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CANADA .

MEDICAL JOURNAL.

ORIGINAL COMMUNICATIONS.

Tubercular disease of the Kidneys and Bladder ; no turbercle in the Lungs ; Ulcer ation and enlargement of the Supra-Renal Capsules ; distinct Bronzing of the skin of Face and Neck, &c., &c. Under the care of D. C. MACCALLUM, M.D., Professor of Midwifery and diseases of women and children, McGill University.

(Reported by Dr. Thos. G. Roddick, Assistant House Surgeon, Montreal General Hospital.)

Benjamin Heritage, aged 36, was admitted on 4th October into the Montreal General Hospital, under care of Dr. Wright, suffering from a difficulty with his bladder.

His appearance denoted the presence of some exhausting disease, considerable emaciation being evident. His complexion dark, skin yellowish, and eyesight completely gone from some previous inflammation.

HISTORY.—Is a printer by trade, but has likewise worked as a painter in the Western States. Has suffered from lead colic on one or two occasions while engaged in painting.

As to his family history, his father was drowned many years ago, and his mother died of dropsy from some cardiac malady. His grandfathers and mothers lived to advanced ages. One of his sisters died a few years ago of a like disease with his mother, and two brothers have since died of consumption.

Some eight or nine years ago he had intermittent fever, and at this time or soon after experienced symptoms of inflammation of the bladder, being unable to retain his water for more than an hour at the most, and occasionally it was tinged with blood. This bladder derangement soon subsided to a great extent; but when at all unwell it would return with nearly its former vigour.

Three years or thereabouts after, while in St. Louis, the irritation returned, and he went into hospital, where he remained for two months, being discharged at the end of that time greatly improved. It was thought while there that he suffered from

vesical calculus, but repeated soundings showed nothing of the kind.

Ever after this the frequent desire to make water remained, but, with one exception some two or three years ago, when he caught a severe cold, the irritation never laid him up till about a year since, when he again had an attack of ague. At this time, also, his eyes were attacked, which resulted in the blindness before mentioned. From this period (a year ago) to the time of admission into hospital, he has seldom left his bed, except during the journey to Montreal.

He has always been a temperate man, in fact a teetotaller as to spirits. For years he was a vegetarian, and for some time never drank tea or coffee. He says he has never been married, or even had connection with a woman.

ON ADMISSION the patient complained of great difficulty in holding his water and slight strangury in voiding it. On examination two strictures were found—one about an inch from the point of the penis, and the other at or in the vicinity of the neck of the bladder. The first was very tight, but the latter caused the greatest pain from the catheter. He could not retain his urine for more than ten minutes, and in fact it was all the time dribbling away, so that he was compelled to have the urinal constantly in bed. The bowels were inclined to be very costive. On percussion the spleen was found enlarged from former ague, but the liver and lungs normal.

An injection into the bladder on one occasion of Nitric Acid min. x to the pint of water, and a suppository and two doses of Black Draught at intervals, were all the treatment he received up to Nov. 2nd.

Nov. 3rd.—An examination to-day per rectum was made by Dr. MacCallum, under whose care the patient has now passed, in the endeavour to find an enlarged prostate or thickening of the coats of the bladder, or anything that would indicate cancerous or other deposit. Nothing abnormal was felt. He cannot retain his urine more than a quarter of an hour at the best, and then it is voided with great difficulty, occasioning an intensely burning sensation.

Nov. 5th.—In introducing the catheter to make an injection, most intense agony was experienced by the patient, causing him almost to faint; pain chiefly at the neck of the bladder. Two and a-half ounces only of Nitric Acid and water, of same strength as before, could be thrown into the bladder, showing its capacity to be very small. The injection itself did not seem to cause much pain, but it was forced out almost immediately, and slightly tinged with blood. A small clot or two of blood remained in the catheter.

The urinal contains the water of the past six or eight hours, which for that time is very small in quantity, with a thick sediment at the bottom, in appearance like ropy mucus, and of a strongly ammoniaco-putrid odour.

Nov. 6th.—Has experienced great relief from the injection, so much so indeed that he can now hold his water easily for at least five minutes longer than yesterday, nor are the straining and pain in voiding it so marked.

Nov. 8th.—Still continues to improve, irritation diminishing fast; urine has nearly the same appearance, though perhaps there is less deposit and the colour more natural.

Nov. 9.—Patient about the same; can retain his urine for some twenty minutes. *Examination of Urine.*—Colour reddish-brown; reaction neutral; Sp. Gr. 1018; albumen, sugar, and bile, wholly absent. Under the microscope were seen brilliant triangular prisms of the triple phosphates; sheaf-like crystals of phosphate of lime; amorphous urates; and an occasional pus globule.

Nov. 12.—Is still improving; irritation very slight; stricture gives but little trouble. Is free from pain, so much so, indeed, that he is able to leave his bed and walk across the hall without assistance. Appears, however, to be emaciating rather than gaining flesh.

Nov. 14.—To-day, seems not so strong. Tinct. of Iron min. xv three times a day is ordered as a tonic. The bladder trouble is almost gone, but he earnestly requests another injection.

Nov. 15th.—An injection similar to the others was given this morning. There was fully as much pain caused by the catheter as last, but more especially when in the bladder, no doubt from touching the mucus coat. About the same amount (two ounces and half) was thrown in, and as quickly rejected with a slight tinge of blood likewise. The urine is increasing somewhat in quantity, but the appearance and odour have not changed since last noted.

Nov. 19th.—He has been troubled for the last three or four days with a very severe hacking cough of a dry character, for which the following dose, to be given three times a day, is prescribed:

Rx Tinct. Prun. Virgin.
Tinct. Hyoscy. aa min. xx
Vin. Ipecac. min. v

He is becoming gradually more weak and emaciated, apparently deriving no benefit whatever from the iron. Considerable œdema of the eyelids and feet is noticeable, probably from the existing weakness. The urine continues about the same in look and quantity.

Nov. 33rd.—œdema is disappearing in the feet, but still remains

especially in the right eyelid. The pulse is slow and weak. Density of urine is 1014, with no albumen, but a large deposit of mucus and pus-like matter.

Nov. 29th and 30th.—Œdema of the feet and eyelids has almost entirely disappeared, but the weakness and emaciation increase; pulse failing fast: indications evidently are to death by asthenia. Three ounces of brandy have been ordered.

Dec. 4th.—Has not changed much in any one respect for the past four days, but complains bitterly of cold, though well covered. An examination of the chest shows nothing definite, although the cough still continues to trouble him greatly. All œdema has disappeared. The amount of brandy last ordered has been increased to four ounces, and the cough mixture discontinued. As an anti-septic Sulphite of Soda is prescribed in Gr. xv dose three times a day. The urine to-day has a Sp. Gr. of 1010; urea entirely absent; no Ammonia in the breath to indicate any tendency to Ammonæmia.

Dec. 8.—The pulse to-day is scarcely distinguishable; hectic flush well marked; extremities very cold; and features pinched. The urine is being passed to some extent in bed, and the bowels are very loose. From a distinctly bronzed appearance of the neck and face Dr. MacCallum stated that the suprarenal capsules were probably involved in disease. The patient complains of a great pain and tenderness over and above the left iliac crest, obliging him to lie altogether on the right side. The abdomen is very tympanitic and largely distended. The bladder and urethra give no trouble whatever, though the urine shows a larger deposit now than it has ever done.

Dec. 12th and 13th.—The pulse at the wrist is with difficulty felt. Slight œdema in the feet is noticeable. The urine is being passed wholly in bed, and the bowels are very loose. The voice is failing, and the abdomen still retains its large size and high tympanitic note, while the extremities are icy-cold.

Dec. 15th.—At two o'clock this morning he became slightly delirious, and at five lapsed into a comatose state which terminated in death in about four hours.

AUTOPSY TWENTY-EIGHT HOURS AFTER DEATH.—Emaciation very great.

PLEURÆ—Strongly adherent to the walls of the chest and to the lungs and diaphragm.

LUNGS—Non-tuberculous, though somewhat emphysematous-looking. There was carnification of the base of the left lung; and strong attachments by old adhesions in this quarter to the pleura,

and through that to the diaphragm, so that the organ was very much torn in being removed.

HEART—Normal in size; valves not thickened or deficient; substance soft, and under the microscope showed fatty degenerations with oil globules and fat granules deposited throughout the fibres.

LIVER—Of normal size, but congested and dark in colour, with strong peritoneal attachments.

SPLEEN—Enlarged, of firm consistence, and black from pigmentsary deposition.

KIDNEY OF RIGHT SIDE—Somewhat larger than in health, and on section showed the secreting portion considerably thickened. In the pelvis were seen three or four spots of tubercular matter, and in the medullary portion as many sacks, varying in size from a pea to a small marble, and containing a sero-purulent matter.

LEFT KIDNEY—Was seen to be half as large again as natural, with great thickening of the cortical portion and capsule, which latter was strongly adherent both to the substance of the kidney itself and to the peritoneum. On making section of the gland some nine or ten abscess-cavities, in size from a wall to a hazel nut, were opened, besides a number of smaller ones that would hold a pea. The larger cavities were filled with a greenish-yellow-mucopurulent fluid of the consistence of thin cream, and in their walls and filling the smaller cavities was noticed a yellow cheesy deposit. These cavities were directly continuous with the mucus membrane of the pelvis, which was likewise thickened and degenerated. The larger cavities were incompletely separated from each other by more or less healthy renal tissue. A few of them were lined by a smooth membrane, except at their opening into the pelvis where some tubercular matter was deposited. The canal of the ureter was occluded, so much so that the smallest probe could not be introduced.

The **SUPRARENAL CAPSULE** of the right side was large and ulcerated in the interior, and that of the left likewise greatly enlarged from chronic inflammation and strongly adherent to the spleen.

The **INTESTINES** were found glued to each other and to surrounding organs from old tubercular peritonitis, small granules being scattered over the membrane.

BLADDER.—The cavity was sufficiently large to contain an orange of medium size. The walls were thickened and indurated in some places, but chiefly about the neck. The mucus membrane was slightly congested and studded with deposits of tubercle. These were scattered and scanty except over the trigone, where the deposit was very abundant in the form of small granulations the

size of a pin-head and larger. A strange anomaly was two distinct openings into the urethra—one situated on either side of a thick fold of mucus membrane. Below the fold likewise were two symmetrical depressions about a line and a half in depth, but without connection. The ureters apparently opened into the bladder at the extremities of the fold, and their canals were thickly studded with granulations of a like size and nature with those over the trigone. Adherent to the walls of the viscus externally were two small and one greatly enlarged mesenteric gland, showing on section the same diseased state as the other glands.

Poisoning by Tincture of Iodine. By T. Mc. J. COWLEY, M.D.
Smith's Falls, Ont.

AUGUST 1st.—I was called upon to visit a child, aged fourteen months, whom the parents reported to me to be choking from the effects of something swallowed. On my arrival at the place (it being only a short distance from the Office), I found the child suffering from Iodic poisoning, as a phial containing about half an ounce of the tincture had been placed on a stand a few minutes previous to the accident, and to which the child had easy access. As far as I could judge, the child must have swallowed all that was contained in the phial, for as no traces of it could be discovered on the clothing or in the apartment where the drug was swallowed, but the usual discoloration produced by the drug was quite visible on the lips and chin, showing that the full amount must have been taken, which was four drachms, a quantity quite sufficient to produce fatal poisoning. On examination, I found the child pale and restless, the eyes suffused, respiration hurried, obstinate vomiting, great tenderness over the epigastrium, a sense of constriction in the throat accompanied with other symptoms such as would indicate a fatal termination. To alleviate these distressing symptoms, I at once had recourse to the antidote, viz. :—Starch in solution; which I administered in large quantities, the child seeming to swallow with great difficulty; in fifteen minutes the vomiting ceased and the child appeared to rally. I then deemed it necessary to administer an emetic in order to relieve the stomach of the new compound formed with the starch. Of the emetic, a teaspoonful was given every five minutes, but on the administration of the second dose, the child vomited freely a dark bluish substance streaked with blood, which was due to the corrosive action of the poison on the mucous passage. In this case, it may be mentioned, the bowels remain unmoved, which is quite unusual according to authors on poisoning by this drug. Having relieved the stomach of

its contents, I endeavoured to produce an operation on the bowels by an enema of starch; this had the desired effect, after which the child seemed quite relieved and showed symptoms of recovery. The bowels being freely moved, I ordered demulcent drinks together with opiates to obviate irritation. By this, it was apparent that the child was much relieved. I then left, but visited him several times during the remainder of the day.

