when cultivated and inoculated in healthy animals, is capable of setting up a septic inflammation. Indeed, the *post-mortem* appearances observed by Dr. Klein point in my mind only to septic complication, which may equally occur in cow-pox, in scarlatina, and in other febrile diseases. I think that the explanation of this micrococcus being found occasionally in scarlatina is that in severe cases with ulcerated throat, the blood is unable to cope with the invasion of micrococci from the surface lesion. If this be so, the opinion which I wrote early in 1886,⁴ concerning the micrococci which had been described in measles, applies also to this micrococcus, namely, that in this and in many other cases I only described these organisms as distinct species "from their association with particular diseases, not because they are believed to be causally related, for there is very little evidence in favour of that belief as yet, but purely for convenience of reference. In many cases they are probably only septic organisms which have found a pabulum in dead tissue, others appear to be identical with organisms which have been found in pus."

Conclusions.—As the practical outcome of this research, I would strongly urge that prompt measures be enforced for isolating diseased animals and preventing the spread of the disease through the herd. And as the milk is liable to be contaminated with blood, pus, and discharges from the teats, I consider that it would only be consistent with the most elementary rules of sanitation that only the milk obtained from the healthy cows in the herd should be sent into the market. Such measures, I trust, will lead to the alleviation of much suffering in the cows, insure greater cleanliness in the milk, and provide another source of vaccine for public use.

THE DIAGNOSTIC SIGNIFICANCE OF HÆMATURIA.

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HÆMATURIA is a symptom common to a number of pathological conditions, which differ essentially in their seat, nature, and relationships. In many of these it is a prominent, in not a few of them the sole prominent, symptom, while its differential diagnosis is beset with difficulties not only from the multiplicity of causes, but from the fact that there are a certain number of cases which can only be attributed to causes still unknown, or at best very obscure.

Blood may appear in the urine in a corpuscular or non-corpuscular form. The latter is called hæmoglobinuria, to distinguish it from corpuscular hæmaturia.

Detection of Blood in the Urine.—The diagnosis of the presence of blood colouring matter in the urine may be made by (1) the eye, (2) the microscope, (3) the guaiacum test, (4) the spectroscope; but the microscope alone is capable of differentiating hæmaturia from hæmoglobinuria.

It has been maintained by Dr. Wickham Legg, an author who has written ably on several of the obscurer problems of clinical medicine, that the blood corpuscles get broken up after the urine is secreted. He maintains that if the urine is examined immediately after leaving the body, corpuscles can always be found. My own observations, which I have had the opportunity of making under the most favourable conditions, do not support this view. Hayem has found free hæmoglobin in excess in the blood serum, while the well known icteroid colouring of the skin and conjunctivæ which sometimes appears, supports the view that the hæmoglobin is set free in the blood before it appears in the urine. I shall have to refer to this matter again, and I believe I shall show that Dr. Wickham Legg is so far right that hæmoglobinuria, as distinguished from hæmaturia, is not always present in the group of cases where chilling of the surface appears to be the essential factor in the production of attacks of bloody urine.

Having premised the necessity of microscopic examination for the differentiation of corpuscular from non-corpuscular hæmaturia, it may be broadly stated that blood in the urine, when in any quantity and chemically unchanged, presents a very characteristic appearance not likely to be overlooked or mistaken for anything else. But when the urine has remained some time in the bladder the bright red colour becomes changed to a dirty brown, giving to the urine a porter colour if present in quantity or a smoky tinge when in less amount. This

change is due to a chemical alteration of the hæmoglobin, which becomes converted into methæmoglobin by the action of the acid urine. Such dark urine may be confounded with that caused by other dark pigments, such as indican or pyrocatechin, which occasionally are present.

Unaltered blood in small quantity is not very visible; but by inspecting the urine in a glass with a good light we can recognise, not only its peculiar colour, but its characteristic dichroism, that is, by reflected light it appears red, while by transmitted light it is green.

The microscopical search for blood is so well understood now by all practitioners that it needs few words. If traces only are present the lowest stratum of urine should be examined after standing some time. The corpuscles undergo many changes in urine, swelling up so as to lose their biconcave form, or shedding their hæmoglobin, by which they alter in shape, appear vacuolated, and ultimately colourless. Such colourless discs may possibly be confounded with discoid oxalates and torulæ, but both these are smaller, the latter containing bright nuclei and being generally oval.

The Guaiacum Test.—This depends upon the ozone-carrying power of hæmoglobin. It is generally performed by adding one or two drops of fresh tincture of guaiacum to about a drachm of urine, shaking the mixture, and filling in about half a drachm of ozonic ether, which is a solution of peroxide of hydrogen in sulphuric ether. If hæmoglobin be present a blue colour appears. Another method is to dip strips of blotting-paper in the tincture and dry them. These are used by touching them with a drop of urine and a drop of ozonic ether successively. Turpentine which has been exposed to the air always contains ozone, and may be substituted for ozonic ether, but cannot be depended upon so well. Unfortunately, this test is not quite perfect. The urine of patients containing iodide of potassium gives a blue colour though no blood be present, while I have often observed that corpuscles are to be seen with the microscope when the chemical report says "no blood reaction." With respect to the latter fallacy two cautions may be given. The guaiacum tincture should not be kept longer than two months; and, secondly, the urine to be tested should be drawn up with a pipette from the lowest stratum, just as it would be for microscopical observation, as the corpuscles naturally sink to the bottom of the glass.¹

