of antiseptics in the removal of septic material from an appendiceal wound.

The question of how frequently to irrigate a wound depends upon what kind of material is used to drain it. When there is a temperature above 101° after the third day I have usually irrigated frequently and freely, sometimes every four or six hours during the twenty-four.

(7) The next three questions may be discussed together. They are, when to drain and not to drain; what material to use as a drain, whether tubes, gauze or rubber dam; and how long to drain.

If there is no pus in the abdomen, of course the wound is closed. I have found that when there is a slight amount of pus in the wound, where the cavity can be completely cleansed, one can safely close it. However, it is safer to err on the side of drainage than non-drainage.

Whether to use iodoform gauze, rubber-dam or rubber tubing has been to me an important question. Rubber tubes, I believe, are indicated where there is a large pus cavity with walls which do not collapse; rubber-dam or iodoform gauze are indicated where the cavity is collapsible; where the intestines fall into the abscess cavity the gauze can be insinuated into nooks and corners and crevices which a tube can never reach. I am sure that it is wiser to use gauze than to use tubing in those cases of early operation for appendicitis where the appendiceal inflammation is not walled off. Where in doubt, and yet where I have closed the wound, I have placed between the edges of the wound a narrow strip of iodoform gauze or rubber-dam, which I have removed on the third or fourth day if it were not found necessary before. The cases which I always feel demand iodoform gauze are those where in operating within forty-eight hours from the beginning of the attack a perforated appendix is found, especially when it is a question whether the general peritoneal cavity is invaded.

In these cases I have left iodoform wicks in for weeks at a time, gradually withdrawing them until every vestige of septic material was removed from the wound by washing with boracic acid or sterile water.

How long to drain is a question that has never been settled in my mind. When the temperature reaches to normal, and when there ceases to be an evening rise in temperature, I usually remove a few of the iodoform wicks or the tube. The wound is, of course, irrigated out daily, and if there is much discharge iodoform is dusted over the open wound. It has been my practice where I removed an appendix, — and I never feel satisfied that I have given the patient the best chance unless I have removed the appendix, — to carry the iodoform gauze down to the stump of the appendix, believing that if this could be covered by granulation tissue a firmer cicatrix would be gained, and less liability to hernia would exist.

As a rule, I have been inclined to remove the drainage too early, judging alone from the wound, and in my later cases have come to depend upon, not alone the condition of the wound, but the patient's temperature, pulse, and the condition of the general peritoneal cavity, whether showing evidence of inflammation or not.

(8) The indications for reopening a closed wound or for exploring an open wound following an appendix operation. To reopen a closed wound offends one's surgical sense, but to allow a patient to die from septic

absorption from defective drainage is, to put it mildly, very unfortunate. On the other hand, to explore an open wound following an appendicitis operation is a thing that I have been led to do in a number of instances. I always think of doing it whenever there is a continued rise in temperature after the fifth day or a chill, where a wound tends to gape, or from which pus flows, a drachm at a time, at indefinite intervals; and whenever there is associated with it evidences of infection of the general peritoneal cavity I believe that the patient should be etherized, the wound carefully explored with the finger, and any pocket of pus or septic material that is loose should be washed out thoroughly. I am sure that this is an important thing to do, and a moment's thought must make it clear that a cavity filled with coils of intestines is very difficult, and at times almost impossible, to free from septic material at the time of operation.

In three instances last summer, between the tenth and twelfth days, after the temperature had been normal, I was obliged to reopen wounds on account of a sudden and continued rise in temperature and chills. An abscess was suspected, but in none of these cases was an abscess found. On opening up the wound, however, and separating the coils of intestines, there escaped a large quantity of offensive gas. It was so marked that in one case a bystander said, "Why, there must be a perforation of the intestines." I suspect that this gas had something to do with the continued high temperature, for in each instance the wounds were repacked, the temperature fell to normal in a short time, and convalescence was established.