AUGUST 2nd.—Visited and found child much easier, he had rested well during the night, breathing not so oppressed,—bowels moved once in night—but urine scanty and high-coloured, for which I placed him on a diuretic mixture containing Potas Acet 2 drs., Spts Ether Nit. 4 drs., Infus Buchu 1 oz., Aqua ad 4 ozs., a Teaspoonful every two hours until the kidneys were freely acted on, after which I ordered beef, tea and gruel in small quantities to keep up his apparently much impaired strength.

AUGUST 3rd.—Croupal symptoms began to show themselves and seemed to be increasing, for which I used the simple form of treatment but without success.—Symptoms began to demand a more active course, I therefore used pounded ice, applying it over the throat and chest; this at first seemed to give great relief, but after a time ceased to be a virtue. My only alternative now was to use remedies of a depleting nature; I applied three leeches over the trachea, the result of which seemed to be instantaneous relief, the breathing after the lapse of an hour becoming more tranquil, the child dozing over asleep and awaking greatly relieved. Since then the child has so far recovered that on the second day after I called to see him, he was running around and is now quite convalescent.

Proceedings of Societies.

PROCEEDINGS OF THE MEDICO-CHIRURGICAL SOCIETY OF MONTREAL.

MEETING HELD AUGUST 12TH, 1871.

The Vice-President ROBERT GODFREY, Esq., M.D., in the Chair. After routine business, John Bell, A.M., Ex., M.D., read the following paper on—

DISEASE GERMS.

All the organic structures in nature in the course of time change and die. The same power which impresses upon each organism its peculiar form, structure, and habits, also fixes the period of

time during which it is produced, progresses to maturity, and declines to dissolution.

Numbers of individuals of the various species, species *in toto*, and even genera, may be destroyed, or become extinct by physical lesions which may be appreciable by the senses, and the manner in which they have been brought about, easily understood. But when individuals of the various species of animals, with all their organs for the maintenance of life apparently in vigorous action, and with an adequate supply of food, die from the action of agents visible and invisible whose *modus operandi* is not at first apparent, our attention is most powerfully drawn to this subject, which presents such an inviting field for scientific enquiry, a subject upon the more thorough knowledge of which depends the happiness and life of millions of beings, and the greater wealth and prosperity of nations.

These noxious substances or agents which thus mysteriously still the busy economy of vital organisms and bring about their premature decay may be of either a gaseous liquid or solid nature, and may produce death either by changing in some way the tissues of the body or by modifying their functions. "It has been supposed by some that the infecting matter may consist of some subtle entity, which was not cognizable by the senses or to be made evident in any way." But such baseless fabrics as this untenable theory will receive but little support in this exact age, when actual demonstration is required, and while there are so many avenues to the truth still unknown or but little explored.

It is well known that many of the simple gases and gaseous compounds directly exercise a deleterious and fatal effect upon the tissues of the body, while others impair the functions of tissues and organs essential to the health of the system, and thus indirectly bring about the fatal end. The same may be affirmed in a higher degree of the solid poisons.

In addition, however, to these classes of poisons whose existence is undoubted, whose chemical composition and physical form are known, and whose action can be more or less clearly ascertained, there is another class which is more particularly the subject of this paper, whose outlines, like those of some dark, hideous spectre but slightly defined, at the present time fill the popular mind with horror and despair. I refer to Disease Germs.

That the air everywhere contains minute particles of organic and inorganic matter in suspension, must be patent to all who have seen a pencil of rays of the sun shining into a darkened space through a crevice in its walls. These particles are so light on account of their comparatively small size that the slightest motion

of the air buoys them up in its midst, and by reflecting the rays of light they become apparent to our sight when any portion of the atmosphere is examined in the way described. It is these harmless particles that many of the imperfectly enlightened public believe to be the death-dealing disease germs. When ordinary dust of the air, particularly that of a house or city, is examined under the microscope it is found to be chiefly composed of comminuted particles of mineral matter and the detritus of organic structures—a small part being the sporules and individual cells of fungi and the smaller algæ, with the pollen of flowering plants.

The spores of the lower vegetable organisms being proved by the microscope to be everywhere present in the atmosphere from the bottom of the deepest mine to the top of the highest mountain, and from various circumstances connected with their presence many investigators were impressed with the idea that these vegetable cells were the active agents in the various malarious and contagious fevers. Carried on beyond the limits of reason and facts by exciting speculation on the subject, many scientific men have in this matter misled the mass of the lecture-hearing and journal-reading public curious to hear something new and intoxicated with wonder at this strange and brilliant doctrine.

I shall endeavour to show, however, that the disease germs or active agents in the production of the contagious fevers are neither of the nature of vegetable genus nor the comminuted detritus of the mineral and organic world, but are living particles of animal origin present in the fluid or solid in which the contagious properties are known to reside.

Of all the poisons which cause the death of man the most subtle and the most difficult to isolate and investigate are those which give rise to certain forms of disease which spread from person to person. Many poisons of this class, as compared with non-living poisonous agents, "act very slowly, and when they destroy life, do so not by their immediate action upon tissue or living matter, but by their indirect influence upon the physiological changes going on the various tissues and organs. Many of these poisons are indeed uncertain in their action and are for the most part fatal to a very small percentage of those attacked. They not unfrequently cause serious structural damage in consequence of which the organism becomes predisposed to certain forms of disease; and oftentimes, it may be not until sometime has elapsed that although the individual has escaped with his life, some delicate organ is irreparably injured by the changes produced by the action of the poisonous material, and death follows after a varying interval of time."

In order to form a better idea of the true nature of disease germs it may be well to observe under a high power of the microscope some of the lower forms of animal and vegetable organisms and to trace rapidly the cell-growth of the higher and more complex organisms belonging to both kingdoms. As an instance from the vegetable world if we examine a specimen of rapidly growing yeast on a warm summer day, it will be found to be composed of numerous globular and elongated bodies, semifluid, transparent, and colourless, surrounded with fluid. If the examination be continued these bodies will be found not to retain the form they at first had but will increase in size and send out diverticula, the connecting isthmus between which and the parent mass will become narrower and the protrusions will be finally separated and form independent individuals with all the powers of the original from which they sprang. If the process of rapid formation be checked from any cause, the individual spores will not shew the same vital activity and tendency to subdivide but in the course of time a well defined outer or cell wall will be formed around each, which Lionel Beal calls formed material in contradistinction to the internal vital matter or formative material, the latter only having the power of increasing in size and producing individuals like itself, when placed under favourable circumstances, by the protrusion of small masses through pores in the coat of formed material, which is now dead so far as its capability of further growth or multiplication is concerned. Among the uni-cellular fungi and algæ this process of multiplication proceeds so rapidly that many millions may be formed under favourable circumstances, in the course of a few hours from a single individual. The force with which this division takes place, and which may be used by the cell organism in providing a suitable *nidus* for itself, is well illustrated by the fact which Dr. Carpenter mentions in his "Elements of Physiology" that in the neighbourhood of Basingstoke, a paving stone measuring twenty-one inches square, and weighing eighty-three pounds, was completely raised an inch and a half out of its bed by a mass of toadstools. Considerable heat is often generated by the union of the elements during the rapid growth of these low organisms, as is also observed during the multiplication of disease germs in an infected organism both before, and for some time after death. If an amœba be examined in water in the same way in which the yeast spore was, it will present all the physical characters of the rapidly growing yeast cell and it will exhibit a capability of motion and of protruding portions of its homogeneous bioplasm or vital mass. Many if not all of these amœboid animals possess the power of secreting from their surface various substances like

shell and coral analogous to the cell wall of the diatome and older yeast plant. The germinal living matter of fungi resembles that of animals in containing albuminous proximate principles and in the capability of evolving phosphorescent light from their structure, as that so far as their physical and chemical properties are concerned, they cannot be separated. The only distinguishing difference being in the vital power impressed on each.

Every multicellular plant from the minute bread-mould of a few days growth, to the gigantic *Wellingtonia* towering like a huge church steeple nearly three hundred feet heaven-ward and lasting for ages, at first sprang from the one homogeneous transparent germinal mass of the spore or ovule. All their various tissues from the mycelium and spores of the one and the cells, fibres, vessels, bark and leaves are but parallel lines of growth originally beginning in the one parent cell. So too, have all the varied tissues of the most complete animal sprung from one and the same mass of bioplasm in the germinal area of the ovum. As this original mass grew and divided some divisions went to form bone, others muscles, nerves and so on, each, at the proper time, exhibiting its peculiar function of secreting one of the various kinds of formed material or tissue of the body. As the mass grew and blood-vessels formed, some parts of each of these divisions of the original bioplasm began to circulate in the enclosed fluid, and formed the masses of germinal matter known as white blood corpuscles. From these it is probable that in the lower animals, parts which have been lost, may be restored in their original perfection, and hence we see the identity of the white blood corpuscles and the germinal matter (the nuclei of Virchow) of the various distinctive tissues.

In the lower or more simple organisms the characteristics of rapid multiplication, and of capability of existing for a long time, and even of growth under adverse circumstances, are more strongly marked than in the higher or more complex beings. It is well known that the living cells of the lower vegetables, and numerous species of animalcules, may be dried and blown about by the wind for weeks and months and on finding a suitable *nidus* may at last begin to show their characteristic symptoms of life. While some of them naturally live in very high or low temperatures, many accustomed to a medium degree of heat will live and grow amongst the frozen snows of the north, and vegetate in the almost boiling springs of volcanic regions, while others will flourish in the acid solutions of the chemists laboratory. It has been found by microscopic investigation that simple masses of bioplasm as the white blood corpuscles, and, more particularly, degenerated forms as pus globules will live, change their form, and even divide or multiply for some

time after their removal from the body. So, in a manner like these lower animalcules, may the degenerate and morbid, but living particles of the contagious fevers rest, in articles of clothing, or float about in the atmosphere until they alight on a surface in which they find the conditions necessary to active life, and through which by their power of vital movement they make their way to the tissues and circulating fluids beneath.

This tenacity of life does not pertain in the same degree among the more elaborately developed tissues of the higher organisms although the fact that it does exist is proved by the results of many plastic operations, the transfusion of blood, and as was well shown at a late meeting of this society by the success of skin grafting.

Since these microscopic fungi are found every where, and many of these vegetables are known to have a powerful influence on the human system, since they float in multitudes in the air we breathe, are found in all the tissues and even in the interior of cells, and grow and destroy the organism when once life has become extinct; since they seem to prevail in unusual quantities in certain localities and in seasons when some contagious and malarious fevers are peculiarly rife, may it not be that these little organisms are the cause of the disorders in question?

"Above us, about us, and in us they roam like vigilant spirits, seeing that all is right within our physical constitution; but gladly availing themselves of the slightest flaw to work our destruction." And to quote from Foot Notes from the Page of Nature. "The Revd. Hugh McWilliam says of these microscopic fungi. "If they were poisonous as many of the fungi are, it admits of being suggested at least that those living in places when dense clouds of them were present, being devitalized by other noxious influences, such as vitiated air, defective sewage, bad water or an inadequate supply of food and consequently in a state of body unable to resist the deleterious action of these cryptogamic germs, died from a form of poisoning."

But on examining the bodies of those who die from the diseases supposed to have been caused by these germs the vegetable spores are not found in unusual numbers, nor are the changes such as could be explained on the supposition of such a cause. "The diseases of man and the higher animals known to depend upon the growth and development of vegetable organisms, are local affections confined to a part of the body, not involving the blood, while for the most part, the different forms of contagious fevers are general affections, in which the whole mass of the blood and in some cases every part of the body is affected and is capable of communicating the disease. In diseases caused by fungi, the struct-

ture of the vegetable organism can be made out without difficulty, and the vegetable examined in every stage of its development." If the spores of innumerable species of fungi be disease germs and float about in the atmosphere, are suspended in all beverages and exist in every morsel of food swallowed by men in all conditions of health, it is miraculous that so many escape. Instead of so few suffering from any contagious disease each individual might reasonably be expected to suffer from one after another, until the power of endurance of his system was exhausted or until he had gone through the catalogue of diseases due to the vegetable germs with which he was surrounded.