The spectroscope has scarcely become a clinical instrument at present, in spite of the labours of my friend, Dr. MacMunn, whose admirable book on medical spectroscopy is well known to you. If blood is present in solution the examination is easy, and may be made by holding the vessel containing the urine between the source of light and an ordinary pocket spectroscope applied to the eye, when two dark bands will be visible between Fraunhofer's lines D and E in the yellow and green of the spectrum; if the colouring matter is converted into methæmoglobin, a band in red will appear in addition to the other two. When the blood is present in an insoluble state the urine must be filtered, and the filter paper with the deposit upon it digested in alcohol and ammonia. This fluid should be examined, as in the other case, but if little blood be present the faintest possible shadow in the orange of the spectrum may alone be visible; on adding ammonium sulphide to the fluid the two bands will show themselves, but disappear when the fluid is shaken with air, to reappear on standing (MacMunn, *Spectroscope in Medicine*, p. 125).

The main purpose of this paper is to deal with renal hæmaturia, but the difficulties of differential diagnosis are so great, that I should be wanting in honesty if I dismissed as foreign to my subject those cases which depend upon other causes. I must therefore, at the risk of trespassing upon your patience, attempt to grapple with the subject in its entirety.

I think I may content myself with the bare statement of the fact that the urine of women is bloody during menstruation, and whenever there is vaginal or uterine hæmorrhage. Hæmorrhage from the urethra may be caused by villous growths, or in consequence of local congestion or injury. The blood is bright red, appears independently of micturition, or is not mixed with the stream, but occurs at the beginning or end of it, and is often accompanied by local pain or other symptoms.

Hæmorrhage from the bladder may be caused by stone, prostatic disease, villous or malignant growths, cystitis, ulcer, parasites (Bilharzia), etc. In stone, prostatic disease, and cystitis, the diagnosis is not difficult, as these conditions have well marked symptoms. The first two can soon be excluded by physical examination, while para-

¹ Dr. Michael Foster states (*Text Book of Physiology*, Fourth Edition, p. 715), that fibrin possesses the power of decomposing peroxide of hydrogen, giving a blue colour with the guaiacum test. I have not been able to obtain this result with well washed fibrin, but in any case fibrin is not likely to be met with in urine apart from hæmaturia.

⁴ *Manual of Bacteriology*, p. 201.

sitic ova may be recognised by the microscope. But ulcers and growths in the bladder present peculiar difficulties, which may long baffle diagnosis.

We may commence by excluding the kidneys. Hæmorrhage from the renal substance usually reveals itself by blood casts of the urinary tubules, but hæmorrhage from the pelvis has no such constant sign, though casts of the ureter may be found. Renal hæmorrhage is usually accompanied by local pain, while the history of injury, a blow, passage of calculus, etc., may help.

Hæmorrhage from the bladder is usually associated with some degree of cystitis and local pain, frequency of micturition, etc. By passing a sound or lithotrite, fragments of growth may be obtained or an irregular ulcerated surface detected. Washing out the bladder may afford useful aid in obtaining fragments of villous growth.

In women, urethral dilatation and digital exploration constitute a safe and easy method of examining the inside of the bladder, while in males, after due consideration, an exploratory cystotomy may be performed. Above all, in these cases medicine must seek the aid of surgery, and surgery of medicine, or grave errors of diagnosis and treatment will be made. This remark applies to many other forms of hæmaturia, as we shall see.

Renal Hæmaturia.—Sir William Roberts, whose admirable book on *Urinary and Renal Diseases* is by far the most valuable work on the subject in this or any other language, divides the causes of hæmaturia into three groups: (1) local lesions; (2) symptomatic; (3) supplementary; and adds, "Cases also occur which are not referable to any of these categories of which the origin is extremely obscure." This is his list.

1. **Local Lesions.**—External injury, violent exercise, calculous concretions, ulcers, abscesses, cancer, tubercle, parasites, active or passive congestion, Bright's disease.

2. **Symptomatic.**—In purpura, scurvy, eruptive and continued fevers, intermittent fever, cholera, etc., mental emotion.

3. **Supplementary or Vicarious.**—To menstruation, hæmorrhoids, asthma.

In one or two instances these may refer to other than renal lesions, but the list is a useful one to modify and extend for our purpose thus.

Local Lesions.—External injury, twisted or movable kidney, calculus, tubercle, cancer, syphilis, embolism, parasites, congestion, Bright's disease.

2. **Symptomatic.**—Blood diseases (purpura, scurvy, hæmoglobinæmia, leucocythæmia), specific fevers, malaria, cholera.

3. **Toxic.**—Turpentine, cantharides.

4. **Neurotic or Vicarious.**—Hysteria, insanity, asthma, menstruation, hæmorrhoids.

