

a dislocation of the spine in the dorsal region, probably dislocation posteriorly of the eighth dorsal vertebra. An attempt at reduction with the hands while the patient was under chloroform failed. Only a moderate amount of force was used. An application of equal parts of whiskey and water was made to the swelling upon the back and one-half grain doses of morphia, pro re nata, to relieve pain were ordered.

On the following day, the swelling had considerably subsided and legs could be moved with much more freedom. On the fourth day after the accident, patient had gained entire control of his lower extremities, but suffered considerable pain in them, especially in ankles. He was not able, however, to turn from side to side in bed without assistance. From the fourth to the eighth day patient was improving slowly in strength and appetite. On the ninth day, he could turn himself in bed without aid. Tenderness over the dislocation was slight, though considerable pain existed over all the lumbar region. Pulse was 84 and rather weak. Tongue was dry, glazed and red, without coating, an appearance it had exhibited since the second day after the injury.

Improvement continued to be gradual up to the nineteenth day, at which time patient became stupid, and mental aberration existed to some extent. Pupils appeared to be unnaturally enlarged; head quite hot; pulse 96 per minute. These last-mentioned symptoms continued two days, after which time progress towards recovery was steady and uninterrupted.

On the twenty-fifth day, patient was able to stand on his feet a few moments; on thirty-sixth day, could walk about his room a little; could not stand perfectly upright.

On May 2d, 1871, seven and one half months after the accident, I saw the patient and examined him. He was able to perform only light work at that time; carried a pail of water with some difficulty; assumed a slightly stooping posture when walking; very thin in flesh. The prominence on the back continued, apparently rising one inch and a half above the surface.

It is remarkable that a dislocation of the spine so complete should terminate in recovery. Seldom does such a severe dislocation of the spine occur without causing a larger amount of paralysis. In fact, it may almost be said that no paralysis whatever existed, for, half an hour after the accident, the patient had control over all his extremities; could move his legs in any direc-

tion, although very slowly and with great difficulty.

The treatment of this case and its termination in recovery show the appropriateness of the advice usually given in cases of dislocation of the spine, to observe a "masterly inactivity" and use no severe measures in attempting *reduction* unless the symptoms are urgent and threaten life.

The word probable is used at the head of this article because the diagnosis is a matter of some uncertainty, and will remain so until death permits an ocular examination. That either a dislocation or fracture or both occurred at the time of the accident is not a matter of doubt. A hard, bony tumor of the magnitude described suddenly appearing over the line of the spinal column, and caused by violence, points irresistibly to one or both of the results above mentioned. The nature of the accident favors the probability of a dislocation. The usual method of fracturing the spine is by the use of some powerful crushing force which acts directly upon the part fractured. In this case, the force was not applied directly to the injured part, but to the upper part of the spine.

Selected Papers.

THE THEORY OF DISINFECTANTS.*

By T. P. BLUNT, M.A., F.C.S.

THE light which has recently been thrown upon the nature of contagion and infection by the labors of Pasteur and others, the results of which have been ably summarized by the President of the British Association in his late inaugural address at Liverpool, seems to point the way to clearer and more comprehensive views than those commonly entertained at present regarding the operation of the substances known as disinfectants.

These may be divided into two classes:—
1. Those which act by the oxidation and total destruction of the virus contained in infected matters, together with the foul gases which usually accompany it, and which are, in fact, nature's danger-signals of its presence. 2. Those substances which do not possess the active chemical properties of the first class, yet are proved by experience to have a similar power of arrest-

* Read before the Annual Meeting of the Shropshire Scientific Branch of the British Medical Association.

ing and checking the spread of infection. The latter are, for the most part, the more ancient and popular, having apparently in some cases been suggested by a just but unreasoning instinct. Thus we find that the use of sulphurous acid, as evolved from burning sulphur, dates even from Homeric days; while the burning of pitch and aromatic gums for disinfectant purposes has an origin at least equally remote.

An attempt will be made, in the course of the observations which follow, to bring the operation of the large majority of the latter class under a general law which shall furnish us with an explanation of their true character. This is especially desirable, since it is to be feared that, for want of such an explanation, many good and valuable disinfectants have been condemned by chemists, on theoretical grounds, as mere deodorizers—not assailing the virus of infected substances, but rather masking their poisonous character by precipitating their offensive gases. An objection to this view at once meets us, in the utter disproportion between the volume of the gases to be fixed and the quantity of salt practically found sufficient for the object required, while it breaks down altogether when applied to such disinfectants as the new "chlor-alum" or chloride of aluminium of Mr. John Gamgee, or the well-known carbolic acid. Before endeavoring to supply a more probable theory, it may be well to remind you that the researches already mentioned have established the fact that contagion and putrefaction, if not actually identical, are processes so closely allied that they require exactly similar conditions; the latter appearing to consist of a kind of disease propagated from particle to particle of a decomposing substance, and ending in its entire destruction. Hence it may be inferred with perfect safety, that any agent which arrests putrefaction is capable also of abolishing the properties of contagion and infection.

This conclusion at once puts into our hands a valuable instrument of research; for while it is difficult, and often impossible, to investigate directly the disinfectant action of a substance, the inquiry being surrounded by innumerable sources of error, the properties of an antiseptic are perfectly well defined and open to the clearest demonstration. Thus, in the case of the two bodies mentioned above, carbolic acid and chloride of aluminium, the antiseptic action of the first is well known, and has long been usefully applied; while that of the latter is maintained in the most positive

manner by its introducer, Mr. John Gamgee, who certainly brings forward overwhelming proof of it in his recorded experiments upon meat and fish; and hence, on the ground given, we are justified in regarding these substances as good and useful disinfectants. It may be stated, in passing, that the deodorizing power which these and other similar bodies possess is probably due to their antiseptic action; the offensive gases of decomposition being sooner lost by diffusion, and their fresh production being entirely suspended.