The facts of every day life show that vegetable germs in themselves are not the cause of disease since in every individual they are constantly surrounding him, passing through his digestive and other canals and resting in his tissues without producing the slightest derangement. In fact the animal lives upon and destroys the fungi with the utmost impurity in the majority of instances, instead of the fungi living upon, deranging and destroying the animal tissues. Amongst those cases when the tissues are actually invaded and desorganized by vegetable growths, there are few in which it cannot be shown that the tissue, had first become enfeebled or disordered so as to become a suitable *nidus* for the development and multiplication of the vegetable parasites. Were it otherwise the prospects of the animal world would be truly deplorable, more especially if it be as many hold, that fungi may be generated at any time from inorganic material—for then fungi might rise from the ground around us at any moment and in any quantity, and fungi being disease germs, the source of untimely death would be as illimitable as the earth and all effort to eradicate it unavailing.

If the advocates of the vegetable germ theory of disease contend that in order to produce disease there must first be a peculiar condition of the system in which the vegetable organisms can produce their characteristic effects, they prove their theory to be defective, for there are contagious poisons which produce their specific effect on the system under all conditions. They have moreover yet to prove that there is any unvarying connection between the presence of fungi and epidemics of contagious disease and between any particular variety of fever and species of vegetable organism.

On the other hand the contagious power of vaccine and other virus is strongest when it is past and contains few or no vegetable germs, and it retains its peculiar virulence only for a definite and comparatively short time, while vegetable organisms increase in number as the matter grows older and loses its specific power

and continue in vigorous growth after all capability of producing the contagious disease is past.

We have already pointed out that all the parts of every organism are the direct descendants of one original cell. A great part of the tissue of the body is formed material such as the harder portions of bone and the parts of the various tissues which gives them their characteristic appearance, but none of this is capable of reproducing itself—so far as the power of multiplying is concerned, it is virtually dead. The power of reproducing, multiplying and sustaining the integrity of the tissues lies in the bioplasm or active living matter of the tissues. Vita^z movement under favourable circumstances, characterizes this substance in all living bodies and even for a while after it has been removed from there. The movement is not muscular contraction, but is peculiar to all living bioplasm, whether obtained from bacteria animalcules, white blood corpuscles put or the higher tissues. The natural origin of white blood corpuscles has been already referred to. Their mode of increase is like that of all other bioplasm, by division of the parent mass when it has attained a certain size, and the separation from it, of minute particles of matter similar to itself, which have the same properties, and are capable of undergoing the same processes as the parent mass. It may here be predicated that this is also the mode of growth and increase of disease germs, or minute masses of bioplasm so altered in their vital properties, as to be capable of setting up certain morbid processes when introduced into a previously uninfested organism. When the capillary blood vessels become overdilated from any cause these minute particles of bioplasm or ungrown white corpuscles, in number innumerable, are found to pass through, and grow and multiply in the tissues surrounding the bloodvessels thus disorganizing or destroying the part into which they are effused. The effect of this process is well seen in scarlet fever where the epidemis is thrown off in large flakes when the disorganized layers of cuticular epithelium in turn comes near the surface. These minutes particles by agglutinating in strings, form the fibrillæ of fibrin and by degeneration form pus and the specific germs of the various contagious fevers. When the capillaries become distended the blood current becomes slower and the white blood corpuscles begin to encrease rapidly in number, as may be seen where distension has been produced by any local irritant or where the blood current is slow as in the embryo, in hibernating animals and in the state of the system attending the contagious fevers. When the circulation therefore is slow and the capillaries enfeebled a state very similar to disease and one favourable to the inception of disease exists.

When the amount of material matter or *pabulum* supplied to any tissue is greater than usual or natural, the bioplasm of the part increases and multiplies faster, and the amount of formed material is less than in health. If the supply be continuous for some time, a morbid state is at length reached in which the product no longer resembles that from which it originated, nor can it produce tissue similar to that from which it sprang, nor return to a similar state. It has acquired an increased power of multiplication and tenacity of life, but is capable of progressing only in one direction—onwards—with no tendency to secrete formed material—thus pus is produced, sometimes with peculiar morbid specific properties.

The process may be watched in congestion and inflammation in the fauces ending in the formation of pus.

So minute are the majority of the particles of bioplasm multiplying in the blood and fluids of the tissues both in health and in states of irritation that they are forced out through the walls of the capillaries and pass into the various secretions. They may be seen of a diameter less than the 50,000 of an inch and were instruments made of sufficiently high power others of still smaller size could be seen floating in apparently clear and homogeneous fluids. It is to these that the formation of fibrin is due and upon their healthy or unhealthy condition depends greatly the condition of the animal. It is upon changes induced among these that contagious diseases depend and also protection from future attacks. Being unprotected by any coat, they are liable to be easily acted upon by outside agents, when applied to them external to the body as is well seen in the stoppage of suppuration in wounds by carbolic acid, or when applied thro' the medium of the serum of the blood. It is by the transference of these particles in a morbid condition to the system in a state favourable to their multiplication that any contagious disease is induced, and not by the introduction of simple fluid of any kind. Chauveau has shown that the active particles of incime lymph subsided after 48 hours, and that no effects were produced by inoculating the albuminous supernatant fluid, while the full effects were produced by vaccinating with the deposit.

There are cases in which we can actually trace the formation of a bioplasm capable of producing specific disease. In peritonitis there may be many degrees of intensity running thro' simple congestion—congestion with slight lymph effusion—effusion so active in character as to produce a creamy deposit of lymph and puriform bodies. If a small portion of this be inoculated with another individual the action will be at once of equal or greater intensity than that in the person from whom the particles were taken. In some

of the pus formed be inoculated into a third subject a still more virulent form of inflammation may be produced until we arrive at a form of bioplasm capable of instituting specific results with unvarying certainty. The same might be proved of changes in other tissues ending in such poisons as those of purulent ophthalmia gonorrhoea and erysipelas, and the probability is great that future investigations will demonstrate that the poisons of diphtheria, scarlet fever, small pox and other contagious diseases have originated in a similar manner and if it be impossible to point out the actual formation of all—sufficiently much of the perimeter of the circle will be discovered to enable us to complete it to the satisfaction of the most sceptical.

When these diseased particles have escaped from an infected subject by the desquamation of the disorganized epithelium of the skin and mucous membranes or by means of the secretions and excretions, the tenacity of life peculiar to their lower nature, enables them to exist alive in many altered conditions until they alight, upon some part of the body to which they have been carried by means of the air, water or solid ingesta. They then begin to multiply and by their power of vital movement at length make their way into the blood and tissues where they set up the peculiar action which was manifest in the organism from which they sprang, either by rapid multiplication or by entering and infecting the existing corpuscles of the invaded organism.

Notwithstanding the tendency of the times to look for the spontaneous origin of organic matter from inorganic material—and to look for the causes of contagious diseases as originating outside the human system—there can be but little doubt that all facts discovered by the most careful observers, point to the origin of disease germs from living germinal matter of the human frame and “if man is not indeed responsible for their origin, he has certainly himself imposed the conditions favourable to their production and dissemination. Human intelligence, energy and self-sacrifice may succeed in extirpating them and may perhaps discover means of interfering with the origin of new forms not now known to exist.”

Dr. Fraser remarked that Germs are particles having the power of self-reproduction. They exist in the atmosphere we breath, the water we drink and the food we consume. By their agency the body is built up and its nutrition maintained. But though such is their normal purpose, it is assumed that there are Germs, the products of decomposition and other abnormal conditions of organised matter, of so poisonous a nature, as to be the media by which certain diseases originate and are propagated. To such the term Disease Germs has been applied.

The great objection to this Germ Theory of disease is, that the distinction between healthy and diseased Germs has not hitherto been satisfactorily made with diseases supposed to be thus propagated. The reason for this appears to be that they are so minute as to require microscopes of such high powers as have been hitherto but seldom employed by investigators. Dr. Beale has delineated germs so small as the 1,000,000th of an inch requiring a microscopic power of from 2,000 to 5,000 diameters linear for their demonstration and states they are invisible by less powerful glasses. It is not therefore surprising that the germinal theory has been hitherto chiefly hypothetical but recent investigations are clearing up this interesting subject and showing that morbid powers originating within and without the body are, at least in many instances, due to germs.

Dr. Beale has apparently shown that Bacteria germs grow and multiply whenever a change takes place in the solids and fluids of the organism which develops compounds suitable for the propagation of these living bodies and ventures to doubt if the unquestionable efficacy of the carbolic and antiseptic treatment is due as suggested by Mr. Lister to the prevention of the entrance from without of these germs. He thinks it more probable that the carbolic acid acts directly upon the growth and multiplication of the bioplasm of the part.

Dr. Fraser stated his belief that further investigations into this novel and interesting field of Medical Science are likely to lead to results of the most beneficial kind; and that Dr. Bell's paper would he hoped interest the members in following such scientific investigations by whomsoever pursued.

Medicine.

LECTURE ON THE DIFFUSION, PATHOLOGY, AND TREATMENT OF ASIATIC CHOLERA.

BY SIR THOMAS WATSON, Bart., M.D., F.R.S.

[At the present juncture, when we are again threatened with an invasion of Asiatic cholera, it has appeared to us that the publication of that portion of Sir Thomas Watson's revised Lectures on Medicine, which relates to the mode of diffusion, pathology, and treatment of this disease, would be of considerable professional interest and advantage. We have accordingly requested and received authority to publish the following portions of this

lecture from advance sheets of the new edition now passing through the press.]

A fourth great visitation of cholera—that of 1865-66—has come and gone since I last addressed you on this subject, and it has been far more fertile of instruction on many interesting points relative to the disease than any of the three preceding epidemics.

Very few, I imagine, of the original doubters remain unconverted to the doctrine which I have held from the beginning, that epidemic cholera is *catching*; that it results from a material poison which is portable, capable of being conveyed from place to place, and communicated from person to person—or from inanimate substances to which it clings, such as articles of furniture or clothing. That the morbid matter floats also in the air, and may be wafted about by its currents, is a general and well-founded belief. I think, with Dr. Baly, that when it travels over great distances, as from one country or region to another, it uses the vehicle of human intercourse; but that it may be and often is diffused over smaller spaces, as from one part of a town to another, or from a tainted port to a ship anchored to leeward, by the movements of the atmosphere. The long migrations of the disease are not made rapidly. Its rate of progress never exceeds, and is often slower than, that of modern travelling. Its primary appearance in an island or a kingdom is always at its outer boundary. In our own country, for example, it first planted its foot in a seaport town on the east coast, over against the mainland where cholera was raging and whence ships had very recently arrived. The same is true of its subsequent visitations. On the other hand, the crews of vessels sailing from healthy places remain free from the disease until they have entered an infected port, or held intercourse with an infected shore.

In his statistical report of the Royal Navy, published in 1858, Dr. Bryson says:—"The medical records of the (naval) service have been searched in vain to discover an instance in which either cholera morbus or yellow fever made its appearance amongst a ship's company, unless one or more of the men or officers had previously—within at most twenty-one days—been exposed in some house, ship, or locality where the infectious virus which emanates from persons ill of the one or the other of these diseases existed. The spontaneous origin of either malady, far away from an infected locality, is unknown in the naval service."

That the atmosphere forms one vehicle of infection seems clearly proved by some incidents ascertained respecting the last epidemic before it struck this country. I copy them from the *Times* news-

paper for October 15th or 16th, 1865:—"Five miles from Gibraltar stands the little town of San Roque; and San Roque and Gibraltar were abruptly smitten by the plague, not only on the same day, but almost at the same moment. At Gibraltar it was a sudden access of the malady; at San Roque a first outbreak. At a small town near Toulon the plague fell upon the place in the night; and thirty cases occurred simultaneously between evening and morning." (This, let me observe in passing, might possibly, though not probably, have happened from the use of drinking water as a vehicle of the poison.) "At Constantinople it was observed that, while the cholera was raging, all the sea-gulls which used to flit over the waters of the Bosphorus deserted the place, nor did they reappear till the disease had departed and the atmosphere became pure once more."