In one case I explored a wound on the tenth day, and found an abscess pointing toward the loin. A counter-opening was made in the back, a drainage-tube inserted and through-and-through irrigation established. Where the appendix rests high up in the loin, and where there is a large amount of pus, I am inclined to believe that this through-and-through drainage would at times be of great value.

In two instances I have had fecal fistulæ develop, but by thoroughly cleansing (by irrigation) the wound it has been possible to bring about a complete, although delayed closure of the wound.

I have presented these questions in the after-treatment of this operation as they have occurred to my mind. There is, of course, room for difference of opinion, and it is impossible at present to lay down principles in the after-treatment of this operation; but I am sure of one principle, and that is, that when we are in doubt the wound and abdomen should be freed from all septic material.

THE PRODUCTION OF VACCINE VIRUS.¹

BY D. D. GILBERT, M.D., CHAIRMAN, DORCHESTER, MASS.

YOUR committee have visited the two principal depots from which the vaccine stock is supplied to this section, namely, the New England Vaccine Company's operating-rooms in Chelsea, and the operating-rooms of the late Henry A. Martin, M.D. We were welcomed with gentlemanly courtesy and attention at both places, where the processes were freely shown and explained. We have also had freely given from Codman & Shurtleff a description of the process pursued by

¹ The report of a committee appointed by the Norfolk District Medical Society to investigate the production of vaccine virus.

them at their farm in Stoughton, which we were cordially invited to visit. Also, I will state that, at the meeting of the Norfolk District Society where this report was originally made, Dr. Francis C. Martin made some remarks in regard to the course pursued by him at his establishment.

At Chelsea we found buildings well adapted for the purpose—a stable so built with cemented floors, gutters and walls, that it could be thoroughly flushed; and it had evidently so been, for not a particle of stable *débris* was present. Leading from this stable, separated by an entry and double-doors, is the operating-room proper. This room has a floor of artificial stone, tiled walls, and is heated by steam. It is furnished with sets of stanchions in which to securely and comfortably confine the cattle undergoing the operations, and with a closet of fine-wire gauze, for the drying of the freshly charged points, admitting the air but excluding the coarser particles of dust. This room can also be thoroughly flushed, and it is claimed that it is so treated with antiseptic solutions from time to time. There is an evident intent to preserve the appearance, at least, of asepsis, but one notices a carelessness of the employes in handling the charged points, etc., with hands which are certainly not surgically aseptic. Whether this comes from ignorance of what science has a right to demand in such a process, or whether it is the carelessness which familiarity with routine work almost necessarily begets, I do not know. In regard to the results I will speak later.

The operating-room at the Martin establishment is an ordinary room opening directly from the carriage-house of the stable. This room has wooden floor and walls, and has no conveniences whatever for producing aseptic conditions other than such as accompany ordinary cleanliness. Mr. Reed told us they made no pretensions to do more.

The process of securing the lymph at the two establishments differs in many ways. At the New England, they use mature animals, about four years old. These are vaccinated on the back of the buttocks, in about a dozen large confluent patches, three to four inches square. At the Martin establishment they use immature animals, preferably under one year of age. These are vaccinated on the back of one buttock and on one side of the belly, in small patches about three-fourths of an inch square, which do not materially enlarge in development. At the New England establishment the animal while undergoing operation remains standing, confined by a set of stanchions. At the Martin establishment the work is done upon the animal lying on its side, and strapped to a table. At Codman & Shurtleff's, and at Dr. Francis C. Martin's, the age of animals and the process are practically the same as at the Martin stable in Brookline.

Dr. Perry, of our committee, has kindly prepared some rough diagrams which will give you a better idea of how the animals are vaccinated than will any verbal description.

Mr. Reed, of the Martin establishment, claimed that the advantages of using young animals are the lesser danger of their being diseased, and the greater facility of handling them. At the New England institute there seems to be no difficulty of handling the animals with the facilities which they have, and each animal before it is taken into their stable has been examined by a veterinary surgeon, and a certificate of its healthy condition issued to the company. This cer-

tificate is numbered, and the cow is tagged with a corresponding number which is recorded. By means of this system of numbering the company are able to know from what animal any issued points have been taken. The same system of numbering, but not of veterinary examination, is pursued at the Martin establishment. Codman & Shurtleff have all their animals examined by a regular physician, and a record of each animal is kept.

