

tians used it and we are told by a Greek writer that Ulysses thus disinfected a palace captured by him. From those times until the acceptance of the germ theory of disease, and the more exact methods inaugurated as a result thereof, SO_2 has been used by successive generations without a doubt of its efficacy as a reliable disinfectant. Koch was the first to show that SO_2 was not omnipotent. He demonstrated that anthrax spores were not killed even when SO_2 in liquid form was poured over them. His results with material not containing spores were more satisfactory. It was attached to silk threads hanging in a closed chamber and exposed to the gas in the proportion of one volume per cent. In only one case did this fail. The micrococcus prodigiosus was not killed after four hours' exposure, but was after twenty-four.

Dr. Sternberg, of the United States Army, in 1884 performed a number of experiments for the American Public Health Association. His experiments were numerous, repeated several times and varied in character. His conclusion in regard to the action of the gas on spores was the same as that of Koch. His conclusion in regard to micro-organisms other than spores was that if free exposure to the gas resulted, the organisms were killed, especially if the gas was produced in the presence of moisture. If, however, the germs were protected, as for instance when folded in a blanket, or if placed on cotton wool and put in a coat pocket, the gas, even if produced in a large volume and in the presence of moisture, could not be depended on to kill them. Dr. Herman M. Biggs in 1887 performed for the New York Board of Health some experiments demonstrating what is known as the vacuum process. Micro-organisms, notably impure cultures of the cholera spirillum, were placed in the centre of a bale of rags. This bale was placed in a bell jar from which the air was then evacuated. SO_2 was introduced in 100 per cent. volume and the rags were allowed to remain exposed for different periods of time in the different experiments, the shortest being twenty minutes. After a large number of careful and varied experiments, his conclusion was that micro-organisms of all kinds excepting spores were killed. We must remember, however, that while the gas penetrated to the centre of a bale of rags and killed the germs, it did so only under pressure.

Approaching more closely, in its conditions,

those that we meet in our every day practice, is the experiment performed at the New York Infant Asylum. In the winter of '87-88, diphtheria broke out. It extended to the adjoining maternity wards and attacked five of the new born children. One of them was suffering at the same time from an umbilical phlegmon. The ward was cleared, windows and doors closed, and all crevices filled up as well as possible. Ten pounds of sulphur to each 1000 cubic feet of space was burned, and the room allowed to remain for twelve hours. At the end of that time several medical gentlemen entered and proceeded to raise a dust by beating the floor with sticks. The dust was allowed to settle on culture media, and in due time cultures were developed. Great numbers of microbes overlying each other appeared under the microscope, and the streptococcus pyogenes was discovered identical in form with the streptococcus found in the umbilical phlegmon.

In this case the SO_2 failed, even though it was used in two and one half times the strength recommended in works of hygiene. It has been claimed that if the gas had been produced in the presence of moisture the results would have been better.

As a bleaching agent SO_2 will de-oxidise only in the presence of moisture, and if its action on bacterial life is of a similar character, evidently the presence of moisture is necessary. Dr. Squibb, of Brooklyn, the chemist, explains the action of the gas as follows: "By seizing on the oxygen of the air, and when that is exhausted on the oxygen of any moisture that may be present, in succession there are formed SO_2 , H_2SO_3 and H_2SO_4 . The organic matter (in this case the bacteria) is de-oxidised, the place occupied by the oxygen being filled with the H_2SO_4 , and thus the organism is killed." Granted that SO_2 may act thus in some cases, it is evident that it has other modes of action, as shown in the experiments performed in a vacuum produced in a bell jar.

Our conclusions in regard to the value of SO_2 as a disinfectant are as follows. As ordinarily used it is a farce. When used in the presence of moisture, in the proportion of three or four lbs. of sulphur to the 1000 cubic feet of space, and in a room closed as completely as possible, it can be relied on to kill all bacteria which are on the surface and freely exposed to its action, excepting