Remarks

ON

THE INFLUENCE OF LISTER UPON MILITARY SURGERY.

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THE general recognition of the value of Lister's antiseptic methods coincided pretty closely with the Franco-German war of 1870-71, and the surgeons who had taken part in it were consequently stimulated to endeavour to secure the benefits accruing from the system to the wounded on the field, among whom the mortality had under older methods been very heavy.

CONSERVATIVE SURGERY.

B. von Langenbeck was one of these, and early drew attention to the practicability of saving the lower limb when the knee-joint had been traversed by a bullet, by antiseptic resection or other conservative measures in place of amputating as had been the practice up to that time. Although his proposal met with considerable opposition, it soon became in fitting cases an established procedure, and was extended to wounds of other joints when the damage was not too great to render it impossible.

THE FIRST DRESSING PACKET.

Another war-surgeon deserves most honourable mention as a disciple of Lister. F. von Esmarch introduced the practice, now nearly universal, of employing the first dressing packet supplied to soldiers in the field. This consisted of two small balls of antiseptic material, such as salicylic wool and gauze, one for the aperture of entrance and one for that of exit, enclosed in a parchment paper wrapping along with the bandage for fixing them, the triangular handkerchief for sling or other purposes, and a couple of safety pins. Directions for use were printed on the outside of the packet.

THE RUSSIAN DRESSING.

These first dressings have been the subject of many subsequent modifications, few of which can be called improvements, save that in use in the Russian army, which is indeed calculated to delight the heart of an antiseptician. Remmert, the Russian Surgeon-General, has them manufactured as follows: The workers, all females save the officers superintending them, on entering the factory where the dressings are made are received into a bare room fitted up only with a species of fountain where a dozen or so of the workers, after putting on sterilized gowns and caps of white linen and sterilized slippers, can simultaneously bathe their hands and bare arms under jets of sterile water which flow down from on high without any stop-cock requiring to be touched to set them in work. With antiseptic soap and lotions they there purify themselves, and next proceed into the workroom, where large tanks of glass are filled with the wool or gauze by means of forks of suitable size, so that the hands never come into contact with the materials. A flood of the antiseptic lotion, sublimate and eosine, flows over the gauze or wool, impregnates it thoroughly and has its excess pressed out. The sheets or masses are then lifted by machinery into a drying press, where they are soon deprived of their remaining moisture by a current of hot filtered air and fall out dry. The same treatment is applied to the other materials for the dressing.

Laid out on glass tables, the materials are next cut and weighed by machinery into suitable quantities and transferred on trays to another set of workers,* who make up the packets by their bare hands and arms, doing so in a glass box or case open only at the side next the worker to admit her arms, so that she sees through its transparent top all that she is doing, but her breath and all dust or impurities are prevented falling into the packet. The packet has for its wrapper a piece of vulcanized rubber cloth about 6 in. square

folded into two; in the fold the gauze bandage, pins, etc., are placed. The free edges of this rubber are then sealed by machinery with rubber cement, and project on three sides like a fringe $\frac{1}{2}$ in. in breadth. The packets are next put into a steam sterilizer, and when their sterility is thus ensured they are stamped outside the rubber with indelible and plain directions for their use.

THE ABOLITION OF PROBING.

Following upon improvements in military surgery which I have briefly sketched above came the abandonment of the custom of probing wounds with instruments or the more questionable finger, in order to find and extract the bullet. This also, like most of the advances on Listerian lines, came from the Continent. The recognition of the fact that bullets were usually more harmless than the means employed to remove them, particularly on or near the battle field, is unquestionably a gain which is to be ascribed to the influence of Lister and his methods. Of late years, of course, the lessened calibre of the bullet has diminished the temptation to insert the forefinger, which now no longer fits the hole. But this is only a side consideration. The principle of non-intervention was established independently of it, and applies even where this proportion does not exist. Radiography has taught us much of the innocence of lodged projectiles, even though we freely admit that experiment has shown that they are often not sterile. How frequently do we nowadays see great numbers of small shot lying harmlessly embedded in the soft parts, where they have become encapsulated without producing any infective process? The modern very small bore bullets, the Lee-Netford and the Mauser, have, indeed, surprised us by the frequency with which they produce wounds which a few years ago we should not have believed capable of healing without infective reaction. It has occurred to me that part of this may be, indeed, due to their rotation. Starting heated from their bath of flame—and the temperatures generated within the barrel by cordite and other modern explosives are much greater than those from the old black powder—they proceed on their course, spinning at the rate of about 2,500 revolutions a second in the Lee-Netford, and 3,600 in the 5 mm. bullet, and develop a centrifugal force sufficient to whirl off any impurities save those that may be firmly encrusted on their apices. But this is a digression.