At the first glance at the animal vaccinated and ready for use, the sight is repulsive, and the broken-down, suppurating crust seems a most disagreeable thing to inoculate into the human organism. These crusts and their accompanying *débris*, you are told, are ground up with glycerine and regularly dispensed as vaccine stock in some foreign countries. *Here* the crust and all loose tissue are removed, thus exposing the base of the vesicle. At the New England institute, this, with the surrounding skin, is thoroughly washed with a sponge and clean water, and after a few minutes the serum exudes and, the animal standing in an upright position, trickles down to the lower edge of the patch from which it is taken upon the points. The first flow is a little discolored with blood, and is kept to revaccinate new animals with. After a while the flow of serum is obtained perfectly clear and of a slightly yellowish shade. By this method, at the New England institute, the points are not brought at all in contact with the raw surface but receive the lymph as it trickles down to the sound skin. The points are then laid upon a nickel-plated metal tray, channelled and adapted for the purpose. When the tray is filled, it is placed inside the gauze closet to dry.

At the Martin establishment, as I have said, the vesicles are individually smaller, and, after having been freed from the crust, are not washed but are wiped with a towel which seems to have done some service in the same direction before. From these vesicles, there being less tension of the tissues than where the patches are larger, the lymph does not exude itself but is squeezed out by compression of the base with forceps, and the points are charged directly from the denuded surface; therefore all are more or less discolored with blood. At the New England establishment the points having been received from the factory are sterilized before being charged—subjected for an hour to a temperature of 212°. At the other place, as I have said, no attempt at asepsis is made.

At Codman & Shurtleff's establishment the process is similar to that at the Martin, except that, instead of dipping the points into the lymph exuding from the raw base of the vesicle, the lymph is collected in little glass cups, and any *débris* present in it is allowed to settle or is skimmed off, after which the points are charged with the clear lymph.

Now, while neither of these processes approach what we know as surgical asepsis, yet the fact remains that we never hear of septic inflammation setting in within a few hours after vaccination, which it surely would do if septic matter were directly introduced into the system; so that we must believe that the charged points are not septic even if the process of preparing them is not ideal.

On the other hand, when suppuration does occur, it sets in as a secondary result to the mature vesicle. This it is claimed, and justly it would seem, is due to atmospheric germs having found their way within the ruptured capsule of a broken vesicle. Therefore, when

this occurs in this secondary manner, it is after the vaccinia has been produced, and it does not, as is sometimes claimed, interfere with the protective power of the vaccination. The resulting sore should therefore be treated antiseptically from that time on, and healed as soon as possible.

Dr. Cutler, at the head of the New England establishment, maintains that a small vesicle should always be obtained, and that, from the commencement, it should be kept as dry as possible, no moist or oily dressing ever being used. A small vesicle produces less inflammation — and so less necrosis of subjacent tissue, less areola, and so less constitutional disturbance. Moreover, it is far less liable to crack and rupture. He claims that the size and accompanying characteristics of the vesicle may be absolutely determined by the size of the original scarification, which had better be a mere puncture, and never should exceed one-sixteenth of an inch in diameter. There should be two or three of these vesicles situated nearly two inches apart, so that they may never become confluent with one another. He exclaimed, "It was a bad day when we were taught to scarify instead of the old-style puncture." His explanation of this and of his theory that a large scarification makes a confluent and highly inflamed vesicle is, that, while it is necessary to spread the inert virus obtained from calves over a large scarification, to get any result — uncertain at best — the lymph obtained from mature animals is richer in germs which become implanted all over the scarification and start numerous colonies, each a nucleus of vesicles which, as they grow, coalesce until they form the large confluent vesicle.