Compare this with an extract from the *Dublin Morning Register* respecting the first epidemic—that of 1832:—

"A Westport correspondent, upon whose veracity we place reliance, has communicated to us the following extraordinary fact:—In the demesne of the Marquis of Sligo, near Westport House, there is one of the largest rookeries in the west of Ireland. On the first or second day of the appearance of cholera in this place, I was astonished to observe that all the rooks had disappeared; and for three weeks, during which the disease raged violently, these noisy tenants of the trees completely deserted their lofty habitations. In the meantime the revenue police found immense numbers of them lying dead upon the shore near Erris, about ten miles distant. Upon the decline of the malady within the last few days, several of the old birds have again appeared in the neighbourhood of the rookery; but some of them seemed unable, from exhaustion, to reach their nests. The number of birds now in the rookery is not a sixth of what it was three months ago."

A striking proof that the air may be a vehicle of infection—that the poison may enter the lungs with the breath—is furnished by the fact that two pilots took the disease in consequence of having their open boat towed by a ten-fathom rope at a considerable distance astern of the steamship "England," on board of which cholera was raging. They were never on board the vessel. Both of them had cholera, and one of them died of it. Both took the disease home, and transmitted it to their families, near Halifax, where the disease had been unknown for many years.

But although the infection thus proceeding from the bodies or the excretions of the sick, and entering by the lungs the bodies of the healthy, may strike and destroy individuals here and there, it

seems very doubtful whether the disorder can become epidemic, except in certain conditions of the atmosphere.

It appears from the extremely interesting report of Mr. Glashier on this subject, that "the first three epidemics were attended with a particular state of atmosphere, characterised by a prevalent mist" (he is speaking of London and its immediate neighbourhood)—"thin in high places, dense in low. During the height of the epidemic in all cases, the reading of the barometer was remarkably high, and the atmosphere thick. In 1849 and 1854, the temperature was above its average, and a total absence of rain, and a stillness of air amounting almost to calm, accompanied the progress of the disease on each occasion. In places near the river the night temperatures were high, with small diurnal range." He goes on to enumerate, as characteristic of the atmosphere at these periods, "a dense torpid mist; and air charged with the many impurities arising from the exhalations of the river and adjoining marshes; a deficiency of electricity; and (as shown in 1854) a total absence of ozone, most probably destroyed by the decomposition of the organic matter with which the air in these situations is strongly charged."

The ozone here mentioned is endowed, as I told you formerly, with peculiar purifying properties. It has a high oxidising power, in virtue of which it unites with, decomposes, and so destroys miasmata, while it is at the same time itself proportionately destroyed. There is no ground for ascribing cholera, as some have done, to the absence of ozone—except in the sense of there not having been a sufficient quantity of it in the atmosphere to counteract all the poisonous miasm which actually produces that disease. The total absence of ozone affords presumptive evidence of the presence of atmospheric impurities.

A remarkable law of *altitude*, that is of elevation above the level of the Thames, has been announced by Dr. Farr as governing the mortality from cholera in this metropolis; and if here, so doubtless, under similar circumstances, elsewhere. "The elevation," he says, "of the soil in London has a more constant relation with the mortality from cholera than any other known element." The mortality is inversely as the altitude.

This law of altitude—so important and so practically valuable—is but an expression of the result of many concurrent circumstances. The material poison of cholera will be likely to gravitate, as the marsh poison gravitates, with which it has many points of analogy, to the lowest part of the atmosphere; where the high barometrical pressure is the greatest, and vaporous diffusion therefore the least; where unwholesome exhalations from the soil and

from the water are the most abundant; where the dispersing and diluting influence of winds is least felt. Indeed the air may be completely stagnant while on the neighbouring heights a brisk breeze is blowing. The lower regions of the atmosphere are the hotter also as well as the moister; and under the agency of a high temperature the organic impurity with which the air is charged runs more readily into decomposition. The inverse law of altitude is therefore an intelligible law. We see also how it may sometimes be disturbed or broken, under exceptional circumstances.

At the time when Mr. Glaisher's observations were made, the river Thames had become, without metaphor, the common sewer of this enormous and ever-growing town. Foul with the daily and hourly influx of abominable filth, it was offensive to the senses, and a cause of added foulness to the incumbent atmosphere. When we learn from Mr. Glaisher that during the summer months the night temperature of the river is considerably above the minimum temperature of the air, and that its vast area was simmering all night long, and throwing off clouds of noisome and noxious vapour, we need be at no loss to account for the special unhealthiness of those quarters of the town which lie nearest to its banks.

But however unwholesome and pernicious the atmosphere may thus become, it cannot generate cholera, unless the specific exciting poison of that disorder be present also. In the autumn of 1859 the Thames stank horribly; yet we had no cholera. On the other hand, there is good reason, I say, to believe that this poison can never create a spreading pestilence, unless it meets with a congenial atmosphere. The foul air lends force and diffusion to the poison, and aids, or causes, its increase.

Notwithstanding that the choleraic poison in an invisible and impalpable state may thus pervade, and be communicated through, the air, it had long been conjectured, and it is now perfectly certain, that (horrible thought), we may eat and drink the poison, and so obtain the disorder. That, as I shall have to tell you, is the case also with enteric fever; the discharges from the alimentary canal are at once the main outlet for the poison and the chief source of infection. The late Dr. Snow was the first to broach the notion that the poison may be *swallowed* with the food which we eat, or the water which we drink; and that its multiplication takes place within the system, whence, by the alimentary canal, a new and abundant stock of it is voided. He showed how easily portions of the rice-water excretions, colourless and but slightly odorous as they are, may, without our notice, come to adhere to

our food during its preparation, or its consumption. And the horribly disgusting fact had been made too certain by the unchallengeable disclosures of the microscope, that the water which is supplied by the several water companies for domestic purposes to this great city habitually contained visible particles of human ordure. Some striking facts had been collected by Dr. Snow, which warranted the presumption that a most fearful outbreak of cholera in Soho was attributable to the water of a certain pump, contaminated from a neighbouring sewer. A remarkable converse fact had been reported by the late Sir William Lawrence. Bethlem Hospital, and an asylum for children called the House of Occupation, stand near together on an open space of ground between fourteen and sixteen acres in extent, lying in the parish of St. George, Southwark. Being dissatisfied with the filthy water then supplied by the Lambeth Company, the Governors some forty years ago sank Artesian wells on the premises, and the pure water thus procured is used exclusively in the two institutions, which between them number about seven hundred residents. There was not a single case of cholera in the Hospital or in the House of Occupation in any of the first three epidemics; although the disease prevailed extensively in the parish, and in the streets in their immediate vicinity.

The result of an inquiry suggested by the Board of Health into the effects of the consumption of impure water during the second and third cholera epidemics was favourable to Dr. Snow's theory. Mr. Simon reported that "the population drinking dirty water appeared to have suffered three and a half times as much mortality as the population drinking other water."

That cholera may indeed be contracted by drinking a mixture of choleraic discharges and water, is demonstrated with all the force, if not with the reality, of an experiment, by the facts thus stated by Mr. Macnamara, a gentleman practising in India:—"I may mention the circumstances of a case in which the most positive evidence exists as to the fact of fresh cholera dejecta having found their way into a vessel of drinking water, the mixture being exposed to the heat of the sun during the day. Early the following morning a small quantity of this water was swallowed by nineteen persons. (When partaken of, the liquid attracted no attention either by its appearance, taste, or smell.) They all remained perfectly well during the day, ate, drank, went to bed, and slept as usual. One of them, waking next morning, was seized with cholera; the remainder of the party passed through the second day perfectly well, but two more of them were attacked with cholera the next morning; all the others continued in good health

till sunrise of the third day, when two more cases of cholera occurred. This was the last of the disease; the other fourteen men escaped absolutely free from diarrhoea, cholera, or the slightest malaise."

At the time of this remarkable occurrence there was no cholera in the neighbourhood, nor had there been for several years, nor, so far as Mr. Macnamara is aware, has there been since.

Mark here the period of incubation, varying from twenty-four hours to two or three days; mark also that the majority of those who drank the tainted water escaped unhurt; in other words, that some persons take the complaint more readily than others.

The epidemic of 1865-66 has illustrated in a very remarkable way the soundness of Dr. Snow's theory. The prevalence of the epidemic in this country was clearly a step forward in the progress of the malady in its rapid advance from Mecca to Egypt, and thence to various places on the eastern and southern coasts of Europe, and in the basin of the Mediterranean. Mr. Simon lays it down as an axiom to be generally accepted in State Medicine, that "contagions current on the continent of Europe must be deemed virtually current in England." The disorder first showed itself here in the autumn of 1865, as usual at a seaport—Southampton. Then, as usual, it slept apparently for a while, to reappear and diffuse itself, after fresh importations from the Continent, and at its customary rate of increase, in the spring and summer of 1866; when, in the middle of July, there occurred in the eastern part of London an increase of the disorder so sudden, vast, and rapid, as to warrant its being spoken of as an explosion. This outburst was limited to a certain definite and remarkable area, the line of limitation having an obvious relation, not to *soils*, but to *houses*; it was contemporaneous over that area, and stopped short abruptly within and along the line of limitation. It had a week's duration only. Its cause began to act during the week ending on July 14, and ceased to act in the week following. On the sixth day of its increased activity cholera had appeared in every portion of the before-mentioned area; the rate of its increase, as compared with the previous week, was nearly seven times greater than in the rest of the metropolis; while in the subsequent week the rate of increase became virtually the same over the whole of London. It is worthy of remark that there had been no undue prevalence of diarrhoea in the affected area.

This strange and definite outbreak must have had some adequate and definite cause; and, upon careful search, there was found evidence only just short of demonstrative proof—evidence which

I cannot stop to state in detail, but which you may study in the ninth Report of the Medical Officer of the Privy Council—that this local calamity was produced by the temporary distribution to the area in question of unfiltered and infected water from certain reservoirs of the East London Water Company.

The peculiar blue mist which was noticed in the epidemic of 1854 was present also in the last epidemic. Mr. Glaisher says of it: "On some days no trace of the mist has been visible; on other days it has been seen for parts of the day only. It has extended from Aberdeen to the Isle of Wight. This mist increased in intensity when viewed through a telescope; usually no mist can be seen when thus viewed." As in previous epidemics, there was a marked deficiency of ozone in the atmosphere. In other respects the meteorological phenomena were in remarkable contrast with those which had occurred during previous visitations of the cholera, and the law of altitude was broken by the predominance of more powerful influences.

With respect to the mode of propagation of the disease, Mr. Simon uses this strong language:—"It cannot be too distinctly understood that the person who contracts cholera in this country is *ipso facto* demonstrated with almost absolute certainty to have been exposed to excremental pollution. Excrement sodden earth, excrement-reeking air, excrement-tainted water—these are for us the causes of cholera."

He adds: "The local conditions of safety are, above all, these two: (1) that, by appropriate structural works, all the excremental produce of the population shall be so promptly and so thoroughly removed, that the inhabited place, in its air and soil, shall be absolutely without faecal impurities; and (2) that the water supply of the population shall be derived from such sources, and conveyed in such channels, that its contamination by excrement is impossible." And he concludes with the pious hope that "for a population to be poisoned by its own excrement will some day be deemed ignominious and intolerable."

Our knowledge of the *morbid anatomy* of cholera has become more complete and more exact during the last epidemic.

Drawing my conclusions not from any experience of my own, but from numerous and very careful *post-mortem* inspections made by Dr. Parkes, by Dr. Johnson, by Dr. Sutton, and by others, I believe it may be stated as a rule—a rule broken sometimes, no doubt, by disturbing but intelligible circumstances—that in cases of death during collapse, when the examination is made sufficiently early, the lungs are found to be shrunken, light, dry, and pale—in one word, unnaturally bloodless; the left ventricle of the heart is

contracted and nearly empty; its right cavities, the trunk of the pulmonary artery, and the systemic veins, much distended with blood; the mucous membrane of the intestines free from congestion, and pale.

In some of these cases the lungs, though very light in weight, are of a dark colour, which gives them an appearance of congestion. This colour Dr. Johnson refers to a backward engorgement of the *bronchial* veins and capillaries, consequent upon the block in the pulmonary artery and its branches.

When death has occurred during incipient and imperfect reaction, the morbid conditions disclosed by dissection are the reverse of these. The lungs are congested, sometimes even inflamed; and the mucous membrane of the intestines is also loaded with blood.