External Injury causes laceration of the kidney substance, which if extensive may call for extirpation of the organ; in most cases the wound heals and recovery takes place. The diagnosis presents few difficulties, and the treatment must depend upon the amount of hæmorrhage, which, if great, will cause a tumour in the flank from effusion into the neighbouring tissues. The treatment must be rest, an ice bag to the part, ergotin subcutaneously, and in the last resort extirpation.

CASE I. Hæmaturia after Injury.—William C., aged 35, stone-mason, was admitted into the General Hospital on December 10th, 1886, complaining of pain on the right side under the short ribs. A week ago he was crushed between a stone and some scaffolding just in the seat of pain; and the next day there was pain on passing his water, which was "muddy" looking. His personal and family history were good; he was well built and muscular, his heart sounds were feeble, his teeth were defective, his tongue dry and furred, and he complained of want of appetite with a foul taste in his mouth. When he first came to hospital on December 10th, he brought a specimen of urine which was red with blood, and in which there was a clot rather flattened in shape, about three-quarters of an inch in length, and three-sixteenths of an inch in diameter, probably a cast of the ureter. On microscopical examination the fluid contained "masses of granular matter, probably fibrinous, enclosing leucocytes and indistinct red blood corpuscles." Urine examined four hours and a half after it was passed contained numerous red cells, while the fibrinous masses were few and small. With rest in bed and a pad and bandage, the blood gradually disappeared, and there was none on his discharge on January 1st.

Movable Kidney.—Closely connected with the foregoing are cases of persistent or intermittent hæmaturia dating from a blow or fall. It is supposed that the organ is partially displaced and rotated on its horizontal axis, so as to twist the vessels at the hilus, thus compressing the vein and causing passive congestion. The following case shows how severe, as well as persistent, such cases may be.

CASE II. Hæmaturia from Displaced Kidney, Following a Fall.—A. R. B., aged 23, clerk, was admitted into hospital on November 2nd, 1886, complaining of hæmaturia and pain in the loins, chiefly on the left side, aggravated by exertion. Four years before he had a bad fall from a bicycle, which was followed by hæmaturia. This passed off, to return in March, 1886, after working at a forge in a metallurgical class at the Midland Institute. Finally, a few weeks later he was nearly run over, and in springing out of the way he seemed to strain his back. Since that time the hæmaturia persisted, in spite of rest in bed for fourteen weeks on milk diet. The quantity of urine was at no time diminished, and there was never any dropsy. His previous health had been good. On admission there were no physical signs of disease or high arterial tension. The ophthalmoscopic appearances were normal. The urine was always sufficient in quantity, and contained a normal amount of urea. Blood casts were constant, but hyaline casts were rare, and an epithelial cast was only seen once. Mr. Langley Browne, of West Bromwich, under whose care he is, has examined his bladder with negative results. The hæmaturia still persists, but for three weeks during last summer there was an intermission. His general state is fairly satisfactory, but he is depressed and anæmic. He has been treated unsuccessfully by a pad and bandage, and all kinds of hæmostatic drugs.

CASE III. Hæmaturia from Displaced Kidney, Following a Blow.—L. B., aged 20, certificated teacher, was admitted into hospital on March 6th, 1886, complaining of pain, which started from the right loin and passed across the back, the front of the abdomen and the right leg. She also complained of swelling of the face, but this was due to urticaria, and soon disappeared. There was a family history pointing to phthisis. Her own health had been good up till five years ago, when the pain came on after an accidental knock against the angle of a wall. The pain yielded to rest, but returned when she went about again. She was a stoutly built, fresh coloured girl, with nothing abnormal about her but a hæmic murmur at the base of the heart. The urine contained a quantity of blood and oxalates, but no casts. After remaining in bed for twelve days, she was free from pain, and the blood was much less, giving a trace with guaiacum and ozonic ether. She was allowed to get up, and discharged on March 25th. She has been kept under observation ever since, and made to wear a pad and bandage. The pain troubles her at times, and the urine generally shows a trace of blood, but has never been distinctly bloody since her discharge.

The next case has no history of injury, but probably belongs to this class, as the hæmaturia was relieved by rest and cured by a pad and bandage.

CASE IV. Hæmaturia due to Renal Displacement: Temporary.—B. B., aged 18, warehouse boy, complained of pain in left lumbar region, which had existed for five or six years. He characterised the pain as dull and aching, worse when walking than while sitting. His previous health had been quite good, but his bowels were very confined. His urine was pale, clear, and contained a trace of albumen but no blood. With rest and attention to his bowels the pain left him, but on returning to his duties the pain returned, and the urine contained blood. He was then ordered to wear a pad and bandage, and a fortnight later was quite free from pain and the urine free from blood. Six weeks later this improvement was maintained, though there was still a trace of albumen. The diagnosis in this case depends mainly on the results of treatment, as there was no history of a blow or fall; but it is supported by the disappearance of the hæmorrhage during rest.

The employment of an efficient bandage is of the utmost importance for the successful treatment of these cases. The following description of a suitable appliance is from a paper by Dr. Apolant (*Deutsches Med. Woch.*, No. 41, 1886).

