when they are in the frequent habit of giving evidence in courts of law, and I will take for example that which happens in the case of railway accidents. It is pretty well known who, among the physicians and surgeons of the day, will be called upon for the plaintiffs, the injured, and who for the defendants, the company. So familiar in legal circles has this knowledge become that the phrase, "So and so is a very rising witness" has been used, and not unfrequently. What does this mean but that members of our profession, whose only object should be truth and justice, "take sides"? Many years ago much of this came under my notice, and I alluded to it in some lectures which I had the honour to deliver before the College of Physicians; but, for many years I have declined to take any part in such proceedings, owing to the manner in which evidence was given by what I must call "party witnesses".

It seems to me quite unpardonable that six or eight members of our profession should meet together, and go through the farce of a so-called "Consultation" when no one of the physicians or surgeons, on either side, would interchange a single word with those on the other. I have tried to break through this absurdity more than once, and sometimes have succeeded in my attempt. But more frequently I have failed, and have given it up; and this because I have heard said in courts of law such things as were so utterly unscientific, ignorant, or perverse that it was simply impossible to deal with them. One instance will suffice; after rather understating the probable issue of a case of hemiplegia, the result of accident, it was urged, "on the other side", by an eminent surgeon, that the man was shamming, because, forsooth, he did not exhibit ptosis, strabismus, and dilated pupil, and that he had never seen a case of hemiplegia in which those three things did not coexist.

There are some members of our profession who have become specialists in this direction, who seem to think that everything that a man tells them of his subjective symptoms are matters of fact and of great importance; and, on the other hand, there are those who regard every plaintiff as either a knave or a fool, and most probably a combination of the two, but who never believe that any man is injured in a railway accident unless he has broken his neck, or has a compound fracture of his thigh.

It is time that this specialism should come to an end; and we, of our profession, can bring it to an end, if we will but insist upon it that the meetings together of the doctors is a consultation, and not a farce.

There are many other points upon which I should have liked to speak to you, of the specialisms that have so limited an area that it is quite impossible for any man, who is restricted to any one of them, to make an income, unless he does so by inducing his patients to pay him needless visits; such, for example, as to touch his throat with something every day; to turn the screw of his "instrument for the back" two or three times a week; or to do something to the Eustachian tube with equal frequency. But what I have said is enough to guard you, I hope, from falling into these mistakes, these "worse than crimes, these blunders".

In conclusion, let me revert to an illustration used at the outset, with regard to what "differentiation" means—viz., the springing into being of varied structures, with their varied uses, and of their development into the being of a perfect whole—a living thing, with complex powers—all its parts subservient to the ends for which they were intended, and for which they are so ordained as to conduce to the "survival of the fittest"; but let me carry the illustration yet further, and say that all these different members are members one of another, and that when any member suffers all the other members suffer with it; and that when any physician or surgeon does that which is ignoble, he not only does injury to himself, but to the whole of the noble profession to which he belongs.

THE EFFECTS OF OIL OF TANSY.—Dr. G. Jewett, *Boston Medical and Surgical Journal*, reports eight cases of poisoning with this drug. Case 1.—Fifteen drops at 11 A.M., teaspoonful, at 2 P.M.; convulsions, shock, general cyanosis; recovery. Case 2.—Teaspoonful to promote catamenia; convulsions and death in one hour and a half. Case 3.—Unknown quantity to cause abortion; convulsions; death in three hours and a quarter; no abortion. Case 4.—Teaspoonful to cause abortion; coma, recovery; no abortion. Case 5.—Four drachms; spasms and death. Case 6.—To cause abortion; rapid death; no abortion. Case 7.—Decoction of tansy leaves to produce abortion; paralysis; coma; death in twenty-four hours without abortion. Case 8.—Infusion of leaves daily for a week; also for vaginal injection; abortion, metritis, peritonitis; recovery after three months. As druggists are often asked for oil of tansy under various pretences, we believe the above table will be useful in reminding them of the dangers attending the sale of tansy and its preparations.