These are points which bear closely upon the pathology of the disease; and upon its true pathology rests its rational treatment. To these I now turn.

There are two conflicting theories as to the pathology of cholera; and there are two conflicting principles—which accord with and flow from these theories respectively—as to its proper treatment. Upon this momentous problem of treatment, the final appeal must clearly be made to experience.

It is acknowledged on all hands that the primary and special danger in cholera lies in its period of collapse. Now it was a very natural and plausible theory which attributed this state of collapse to a drain upon the blood by the profuse and repeated fluxes from the stomach and bowels, whereby the blood, being robbed of its more liquid ingredients, and made thick like tar or treacle, became incapable of flowing freely, if at all, through its natural channels; and thus the circulation coming ultimately to a stop, life stopped also. And the practice suggested, and put in force, as a direct corollary to this theory, was that of endeavouring to arrest the destructive flux by astringent drugs and by opium, to sustain or urge on the lingering circulation, and to restore the spent strength and the lost animal warmth by alcoholic and other stimulants. Upon similar grounds was advocated the dilution of the thickened blood by water injected into the veins.

It is affirmed, on the other hand, that the condition called collapse is not due to the excessive discharges from the body; that those discharges are really eliminative of the poison, or of the products of the poison, which caused the disease, and are to be permitted, or even encouraged, rather than checked; that to pen the poison and its products within the body is to fight against the conservative forces, and to do what art can do to ensure the mortal

agency of the poison, and, therefore, that astringents and opiates can do no good, but are, on the contrary, positively hurtful.

Were the first-mentioned theory true, there must be a discernible relation between the alleged cause and its effect. The greater the amount of the intestinal discharges, the more certain and the more decided should be the resulting collapse. But no such proportion has, in fact, been observed. Nay, the very reverse not seldom obtains. The most hopeless cases are those of collapse after very scanty discharges, or with no discharges at all.

Again, if the collapse were indeed owing to the drain upon the blood effected through the intestinal discharges, it would be prolonged, deepened and rendered more perilous, by the continuance of those discharges; whereas it is notorious that patients emerge from the state of collapse, and recover, while the evacuations nevertheless go on, and that the cessation of the evacuations during collapse is a fatal sign. "It may confidently be asserted," says Dr. Parkes, "that there is no one who has seen much of cholera who does not know that, exclusive of the mildest forms of the disease, a case with little vomiting or purging is more malignant and more rapidly fatal than one in which these are prominent symptoms."

Tested, then, by the evidence of acknowledged facts, this theory must be pronounced a failure, and the treatment founded upon it a mistake.

In truth, a fallacious analogy has been assumed between the collapse or exhaustion arising from a drain upon the blood and the collapse in cholera. In one single point—namely, the smallness and weakness of the arterial pulse (in other words, the defective circulation of the blood)—the two may seem to touch each other. In almost every other point they differ widely. A person exhausted by loss of blood, or by a long continued drain upon that fluid, is in a state that is very near to syncope. When the exhaustion is extreme, if he assume the erect posture, he faints outright, and becomes unconscious. To walk, to stand, or even to sit up, is simply impossible; whereas, in the collapse of cholera, a patient, with death stamped apparently upon his features, with no pulse to be felt at his wrist, with a blue and icy-cold skin, may be able to walk about the room, and to perform many of his usual functions. He does this indeed at the peril of his life; but the fact that he is capable of such an effort proves that there is an essential difference between cholera collapse and ordinary syncope. The exhausted man, if he recover, recovers slowly; the repair of his impoverished blood is necessarily a gradual process. The cholera patient rallies from his collapse at once, if at all. He may be in full collapse to-day, and convalescent the day after to-morrow, and apparently but

little the worse for the terrible disorder through which he has so recently passed. "I have seen", says Mr. Grainger, "a man stand at his door on Wednesday, who on Monday was in perfect collapse." Again, the way in which remedies tell upon the two contrasted conditions is totally and instructively unlike. The coldness and faintness of exhaustion are relieved at once by a glass of wine or of brandy; the pulse instantly acknowledges the virtue of the stimulus. But alcoholic stimulants do not warm or invigorate, even for a moment, the patient in choleraic collapse; rather, they seem to make matters worse. On the other hand, blood-letting has often brought marvellous relief under collapse; while to draw blood from a person who is fainting from exhaustion would probably ensure his death, and would certainly aggravate his danger. Take the following instances, recorded by Sir Ranald Martin, of the effect of venesection. "On visiting my hospital in the morning, the European farrier-major was reported to be dying of cholera. I found that during the night he had been drained of all the fluid portion of his blood. His appearance was surprisingly altered: his respiration was oppressed; the countenance sunk and livid; the circulation flagging in the extremities. I opened a vein in each arm; but it was long before I could obtain anything but trickling of dark treacley matter. At length the blood flowed, and by degrees the darkness was exchanged for more of the hue of nature. The farrier was not of robust health, but I bled him largely: when he, whom not a moment before I thought a dying man, stood up and exclaimed, "Sir, you have made a new man of me. "He is still alive and well."

The question has naturally been put, "Is it possible to reconcile facts of this kind with the theory that the collapse of cholera results from the loss of the liquid constituents of the blood?" If Sir R. Martin's hypothetical statement that his patient "had been drained of all the fluid portion of his blood" were an accurate expression of facts, can we conceive it possible that he could have "made a new man" of him by extracting largely the blood which remained in the vessels?

The main advocate in this country, and, as I think, the triumphant advocate, of what may be called the evacuant or cleansing practice in cholera, is your present able professor of physic, Dr. George Johnson. To him is justly due the great merit of having established, by his persevering efforts in the face of much opposition and discouragement, the worth and efficacy of that practice, although he was not the first to recommend or to adopt it. It was, in fact, tried, with favourable results, nearly half a century ago, by English practitioners in India; its professed object being that of

getting rid of offensive morbid secretions. The practice thus vouched for by Dr. Johnson is directly in accordance with, and serves to confirm, that view of pathology of cholera which, by a methodical display of numerous facts, and by a process of close and conclusive reasoning, he may fairly challenge as his own. Briefly, he holds, as many before him held, that the phenomena of cholera result from the entrance of a peculiar poison into the blood, where it probably undergoes, like that of small-pox, a rapid process of self-multiplication, and spoils certain of the blood-constituents, which are then ejected through the mucous membrane of the alimentary canal; that the feelings of general oppression and *malaise* sometimes experienced before the onset of the bowel symptoms, are indicative of blood-poisoning; that the copious discharges are expressive of the efforts of nature to throw off a noxious material, and really form, therefore, a necessary part of the process of recovery; and that, if the pouring forth of the vascular excretion be checked (as it can, perhaps, be by opium), the risk of fatal collapse is thereby increased. He declares that the results of his own practice, founded on these views, have amply justified them; and a considerable body of other evidence has now been furnished in support of the same plan of treatment.

It is plain that, if "elimination" be a condition of recovery, the method of elimination is Nature's method, which Art may help or hinder—help by the cleansing method, hinder by the astringent.

In discussing the principle of treatment I have shot ahead of several points in the novel, interesting, and, to my mind, satisfactory exposition of the general pathology of cholera by Dr. Johnson.

Remember the abrupt contrast seen, upon early examination of the body after death during collapse, between the anæmic condition of the lungs, and the gorged condition of the trunk of the pulmonary artery and of the systemic veins. What is the explanation of this sudden arrest of the stream of blood in the small arteries, just before it reached the capillaries? Were the arrest of motion due to gradual thickening in consequence of the continued abstraction of its liquid portion, it would be found stagnating in the capillaries, as well as in the arteries. Bear in mind that one characteristic symptom of cholera—that symptom which, irrespectively of the fatality of the disease, renders it truly a disease to be dreaded—consists in very painful cramps of the larger muscles of the body. These contractions, it may be assumed, are produced by the choleraic poison, just as we know they are producible by the poison of strychnine. Dr. Johnson supposes that a similar spasm or cramped state of the muscular fibres which embrace the minute pulmonary arteries, is caused by the same choleraic poison,

and bars these slender channels against the advancing blood : that the stopcock action which I have so often explained to you, comes here into play. The thickening of the blood is a consequence, and not a cause, of the arrested circulation and the collapse. Precisely the same blood-thickening occurs as a result with long continued, extreme, and fatal apœnea, as I have explained to you in a former lecture.

The true explanation of the fact that mere diarrhœa, however profuse, does not thicken the blood, is probably, as Dr. Johnson suggests, that water is rapidly absorbed by the soft tissues to take the place of that which escapes from the alimentary canal. Acting on this principle of physiological hydraulics, we remove a dropsical accumulation by the action of a hydragogue purgative.

Surely the theory that I have now placed before you seems a reasonable theory. It is founded on a true analogy ; it is consistent with the symptoms noticed during life, and with the conditions discovered after death. We may, therefore, legitimately regard it, until fairly refuted, as a sound as well as a most ingenious and important theory. In truth, it derives strong confirmation from the fact that it unlocks, like the right key, the whole of the pathological intricacies of the disease. Thus the emptiness of the systemic arteries accounts for the extinction of the pulse at the wrist, for the cadaverous sinking in of the eyeballs and falling of the features, for the blueness and coldness of the skin, and for the absence of syncope. The circulation stops, not from debility of the heart, as in exhaustion, but in consequence of a direct mechanical impediment to the onward course of the blood. We can understand the impotence of brandy against this condition ; and how, on the other hand, bleeding may help, both by relaxing the spasm and by unloading the distended right heart, to restore the circulation. Into this explanation Dr. Johnson presses, plausibly enough, the singular effect of the injection of fluids into the veins of their patients. It appears that, to be most influential, the fluids must be hot ; and he concludes that they act partly by diluting the morbid blood, but chiefly by relaxing, through their warmth, the spasm of the smaller arteries. The blood then flows on again, and the symptoms of collapse are for a time removed. Again, the husky whispering voice is owing, not to muscular weakness, but to the small volume of tidal air in the respiratory currents. As but little venous blood reaches the lung-tissue proper, there is but little demand for air to meet and decarbonise it. The respiration accordingly becomes shallow, and the vocal pipe, feebly blown through, refuses to speak. Under the temporary impulse of the warm injections, the voice regains its usual tone and note. Once

more, there are chemical and less obvious changes which receive their explanation from this theory, and further attest its truth. The stream of blood through the pulmonary capillaries being greatly lessened, the supply of oxygen is proportionally reduced in quantity. Hence during the stage of collapse there is defective oxygenation of the blood and of the various tissues of the body, coldness and blueness of the surface, diminished exhalation of carbonic acid, and suppression, nearly absolute, of bile and of urine—carbonic acid, and the chief constituents of bile and urine, being all results of oxidation. That this is the correct explanation of the suppression of bile and urine during collapse is rendered all the more probable by the curious fact that, when a nursing mother becomes the subject of cholera, and falls into collapse, the secretion of milk continues unchecked. Now the chief constituents of milk—casein, sugar, oil, and water—may be obtained from the blood without the addition of oxygen. They are *not* products of oxidation.

If the doctrines advanced by Dr. Johnson be well-founded, as I firmly believe them to be, it must be wrong to dam the choleraic poison and its products within the body. Even when those products have, in one sense, been separated from the system, they may produce highly noxious effects if they remain shut up in the stomach or bowels, there to ferment and decompose. Admitting, as we must, that a minute quantity of the morbid excretions swallowed with water may suffice to produce the disease, a large quantity retained, through weakness or the expulsive powers or otherwise, can scarcely be harmless. Rather may we expect that its expulsion will tend to liberate the patient from danger and discomfort; just as the opening of large abscesses, and the discharge of foul pus and imprisoned gases, are often seen to rescue, as if by magic, a sick man from apparently impending dissolution. Whatever may have been Dr. Johnson's earlier purpose, he does not now propose to *excite* discharges from the mucous surface of the digestive canal; but simply to facilitate the removal of matters lodged there. And this he would do by emetics, by draughts of tepid water or other diluents, or by castor-oil, of which the action is both speedy and gentle. The recommendation of the evacuant plan must, after all, lie in its comparative success, and its worth has already been put closely and extensively to the proof.

In the fiftieth volume of *Medico-Chirurgical Transactions* there is a most instructive communication from Drs. M'Cloy and Robertson. They show that, of 375 cases of cholera admitted into the Liverpool Parish Infirmity in the last epidemic, 161 proved fatal—a gross mortality, under all the modes of treatment adopted, of 42.