"The bandage used to reduce the kidney was simply a belt fitted to the abdomen, with appendages of india-rubber webbing so arranged as to grasp the hypochondrium. To prevent it slipping up, two covered india-rubber gas tubes secured it to the thighs. Inside the bandage, in a position somewhat below the normal position of the kidney, a firmly-padded convex leather cushion, somewhat larger than the fist, was fixed, which exercised pressure on a considerable area of the abdomen over the very yielding intestines. This pressure, while being pretty strong and constant, must be of such a nature that the abdomen can expand and contract during breathing. This is effected by the india-rubber."

Calculus.—A medical friend of gouty habit and a great sufferer from oxaluria was getting into his brougham one day, when his horse started and flung him on the back seat in such a way as to bring on an acute pain in the left loin as if he had strained a muscle. Later in the day he vomited, and the pain was so great at night that he

took opium to relieve it. The urine became bloody. In the course of twenty-four hours he passed a small oxalate of lime calculus, and his troubles ceased. This case shows that hæmaturia after a strain or blow may be caused by the displacement of a calculus which had formerly occupied some position in which it gave rise to no symptoms. Had the stone not passed the cause of the hæmorrhage would have remained obscure or it might have been put down to partial displacement of the kidney. The symptoms of renal colic are tolerably characteristic. The pain shooting down towards the groin, with vomiting, and retraction of the testicle, are not met with in any other condition. It is noteworthy that the pain in biliary colic does not pass downwards to the abdomen, but radiates round the thorax, and is especially localised at a spot below the right shoulder blade. A medical friend whom I recently attended for biliary colic tells me that the worst pain of all was a feeling as if three or four vertebrae were being gripped by a pair of pincers. Confusion between these two conditions is impossible if hæmaturia is looked for and relied upon, as I believe it may be, as a constant symptom of renal colic, but it may not always be present in quantity sufficient to reveal itself to inspection with the naked eye. Conversely I hold that the diagnosis of calculus in the kidney is incomplete until hæmaturia has occurred.

The following case, probably also an example of renal twist or displacement, illustrates the difficulty of diagnosis of calculus from the symptoms of pain and hæmaturia alone.

CASE V. *Hæmaturia due to Renal Twist.*—Mrs. M., aged 43, was sent to me by Dr. Lycett, of Wolverhampton, with the history that she had been ill for four or five years, and had been told by her previous medical attendant and a physician in Birmingham that she had Bright's disease. Her symptoms were pain at the bottom of the back, worse on the left side, shooting down towards the groin, with albumen in the urine. She was a very stout woman, who had had six children very rapidly. At the time of her marriage she was very thin, but got stout during each pregnancy, becoming thin again after the first and second confinements. She was never strong. There had never been any dropsy. The urine had been dark at times, but never like porter. Dr. Lycett had found that the urine was normal in amount and specific gravity, that the urea excretion was not diminished, that there were never any renal casts, that the albumen was very small in amount and was frequently accompanied by blood; oxalates and uric acid crystals were very abundant. As she made extreme complaints of the pain incapacitating her from all her duties, an exploratory incision was made by Mr. Tait, but no calculus could be found. The wound healed perfectly, and she left Mr. Tait's hospital quite free from pain and hæmaturia, but these came on again in a few weeks. I recommended an abdominal belt and pad, and this she wears, but still complains of pain. Her abdomen is very large, and the walls are very relaxed, so that it is difficult to apply pressure efficiently to the kidney. She is, however, no doubt much better than she was, and is certainly not the subject of Bright's disease.

It may be contended that the negative results of operation do not absolutely exclude calculus. In a case treated at one of our hospitals I believe a stone was passed *per vias naturales* after an exploratory incision had been made without success, so that we must allow that even surgeons are fallible, and we know that a stone of small size may give rise to marked symptoms without getting into the infundibulum.

Tubercle.—Hæmaturia in tubercle is accompanied by pus and shreds of renal tissue. Tubercle most commonly causes pyelitis, and there is much more pus than blood in the urine. The diagnosis of tubercle depends mainly on the evidences of tubercle elsewhere and on family history.

Cancer.—Hæmaturia is not always present in cancer, when it is it is very profuse. The diagnosis in some cases is easy, as a tumour may be felt, and deposits in other organs can be made out. Microscopic examination may show characteristic cells, but this cannot be relied upon. In some cases the differential diagnosis from calculus is very difficult. The hæmorrhage is, perhaps, more profuse and persistent. The subjects of cancer may last a long time in fair health; one patient of mine had suffered from hæmaturia for four years before I saw him, and lived quite two years afterwards. Mr. Chavasse made an exploratory incision under the belief (which I shared) that he had a calculus. He recovered from this and died some time afterwards, the *post-mortem* examination, at which I was not present, showing cancer of the kidney and liver.

Syphilis.—Gummatous deposits in the kidney are well known in the *post-mortem* room, but their clinical phenomena have not been fully made out. In this respect the following case of syphilitic ulceration of throat accompanied by hæmaturia is of interest.

