THE TREATMENT OF ANAEROBE-INFECTED WOUNDS WITH LACTIC ACID.
PRELIMINARY NOTE.
By MAJOR L. W. HARRISON, D.S.O.
Royal Army Medical Corps.

The micro-organisms of the gas-brand and malignant oedema series have caused so much loss of life and mutilation during this war that no excuse is required for the following note, though under other circumstances its publication would have been delayed till it was better grounded.

Whilst engaged recently at No. 14 General Hospital on bacteriological work which included the flora of septic wounds, it occurred to me that since anaerobes of the gas-brand and malignant oedema series degenerate, fail to spore and do not liberate toxin in a distinctly acid culture medium the treatment of wounds in such a manner as to make distinctly acid to litmus the discharge in which these organisms abound would prevent and arrest their poisonous effects. There seemed to be better grounds for formulating such an hypothesis in the case of what we may shortly term malignant anaerobes than in that of ordinary pathogenic infections, since in the former the microbes largely manufacture their toxin in the wound (quite possibly from the dead matter in which they flourish), and invade the tissues beyond the wound only when these are almost devitalized by concentrated toxin. One can easily...
The Treatment of Anaerobe-infected Wounds

liken a type of septic thigh wound which has been very common during this war to a culture flask in which multitudes of malignant anaerobes are flourishing in dead protein. The difference is that while in the former fresh culture medium (i.e., serum) of the correct reaction for maintaining the virulence of the organisms is constantly being poured into the wound cavity, in the ordinary culture flask the medium is generally becoming more and more acid and, apparently pari passu, the organisms less and less virulent.

An opportunity of testing this theory was first afforded me by Lieutenant H. W. Parnis, R.A.M.C., in the following case. A soldier suffering from a very severe septic compound fracture of the thigh was very ill constitutionally. The wound was very foul and contained myriads of malignant anaerobes, though it had been opened up freely and treated with peroxide in the usual way. At the morning dressing a ten per cent solution of lactic acid was syringed into the wound, one aperture of which was temporarily plugged so that the cavity would hold the acid better. The same evening the patient’s temperature had dropped from 103.4° F. in the morning to 100° F., and there was a very marked general improvement. For three days after this the acid was used rather sparingly as the supply was limited, and meantime the patient only maintained his first improvement. As the pus was then amphoteric in reaction and anaerobes were still numerous, it was decided to risk failure of further supplies and treat the wound thoroughly with the remainder of the acid in stock. Coincidently with the maintenance of an acid reaction of the pus the improvement recommenced, two days later the wound was granulating and the micro-organisms were very considerably reduced, while the patient was well established on the road to recovery.

In the next case more careful bacteriological observations were made. A patient was admitted to Lieutenant W. H. Parry’s ward, on transfer from a clearing hospital, with a severe wound which had necessitated amputation at the junction of the upper and middle third of the right upper arm. The flaps, which had as usual been left open, were oedematous and almost black, the oedema spreading upwards over the shoulder and down almost to the angle of the scapula. The stench from the wound was very bad, and the patient was blanched and very feeble from loss of blood and toxemia. The pus, which was amphoteric to litmus, was swarming with gas-brand anaerobes and cocci, and the former were sporing freely. Temporary Major A. E. Johnson, R.A.M.C.,
L. W. Harrison

disarticulated the remainder of the arm and treated the stump with ten per cent lactic acid, some of which he injected into the surrounding tissues. Eight hours later the pus was found to be acid, and on microscopical examination the anaerobes were extremely scanty and none of them free or sporing, all which were seen being enclosed within phagocytes. On the following day it was generally agreed that the patient was better constitutionally. No examination of the pus was made, but on the day after this it was again tested as it was obvious that the patient was worse. The pus was then amphoteric and again swarming with anaerobes, with the usual cocci. The acid was accordingly pushed (four hourly dressings) with the object of keeping the reaction of the pus constantly acid. Twenty-four hours later it was again found to be acid, and again the anaerobes were very scanty. Roughly comparing the number on this with that found on the previous day the latter was fifty per field and the former two. Coincidently, the patient's general condition showed a marked improvement. This improvement was maintained, and five days after the first application of the acid the wound was granulating. As sloughs separated the patient complained of smarting when the lactic acid was applied. This was no greater than that resulting from the peroxide with which the wound was first swabbed, but in order to lessen the pain, and also for its effect on the cocci in the secretion, carbolic acid was mixed with the lactic acid to a strength of two and a half per cent. I left the hospital just after this innovation and cannot speak as to its effect. Unfortunately this patient died of secondary hemorrhage about five days after I left.

It may be asked, why waste a reader's time over the recital of such an unconvincing story? But those who witnessed the effect of the lactic acid on these two cases and saw the slides of the second, believed with me that it had certainly hampered the activity of the anaerobes to an extent not witnessed under other treatments.

In a letter received recently from Lieutenant J. F. Smith, R.A.M.C., who very kindly promised to report to me the results of any further trial of lactic acid, he said, “Morris has had a very septic (anaerobic) compound thigh which did marvellously well on lactic acid. Parry has used it on several cases, but they were not sufficiently bad to afford a good test.”

If further trial shows that lactic acid acts in the manner suggested above, it should not be necessary to open out wounds so freely as is usual at present, but treat the cavity as a culture
The Treatment of Anaerobe-infected Wounds

flask, filling it from time to time with the lactic acid. It is possible that a more concentrated solution would act more quickly, and still be tolerable to the patient. A weaker solution is certainly not so efficacious.

It is essential in the treatment of wounds with lactic acid that pus from the depths of the wound should be tested with litmus at each dressing, since if the reaction is not distinctly acid the lactic acid has not been applied in such a manner as to fulfil its object. I have no evidence that lactic acid is of any use against cocci.