93 per cent. Of these cases, 91 were treated with astringents and stimulants, camphor and iced water, applications of ice, and hypodermic (opiate) injections; and the mortality per cent. of these cases was 71.42. 87 cases were treated with castor-oil, and with a liberal use of food and alcohol; and the mortality was 41.37 per cent. 197 cases were treated with castor-oil only, and the mortality was 30.45 per cent. The authors of the paper declare that "recovery never occurred without the continuance of the intestinal discharges; on their restoration, if previously arrested."

The late Inspector of Prisons, Mr. Perry, had charge, in 1832, of the cholera patients in the Marylebone Workhouse. He told me that, though he had no specific notes to refer to, he distinctly remembered that about thirty patients were treated with castor-oil; and that they did better than any of the others.

When I last spoke on this subject in these lectures, I stated that the few recoveries which I had witnessed had all taken place under large and repeated doses of calomel, but that I could not venture to affirm that the calomel cured them. At present, I am much disposed to believe that, by its cleansing action, the calomel may have helped the recovery; and, after all that I have since seen, heard, read, and thought upon the matter, I must confess that, in the event of my having again to deal with the disorder, I should feel bound to adopt, in its generality, the evacuant theory and practice; and to avoid alcoholic stimulants and opiates.

Now, if this theory and practice in respect of cholera be true and right, the practice ought to be right in respect of the associated diarrhoea also; and it is strongly affirmed by those who have largely tried it, that it is right, inasmuch as it is eminently successful. Dr. Johnson avers that he has found it so.

Hear the concurring testimony of Drs. McCloy and Robertson: "Our experience of diarrhoea was very extensive. Several thousand cases came under our observation in the different dispensaries connected with the West Derby Union and in the Liverpool Parish Infirmary. Among these were doubtless many which would have recovered under any mode of treatment, or by the *vis medicatrix nature* alone. But there were many, too, of a most severe choleraic type. The treatment adopted was generally evacuant in its nature; and consisted in the administration of castor-oil, calomel, rhubarb, or magnesia. In every case relief was afforded 'pleasantly, quickly, and safely.' It was but seldom that more than two or three doses of oil were required." The medical officers of the Bootle Dispensary depose to the same effect: "We certainly had less trouble with the evacuant mode of treatment. Our patients seldom gave us a third visit; two doses of castor-oil or

rhubarb mixture being generally sufficient to cure the disease." "We never saw a diarrhoea patient, treated with evacuants from the commencement of his attack, require subsequent removal to hospital. In a large proportion of our cases there was 'premonitory diarrhoea,' which had been treated, often for four or five days, with astringents. Diarrhoea patients undoubtedly recover when treated with astringents; but the recovery is not consequent upon the arrest of the discharges, as these are invariably restored before the patient feels well."

In the face of this and of much similar evidence, I feel bound to say that the rules laid down by Dr. Johnson for the treatment and prevention of diarrhoea and cholera, seem now to me safer and better than the less discriminating advice which heretofore I gave you, "whenever a suspicion arose that cholera was present in the community, not to try, in cases of diarrhoea, to carry off the presumed offending matter, but to quiet the irritation and to stop the flux as soon as possible, by astringents, aromatics, and opiates."

No doubt, the true indication of treatment is, to stop the flux as soon as possible; but this may sometimes be best effected (as also in "crapulous diarrhoea, and in the summer cholera of Sydenham") "by carrying off the offending matter."—*British Medical Journal*.

ON THE ACID DYSPEPSIA OF INFANTS.

By EUSTACE SMITH, M.D., Phys. Ext. to H. M. the King of the Belgians, Phys. to the North-west London Free Dispensary for Sick Children, etc.

Acid dyspepsia is one of the commonest digestive derangements met with in young children, and few infants can be said to escape it altogether. A trifling complaint, and readily recovered from when attended to early and judiciously treated, if neglected it becomes a most serious and obstinate disorder, which may resist all treatment, and may lead to the most extreme emaciation, or even to death itself.

The food taken seems shortly after being swallowed to undergo an acid fermentation; sour gases are evolved, great discomfort is produced, and nutrition is seriously interfered with. The derangement is usually caused by overfeeding with farinaceous foods. It is too commonly the case that these foods are given in enormous quantities—in quantities greater than any infant with ordinary digestive power can by any possibility assimilate. The reason of this reckless feeding is, partly, the mistaken notion which so

universally prevails of the digestibility of these foods; partly the eagerness with which the child himself will swallow large masses of sop; for the griping and flatulence occasioned by the presence of large masses of starchy matters in the alimentary canal will—if not too severe—excite a fictitious hunger which is not easily appeased. An infant of three or four months old, in whom the secretion of saliva is but lately established, or an infant of a yet earlier age, who has no saliva at all, is often fed with a large table-spoonful of corn flour or other farinaceous powder, boiled with milk or with water, four, five, or even more times in the day. The food lies undigested in the bowels, ferments, and a state of acid indigestion is set up, which does not cease with the removal by vomiting and purging of the cause which has produced it. Even a return to a simpler diet is often insufficient by itself to put an end to the derangement; plain milk and water is vomited sour and curdled, and everything taken into the stomach seems to undergo the same acid change.

As this derangement is so easily excited by improper feeding, even in healthy infants, children whose strength has been already reduced by disease, and whose digestive power is therefore lowered in proportion to the weakness of the whole system, are still more likely to be affected by the same cause. On this account acid dyspepsia is a not unfrequent sequel of acute disease in infants, and may, after apparent convalescence from the primary disorder, lead to death by the interference with nutrition and by the exhaustion which it so often produces. The diarrhœa, which is a not uncommon sequence of some of the acute specific diseases, as scarlatina and measles, is often primarily excited by this derangement, and is too frequently a cause of death. Severe operations upon the child, such as that for stone in the bladder, may also be followed by the same complication, for anything which lowers the easily depressed general strength reduces also the digestive power and predisposes to this complaint.

Children brought up by hand are especially liable to this acid dyspepsia, for even when fed upon a suitable diet, carelessness in the administration of the food selected, so that the stomach is overloaded by too frequent or too copious meals, or neglect of the necessary cleanliness, so that they are allowed to take milk which by being put into a sour bottle has already begun to change, will excite this indigestion. Amongst the poor of London it is not uncommon to find a child brought for medical advice sucking at a feeding bottle, of which the intensely sour smell at once discloses the cause and suggests means for the relief of the complaint under which he is laboring.

The earliest symptoms of this derangement are due to the uneasiness produced by flatulent distention and griping pains. The infant is restless and fretful, whining and crying and refusing to be pacified. Large quantities of gas are evacuated both by the mouth and by the rectum, affording at first some relief, and the child becomes quieter until a reaccumulation takes place. At night the griping is exceedingly distressing, and his sleeplessness at this time, by the discomfort it occasions to his attendants, is usually the symptom which assumes the greatest prominence in the mind of the mother, and is the chief reason for applying for advice. The infant, after lying for a time in uneasy sleep, starting, twitching, moaning, frowning, and drawing up the corners of his mouth, suddenly wakes up with a loud cry, and is seized with a fit of violent screaming which resists all efforts to calm him. He throws himself from side to side, jerks about his lower limbs, or suddenly straightening them out in a line with his body, becomes for a few moments rigid as if turned into stone. These attacks of colic are sometimes so severe as to cause great alarm; the child falling into a state of collapse, or being thrown into convulsions, which may be repeated again and again. The ravenous appetite noticed in children suffering from flatulence has already been referred to. This symptom usually disappears as the derangement becomes more marked. Vomiting comes on after a time, the appetite then fails, and the child is thirsty and feverish. Vomiting is at first excited by taking food, but may afterwards occur when no food has been lately taken, and in bad cases may be caused by a sudden movement, or even by a touch, as in wiping the mouth. The vomited matters consist at first of food and curdled milk, afterwards of clear fluid like water; the smell is usually intensely sour. The bowels at first are confined, but after a time diarrhoea comes on, the motions being either pale, frothy, and sour-smelling, or watery and fetid. There may be straining during the passage of a stool, in which case the motions may contain streaks of blood. An eruption of red strophulus, covering the body and arms of the child, is a not uncommon symptom; it may be mixed with urticaria.

An infant suffering from this derangement soon becomes pale and thin. His face assumes a constant expression of fretfulness, which is increased by the furrow which appears, passing on each side from the nose, to encircle the corner of the mouth. The lower eyelid and upper lip are disposed to be livid; the lips twitch, and the corners of the mouth are frequently drawn up, giving a peculiarly plaintive and helpless expression to the face. The fontanelle is depressed more or less deeply, according to the

degree to which the strength is reduced. The eyes sometimes assume a fixed stare, while the muscles of the face twitch, and the thumbs are drawn inwards upon the palms of the hands. These nervous symptoms—well known to nurses by the name of inward fits—are of importance, as being sometimes the forerunners of convulsions. The tongue is at first covered with white fur, through which red papillæ project; afterwards it is apt to become pale and clean, or with little patches of fur scattered here and there over the dorsum. In bad cases the whole body has an offensively sour smell. This smell proceeds not only from the breath, but from acidity of all the secretions; the saliva, the perspiration, and the urine being all intensely acid. The cutaneous secretion is, however, seldom in excess; more usually the skin is dry, and is in consequence harsh and rough to the feel, especially at the backs of the arms and the belly. The feet are generally cold, and the child lies with the knees drawn up to the abdomen. The coldness of the feet is no doubt one cause of the griping pains which are so constant in this derangement, for even in healthy infants abdominal pains are frequently excited by coldness of the feet, and cease when these are warmed. During the earlier periods of this disorder the complexion turns slightly yellow from time to time, the yellow tint remaining for some hours or days. Occasionally the skin becomes completely jaundiced. After the complaint has existed for some time a peculiar earthy tint is noticed of the face and whole body, which is very characteristic of chronic derangement.

If the disorder is primary, and is not soon arrested, a chronic catarrh of the stomach is often set up, the bowels becoming obstinately confined, and the vomiting continuing as a persistent condition. In other cases, again, the derangement may settle principally upon the bowels, leading to a chronic diarrhœa. The most extreme emaciation is often reached through these means, and it may be only after weeks, or even months, of illness that a termination by recovery or by death is arrived at.

When the disorder is secondary to some acute disease, or follows a serious operation, the strength is usually so much reduced by the original illness that the child, weakened more and more by the vomiting and diarrhœa, and by his inability to digest any nourishment whatever, soon becomes exhausted. Thrush appears upon the inside of the mouth, and the child sinks and dies. Pneumonia is a not uncommon complication in the latter stages of the disease, and, if the strength be much reduced, may exist without manifesting its presence by any of the usual symptoms. There is no cough, and the heat of the body is not appreciably

heightened, or if heightened at first the elevation of temperature soon passes off. This pneumonia usually attacks the bases of both lungs.

The earlier treatment is commenced in this derangement the more readily will the complaint be arrested, for as the strength becomes more and more reduced, and the stomach and bowels become more and more disordered, treatment which in an early stage would be at once attended by improvement, loses much of its efficacy, and great difficulty is experienced in making any impression upon the disease.

