Some Studies in Asepsis.*

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Occasional visits to operating rooms have impressed me with the fact that, to some extent, surgeons are inclined to overestimate the importance of small possible dangers, and to take more or less for granted absolute immunity from some others of greater magnitude. It was the unquestioning faith which some have shown in the instantaneous germicidal power of corrosive sublimate and other chemicals that gave me my first active interest in the general subject of sepsis and infection; and investigation of the actual value of a large number of these substances led me to consider other matters connected with operative work, including the danger of aërial infection, the sterilisation of dressings and sponges, and the disinfection of the skin of the field of operation and of the surgeon's hands.

I shall never forget the look of utter consternation on the faces of all concerned when, one day, during an operation for hernia, I placed a sterile Petri dish upon a spot on the instrument table, about 8 in. away from anything lying thereon, in the belief that the surgeon, by whose invitation I was to make certain observations, had arranged for the same with his colleagues. One would have supposed that that innocent dish was a seething mass of infection, fully prepared to disseminate the germs of septicæmia in all directions, even as a pinwheel throws its sparks. A hurried consultation was held, while I made my excuses and attempted to explain the absence of real danger. The result was the covering of that end of the table and the dish with a sterile towel. At this stage of the case, my culpable partner entered and explained matters, whereupon the towel was removed, the culture medium in the dish was exposed, and the operation proceeded. At the close of the operation, the dish was removed and incubated. The result demonstrated that upon each square inch of the dish and, inferentially, of the table and of the instruments thereon, and presumably of the field of operation, no less than 120 organisms, chiefly pus cocci, were deposited from the air in the course of an hour. It is not for me to say how much danger may reside in such a shower of bacteria. Frankly, I do not know, nor does there seem to be any unanimity of opinion on the part of those who have investigated the question of aerial infection; but it seems to me that the subject is not generally considered to be of such importance as the possibility of infection from sweat or from the introduction of an occasional bacterium from the superficial or deeper layers of the skin or from other sources. It has seemed to me that the danger of infection through the escape of droplets of sweat of a carefully prepared hand through an accidental puncture of a rubber glove is accorded undue weight. I have read numerous reports of experiments concerning the infectivity of sweat, and most of them have impressed me as unwarranted in their conclusions, owing to faulty premises and technique. In a recent article on the subject, it is dogmatically asserted, "The purest of sweat is impure; it is never sterile." With that statement I take issue. Six different times in my laboratory, sweat has been made to flow from well-cleaned, and so far as is possible, sterilised forearms and hands, incased in sterile glass cylinders heated by appropriate means; and in not a single instance could a bacterial growth be obtained. Moreover, injections thereof in fairly large amounts into animals—subcutaneously, intravenously, and intraperitoneally—were quite devoid of results. That there are bacteria in the various layers of the skin and in the hairfollicles there can be no doubt; but that they exist in the sweat-glands, from which the outflow of secretion would tend to bar them, is by no means clear. Indeed, I am informed by a number of our leading pathologists that an infection starting in a sweat-gland is exceedingly rare.

Of far greater importance, it seems to me, is the danger of infection through saliva. Repeatedly have I seen surgeons, even in abdominal cases, talking directly into the wound. It has been demonstrated by Flugge, of Breslau, and by several others, that in ordinary conversation there is a constant throwing out of minute droplets of saliva, some of which are projected laterally several feet. They are expelled in great numbers in the use of words or syllables beginning with the consonants *d*, *k*, *p*, and *t*, the formation of which involves the sudden explosive liberation of air held in the mouth under pressure. They may be sent forth as numerously during whispering as with loud speech. Now, the mouth cavity is a singularly unclean place, for the secretions of the mouth are likely to be richer in bacteria than the foulest sewage, and these bacteria are largely staphylococci, diplococci, and streptococci, and are likely to be exceedingly virulent. In one series of experiments, recently published, the average number of organisms per droplet of saliva as cast out in ordinary speech proved to be no less than 4,375. Is not the danger of infection by this means entitled to greater consideration than that more or less imaginary one of infection through sweat?

That the deeper layers of the skin yield bacteria is a well-known fact, but the mere obtaining of positive results from inoculating culture media therewith is no proof of their harmful nature. Indeed, several of the species commonly present, are known to be non-pathogenic.

In speaking of these several matters, I have no intention of advocating any lessening of the pre-

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