CASE VI. *Syphilitic Sore-Throat: Hæmaturia.*—A. H., aged 19, an inmate of the Edgbaston Asylum for the Blind, was admitted into

hospital on March 10th, 1887, complaining of her water being high-coloured and scanty, and of deafness. Three years ago she suffered in the same way. She had been blind from her birth, and since nine years of age had been an inmate of schools for the blind. Her mother was dead, but she could not tell the cause of her death. Her father and the rest of the family were living and healthy. She was a well-nourished girl, rather delicate-looking. Cheeks flushed; both corneæ disorganised and staphylomatous; no œdema anywhere; thoracic and abdominal physical signs normal; temperature 98.6°; pulse 96; respirations 24. Urine the day after admission 32 ounces, specific gravity 1022, acid, turbid reddish in colour; deposit consisted of red and white blood-corpuscles, urates, and squamous epithelium. On boiling there was a thick cloud of albumen, and the chemical reactions for blood were present. A very few hyaline casts were seen on only one occasion. The hæmaturia persisted for several weeks, but nine days after admission she began to complain of her throat, and liquids tended to come back through her nose. The pharynx and tonsils were very congested and covered with sticky muco-pus. Two days later a sloughy eroding ulcer appeared in the soft palate to the left of the uvula, which I have no doubt was syphilitic. In answer to inquiries she stated that her throat had been sore ever since the previous August. The ulcer was treated by the application of acid nitrate of mercury, and the patient took a mixture containing the perchloride of mercury combined with the perchloride of iron. The throat got slowly better, and on April 18th was nearly well, while at the same time the blood is noted to be "much less." On April 30th the hæmaturia had entirely disappeared, and she was discharged cured.

Embolism.—Embolism of the kidney is not an uncommon accident in heart disease, especially in vegetative endocarditis, also in pyæmia. Hæmaturia occurring under these conditions may safely be attributed to embolism.

Parasites.—Hydatid cysts in the kidney cause hæmaturia, and can only be recognised by the passage of fragments of hydatid membrane in the urine. Bilharzia hæmatobia, which generally attacks the bladder, may occur in the pelvis or substance of the kidney, and manifests itself by the characteristic ova and embryos in the urine.

Congestion.—Congestion may be active or passive. Active congestion is often only the initial stage of acute inflammation, a condition which very rarely attacks healthy kidneys, except during the course of acute specific diseases; for example, scarlatina, diphtheria, tonsillitis, typhoid fever, etc. But such congestion also occurs when the functions of the skin are seriously interfered with, as by extensive burns, or more commonly by chilling of the surface as in bathing, exposure to cold, etc.

A few years ago a young man consulted me, saying that he believed he was passing blood. He had been to a swimming bath, and after returning home, noticed his urine was bloody. This was on Saturday, and on Monday, when I saw him, the urine contained only a trace of blood. By Wednesday the urine was normal. This patient told me that his brother had consulted Dr. A. H. Carter for hæmaturia following exposure to wet after playing football.

The following case of persistent hæmaturia appears to me due to a special susceptibility to chill. These cases show that corpuscular blood may be passed as the result of chill.

CASE VII. *Hæmaturia due to Chill.*—S. A., aged 19, came to me in December, 1886, complaining that his urine had been bloody for the last three weeks. Eighteen months before, in June or July, he first passed coffee-coloured urine for one day after playing cricket. He could not remember any blow or fall having preceded it. He had no shivering fit, and felt quite well. His previous health had been good, but he had been very subject to chilblains on his feet in summer as well as in winter, and his hands and feet easily get cold. He was a well-developed, fairly well nourished lad, with no objective signs of organic disease, but his face and hands had a congested and cyanotic look. He suffered no pain or uneasiness, had never had syphilis, jaundice, or dropsy, and had never been out of this country, but he had been at Cambridge for the last two years. The urine was dark amber, acid, 1018, with brown, flocculent deposit, composed of red and white blood corpuscles, spermatozoa, blood casts, a few hyaline casts, and granular matter. The quantity of urine was 50 ounces, and the excretion of urea 300 grains *per diem*. The quantity of albumen was not more than was accounted for by the blood. In spite of careful clothing and staying indoors, the hæmaturia persisted. At the beginning of the May term he went back to Cambridge, and kept much the same, well in himself, but the urine persistently bloody, though never very bad. It was no better in the very hot weather than it has been since it has turned colder. He has been playing tennis, and taking other exercise freely. I saw him again on October 8th, and found no change except an occasional in-

termination in the pulse, which was rather small. The urine was amber, acid, 1014, contained blood, and one-twelfth column of albumen. The deposit consisted of blood, oxalates, a few blood casts, and hyaline casts with blood corpuscles sticking to them.

Passive Congestion.—Venous engorgement, consequent upon liver, heart, or lung disease, may cause slight hæmaturia. The condition is easily understood, and readily recognised.

Bright's Disease.—In acute nephritis, more or less hæmorrhage occurs, and persists throughout the acute stage. The diagnosis depends upon the other evidences of Bright's disease—for example, dropsy, and the presence of epithelial casts in the urine. In chronic Bright's disease, hæmorrhage is not constant, but may occur at any time. The amount is usually moderate, but, in rare instances, may be alarmingly profuse and fatal. The recognition of the nature of the case depends on the presence of casts in the urine and other confirmatory signs—such as polyuria, low specific gravity of urine, cardiac hypertrophy, high arterial tension, albuminuric retinitis, etc.