ON THE OCCURRENCE OF MICRO-ORGANISMS IN FRESH URINE.*

By WILLIAM ROBERTS, M.D., F.R.S.,
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THE fresh and healthy urine is perfectly free from bacteria or other minute organisms. The ordinary types of morbid urine, although they may contain blood, pus, or casts of tubes, are equally free from organisms. But there are conditions in which the urine, at the moment of emission, contains bacteria, that is to say, conditions in which the urine breeds, or becomes contaminated with, bacteria during its sojourn in the urinary passages. It is to these that I propose now to direct your attention. Before doing so, it will facilitate the understanding of my subject if we glance very briefly at the quasi-spontaneous changes which the urine undergoes after emission when it is abandoned to itself.

When a sample of acid healthy urine is set aside in a clean bottle or other glass vessel, it remains for a while apparently unaltered; but after a time it begins to change. In a day or two, it loses its transparency and becomes turbid. If a drop be now examined under the microscope, it is found to swarm with dancing dots and actively moving minute rods; these are bacteria. At first the urine continues acid, but the acidity gradually declines, and in two or three days the urine becomes neutral, or even slightly alkaline. This is the phase of incipient decomposition. Then a further change ensues: the urine becomes strongly alkaline from the production in it of carbonate of ammonia; it exhales an evil ammoniacal smell; the earthy phosphates are precipitated, and the chemical constitution of the secretion is profoundly altered. This is the phase of ammoniacal decomposition. These two phases run into each other without any appreciable break; but it is important to distinguish the one from the other; for, as we shall presently see, they correspond to clinical conditions which are widely different.

The changes just described as incipient and ammoniacal decomposition are entirely due to the ferment-action of bacteria. These organisms, or their germs, gain access to the urine with the dust particles which pervade the air, or with the subtle particles which float in every natural water and cling to all surfaces that have come in contact with water. The leading or principal ferment-change which occurs in decomposing urine is the transformation of urea into carbonate of ammonia.

The most common and numerous of the cases in which micro-organisms are voided with the urine are those in which the urine has become decomposed in this manner in the bladder. But there are other and different cases in which bacterioid organisms come away with the urine, and yet the urine is not in the least degree changed by decomposition. It is, therefore, necessary to divide cases of bacteriuria into a certain number of groups or categories. How many groups of this kind it may eventually be necessary to establish, I cannot say; the subject is as yet new, and the field of inquiry only partially explored. The examples which have fallen under my own observation up to the present time are divisible into four categories, namely:

I.—Bacteria with incipient decomposition of the urine.

II.—Bacteria with ammoniacal decomposition of the urine.

III.—Bacteria without decomposition of the urine.

IV.—Beaded filaments (micrococcus chains) without decomposition of the urine.

Each of these categories demands a separate notice.

I.—*Bacteriuria associated with incipient decomposition of the urine* is not uncommon, especially among women. The urine in these cases is opalescent when voided; it is feebly acid, neutral, or feebly alkaline in reaction. When examined under the microscope, it is found to contain bacteria in active motion. The urine, on standing, does not recover its transparency; on the contrary, the turbidity tends to increase, and it passes quickly on to ammoniacal decomposition. This condition is accompanied with few or no symptoms; there may be a little heat about the genitals or a slight undue frequency of micturition, but for the most part no complaint is made. This condition is not unfrequent in females of weak health suffering from leucorrhœa, and among men who have suffered from stricture and who have frequently used catheters or bougies. It is in itself of no importance, and may persist for years without requiring attention; but it assumes a graver significance if, as

* Read before the North Wales Branch of the British Medical Association, September 22nd, 1881.

I have reason to think, it renders the subjects of it liable to the next form of bacteruria with ammoniacal decomposition of the urine.