When the case is seen early, and the symptoms complained of are merely griping flatulence, with ravenous appetite, unaccompanied by sickness or diarrhoea, careful inquiry should at once be made into the diet and general management of the infant. It should be explained to the parents that the appetite will best be satisfied, not by increasing the quantity of farinaceous matter and the frequency of the meals, but by carefully adapting the food supplied, both in quality and quantity, to the digestive power of the child, so that the nourishment given may be only such as the stomach is able to digest. This may seem a simple and self-evident proposition, but it is one which is constantly forgotten. That a child will be nourished in exact proportion to the amount of food he swallows, and that the more solid the food the greater its nutritive power, are two articles of faith so firmly settled in the minds of many mothers that it is very difficult indeed to persuade them to the contrary. To them wasting in an infant merely suggests a larger supply of more solid food—every cry means hunger, and must be quieted by an additional meal. It is difficult to lay down precise rules for diet in every case of this derangement. This is a matter which can be properly learned only by experience. There are, however, certain plain rules which should always be observed. Of these one of the most important is, that farinaceous food is unsuitable to an infant under the age of three months. Before that age he should be restricted entirely to the breast, supposing that the secretion of milk be of proper quality and be supplied in sufficient quantity. In cases, however, where additional food has to be given on account of the insufficient supply of breast-milk, recourse must be had to cow's milk, or the milk of the ass. If cow's milk be used, it should be diluted with a third part of lime-water, in order to prevent the too firm coagulation of its casein. Even, however, when thus diluted and alkalinized, the cow's milk is sometimes undigested by young infants, who seem to thrive better upon the milk prepared with a very small quantity of arrowroot or baked flour. This scarcely accords with the

statement made above, of the unsuitableness of such foods to young infants; but an explanation of the seeming contradiction is found in considering the action of the farinaceous food under such conditions. The arrowroot itself probably contributes little, if anything, to the nutrition of the body, but when thus intimately mixed with the cow's milk it has a mechanical action in separating the casein into minute portions. The curd, therefore, coagulates, not in one large clot, but in a multitude of small clots, which are more readily attacked by the digestive juices. It is, however, as has already been said, always a risk to give farinaceous food to young infants, and the same object may be as readily effected, and without any danger to the child, by adding a small quantity of isinglass or common gelatine to the diluted milk in the proportion of one teaspoonful to four ounces.

In older children, brought up upon artificial food, the above symptoms are often complained of, even although the quality of the food with which they are supplied leaves nothing to be desired. In these cases it is the quantity which is the fault: the child is supplied with food largely in excess of his wants or his powers of digestion, and the stomach and bowels revolt against the burden imposed upon them. For an infant of six months old, one, or for a very robust child two, teaspoonfuls of farinaceous food, carefully prepared with milk, and given twice in the day, are as much starchy matter as he is able readily to digest. His other meals should be composed of milk and lime-water, or the milk and water with isinglass, as directed above.

The kind of farinaceous food is of some importance. Different foods vary very much in the proportion of their several constituents, and the albumen, gluten, salts, &c., they contain are to be considered quite as much as the starchy matter. The very best food is, perhaps, pure wheaten flour slowly baked in an oven till it crumbles into a light grayish powder. This, prepared with milk, and sweetened with milk sugar, forms an admirable morning and evening meal. It may be varied occasionally with other farinaceous articles, but whatever be the food selected, the quantity mentioned must not be exceeded. An alteration in the diet, in accordance with the above rules, a small dose of castor oil, or rhubarb and soda, to clear out undigested matter from the bowels, and the administration of a little bicarbonate of soda or potash, with an aromatic to neutralize any remaining acidity and promote digestion, are all the measures that are required at this stage.

If the derangement have gone on to vomiting and purging, with an intensely sour smell from the breath and from the ejected

matters, other means must be resorted to. In this case the stomach and bowels are filled with the acid products of fermentation, and the vomiting and diarrhoea are merely the forcible efforts of the alimentary canal to expel its irritating contents. Sedatives to the stomach and astringents to the bowels are here out of place; we shall best cure the derangement by assisting the expulsion, and not by obstructing the exit of the fermenting food. In determining, however, the exact measures to be adopted, the state of the child's strength is an important consideration, and this is best estimated, not by the condition of the pulse, but by the degree of depression of the fontanelle. If the fontanelle is not much hollowed, a teaspoonful of ipecacuanha wine should be at once administered, and should be repeated every ten minutes until vomiting be produced. The acrid matters in the stomach having been thus evacuated, half a teaspoonful of castor oil should be given after a short interval, to act gently on the bowels, and the child should be allowed nothing but a little cold, thin barley-water, given occasionally with a teaspoon. At the same time the belly should be kept covered with a hot linseed-meal or bran poultice, and the child, warmly wrapped up, should be kept perfectly quiet in his little cot.

If the derangement have only existed a short time, the above measures will be usually successful in checking the symptoms, and the child will be found to retain the breast-milk, or the milk and water with which he is supplied in small quantities. Any tendency to acid fermentation that may remain should be neutralized by five-grain doses of bicarbonate of soda, given three or four times a day, and the patient may be allowed to return very gradually to his ordinary diet.

When, however, the derangement is of long duration, or is secondary to a severe operation or to some acute disease, the symptoms are not so easily overcome. Here the weakness, as shown by the depressed fontanelle, will not allow very active measures to be employed, and therefore the accomplishment of our twofold object, viz., of removing already formed acid from the system, and of preventing further fermentation, requires the most careful management. Emetics are here out of the question, for the strength will not bear further reduction, and the administration of such a remedy would be attended by the greatest danger. Our first care should be to endeavor to restore the circulation to the extremities, by placing the feet as high as the knees in hot mustard and water. If the weakness be very great, the whole body may be immersed in a mustard bath as high as the neck. It is of extreme importance in such cases to restore the

proper action of the skin, for it is by this means chiefly that we hope to effect the escape of acid from the system. On being removed from the bath the infant should be carefully dried: a hot linseed-meal poultice is then to be applied to the belly, and the child, well wrapped in flannel, must be returned to his cot. The warmth of the surface must be kept up by hot bottles placed by his sides, and the feet and legs should be well rubbed at intervals with the hand alone, or with a liniment composed of equal parts of compound soap liniment and the compound liniment of camphor. If the child can bear the motion, frictions with the same embrocation may be used to the whole body; but in cases where the weakness is extreme and the vomiting obstinate, violent retching may be excited by the slightest movement, so that the frictions would have to be discontinued. In such cases the feet and legs should be wrapped in hot flannels on which some flour or mustard has been sprinkled, and the most perfect quiet should be enforced. A napkin must be placed under the chin, to receive all matters ejected from the stomach, and when moistened the cloth must be immediately removed and a clean one applied in its place.

If diarrhoea exist, astringents are not to be employed so long as a sour smell from the breath and evacuations indicates the continuance of fermentation in the stomach and bowels. For a child of a year old, twenty drops of castor oil can be administered, and will be usually kept down. After its action a simple chalk mixture may be given, or a draught containing five grains of bicarbonate of soda, with three grains of nitrate of potash, in some aromatic water, three or four times in the day. Half a drop of tincture of capsicum is a valuable addition to each dose of this mixture.

If there is constipation, the bowels must be opened by an enema containing castor oil, and be kept in regular action by the occasional administration, as required, of one or two drops of a solution of podophyllin in alcohol (a grain to the drachm), or by suppositories of castile soap placed in the rectum.

The form of nourishment to be given in these cases is of the utmost importance. All matters capable of undergoing fermentation must of course be excluded. Even milk itself, however diluted and alkalinized, can seldom be borne, as it is usually vomited sour and curdled immediately after being taken. Women's milk is usually well digested, but not always. In some cases it seems to agree as the milk of the cow; in others, where the irritability of the stomach is very great, the mere movement of the mouth in the act of sucking may be sufficient to excite a

return of the vomiting. If this be found to occur, the breast-milk should be given with a teaspoon. In cases where a return to the breast is impracticable, or is not followed by the expected improvement, a good food is whey, made fresh as required by adding prepared rennet to cow's milk in the proportion of a teaspoonful to the pint. To two tablespoonfuls of the whey add one tablespoonful of fresh cream, and dilute with two tablespoonfuls of hot water. Of this food small quantities can be given at regular intervals, and care must be taken that it be either hot or cold, but not tepid, as liquid food given in a lukewarm state would be apt to favor a return of the vomiting. Liebig's food for infants, carefully prepared with freely diluted cow's milk, will often be borne; but in very bad cases it is inferior to the diet just described. In addition, the waning powers of life must be supported by five-drop doses of pale brandy, given in a teaspoonful of the food every hour, or even oftener, according to the condition of the fontanelle.

By such measures success is often attained even in the very worst cases of this derangement. The obstinate vomiting is best arrested not by sedatives, but by giving the stomach as much rest as is consistent with supporting nutrition. Of all special drugs, calomel in doses of one-eighth or one-sixth grain, laid dry on the infant's tongue, is perhaps the one which is the most generally successful; but our chief reliance should be placed on a careful diet, and on stimulating and not applications, so as to promote the circulation and encourage the free action of the skin. The existence of cold feet alone would be a sufficient obstacle to the success of any treatment whatever.—*Amer. Journ. of Obstetrics*, p. 597.)

A CASE OF HEREDITARY EPILEPSY CURED BY BROMIDE OF POTASSIUM.

BY HENRY K. STEELE, M.D., DAYTON, OHIO.

November 19, 1866, I was called to see Miss E., aged about 15, who was suffering for the first time from an epileptic paroxysm. She had recovered from the attack when I reached the house. Her catamenial period had just commenced, and the flow was still on her. I prescribed a solution of bromide of potassium, ten grains three times daily, with directions not to omit it until I gave permission. On the 29th of May, 1867, almost six months afterwards, I was again called to see her. I learned that having presumed she was well, she had omitted the medicine for three weeks, and was now undergoing a second epileptic paroxysm.

-I repeated the prescription, impressing upon her the impression of continuing it; which she has done to the present time, a period of two years and almost four months from the date of the last attack, without the omission of a single day, and without the recurrence of the paroxysm.

It has been suggested that after fifteen or sixteen months' exemption from the disease a cure might be considered effected, but I have not thought advisable to follow that suggestion, although emanating from so distinguished a source as Dr. BROWN-SÉQUARD; on the contrary, in May, 1869, after an uninterrupted continuance of the remedy for two years, I added five grains of the bromide of ammonium to each dose, believing that the system having adopted and appropriated as part of its natural sustenance the bromide of potassium, it might require a little more of the bromide as a counteracting tendency to the disease. She still continues the prescription, therefore, as increased last May.

The mother of this young lady, whom I saw frequently, was attacked with epilepsy about the same period of life her daughter was. The attacks were not controlled, but became gradually more frequent and violent; insanity followed, and she died in an insane asylum, the epilepsy continuing to the close.—*Amer. Journal of the Med. Sciences.*

THE CLIMATIC TREATMENT OF CONSUMPTION.

The *Practitioner* concludes a review of recent publications on the treatment of pulmonary phthisis with the following "brief retrospect of the progress made, on the whole, towards a clear idea of the best way of treating consumption:"

1. It seems difficult to doubt any longer that the circumstances, whatever they are, which prevail in certain mountain valleys offer a more complete immunity from phthisis to the natives, and a better chance of cure to phthisical visitors, than is afforded by any other mere climatic influence whatever. It also appears very doubtful whether the influence really is climatic merely, and quite certain that it, at any rate, is not regularly proportionate to the mere degree of elevation of the district.

2. It is nevertheless impossible to suppose that all the benefits have been attributed to warm southern climate which were imaginary; on the contrary, there is scarcely a practitioner who has not seen the greatest benefits accrue from sending consumptive patients to climates which, compared to their own, may be called, on the whole, decidedly mild and equable. Note here, however, two points. With very few exceptions those climates which have been

popularly associated with this idea are, in reality, both much less mild, and much less equable, than the majority either of patients or even of medical men are accustomed to think, until they have had personal experience. And secondly, those who are in the habit of analysing results with care have often noted this singular fact—that patients who have returned from wintering at such places, where they had expected to be bathed in the luxury of the *ideal* “Italian” climate, complaining bitterly that they have been starved with cold, and really giving evidence in some particulars of apparent increase of catarrhal mischief for the time, do nevertheless appear after a short interval to show the unmistakable influence of their winter sojourn, unpleasant though it has proved to them.

3. A more important practical observation than any other, except that of the influence of elevated health-resorts, is the discovery of the extraordinary value of *long sea-voyages*, which, during the last few years, has been increasingly impressing itself on the medical mind. It is, perhaps, not too much to say, that we are now certain the voyage itself was the only really beneficial agent in the otherwise mistaken and disastrous practice of sending consumptives to Madeira.

4. The kind of alimentation and medication which alone are useful is now pretty well settled; the only question which remains open being the degree of development that may be given to the use of certain metallic tonics, especially arsenic, which seems to offer the good results of iron *plus* an unknown, but probably very valuable, influence on the nervous centres.