Symptomatic Hæmaturia.—Hæmaturia occurring in connection with specific diseases, such as yellow fever, malarial fever, and cholera, or in the course of blood diseases, such as purpura, scurvy, and leucocythemia, depends for its correct diagnosis on the recognition of these diseases, each of which possesses well marked symptoms and definite clinical relations. But this is not the case with hæmoglobinæmia, which demands special attention. This condition consists essentially in the dissolution of the red blood corpuscles in the body, and the presence of free hæmoglobin in the liquor sanguinis. Under these circumstances the hæmoglobin escapes through the Malpighian tufts, and appears in the urine. The determining causes of this change are not clearly known. Certain poisons have this property of breaking up the blood corpuscles by direct action upon them. In certain septic conditions, puerperal fever, pyæmia, etc., hæmoglobinæmia occurs. Physiologists now believe, but it is not formally established, that the red blood corpuscles are broken up and converted in the liver into bile pigment. It is supposed that in disease this process is interfered with, the destruction taking place in excess of the power of conversion, or the process stopping short at the stage of destruction. Paroxysmal hæmoglobinuria occurs as an independent disease, of which the following case affords a specially good example.

CASE VIII. Paroxysmal Hæmoglobinuria.—K. G., aged 28, a labourer, was admitted into hospital on February 22nd, 1886, complaining of shivering, pain in the back and legs, and bloody urine, which had lasted since the previous morning. He had been subject to these attacks for the last three winters; the first came on while working in a cold wind in the early winter of 1881. There was no history of ague or residence in a malarial district. He had had syphilis, a chancre followed by a skin eruption ten years before. He fell from a scaffold in 1879, and had a blow on the head three years ago; but these were not in any way related to his attacks. While in hospital he had a well marked attack, which I will relate in detail.

On March 4th, his temperature was normal; he passed 40 ounces of urine, which was quite normal in every respect.

March 5th was a clear but very cold day, and he went into the yard between 9 and 10 A.M. for twenty minutes. At 10.30 A.M. he began to shiver; temperature 98°. At 10.45 he passed urine, which contained a trace of albumen, and gave a faint hæmoglobin reaction. At 11 A.M. his temperature was 100°. At 11.15 he passed 2 ounces of urine, which looked like pure blood; this was at once examined microscopically, and showed no blood corpuscles, but a few round cells, much granular matter, granular casts, and oxalates. The spleen was distinctly enlarged, reaching 2 inches below the costal border. 11.30 A.M. Temperature 105°; Five minutes later he vomited. 12 noon. Temperature 106°; pulse 124; respiration 44. 12.30 P.M. Temperature 105°; sweating profusely; complained of rushing noises in his head as soon as he began to get warm, and pain in his back when the attack came on, but these have now left him. 1 P.M. Temperature 105°; copious faintly acid sweat; complains again of pain in the back. 2 P.M. Temperature 104°; urine like tawny port, faintly acid, 1015; deposit under the microscope does not differ from that previously described; tested for indican with HCl and CaCl₂ gives a rose pink colour, indigo red. 3 P.M. Temperature 102°; pulse 116. 4 P.M. Temperature 101°. 5 P.M. Temperature 100°. 6 P.M. Temperature 100°; has stopped sweating about half an hour; no pain in the back; pulse 88; difficulty in commencing to pass water; urine amber, 1014, faintly acid; deposits a brownish cloud, which gave the hæmoglobin reaction, and, under the microscope, was composed of granular matter. 6.30 P.M. Temperature 99°. 9 P.M. Temperature 98°. 11 P.M. Temperature 98.5°; urine pale amber, 1017; deposits a mucous cloud, acid; gives hæmoglobin reaction.

March 6th. 8.10 A.M. Temperature 98°; pulse 80; urine 1023, acid, amber; very little granular deposit; slight reaction with guaiacum; spleen cannot be felt. The urine passed later in the day contained only a faint trace of albumen; bowels confined.

March 7th. Urine free from albumen; complains of headache tongue foul; bowel open.

He had another slight attack before leaving hospital, and was finally discharged on March 31st, but has been in hospital since.

The next case differs from the preceding in the absence of pyrexia.

CASE IX. Paroxysmal Hæmoglobinuria.—J. E., 86, boiler maker, was admitted into hospital on October 18th, 1886, complaining of chills, and passing bloody urine. He said that thirteen years ago, on a cold day in early winter, he was hard at work, when his feet suddenly became cold, and the next urine he passed contained blood. Since then he has been liable to these attacks every month or three weeks throughout the cold weather. He had never lived further than eight miles away from Birmingham, had never had ague or syphilis, but had drank a good deal of beer. He was a stoutly built, florid complexioned man. Physical signs normal. Temperature on admission 99°, afterwards generally below 98°; urine 1024, acid, brownish red; urea 2.6 per cent., contained albumen, hæmoglobin, hyaline casts, yellowish brown granular matter, oxalates, no blood corpuscles. He said that he has occasionally pains in his back preceded by a chill, which commences in his feet and passes upwards; the muscles of his legs twitch. The chill lasts about two hours, and when he gets warm he passes a large quantity of dark coloured urine, and the pain in his back goes away. He attributed his present attack to getting wet the day before. His conjunctivæ were slightly yellow, and he says when he is very bad his eyes are very yellow. An attempt was made to get some blood serum by means of a blister, but this did not rise. The urine became normal by the 21st, and he left the hospital on Nov. 1st.