II.—*Bacteruria with ammoniacal decomposition of the urine* is a condition which always involves the patient in serious suffering and danger. The change, or at least the chief change, which occurs in the urine in these cases is the transformation of the bland innocuous urea into fiery carbonate of ammonia. This change, from a chemical point of view, is a simple matter. One atom of urea assumes two atoms of water, and these become two atoms of carbonate of ammonia ($\text{C}_2\text{H}_4\text{N}_2\text{O}_2 + 2\text{H}_2\text{O} = 2\text{NH}_3\text{C}_2\text{O}_3$). This transformation is due to a ferment action, and is identical with that which takes place in the ammoniacal decomposition of the urine outside the body. The urinary ferment has been named the "micrococcus urææ". If you examine the urine of a person who voids his urine in an ammoniacal state, you will find it under the microscope to teem with dancing dots or micrococci, mixed more or less with bacteria rods. I am unable to say whether this organism is a distinct species of bacteria, or whether it is merely the micrococcus phase of the common putrefactive bacterium (*B. termo*). But in any case, wherever you find the urine ammoniacal as it escapes from the bladder, there you also find these micrococci, generally, if not always, associated with bacteria rods. The urine, as you know, is very rich in urea; and if all, or the larger part, of the urea becomes changed into carbonate of ammonia, the urine thereby acquires the property of a strong irritant to the sensitive mucous membrane of the bladder, and speedily provokes a dangerous cystitis, with abundant discharge of pus, and mayhap of blood, with micturition.

Ammoniacal decomposition of the urine, with all its alarming and painful accompaniments, is apt to arise in old stricture cases, in cases of stone in the bladder, enlarged prostate, paraplegia, fungoid growths in the bladder, and in all conditions where the organ is unable to empty itself completely, or which require the frequent use of instruments.

In this class of cases, and in those milder ones where bacteruria is associated with incipient decomposition of the urine we must assume that the offending organisms gain access to the bladder from without by the urethra. In the female, the short and comparatively wide urethra offers obvious facilities to wandering bacteria to penetrate into the viscus from the external genitals. In the male, the long and narrow urethra forbids this mode of entrance in the healthy state; but, in cases of gonorrhœa, or other type of urethritis, in which the passage is lined with a continuous layer of purulent discharge, it is quite easy to understand that, along this purulent tract, bacteria may breed their way up into the bladder. In a good many cases, the infective organisms steal in with the instruments, which always come into use, sooner or later, in all kinds of vesical trouble. A dirty catheter is a most efficient infective agent. It must not, however, be overlooked that, in states of depressed vitality, septic germs may, occasionally at least, find their way into an ailing organ or tissue by the channels of the circulation. Such a mode of intrusion of bacteria-germs into the bladder in cases of paraplegia seems highly probable.

The rational treatment of these two classes of bacteruria is based on the assumption that a colony of bacteria has become established in the bladder; and the method of dislodging this colony consists in washing out the viscus with antiseptic solutions. One of the most effective of these, and at the same time one of the least irritating, is a solution of boric acid, in the proportion of two drachms to the pint of water.

III.—*Bacteruria without decomposition of the urine* is a much less common condition. The organisms which appear in the urine in these cases consist of moving bacteria-rods and micrococci, which are not clearly distinguishable in structure from those which appear in decomposing urine. But the character of the urine in the two classes of cases is very different. In decomposing urine, the turbidity is persistent, and the organisms go on multiplying in it until it becomes ammoniacal.* But, in the group now under consideration, the urine, although opalescent when voided, becomes clear on standing, and continues transparent and acid for many days, and the organisms show no disposition to multiply in the urine. Indeed, the urine shows less tendency to decomposition than the healthy secretion, and remains clear and acid for seven or ten days. This leads to the inference that, in this kind of bacteruria, the seat of growth of the organism is not the urine itself, but some portion of the surface of the urinary mucous membrane. These cases run a long and interrupted course, and the symptoms consist of more or less severe irritation of the urinary passages.

This form of bacteruria seems to be controlled in an important degree by the internal administration of full doses of the salicylate of soda.

* It must be remembered that, when ammoniacal decomposition is completed, the urine again becomes clear, with subsidence of a large deposit of phosphates.

As I have given a detailed account of this disorder, in a paper read before the Medicine Section of the International Congress in London, I will now content myself with a brief relation of two typical cases.