5. The question of the kind and amount of physical exercise to be enjoined or permitted offers serious difficulties: but it also, so we think, promises to shed indirect light on the general climatic question. It is, on the one hand, known that great benefits often result from the mere influence of the free use of open-air exercise, independent of temperature or the other features of climate. It is, on the other hand, loudly protested by some of the most experienced practitioners, * that nothing more frequently ruins a patient's chances of recovery than the incurrence of muscular fatigue. Now let us turn to the instances of long ship-voyages, a mode of treatment which is quite indisputably successful in a great number of cases—does it not strike the reader forcibly, on reflection, that one most important circumstance of ship board life is its *lazy, effortless monotony*, giving nearly perfect *rest*, if one

* We may mention that Dr. Burslem of Bournemouth has particularly enforced this view, in conversation with us.

may say so, to both bodily and mental muscles? Now, the other grand feature of life on a ship is the *constant and copious inhalations of air free from organic impurity* and charged only with matters (especially, perhaps, chloride of sodium) which are directly beneficial to nutrition and general health. Does it not seem as if there were, after all, a common measure, discernible if not completely definable, to all the various plans of hygienic treatment for consumption which of late years have commanded any wide support from medical men? It appears to us that we may tabulate side by side the elements of equal success from either of two modes of treatment:

1.	2.
Prolonged residence in a high but fairly sheltered mountain valley.	A prolonged ocean voyage.
Free carriage exercise, little or no walking.	Free exposure on deck, only gentle and slight walking exercise.
With, of course, all proper precautions about warm clothing, and the avoidance of draughts indoors.	Same precautions about sufficient clothing, and avoidance of draughts, getting chilled with wet clothes, &c.

If this view be ultimately justified by larger experience, it will then, we think, be obvious that by either of these two plans we offer, in a regular and necessary manner, all those advantages which are only partially and in an uncertain and fluctuating way offered by the fashionable health-resorts of which the Riviera may be taken as the type; and that there is no evidence that the latter really possess special advantages of their own. The copious inhalations of an air comparatively free from organic impurities very probably accounts for five-sixths of all the benefits received at such places; and to the pleasing novelty of a foreign residence we should be inclined to attribute the rest.

ON HYPODERMIC INJECTION OF MORPHIA.

BY GEORGE OLIVER, M.D., London.

I am glad the question of hypodermic injection of morphia has been raised by so excellent an authority on the subject as Dr. Allbutt. I have met with two undesirable results from hypodermic morphia: one connected with the oft-repeated use of the injections, the other with the operation itself. But after all, I think these objections to the hypodermic use of morphia are as nothing in the scale against the benefits conferred by this mode of treatment.

I. A craving for repetition of injections—mainly because of apparent or real benefit from them—with toleration of increasing doses of morphia; and after a time, great misery, and, to all appearance, considerable physical exhaustion, when the injections are withheld altogether, or the dose of morphia much reduced. This effect of the continued hypodermic use of morphia has no doubt been noted over and over again; it is evidently akin to the opium-habit; but, unlike this, it is not attended by derangements of the gastro-intestinal tract; on the other hand, it not unfrequently does good to the stomach and bowels, and, above all, to the circulation; the feeble frequent pulse, for instance, not unfrequently opens up, and becomes firmer and less frequent; of course, hypodermic morphia by cutting off (at any rate very considerably) the baneful influence of pain on the heart and stomach may, on the principle of rest and ease, in great part produce these tonic effects. But against them we have the setting up of a morphia-habit, and, as suggested by Dr. Allbutt, the possible—nay, in some cases, probable—perpetuation of pain by oft-repeated injections of morphia, when resorted to as the sole method of medicinal treatment. I suspect it will be shown, by those practitioners who have had large experience of the hypodermic use of morphia, that this mode of treatment does tend to perpetuate pain in certain cases. I believe these will fall chiefly under that class of patients suffering from obstinate chronic neuralgia; in fact, the very class for which hypodermic morphia was at first thought of specially as the cure. A prominent instance is presented in intractable menstrual neuralgia—neuralgic dysmenorrhœa. I have met with more than one instance of this kind of suffering which clearly supported the position, that one effect of morphia was to greatly aggravate the intensity of the periodic pain. Except in the very worse cases of this kind, when it may come to a balancing of evils nearly equal, I should refrain from prescribing the injections of morphia, even in very small doses, because of the danger of these leading on to larger and larger doses, and of a progressive increase of suffering proportionate thereto, when the time came for the reduction of dose, and, in particular, when we must abandon the injections altogether.

But, on the other hand, I am convinced there is another important class of cases, though smaller than the foregoing, in which we may secure all the good out of morphia (alleviate pain and improve the general health), set up a morphia-habit, and then get safely over this habit by firmly withholding the morphia, and yet retain the good results—absence of pain and restoration of health. The cases I refer to are such as are apt to run a lingering course,

with pain the principal element of trouble, and even of danger to the patient's life, affecting some part (*e. g.*, some of the abdominal viscera) which clearly needs much a rigid application of the principle of rest and ease, so as to give nature the most favorable opportunity of restoring some damage done, of effecting her own cure, which she is unable to do while the part is in a state of irritation, and perhaps of undue activity. Here hypodermic morphia may help us much in the cure; it may secure the intelligent end of rest for long periods; beside the temporary alleviation of pain far better than any other means at our disposal; and the rest and ease are not for the patient's comfort only, but also for his cure. In such cases pain is not perpetuated by hypodermic morphia; it diminishes day by day until it is quite gone, and when the morphia is given up—if the cure of the affected part be complete—it does not return. This may be best illustrated by a case of which the following is a brief outline:

Mrs. R., aged 32, when in her usual health, stout and robust. A week or two after her first confinement, which was in every respect easy and natural, she was seized with what appeared to be an attack of ordinary typhoid (this fever had been in the house adjoining a few months before; the drains were altogether very unsatisfactory; into her bedroom drain-effluvia entered; and drinking water was taken from a well within a few feet of the ordinary drain, privy, and ashpit); but there were no spots. Toward the end of the fourth week she had most troublesome bowel complications—tympanitic distention, severe paroxysmal pain, etc., which really for a time threatened her life, and from which she only recovered imperfectly. She got about the house after a while, the abdomen still a little blown. In a week or two paroxysms of most severe pain within abdomen came on, accompanied by very loud rumbling and bubbling sounds, and she completely broke down. The abdomen was tympanitic; nowhere could I detect dullness or any indications of fecal accumulation. Pressure of hand over umbilicus produced great pain, which appeared to be connected with vermicular contraction of bowels, and this could be seen travelling across the abdomen, and setting up loud rumbling. Every now and then severe pain came on without any external exciting cause. Obstinate sickness would last for hours together. There was great uncertainty as to the kind of lesion, the cause of all this trouble; but there was much evidence to support the theory of obstruction, and, in fact, the pathological reading of the symptoms could only come to this. Enemata and aperients were resorted to on the slender hope of there being fecal accumulation, but these means were tried with a doubting

mind as to whether they might not do harm to the bowel possibly distressed by some pathological lesion. The result of this treatment was far from satisfactory; and I was led again to give aperients only at the request of a practitioner of great experience whom I met in consultation, and the symptoms were again so much aggravated by them, that I was compelled for the patient's safety to relinquish them as positively harmful. Then sedatives by mouth and rectum were diligently tried; suppositories per rectum had, however, little chance of doing much good, because there was great relaxation of the sphincter ani. Then for a while I gave up all medicinal treatment. The patient's condition became daily worse and worse—vomiting and pain more severe, emaciation extreme, pulse from 120 to 150, very small, face pinched. Though we only got an evacuation now and then, still it seemed every day more and more clear that to give rest and ease to the distressed bowel was the correct thing to do in the way of treatment, and all hope of a successful issue seemed to center in that. At last we determined to rely entirely on the hypodermic injection of morphia night and morning. The severe pain and loud rumbling (which before the injections had been almost constant) at first gradually diminished in intensity, and these, in the course of a week or two, entirely ceased after every injection, but still frequently returned toward the time of the next injection. It was clear we were gaining ground, and we had at last got rest to the bowel. As the night and morning injections were continued, it was most interesting to observe how the tongue cleaned and the vomiting ceased, how food began to be tolerated by the stomach, how the appetite returned day by day, how the pulse enlarged in volume and became more and more reduced in frequency, how the previous constipation gave way (without any treatment specially addressed to it), and, as a result of all this, how the flesh and strength came back. Progress dated from the time the irritated bowel got under the influence of hypodermic morphia. In the course of a few weeks it was observed that the omission of only one injection at the usual time caused the patient to pass several miserable hours—not so much from pain in abdomen, though this was still felt, as from a feeling of great prostration, as if because of the withdrawal of an accustomed stimulant. Being fearful lest my patient, imperfectly cured, should, without the injections, relapse into something like her previous state, and seeing how useful the morphia appeared to be as a tonic, I advised the night and morning injection to be continued. This was done for two months, and then she had one injection daily for three months more. She now being quite restored to her usual health,

health, the only remaining thing to do was to withhold the injections, and this involved a struggle. I sent her away without her syringe (she injected herself), and she passed a few very miserable days, and got over it without further trouble. I might have stopped the morphia before this, but it appeared to me it brought back her health far more quickly than any other tonic I could have prescribed.

I look upon this case as a triumph for hypodermic morphia; without it I fear my patient would have died. But beside this bright side, the case shows there is undoubtedly such a thing as morphia habit, which may, however, be overcome without harm resulting.

I relate this case for the purpose of insisting on the fact that medical cases *now and then* appear, which may be best treated even for long periods by hypodermic morphia alone; and chiefly because this is perhaps the best medicinal means the physician has for carrying out efficiently the valuable principle of rest and ease to excited and irritated parts, so as to put them into a state in which natural restoration is favored, and to shield the nervous system, and the heart in particular, from the depressing influence which they are apt to exert upon these important organs. I have found that pain and unrest of the viscera—parts supplied by the sympathetic system—are very susceptible to the control of hypodermic morphia; and when doses of this remedy are repeated often enough, and for a sufficiently long period, it forms no small item in contributing to the restoration of the affected part—if repair will go on at all—and of the patient.

Then, of course, as everybody knows, there is the class of recently established neuralgiæ—*e. g.*, sciatica in particula—which, even when rather obstinate to ordinary treatment, often gives way under hypodermic morphia alone, and this does not in any sense perpetuate pain even when the treatment must be pushed on for some time.

II. Alarming symptoms may arise from the injection of morphia directly into a vein. This accident must be of rare occurrence; yet it should be kept in mind. I have only met with (what I suppose was) one instance. Immediately after the morphia was turned on, the patient cried out with an expression of great alarm, eye-balls prominent, face very red, pulse extremely small. Brandy was given freely, and all came right in about half an hour. The patient told me afterward something shot to the head like lightning the instant the injection took place. On withdrawing the syringe there was a good deal of hemorrhage. The patient had had several injections before without any untoward results. I

have thought of the possibility of sudden death from the injection of morphia into a vein. Might not some of the deaths which have followed the hypodermic use of morphia be referred to this cause? To avoid such a serious risk, we should keep from parts freely covered by superficial veins, and insert the syringe perpendicularly to the surface, and not in a slanting direction under the skin, so as to avoid running the needle along the longitudinal axis of a vein.

REDCAR, December, 1870.

Midwifery.

CAUSE OF THE OCCURRENCE OF LABOR AT THE CLOSE OF THE NINTH MONTH OF UTERO-GESTATION.

Prof. Alexander R. Simpson, in his introductory lecture (*Edinburgh Med. Journal*, Dec., 1870), gives the following explanation of this: "Since the true nature of the decidual membrane came to be fairly understood, it was natural to seek in the changes which it undergoes for an explanation of the cause of the occurrence of labor at the close of the ninth month of utero-gestation. The search has not been fruitless. For it has been found that in the natural course of development, the decidual membrane at this period has undergone a degree of fatty degeneration which has brought it to the last stage of its existence, when it would either require to be melted down and absorbed, or be thrown off as a foreign substance. The same change occurs in it at an earlier date, if through some disease, an end be put to the life of the fetus, and in such a case expulsion of the dead child does not take place until the time has been given for the degeneration to occur in the decidua, which leads to its being loosened from the uterine parietes and reduced to the condition of a foreign body. The observation of this phenomenon has led by a beautiful induction to the employment of the simplest, safest, and surest means of bringing on labor, by imitating the process of nature and producing an artificial separation of the membrane from the interior of the uterus in those cases where, to save the life of the child and to lessen the mother's risk, it is found needful to induce the labor prematurely.—*Med. News and Library.*