FUTURE IMPROVEMENTS.

The improved Listerian methods which gained a firm footing in private practice and in hospitals, have likewise taken root in military practice and in military hospitals. This is true everywhere, although perhaps there is still a great deal to be wished for. Man is by nature a dirty animal, and until all are trained to the same belief and conviction in the evils of the unseen germs, which they more readily acquire in the case of visible causes of death and disease, we cannot look for such results in the mass as are obtained by the exceptional individual. Again, perhaps, our help may come from the Continent. There the military surgeons are provided with mackintosh operation coats; and, even in their field hospitals, they have sterilizable linen operation coats supplied to them. The way in which they there strive towards the attainment of all possible perfection in war surgery is a hopeful omen for the condition of less advanced nations in the days to come, and a great tribute to their absolute faith in the scientific advances that will ever be associated with Lister's name.

[We may be allowed to recall the fact that in 1870 during the Franco-German war Professor Lister (as he then was) contributed to the BRITISH MEDICAL JOURNAL (vol. ii, p. 243) a paper on "A Method of Antiseptic Treatment Applicable to Wounded Soldiers in the Present War." In this he described a simple method of dressing gunshot wounds with carbolic lotion and carbolic oil, and such dressing materials as were likely to be at hand in the ambulances of that day. He explained also how the essential objects of the treatment could be applied in the management of compound fractures. We may perhaps be permitted to add that during the recent war in South Africa, Lord Lister took a great interest in the method of treating the smaller wounds made by modern bullets by dry powder and dry dressings. Mr. Lenthal Cheate has men-

* The workwomen are not admitted during their periods, but their pay continues nevertheless.

tioned in our columns (BRITISH MEDICAL JOURNAL, 1900, vol. ii, p. 667) that he used the double cyanide of zinc and mercury with which Lord Lister had supplied him in powder, but more conveniently in a paste made with a watery solution of carbolic acid. Mr. Cheate states that it "proved most satisfactory." Mr. Watson Cheyne has also described this method of treating gunshot wounds (BRITISH MEDICAL JOURNAL, 1900, vol. i, p. 1193).—ED. B.M.J.]

An Address

ON

PASTEUR AND LISTER.*

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At the opening of a session, what we all need is encouragement—something to give us the initial impetus that will keep our energies going until the welcome goal of the end of the term is reached. That great master of English, Newman, has said, "Persons influence us, voices melt us, books subdue us, deeds inflame us." What persons, what deeds can we at present consider to stir up our latent energies?

The greatest discovery of the last century has undoubtedly been that relating to the nature and prevention of septic disease. With the foundation and building up of this knowledge two great names are associated—Pasteur and Lister. At Pasteur's jubilee, held in Paris in 1892, the meeting of these two great scientists gave practical expression to the fact, and, as Pasteur's biographer puts it, as only a Frenchman can: "When Pasteur rose to embrace Lister, the sight of those two men gave the impression of a brotherhood of science labouring to diminish the sorrows of humanity." Let us briefly, then, consider how this great discovery arose and some of the lessons to us all from its evolution.

PASTEUR'S YOUTH.

Louis Pasteur was born at Dôle on December 27th, 1822. His parents were of comparatively humble rank, but of sterling worth. To his father—a tanner and an old Peninsular hero of Napoleon the Great—he owed his tenacity and seriousness. From his mother he got imagination, activity, enthusiasm. He had an excellent literary and scientific training at Besançon, but, while he passed before the Dijon faculty satisfactorily, he was put down as only "mediocre in chemistry." His study in Paris under Dumas, the famous chemist, inspired him, however, and he took much higher places in his classes and examinations afterwards. There are, however, significant facts that show his powers and energy; one of these is his preparing 60 grams of phosphorus from bones, as the lecturer had not had time to go into the process sufficiently. This took him seventeen hours' consecutive work to accomplish.

CRYSTALLOGRAPHY.