CASE I.—A retired professional man, about fifty years of age, fell on his left hip on February 11th, 1881. As the hip continued painful, a strong solution of iodine was applied to it, which produced vesication. Four or five days afterwards, there arose a violent irritation of the bladder. It was thought that this might be due to a congested state of the prostate, and, with that view, blistering fluid was freely applied to the perinæum. This was followed by an immediate aggravation of the bladder-symptoms. Micturition became excessively frequent and painful. These symptoms persisted with severity for a period of two months, and then began to abate under the influence of warm baths. Neither blood nor albumen appeared in the urine during all this time, and the reaction of the secretion was always acid.

When he consulted me, three months after the accident, the same symptoms continued in a mitigated degree. He voided urine in my presence. It was opalescent, and swarmed with bacteria, but it was sharply acid. A portion set aside in a urine-glass became quite transparent in twenty-four hours, and let fall a deposit consisting of bacteria-rods mixed with pus-corpuscles. This urine remained transparent and acid for seven days in a warm room. Three other specimens subsequently examined behaved exactly in the same way. Thirty grains of salicylate of soda were prescribed twice a day. In less than a week, the symptoms subsided, and the bacteria disappeared from the urine.

CASE II.—A merchant, aged 40, consulted me in June of the present year. Ten years ago, I had attended this man for severe chronic cystitis, with abundant discharge of pus. This attack gave way after some weeks of treatment with large potations of the decoct. trit. repens., and the patient resumed his occupation. But the recovery was never quite complete; there still remained a recurrent slight irritation of the bladder. Some months ago, he fell ill with what he called rheumatic gout. While slowly recovering from this, the bladder-trouble returned in great severity, and for this he sought my advice.

A sample of urine voided in my presence was found to be loaded with actively moving bacteria-rods. This specimen cleared on standing, and retained its acidity undiminished for over ten days. Several other specimens, obtained at subsequent visits, behaved in a similar manner. They were all acid, and opalescent from bacteria when voided; they became transparent on standing, and continued so, without losing their acid reaction, for more than a week in warm summer weather.

The irritation of the bladder speedily subsided under the use of thirty-grain doses of the salicylate of soda twice a day; but the patient was very intolerant of the drug, and the full doses were not continued for more than a fortnight. At the end of two months, I could still detect a few, very few, bacteria in the fresh urine; but the symptoms remained in abeyance.

In neither of these cases had an instrument ever been passed into the bladder. We must, therefore, assume that the organism had obtained access to the urinary channels through the circulation; and that the mode of infection resembled that which occurs, on the assumption of the germ-theory, in an ordinary case of contagious fever.

CASE IV. *Beaded Filaments (Micrococcus Chains) in the Urine.*—I have only encountered one case of this kind, but it is a sufficiently remarkable one. The patient is sixty-eight years old. Thirty years ago he spent some years in South America, and of late years he has had a few slight but undoubted attacks of gout. His health continued generally good until a year and a half ago, when he suffered from hæmaturia for a few days. Six months later, the hæmaturia returned with more persistency, and gradually assumed a threatening severity. In May and June of the current year, the bleeding became so constant and profuse that the patient sank steadily, until at length he was entirely confined to his bed. There were no physical signs. The bladder was repeatedly sounded for stone, with negative results; and no signs of renal tumour existed on either side. No gravel had ever been passed at any time. The examination of the urine up to this time had only revealed the presence of blood-corpuscles and little flakes or masses of leucocytes. There was some irritation of the bladder, but no pain in the loins. The usual hæmostatic remedies were all exhibited without benefit. Towards the end of June, larger doses of the oil of turpentine than had hitherto been employed were tried. Fifteen drops of the oil, enclosed in gelatine capsules, were administered three times a day. Under this treatment, a decided improvement took place; the hæmorrhage lessened greatly, and the patient's strength steadily increased. At the present time (September 1881), the condition is stationary; there is still a discharge of some blood and a considerable quantity of leucocyte-flakes with the urine;

micturition is too frequent; and the patient is also much tormented with hæmorrhoids, and with an eczematous state of the skin about the neck and face.

