. The benefits from visits to the mineral springs of Europe are largely due to this fact. Dr. Todd,\* when speaking of acne, says, "in many diseases of the skin we have found the greatest benefit from sponging sound parts of the skin two or three times every morning, with a lotion consisting of two drachms of nitro-muriatic acid and two pints of water."

Finally, many medicines are of benefit in diseases of the skin by virtue of acting in a manner calculated to affect the urinary secretion. Dr. Easton † reports most satisfactory results from the use of acetate of potassa in eczema and psoriasis, given in half drachm doses three times a day, an experience which I have long verified, and he gives some interesting details of the urinary relations during its administration. The smallest amount of urine voided by any of his cases when under its influence was 54 ounces daily, the largest 120 ounces, an increase of about 14 ounces as a minimum, and 80 ounces as a maximum over that in health. The total solid constituents were also increased to 1026 grains daily for a mini-

\* Copland's Encyclopedia of Pract. Med., 1833, Vol. I. p. 31.

† Monthly Med. Journ. 1850, p. 422. Braithwaite, Vol. XXI, p. 245.



mum, and 1320 for a maximum, or from 200 to 500 grains of solid matter daily above the average of health, and with this increase the skin affection rapidly improved. The same is shown in the case I have quoted of Dr. Mapother, where under the use of the citrates of lithia and potassa the total daily solids excreted by the urine, as estimated roughly by the specific gravity, increased about 200 grains as a minimum and 400 as a maximum, above that observed in the same patient before treatment. The use of alkalies in treating diseases of the skin is of old date and urged in strong terms by those with much experience in these affections. Dendy\* thinks their efficacy specially during the period of childhood, due to their "improving the quantity and quality of the renal secretion, which, in skin diseases, are often so unhealthy." Colchicum we have seen to have this effect in urticaria, and the mineral acids in proper cases do the same.

From what has preceded it will be seen that I cannot subscribe to the views entertained by some as to the local nature and treatment of the many affections of the skin. The German school, in which I was myself instructed, has done much to improve local cutaneous therapeutics, but it has also done much to discredit the dependence of skin lesions upon internal disorders, and thereby has, in my opinion, done much harm. It is true that a large measure of success may be obtained by the judicious employment of local remedies and that therein much of the skill of the specialist is often shown, but it is also quite as true, or even more certain that we can afford most permanent and satisfactory relief in certain skin diseases by a proper regulation of diet, exercise and medication tending to restore and keep the assimilative functions in perfect order.

In the present paper I have desired to direct very serious attention to the importance of the urine as an element in the study and practice of Dermatology. To this end, in addition to quoting what I have been able to find on the subject, I have endeavored to give an account of the urine as I have actually observed it during the course of diseases of the skin, and I can affirm that I have received very great assistance at times from these examinations. I am well aware of their imperfection, but the desire was to present such methods of investigation as could, and should be made by every physician, involving mainly the quantity, acidity, specific gravity and gross appearances, together with a simple microscopic examination, easily made with the assistance of any good text book on the urine. To be of more real value to science, and perhaps to practice, the investigations should involve the entire quantity of urine voided in the 24 hours, and its total specific gravity, as well as that of morning and night urines, and the acidity should be tested by saturation with caustic soda. It would be further desirable, scientifically, to test the daily excretion of urea, and quantitative tests of other elements, would greatly

\* Diseases of the skin during infancy and childhood. Phil. 1841, p. 20.



develop the subject. But the simple and practical measures we have employed and here reported, yield abundant reward in the confidence thereby given of a knowledge of the performance of its functions of the most important depurating organs of the body—the kidneys. Dr. Philips, in 1840, wrote\* “In lepra and psoriasis you will commonly see the kidney endeavoring to perform the function which the skin has abandoned, you will find uric acid thrown down in considerable quantity in the urine \* \* \*

It will be very desirable in the different affections of the skin to test the urine, as well as the cutaneous exhalation.”

In conclusion, I may add that although as yet a sufficient number of accurate observations have not been made in the various diseases of the skin to enable us to state positively that such and such changes belong necessarily to one disease, and such others to another, still the indications of urinary derangement in these affections are such as to invite further study, and at the same time to furnish oftentimes very valuable assistance in the daily treatment of diseases of the skin.





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