The colouring of the conjunctivæ is noteworthy as evidence of free colouring matter in the blood.

The observations in Case IX made on the urine directly it was passed disprove the statement that blood corpuscles are always present in the urine at that stage; but there is a strong resemblance between these cases and those of hæmaturia due to chill. It is noteworthy that many of the reported cases of hæmoglobinuria have been ascribed in their first onset to a fall or blow on the back, though a chill is always the determining cause of subsequent attacks. The disease has been said to depend upon syphilis, but in what way is not explained. The strongest argument in favour of this doctrine is that one patient lost his liability to attacks on anti-syphilitic treatment. But the force of this is modified by the knowledge that though some cases are very obstinate, others recover of themselves. One case specially is known to me in which no attack has occurred for several years, though no special treatment has been followed, except care to avoid as far as possible exposure to chills.

It is worth bearing in mind that albuminuria is occasionally persistent in these cases, and Dr. Ralfe believes that this is due to a permanent inability to dispose of the albuminous material set free by the destruction of the red blood corpuscles. But if this were true, the albumen excreted should be globulin, not serum albumen, a suggestion already made some years ago by Sir William Gull. I have endeavoured to test the truth of this hypothesis, but my analyses always showed that serum albumen was present as well as globulin. I should be very glad to see this point investigated by so competent a chemist as Dr. Ralfe.

Toxic Hæmaturia.—Hæmaturia may follow the application of a fly blister or the internal administration of cantharides. The latter is seldom practised, but the drug has been recommended on quasi-homœopathic principles by Dr. Sydney Ringer for nephritis, and in that condition I have seen it even in one-minim doses cause distinct hæmaturia. When given for criminal purposes the dose is usually large, and the hæmaturia is accompanied by strangury, vomiting and symptoms of irritant poisoning. Turpentine does not usually cause hæmaturia, though the readiness with which the violet odour appears in the urine shows that it is absorbed and excreted by the kidney. I have had one very interesting example of hæmaturia due to this cause in a varnish maker who was sent to be examined for life insurance. He seemed a perfectly healthy man, but after he had gone I examined his urine, and found it contained a little albumen. I then noticed the odour of violets, and closer examination showed that the albumen was due to the presence of blood. There were no other evidences of renal disease, but there was certainly some special susceptibility to the action of turpentine, as this gentleman informed me that he was not personally engaged in the manufacturing processes, though he was much about the factory. I tried to follow up the case, but could not, as he abandoned the proposal.

Neurosis and Vicarious Hematuria.—I have no personal experience of these conditions. Laycock (*Nervous Diseases of Women*, p. 229) mentions hæmaturia as not uncommon in hysteria, but I have not yet recognised a case, though I have certainly met with one or two cases of hæmaturia in women which I have not ventured to class in this paper. Sir W. Roberts mentions menstruation, hæmorrhoids, and asthma as conditions in which vicarious or supplementary hæmaturia occurs, but I can only quote him, and leave the matter without further comment, as I have never met with such cases. Dr. G. H. Savage states that hæmaturia may occur spontaneously in acute mania and general paralysis.

Treatment.—A very few words as to the general treatment, which must be specially regulated in each case by the cause. Undoubtedly hæmaturia usually passes off by rest, after a shorter or longer time, independently of drugs. But, as we have seen, there are persistent cases in which we are bound to do our best, and ample opportunity is afforded for trying all known remedies. My experience has been that they are all very untrustworthy, and I hesitate to give the preference to any one. Acetate of lead, ergot, hamamelis, gallic acid, and perchloride of iron, should have a fair trial. In hæmoglobinuria a tea-grain dose of quinine should be given at the commencement of the attack, and five grains three times a day till convalescence is established. Chloride of ammonium, recommended by the late Dr. Warburton Begbie, has never been followed in the hands of others by the fortunate results he obtained.

In the discussion which I hope will follow I should be glad to elicit opinions upon (1) the differential diagnosis of renal and vesical hæmaturia; (2) on the differential diagnosis of twist, calculus, and cancer of the kidney; (3) on the occurrence of hæmaturia in syphilis; (4) on hæmaturia from chill; (5) on the results of the drug treatment of persistent hæmaturia.

ON THE OCCURRENCE OF ALBUMEN IN THE URINE OF THE INSANE.

By JOHN TURNER, M.B.,

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THE JOURNAL for June 11th, 1887, contains an abstract from a paper by Professor Grainger Stewart concerning the occurrence of albumen in the urine of healthy people. He found that, in 407 cases, albumen occurred in 31 per cent.; in soldiers, a rise of from 15.6 before breakfast to 40.6 after breakfast; in old men, 37.5 to 67.5; and in children, 12.5 per cent. to 17.5 per cent.