Now comes the curious part of this history. During the height of the hæmaturia, the urine had been repeatedly examined, with no other result than the finding of blood-discs and leucocytes; but on July 14th I saw something I had not observed before. I saw in the deposit a number of long delicate beaded threads. In all my experience of urinary examinations I had not seen anything like them in the fresh urine. Since this date, I have examined more than twenty different samples sent to me at half-weekly intervals, and invariably have seen the same appearances. Care was taken to obtain the specimens fresh and uncontaminated; and on one occasion the microscope was actually taken into the patient's bedroom, and the urine was searched as soon as it was voided; so that no doubt could exist that the beaded threads came from within the urinary passages; and that they were not, as was at first suspected, intruders from without.

The following account of the beaded filaments was gathered from repeated examinations of different specimens of the urine. To the naked eye, the fresh urine looks very much like that from an ordinary case of acute Bright's disease. It has a smoky appearance, and deposits on standing a loose reddish-brown sediment. On closer examination, the sediment is seen to consist of little soft brownish masses, or flakes. Under the microscope, these flakes are found to be composed of leucocytes or pus-like corpuscles, intermixed with a few blood-discs. In these flakes are found the beaded filaments, twisted and turned in every direction, and forming an inextricable tangle of threads running in and out amongst the corpuscles. There is also not unfrequently observed a brownish granular matter, like altered blood-pigment, lying amid the threads and leucocytes. In perfectly fresh specimens, the threads are found exclusively in these leucocyte-flakes; but, after the urine has been kept awhile, the flakes tend to break up more or less, and then detached fragments of the threads are seen scattered about in the field of the microscope.

With a magnifying power of 500 diameters, the threads are seen to consist of moniliform filaments, of extreme delicacy and regularity of structure. Their width measures about a tenth part of that of a blood-disc, and is remarkably uniform. Their length varies greatly. Some are so long that they stretch across and beyond the field of microscopic vision; but, for the most part they are so twisted and turned on themselves, that it is impossible to gain a precise idea of their length. Some appear as shorter fragments, and many of these have, at one end, a brightly refracting molecule, which is larger than the width of the rest of the thread, and suggests the idea that this is a spore from which the filament springs. Under an immersion-lens, and with good illumination, the threads are resolved into a row of minute spores or micrococci, apposed end to end like a string of beads. Here and there are seen isolated, larger, and strongly refracting molecules, similar to those just described as forming the initial element of one of the shorter threads. The aniline dyes stain the threads deeply, and bring out their structure splendidly. Neither the threads nor the isolated molecules exhibit the slightest movement. The common forms of bacteria-rods and micrococci are never seen in the fresh urine, which exhibits no undue tendency to decomposition. The threads dry on a glass-slide without appreciable change, and they can then be stained and mounted in Canada balsam without losing their characteristic appearance.

As regards the nature of these beaded filaments, I cannot pronounce positively. They certainly resemble no tissue of the animal body—either normal nor pathological. I can make them out to be nothing else than chains of micrococci. Chains of this character constitute a phase in the life-cycle of several bacterioid organisms. F. Neelson has described and figured such chains (calling them "gonidia-chains"), as occurring in the life-history of the bacillus, which produces the pigment of blue milk.* I could not detect, in the chains found in this patient's urine, any tubular structure enclosing the molecules—nor any investment of any kind.

The relation of the organism to the symptoms is, at the present stage of the inquiry, only a matter of conjecture. It is not difficult to conceive that a mycelium-like growth of the beaded filaments might act destructively on the lining membrane of the urinary passages, and cause hæmorrhage. The fact that, in the fresh urine, the threads are found exclusively in the leucocyte masses, seems to indicate that their seat of growth is not in the urine itself, but in a proliferating tissue. I may also remark that the only remedies, among the many that were tried, which efficiently controlled the hæmorrhage, were the oil of turpentine and the oil of eucalyptus—both of them agents of high antiparasitic repute.