When a large confluent vesicle is produced in the human subject, the resulting cicatrix often fails to present the minute pits which the older vaccinators considered characteristic of successful vaccination, but this is really of no importance. In the human subject vaccinia produces a deeper inflammation than in the cow, and this fact, taken in connection with the high degree of inflammation produced by a large confluent vesicle, accounts for the necrosis of tissue which destroys the natural base of the vesicle with its characteristic pits. The simple appearance of a cicatrix affords no evidence as to the amount of protection. A cicatrix is only presumptive evidence of previous vaccination, and, if it is more than five years old, vaccination should be done in the presence of an epidemic. The only real evidence of protection is the insusceptibility to vaccinia under the most favorable conditions. Insusceptibility to vaccinia under such conditions is insusceptibility to variola. In the early history of vaccination some bold experiments were made at the small-pox hospital established by the Boston Board of Health at Noddle's Island. Massachusetts, by the way, was the first colony to introduce small-pox inoculation, and the first State to introduce kine-pox vaccination. "On August 16, 1802, 19 boys were vaccinated, and all passed through the regular stages of the cow-pox; and on November 9th following, 12 of them, together with the son of Dr. Bartlett, who had previously had the cow-pox, were inoculated for the small-pox with matter taken from a patient in the most infectious stage of the disease; and no trouble whatever followed." These facts are given in a report signed by eleven physicians, including Benj. Waterhouse and James Lloyd. A full and official account of the affair is found in the *Columbian Centinel*, December 18, 1802.

The formation of the areola is claimed to be the only test of constitutional or protective vaccination. If a person has been infected with small-pox, vaccination will not modify the disease unless the areola forms before the small-pox symptoms show. If, however, the stage of areola is reached before the symptoms of the graver disease appear, that disease will be aborted or modified by the vaccination.

Distinct, probably, from the various post-vaccinal eruptions which are sometimes called into activity by the excitement of vaccination, is a more or less widely distributed exanthem, or roseola, which is claimed to be simply a distributed areola, and need give rise to no anxiety, since it runs the same course as, and disappears with, the areola.

In conclusion, your committee are inclined to believe, from the limited observation which they have been able to make, that the New England virus is the more active and therefore the more dangerous virus to use; that the Martin virus is not as active and consequently may be the safer for general use. In reference to this, the New England people state that the danger of excessive result should not be laid at the door of active virus, which is necessary to fight an epidemic with, but is due to the ignorance of the proper technique of vaccination among some members of the medical profession, and especially among laymen who often do not hesitate to perform the operation. On the other hand, the late Dr. H. A. Martin has maintained that the serum from the large confluent vesicle on the cow, with its higher degree of inflammation, is alone responsible for the greater degree of irritation in the human subject. Your committee believe that these points can only be settled by a more careful attention, on the part of physicians, to the technique of the operation, and an observation of subsequent results.

Further, your committee are led to the positive belief that the whole subject of preparation of vaccine stock should not be left in the hands of rival commercial companies, but should be wholly under the official control of either city or State.

WHAT MIGHT BE DONE BY THE OBSTETRICAL SOCIETY TO ADVANCE THE TRAINING OF NURSES.¹

BY A. WORCESTER, M.D., WALTHAM.

In the successful management of obstetric cases much depends upon the nursing service. Indeed, in normal cases, more depends upon the nurse than upon the physician. And in abnormal cases, especially where surgical interference is exercised, after the operation or the delivery is over, then even more responsibility falls upon the nurse for the happy uninterrupted recovery of the patient. If, to this is added the responsibility of starting a baby on a prosperous career of health and happiness, it would seem as if the monthly nurse always ought to be at least an angel. Sometimes she is one: sometimes she — isn't.

If obstetricians have poor or only tolerable nurses, it is their own fault: if they submit their patients to positively bad nursing service, then their fault is inexcusable. In other words, the physician is not blameless if his patient suffers from faulty nursing.

This particular responsibility of the doctor is of comparatively recent origin, and is due to the fact that

¹ Read before the Obstetrical Society of Boston, March 10, 1894.