The following is the result of the examination of the urine of 200 male lunatics made during the months of August and September. The water was collected three times in each case during the day, when possible; but a considerable number refused at times to micturate when requested to. The first collection was made between the hours of 6 A.M. and 7 A.M., after rising; the second was at 9 A.M., that is, about half an hour after breakfast was finished; and the third at 12.45 P.M., a quarter of an hour before dinner, and after the able-bodied and willing men had finished a morning's work. The diet of all these men was nearly alike, but the workers had bread and cheese and one pint of beer at 11 A.M. The breakfast consists of six ounces of bread, half an ounce of butter, and one pint of tea with milk. The albumen was tested for in every case both by the cold nitric acid (Heller's method) and picric acid tests, and varied from a slight, almost imperceptible trace to a heavy cloud appearing immediately the test was added. It was only when the nitric acid test was corroborated by the picric acid, and *vice versa*, that albumen was accepted as present. In some cases the picric acid, when added to the urine, threw down a dense cloud immediately, which might easily be mistaken for albumen, but that it is completely soluble on boiling, and does not appear with the nitric acid.

In these 200 males, albumen occurred at one time or another during the three collections in 81 cases, or 40.5 per cent.; before breakfast, in 22.3 per cent.; after breakfast, 24.5 per cent.; and before dinner practically the same percentage, 24.4. On separating these cases into the two classes of workers and those who do not work either from bodily feebleness, unwillingness, or excitement, etc., it appears that, out of 115 workers (either working on the land or in the shops, or doing ward work, such as scrubbing, etc.), albumen occurred in 45 cases, or 39 per cent. Before breakfast the percentage was 24.4; after breakfast, 28.9; and before dinner, 30.0. In 85 patients who did no work it occurred in 36, or 42.3 per cent.; before breakfast the percentage being 32.8, after breakfast 32.2, and before dinner 31.3; in the former class there being a rise in the percentage

from before breakfast to before dinner, and in the latter the percentage falling very slightly. The rise after breakfast in the workers is not nearly so marked as Professor Grainger Stewart showed in his series of cases.

It will be seen from the following table that the albumen occurred in the largest number of cases between the ages of 20 and 25, the next highest number between 65 and 70.

15 to 20 = 5 cases	50 to 55 = 6 cases
20 „ 25 = 18 „	55 „ 60 = 6 „
25 „ 30 = 3 „	60 „ 65 = 3 „
30 „ 35 = 10 „	65 „ 70 = 11 „
35 „ 40 = 7 „	70 „ 75 = 4 „
40 „ 45 = 4 „	75 „ 80 = 3 „
45 „ 50 = 6 „	

Epileptics frequently have albumen in their urine, and as this class contains many young men, they serve to swell the numbers in the quinquennial period between 20 and 25. No fewer than seven of the thirteen cases were epileptics. The urine of one epileptic was examined shortly after his having had fits, and it contained no albumen. This was just before dinner. After breakfast and prior to the fits it contained a quantity.

Of 60 cases of mania (recent and chronic) 23, or 38.3 per cent., contained albumen in the urine.

Of 40 cases of secondary dementia, 21, or 52.5 per cent., contained albumen in the urine.

Of 11 cases of senile dementia, 7, or 63.6 per cent., contained albumen in the urine.

Of 80 cases of epilepsy, 11, or 36.6 per cent., contained albumen in the urine.

Of 13 cases of general paralysis, 1, or 7.6 per cent., contained albumen in the urine.

Of the eleven epileptics whose urine contained albumen, seven were between 20 and 25 years of age, two were 34 years of age, one was 18, and another 54.

Only one general paralytic's urine contained albumen; he was a man aged 56, and it is unusual for this disease to occur in men of such an advanced age.

The number of cases from which these results were obtained was necessarily small, the total number of male patients being about 300, of which a great many refused to micturate when requested to, whilst others were wet in their habits; but I have recorded them hoping that others with similar facilities may do likewise, and thus trustworthy and valuable information on the occurrence of albumen in the urine of the insane, and its causation, may be obtained.

A CONSECUTIVE SERIES OF TWENTY-SIX OPERATIONS FOR THE RADICAL CURE OF HERNIA.

Read in the Section of Surgery at the Annual Meeting of the British Medical Association, held in Dublin, August, 1887.

By A. W. MAYO ROBSON, F.R.C.S. ENG.,

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WHEN it is borne in mind that a considerable percentage of the inhabitants of the United Kingdom suffers from rupture, and, that to each individual so afflicted, the inconvenience and discomfort which has to be borne is a matter of no small moment, although slight in comparison with the danger of strangulation, which is constantly present; one cannot help wondering why the sufferers will bear their troubles so long before submitting to an operation for radical cure. The only apparent explanation of this fact, is that operations for the cure of hernia are considered uncertain and dangerous. If it can be proved that safety and certainty are the rule and not the exception, I think that medical men will advise, and patients will see the expediency of submitting to operation, as soon as the hernia ceases to be controlled by a truss, either on account of its size or irreducibility, or from any other cause.

The following twenty-six operations, which are a consecutive series of both hospital and private cases, will serve to illustrate my remarks.

It will be noticed that whilst in every case the operation for radical cure was performed; in one half it was done after reducing strangulated hernia, and in the other thirteen on account of trusses having failed to do good because of irreducibility or from the large size of the hernial aperture, the patients being incapacitated in consequence from carrying on their duties. In all but two cases, where Wood's operation was performed, the sac was excised after its neck had been ligatured, the canal being sutured only if very open. In every case