Whether this case will furnish a key to some of those inexplicable cases of hæmaturia, which one not unfrequently encounters in practice, can only be determined by future research.

A SUBSTITUTE FOR CARBOLIC SPRAY.

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THE purpose of the present paper is to give the results of some experiments which have extended over a period of several months, and which were undertaken in the hope of bringing before the notice of the profession a substitute for carbolic spray, now used in antiseptic surgery.

Most, if not all, surgeons acknowledge the advantages of the Listerian method of dressing wounds; and nearly all are equally unanimous in asserting that the spray, hitherto a necessity, is both inconvenient and dangerous. The surgeon has his vision obstructed, and his sense of touch impaired. He moreover has the serious discomfort of living during a considerable portion of his time in an atmosphere which treats him not quite so well as an ordinary Scotch mist would. There are many slighter inconveniences to patient, assistants, and surgeon, which are so well known that it is unnecessary to mention them here; but these are trifling when compared with the dangers to the patient attending the use of the spray, especially in abdominal surgery. That the risks of poisoning are not fanciful has, I think, been abundantly proved by Dr. Keith and other observers, who have been led to abandon the spray in ovariectomy. I believe I have myself seen death caused in more than one case of abdominal section by chilling of the viscera.

More than a year ago, an apparatus was advertised as a substitute for the spray, which created a current of air by means of a fan set in motion by clockwork, the air being forced through layers of gauze moistened with 1 in 40 carbolic solution. About the same time I had an apparatus made which created a current by means of bellows, and sucked the air through two wash-bottles filled with 1 in 10 carbolic solution. From some experiments I made at the time with sterilised flasks, I came to the conclusion that, although the carbolic air was pure or aseptic, it was not antiseptic. It then occurred to me that, if one could saturate the air with some more volatile antiseptic, such as oil of eucalyptus, cajuput, or peppermint, a really antiseptic air might be obtained, which, by being diffused in a room or blown on a wound, might answer the same purposes as the spray, without having its disadvantages. Unfortunately, I was prevented by other work from following out my ideas until last month, when I made the following experiments, in which I have been much assisted by my brother.

The first and most essential point to be proved was whether or not air impregnated with the vapour of volatile antiseptics is really antiseptic. To ascertain this, I sterilised a number of flasks of hay-infusion by boiling for fifteen minutes, capping with cotton-wool, and boiling for five minutes longer; after which, to prove their freedom from life, they were placed in an incubator, and kept at a temperature of 100° Fahr. for two days. Having obtained some large wide-mouthed glass jars, capable of holding several gallons, I poured into one series about an ounce of eucalyptus-oil, and into another series the same amount of cajuput-oil, so as to have a thin layer of the fluid covering the bottom of the jar. Into these jars the sterilised flasks, previously freed from their cotton covering, were inserted; being suspended by means of thread from a bar placed across the mouth of the receiver. The transference and opening of the flasks were rapidly performed under carbolic spray; but, when once in the jars, there was nothing to interfere with the entrance and exit of the ordinary atmospheric air.

After a varying period of exposure of from two to twenty-two hours, the flasks were recapped with cotton, and again transferred to the incubator; in doing which the former precautions were adopted, and, in addition, the cotton which had to come immediately over the flask was moistened with a little 1 in 40 carbolic solution, to avoid the contact of germs. After being in the incubator for two days, they were put aside to be examined at leisure.

No change occurred in the flasks through keeping, the hay infusion looking bright and transparent throughout; there was a slight sediment in all, both in those simply sterilised and in the ones subjected to the action of eucalyptus and cajuput; but in no case was there a formation of scum on the surface of the fluid. In contrast to this, some flasks that had been simply exposed to the air, and then covered with cotton-wool, began to appear opaque and have a scum on the surface within six hours.

In order that the report might be free from bias, I asked Mr. Abbott, an experienced microscopist and botanist, to examine the solution microscopically for me, which he kindly did, giving his opinion before I examined the slides.

* Cohn's *Beitrag zur Biol. d. Pflanzen*. Band III, Heft 2, pl. xi.