

that they were always covered with bacteria. They then exposed some of these to the action of 1.40 solution of carbolic, and on examination bacteria were found on all but two. The same was true of 1.500 alcoholic solution of hydronaphthol. Next they boiled the instruments for two hours, all sterile; some were simply steamed, and were found to be not entirely sterile. Another lot of instruments were baked, part at a temperature of 130° C. and the remainder at 160° C. These instruments were all sterile and had not been harmed by the temperature.

From these experiments we learn that instruments can be more certainly sterilized by heat than by any of the chemical antiseptics, which will not destroy them.

The only objection to the use of dry heat is that the danger of an excessive temperature damaging the instruments makes very careful watching of the heating-apparatus necessary. That this objection can be easily overcome, I will demonstrate later on.

All dressings can be readily freed of germs by the use of either dry or moist heat.

The dry heat renders the gauze hygroscopic; but this can be obviated by first saturating the gauze with a ten-per-cent. solution of glycerine and drying before placing in the sterilizer.

As to the means of using heat for sterilization: For moist heat we have in the Arnold Steam Sterilizer a simple and efficient apparatus. With it, in a very short time, a temperature of between 212° F. and 215° F. can be obtained, as the steam generated is under moderate pressure.

Dry heat may be obtained by the use of an ordinary gas oven. In this, with the heat of a single Bunsen burner, a temperature of 400° F. can be had. As instruments would probably be damaged by such a temperature, it must be regulated by some automatic device. This can successfully be done by employing Reichert's thermoregulator, by which the temperature can be kept continuously within 5° F. of any given point. The instruments to be sterilized may be placed in the oven, in a tray, and in this removed while still hot, and immediately

covered by an antiseptic solution or distilled water. The exposure should be at about 130° C. (266° F.) and continued for an hour.

An objection to using steam as a sterilizer for instruments is that it soon destroys nickel-plating, and rust immediately forms on the steel. This objection does not hold with dry heat. Dry heat is said not to ruin sponges, providing they are dry when placed in the sterilizer.

To sum up, we may say:

That in heat we have a most efficient sterilizer;

That it can be easily obtained, either in a moist or dry state;

That if care be taken not to exceed 150° C., but to go above 130° C., no harm will come to the instruments, and they will be absolutely sterile; and

That all dressings, gowns, towels, etc., can be treated satisfactorily by heat.

Dressings prepared by heat alone (aseptic dressings) are not sufficient for cases that are already septic. In these cases a chemical antiseptic should be added. Dressings sterilized by heat should be prepared just at the time they are to be used, and should be applied directly from the sterilizer.

Again let me repeat that aseptic instruments and dressings are useless without aseptic hands, and to have the hands aseptic they must be exposed to the chemical solution for a longer time than is ordinarily given. Simply dipping the hands in the solution is but to delude one's self. With nail-brush scrub the hands in hot 1.1000 bichloride for five minutes, after having previously washed them with soap and warm water, and see that no dirt remains beneath the nails.

A bacteriologist not long since remarked: "When surgeons use heat as their means of sterilization, they will have reached the ideal of asepsis." I think we may say that this means of sterilization is sure to surpass all others.

DISCUSSION.

Dr. PILCHER.—The paper is before you for discussion, gentlemen, as well as the general subject of sterilization of instruments by heat. Dr. John B. Roberts, of Philadelphia, in response to my invita-