WOUND FLORA IN RELATION TO SECONDARY SUTURE.

BY

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I.

THE sterilization of septic wounds followed by secondary suture or closure, having for its objects the shortening of the patient's stay in hospital and the lessening of impairment of function, is the ambition of most army hospitals to-day.

Many brilliant successes have been recorded by those following the various methods in vogue. Several, on account of a few failures, have become sceptical about the results claimed by others, and have drifted back to pre-war methods.

An analysis of failures often teaches us much. The flora of all septic wounds consists of a conglomerate variety of bacteria—staphylococcus, streptococcus, *pyocyaneus*, *welchii* group, and bacilli with end or central spores, etc. On analysing fifty cases of secondary closure it has been noted that in all failures the anaërobic culture showed we had previously had to deal with a very active infection, which digested the meat medium rapidly and gave off abundance of gas with rotten-egg odour. The cultures obtained showed in some cases infection by an active streptococcus, in others by a spore-forming bacillus. In both cases, even when the bacterial count was low, the wounds so infected broke down on secondary suture. On the other hand, where the cultures obtained showed an absence of these particular groups of bacteria, and the meat medium was unchanged, wounds were closed successfully, even when affording a comparatively high bacterial count (20 to 30 per microscopic field).

Sufficient data are not yet before us to state definitely that all infected wounds might be classified clinically according to the findings of the anaërobic culture, but we have gone far enough to be of opinion that where the anaërobic culture shows a virulent infection, and where the culture obtained shows spore-forming bacilli, it would be advisable not to attempt secondary suture until the wound is absolutely sterile.

II.

After making many bacterial counts as a routine procedure in wounds, especially those which were being treated by the Carrel-Dakin method, it appeared that although the factor of the bacterial count was not an absolute guide it was of very considerable help, and a fair indication as to the progress of the combat between the tissues and the infection. Nevertheless, it seemed that other factors came into play, and it occurred to us that possibly the most important of these was the particular bacteria present in a particular wound. Accordingly it was decided to make cultures from a series of wounds with a view to determining the total bacterial flora of each, both aerobic and anaërobic.

A swab is taken from the wound either the day following or, in cases where the wound is very dirty, within two or three days after the patient arrives in hospital from France. This is planted in nutrient bouillon and in the meat medium recommended by the Tetanus Committee for the growth of anaërobics.

It seems advisable either not to inactivate the meat medium after inoculation with a view to eliminating all but spore-forming organism, or, if this be done, to run two cultures, one of which has been inactivated and one not, as the action of the facultative anaërobics on the medium appears to afford a clue to the virulence of the infection.

The broth culture is examined at the end of twenty-four hours and the findings recorded. The anaërobic culture is examined daily as to the bacteria present, colour, gas formation, digestion and odour, and the findings recorded. These examinations are carried out until it is apparent that nothing more is to be gained. A culture which has at any time shown *B. welchii* or bacilli of the malignant

oedema group is usually carried on for two or three weeks unless bacilli of the end-sporing group appear before this time.

In attempting to judge of the virulence of the streptococci attention has been paid to the effect on the meat medium, the length of the chains formed, and the extent to which the streptococcus dominates the culture. Certain forms of streptococci rapidly digest and darken meat, produce gas, and even a disagreeable odour. These are considered virulent. Others, although a good growth is obtained, leave the medium unchanged. These have been regarded as the less virulent. Along with streptococcus, the *B. welchii* is found almost constantly, and in doing bacterial counts this organism in many instances accounts for a large percentage of the bacteria counted, although it would not appear to be an important factor in the healing of the wound. Streptococcus is the most persistent of all organisms we have found.

The malignant oedema group of organisms has been active on the meat culture, rapidly digesting it, forming gas, darkening it to brownish-black or even black, and producing an extremely disagreeable odour like that of rotten eggs. These have been regarded as a dangerous infection, even in the presence of a low bacterial count. The fact that the bacillus of malignant oedema may, in a non-inactivated culture, occasionally be mistaken for one of the *B. welchii* group, does not seem to be of great practical importance, as the identity of the malignant oedema group is later shown by the formation of the typical spores and the effect on the medium. Further, there is undoubtedly such a relationship between the occurrence of the two groups that where *B. welchii* is found one would hesitate in saying the other group is absent.

End-sporing bacilli, oval and round, have been found in a small percentage of cases. Among these may be mentioned a stump which repeatedly broke down, and a replating of femur for malposition, which broke down although the original wound had been completely healed for a period of six months.

It is within the power of many if not most of the laboratories now attached to our general hospitals in England to make cultures from almost if not all wounds in the hospitals where a secondary suture is likely to be undertaken. It is in the cases which early show a low bacterial count that the kind of organism present is of prime importance. At the end of a week or ten days the culture will have shown whether or not there is an extensive or virulent infection present, which it is probably not going to be advisable to close in by secondary suture.

THE VALUE OF A MIXTURE OF CYLLIN, IODOFORM, AND OLIVE OIL IN INTRATHORACIC SEPSIS.

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A CASE of pulmonary gangrene, apparently cured by post-operative injection into the lung tissue of the following mixture, was published by one of us (W. G.) in 1912:—

R. Iodoform	...	...	...	gr. v
Cyllin	...	...	...	℥ v
Ol. olivæ	...	...	...	3ss

We now desire to report two cases of intrathoracic sepsis in which the same mixture has proved of undoubted service.

CASE I.

Cpl. R. L. was admitted from overseas on September 14th, 1917; he had been seized with pains in the left side of the chest on July 25th, and on August 14th a fetid empyema had been opened and drained. On admission his temperature was 102° and the next day 103°. The discharge from the wound was copious and most horribly offensive. The wound was packed with gauze soaked in the above mixture. Chart 1 shows the result on the temperature. The offensiveness of the discharge ceased immediately; there was no bad smell next day or afterwards. The dressing with the mixture was continued until his