One of his first pieces of original work was that in relation to crystallography. I merely note it here, as it shows early Pasteur's powers and method. It had been observed that two salts of soda—the tartrate and paratartrate—although of apparently similar crystalline form and chemical constitution, behaved differently to polarized light. No explanation had been given of this by such authorities as Mitscherlich, but Pasteur showed for the first time that it was due to a peculiar faceting on one side of the crystals in the tartrate—that is, they were asymmetrical—while in the paratartrate they were symmetric. In the first, one got, therefore, the deviation of the plane of polarized light to the right, while in the paratartrate the symmetric arrangement was inert to polarized light. Pasteur gave, indeed, a triumphant demonstration as he separated the paratartrate crystals into right and left groups, and showed that the one turned the plane of polariza-

tion to the right, the other to the left. This Biot confirmed; a solution of both was inert.

Carlyle has said of a famous French historian, that you did not dig long in his work before you came to water. With Pasteur it was otherwise; he thought out his investigations to the "bed rock," and built on it a stable research. He expressed his delight at this discovery in almost Archimedean fashion, and, as the paratartronic acid (racemic acid) was seldom obtained then, he journeyed to Germany, Trieste, and finally settled that it was sometimes found in the mother liquor. He also made it artificially, as a triumphant telegram to his father announced.

We see here, early in his career, Pasteur's method of research; how an anomaly fascinated him, how with unbiased eye he collected his facts, how his imagination furnished him with a theory or theories which he rigorously tested, and how finally he ran the anomaly to earth. All this was done with immense enthusiasm and with a defence of his work when assailed, as vigorous as it was successful. Pasteur tried to penetrate further into molecular mysteries, but gave it up. He laid the foundation, however, for some very beautiful work by future observers.

FERMENTATION.

We now come to the fundamental part of Pasteur's work, that on which his magnificent researches were built—his studies on fermentation and spontaneous generation. Almost all his subsequent discoveries were the outcome of these researches or ran on similar lines. Of course, I merely touch on these subjects, not critically, or in detail, but solely to illustrate the lessons they afford us all. When Pasteur was appointed to Lille he was in the centre of the distillery district, and naturally the question of fermentation came up. The dominant view as to fermentation was that of Liebig, that it was a "change in organic fluids and tissues set in motion by the access of oxygen or of bodies in a state of decomposition," practically this was a theory, a purely chemical phenomenon, not a vital one. The presence of organisms he considered accidental. Pasteur, however, showed, with others, that the yeast plant was not a secondary formation in alcoholic fermentation, but the prime cause. By growing yeast in a solution of pure sugar, with no albuminoids but only ammonium salts to give nitrogen, Pasteur got alcohol and carbonic acid, thus showing that the yeast itself was the actual agent in the fermentation, and he thus confirmed and proved the original work of Cagniard, Latour, and Schwann, which had been obscured by Helmholtz, Liebig, and others. Similar evidence he provided for other fermentations, and thus what had been obscure and darkened by words now stood forth clear and distinct.

The exact facts about lactic acid fermentation were further made out by Lister in a series of very beautiful researches. One of Lister's points has always seemed to me very significant to medical men. Lister found that milk had no "inherent tendency to undergo lactic acid fermentation," but that it underwent it very readily in a dairy where, of course, the bacterium lactis flourished. This must be kept in mind in regard to our hospitals. The greatest precautions must be taken lest we grow in them specific organisms causing sepsis. This, of course, is done.

SPONTANEOUS GENERATION.

Pasteur was, naturally, next led to investigate the subject of spontaneous generation. To us, to whom the non-existence of spontaneous generation is an axiom, it seems difficult to realize that it was disputed. The history of the controversy is extensive, but Pasteur is generally considered to have dealt the death blow to this specious theory. Micro-organisms—or, to use Pasteur's favourite word, microbes—will not develop spontaneously in a fluid, after that fluid has been sterilized by careful boiling, if air either has not access or is filtered of its impurities. Thus the various fermentations are not spontaneous, but the specific organisms causing them are introduced from without, from the atmosphere or from unpurified surroundings. The fight here was a prolonged and bitter one. It was valuable, however, to have this severe criticism. For instance, it came out that some organic infusions needed prolonged heating at a temperature above boiling point to sterilize them. It also showed that at different places the contaminating power of air varied.

* A report with some omissions of an address delivered at the opening of the winter session, 1902, of the Medical Faculty of the University College of South Wales and Monmouthshire, Cardiff.