Let us now proceed to a consideration of the origin of the remarkable properties which we have described. This appears to have been traced with some degree of probability, in the case of carbolic acid, by Dr. Joseph Hirsch, the writer of an article which appeared in the *Chemical News* about the end of February, 1869. He advances the bold and ingenious speculation, that the disinfectant action of that substance depends upon its power of coagulating albumen. He supposes that the acid finds its way into the minute organisms, which propagate disease by diffusion through their investing membrane; that it coagulates the albumen which they, in common with all germinal matter, contain as a necessary constituent; and thus practically destroys their vitality as perfectly as immersion in boiling water terminates that of an egg.

In order to test the accuracy of the view thus enunciated, I selected a substance of which the albumen-coagulating power was well known, and examined it with regard to its antiseptic and, therefore, disinfectant properties. The substance chosen was nitromuriatic acid, which has long been in use as a test for albumen in urine. The experiments were conducted as follows:

1. Two samples of fresh healthy urine, passed at the same time, each measuring about one ounce, were placed side by side. To one of them six drops of strong nitromuriatic acid were added. In a few days, the unacidified specimen was covered with a thick crust of mould; while that to which the acid had been added was unaltered, except by a slight darkening of color and deposition of crystals of uric acid.

2. Some fresh meat was pounded into an emulsion with water—the whole divided into two equal portions of about six drachms each. To one of them six drops of strong nitromuriatic acid were added, as in the former case. In a day or two, the unacidified sample was quite putrid and offensive; while that to which the acid had been added retained the smell of fresh meat, and

continues to do so still, after the lapse of nearly a month.

I now proceeded to test some of the salts commonly used as disinfectants, with respect to their possession of this power of coagulating albumen. The examination was conducted thus: One part of the salt to be tested was dissolved in one thousand parts of distilled water, and the solution was mixed thoroughly with the fresh white of an egg. The salts examined were iron-alum, sesquichloride of iron, common alum, chloride of zinc and nitrate of lead. Coagulation followed immediately in every instance. In one or two cases the dilution was carried much further—one part of the salt to three or four thousand of water. Here, too, coagulation followed in one or two seconds.

It may be remarked, in passing, that the hæmostatic action of the iron-salts is probably to be attributed in great measure to this faculty of coagulating albumen, exercised upon the serum of the blood.

The attempt to obtain similar results from the sulphites entirely failed. They appeared, indeed, to retard coagulation by other reagents. The coagulating power of sulphurous acid was faint and ill defined.

If we review the evidence now before us, we shall find that it stands thus:—

We start with two assumptions—the first justified by recent research, the second borne out by analogy, viz., that infection results from the transference and development of minute germs; and that these germs contain albuminous matter as a necessary constituent, the coagulation of which terminates their existence. Upon these assumptions we frame our major premise—that “all coagulators of albumen are disinfectants;” and, having arrived at this result by a process of pure reasoning, we proceed to prove its truth by experiments upon the antiseptic, and so upon the disinfectant, properties of a well-known albumen-coagulator. Having thus established our fundamental proposition, we produce experimental proof of our minor premise—that “nearly all the substances to which popular experience has assigned the property of arresting the spread of infectious diseases, where that power is at present unexplained, are coagulators of albumen.” The conclusion then necessarily follows, that these substances are disinfectants; and thus a vindication of their efficiency is furnished in those cases where it has been called in question by chemists on the ground that no sufficient explanation of their action has been offered.

The above conclusion does not apply to sulphurous acid and the sulphites. In their case, we must probably look for some more remote physiological effect upon germinal existence.

Note on the Use of Hydrochloric Acid as an Antiseptic.—It is probable that hydrochloric acid, which shares the properties attributed to nitro-hydrochloric acid in the foregoing remarks, will be found to be a valuable preservative of animal food. A piece of meat, immersed for fifteen minutes in a mixture of one part of the acid to three of water, remained entirely free from putrefactive change after nearly a fortnight, though the action of the acid was not sufficiently powerful to prevent the appearance of a small quantity of mould. The meat was then immersed in a dilute solution of carbonate of soda, and the superficially absorbed acid was thus converted into common salt. This reaction obviously gives hydrochloric acid a great advantage over other antiseptics, which introduce into the food a foreign substance, inimical by its very nature, in most cases, to the process of digestion.—*London Pharm. Journ.*, July 22, 1871, from *The British Med. Jour.*

A CASE OF CÆSAREAN OPERATION, SUCCESSFUL TO MOTHER AND CHILD.

By J. WALTER HILL, M.D., of Edgesfield, S. C.

On the 10th of October, 1869, I was called at night to Margaret Gray, a colored woman of pure race, about thirty years of age, married, five feet high, well formed, in good health, and in her second labor. She had been in labor fifteen hours, and informed me that twelve years previously she had a difficult labor, which lasted for six days. I was unable to learn the cause of the protracted labor, but upon examination the result was shown, in total destruction of the perineum, in contraction of the vagina to a degree which precluded a digital entrance, and by a firm, tense, unyielding membrane of cicatricial tissue, about one inch from the ostium vaginae. Upon more careful exploration, I found an orifice in this cicatricial membrane which admitted a No. 10 bougie; an adhesion of the urethra half an inch from the meatus, which made it impervious, and prevented the introduction of the catheter, and in addition a vesico-vaginal fistula. There was no deformity of the pelvis. The woman stated that immediately following her last labor there had been a constant flow of urine, over which she had no control.