

other disinfectants. I have used it largely for the disinfection of the vaults of churches, where the atmosphere has been so charged with offensive and dangerous organic vapors, let loose from the contents of the decaying coffins, that the workmen could not enter the vaults with safety. In this manner all the vaults of the city churches have been disinfected, and the contents of them put in order and covered with fresh mould. I have found also that chlorine is best suited for the disinfection of rooms where, as is the case with the poor generally, the occupant cannot be removed for a thorough cleansing; and I have employed it with great advantage in places where persons have been sick with fever, scarlet fever, small-pox, and cholera. The process which I adopt is the following: About a teaspoonful of the black oxide of manganese is put into a teacup, and there is poured over it, little by little, as occasion requires, about half a teacupful of strong muriatic acid (spirit of salt). In this manner the chlorine is gradually evolved, and the action is increased, when necessary, by stirring the mixture, or by putting the teacup upon a hot brick. As chlorine is heavier than atmospheric air, it is best diffused through the room by putting the mixture upon a high shelf. The quantity of chlorine thus diffused should never be sufficient to cause irritation to the lungs of those who occupy the room, and yet it should be sufficient to be distinctly recognizable by its odor. If it be properly managed, the chlorine may be thus diffused through the atmosphere of the room, even during its occupation by the sick.

2. *Chloride of Lime* has been very largely used in the city during the recent epidemic of cholera. The inspectors have sprinkled it upon the floors of the houses occupied by the poor, and have scattered it about the cellars and yards. In some cases, it has been used with water for washing the paint-work and the floors of rooms. Altogether, indeed, with an average staff of 45 men, we have used rather more than 7 tons of chloride of lime in this manner in disinfecting every week about 2,000 of the worst class of houses in the city, and the results have been most satisfactory.

3. *Carbolate of Lime*, which is a mixture or rather a chemical compound of carbolic acid and lime, has been used in many cases where the smell of chloride of lime or its bleaching action has been objected to. It has been used by dusting it by means of a dragger over the floors of rooms and cellars: but as the disinfecting power of this substance is destroyed by chloride of lime, it is of great importance that they should not be used together. The carbolate of lime which we have employed contains 20 per cent. of carbolic acid. It is essential that this should be its minimum strength, or its power is not sufficiently efficacious. The strength of it may be ascertained by treating 100 grains of it with sufficient muriatic acid, diluted with its own bulk of water, to dissolve the lime, when the carbolic acid is set free, and floats upon the liquid; this, when collected, should weigh 20 grains at least. The advantage of carbolate of lime is its continuous action; for the carbonic acid of the air slowly lets loose the carbolic acid, which diffuses itself through the atmosphere in sufficient quantity to act as a disinfectant, and it does not destroy the color of clothing.

4. *Carbolic Acid* has been used as the sole agent of disinfection for privies, drains, and sinks, and for the sewers and the public roads. In the former case it has been used in its concentrated state by pouring it at once into the privy or drain, but in the latter case it has been diluted with about 2,000 times its bulk of water and sprinkled by means of the water-carts upon the public way. In this manner about 1,000 gallons of carbolic acid have been used in the city thoroughfares; and the acid getting into sewers, we have observed that the usual decomposition of sewage has been arrested, and instead of a putrefactive change with the evolution of very offensive gases, the sewers have been charged to a slight extent with carbonic acid and marsh gas. As there are many coal-tar acids now sold for carbolic acid, it is of importance that the adulteration should be recognized. This may be done by observing the strength of the soda solution which

will dissolve the tar acid. All the inferior acids are insoluble in a weak solution of caustic soda.

5. *Chloride of Zinc* (Sir William Burnett's fluid, or, as it is sometimes called, Drew's disinfectant) is well suited for the disinfection of the discharges from sick persons, but it is hardly applicable to any other purpose. The liquid should be of a proper strength, as having a specific gravity of 1.594, water being 1.000, and it should contain about from 50 to 54 per cent. of solid chloride of zinc. A tablespoonful of this liquid is sufficient to disinfect each discharge from the body.

6. *Chloride of Iron* is applicable in exactly the same manner as chloride of zinc, and is only suited for the disinfection of the discharges from the body. It should have a specific gravity of 1.470, and should contain about 40 per cent. of metallic chloride.

7. *Pernanganate of Potash* is only suited for the disinfection of drinking-water; for not being a volatile disinfectant, and being very slow in its action and requiring much of it for any practical purpose, it is not available as a common disinfectant: besides which it attacks all kinds of organic matter, and will therefore destroy clothing and be neutralized by every species of organic substance. As a disinfectant of water, however, in localities where good filters of animal charcoal cannot be obtained, it may be usefully employed to disinfect water by adding it thereto until the water retains a very pale but decidedly pink tint. The permanganate which is sold generally has a specific gravity of 1.055, and contains about 6 per cent. of permanganate of potash. It will take more than a pint of this liquid to disinfect a pint of the rice-water discharge from a cholera patient, and even then the disinfection is very uncertain.

8. *Animal Charcoal*.—I may state that, for the disinfection of water and the removal of dangerous organic impurity. I have ascertained by experiment that the best treatment is first to filter the water through animal charcoal, and then to boil it for a few minutes. It may then be safely drunk.

The disinfection of bedding and all articles of clothing is best effected by exposing them in an oven to a heat of from 260° to 300° Fahrenheit. The exposure should be sufficiently long to insure the thorough heating of every part of the material to that temperature. When such a process cannot be used, the clothing should be put into boiling water, and kept there until the water cools to the common temperature.

I refrain from entering into any explanation of the mode of action of these several disinfectants; for, whether the agent of disease is a living germ, capable of reproducing itself in the human body under certain conditions,—as most likely it is,—or whether it is an unorganized, or, even as Dr. Richardson supposes, a crystalline compound, the practical results are the same, and are unquestionable; and, in conclusion, I would say, by way of summary, that for the disinfection of sick-rooms, chlorine and chloride of lime are the best agents; for the disinfection of drains, middens, and sewers, carbolate of lime and carbolic acid are the best; for the discharges from the body, carbolic acid, chloride of zinc, or chloride of iron are the best; for clothing, the best disinfectant is heat, above 260°, if a dry heat, and 212°, if a wet heat; and for drinking-water, filtration through animal charcoal and a boiling temperature.

I may mention that the best disinfectant for stables and slaughter-houses is a mixed chloride and hypochlorite of zinc, and it has the advantage of mixing freely with the liquid matters of the slaughter-house, and not tainting the meat with any unpleasant odors. We have used it very largely for this purpose, and it is also applicable to the disinfection of houses in place of chloride of lime, which it much resembles in its chemical nature and mode of action.

Dr. Harris, registrar of the New York Board of Health, has written a circular on the subject of disinfectants, and the manner in which they should be used, from which the following are extracts:—

"In this memorandum the words infection and disinfection are employed just as they are commonly understood, as referring