The operative procedure mentioned above was carried out on these animals, and we found that it was just as easy and just as practicable as on the normal stomach. In making pyloric closures and simple gastro-enterostomies on animals in which we had produced ulcers, we found that the clinical course was much better when the ulcer was excised.

Of interest in connection with the question of vitalization of the fascial transplant by the free edge of the attached great omentum in an infected field are four cases in which operation was performed for perforating gastric ulcer and in which the ulcers were so large and indurated that purse-string sutures and inversion was out of the question.

In the first patient the edge of the ulcer was curetted, and two deep sutures were placed through the indurated area to bring the freshened edges together. A large fascial transplant from the anterior sheath of the rectus was sutured with interrupted silk stitches over the entire field, extending beyond the indurated area of the ulcer. The free edge of the attached omentum was now brought over this entire area and sutured over the transplant.

In the second patient the induration was so marked that the edges of the ulcer could not be brought together by suture, and the fascial transplant was simply sutured over the opening and covered by omentum. The other patients were operated on in the same manner. All four patients made uneventful recoveries and are at present in good health.

These cases illustrate the practicability of using the attached omentum to vitalize free fascial transplants in an infected field as well as in a clean field. The omentum not only vitalizes the fascial transplant but also produces a collateral circulation around the indurated areas and thereby promotes healing of the perforated ulcer.

CONCLUSIONS

1. Three years' experience with this method has proved it to be an absolutely safe procedure.

Fig. 13.—Photomicrograph of transverse section of pylorus where single transplant has been used: A, fascial transplant; B, fascial transplant united to muscularis; C, mucosa. At end of ten months.

2. In view of the relationship of ulcer to cancer, and the fact that it probably is a localized lesion produced by streptococcus infection, this method of excision seems far more rational than gastro-enterostomy with or without pyloric closure.

3. The operation leaves the stomach in its normal anatomic condition and physiologic relationship, and

does not mutilate the organ or cut away any of its most important parts.

4. The operation takes far less surgical skill, produces much less shock, and takes less time than a simple gastro-enterostomy.

5. The vitalization of the free fascial transplants by the free edge of the great omentum, in both a clean and an infected field, has been proved both experimentally and clinically.

6. The closing over of a perforated ulcer by a free fascial transplant and the attached omentum is far safer and more permanent than a purse-string suture placed in the indurated area of an ulcer.¹

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USEFULNESS OF SERUMS AND VACCINES UNDER WAR CONDITIONS

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The development of biologic products used for prophylactic and therapeutic purposes has been so extensive that confusion exists as to the value of some of the agents of this group, and a brief discussion of the subject at this time is warranted.

The brilliant results which followed the use of the first agents of this group, notably vaccine virus, anti-diphtheric serum and antitetanic serum, have not been duplicated by the majority of those that have come into use in recent years.

In this country products of this class may not be imported, exported, or sold in interstate commerce without a license issued to the manufacturer by the secretary of the treasury, which license is based on a careful investigation of methods of the manufacture of the products and conditions surrounding it.

The license means in effect that products are produced under conditions which should insure freedom from dangerous contamination and, in cases in which a potency standard has been established, that the product is of the potency claimed. Such standards have been adopted for the antitoxins for diphtheria and tetanus; a tentative standard has also been established for antityphoid vaccine.

Products for which there are no potency standards range all the way from such trustworthy agents as vaccine virus and antirabic virus to those of such doubtful value as many of the bacterial vaccines and the large family of tuberculins.

Aside from licensed manufacturers, certain municipal and state health laboratories produce biologic products. These laboratories are supervised only by their own departments; this supervision may

be effective or otherwise, depending on circumstances. Before consideration of the individual agents that will be discussed, it may be pertinent to state that

1. This paper is the third report of investigations made in this laboratory on this subject. The preliminary report, "New Methods of Pyloroplasty," appeared in THE JOURNAL, Oct. 30, 1915, p. 1533. Reference should also be made to "Reconstruction of the Pylorus," Surg., Gynec. and Obst., Jan. 7, 1916, p. 496.

the available supply of biologic products, actual and potential, is fully equal to any conceivable requirements. Indeed, during the war, American manufacturers have furnished to foreign governments large quantities of tetanus antitoxin, the product most extensively used in active military operations. If our supplies of munitions of other sorts were relatively as abundant, our condition of preparedness would be all that could be desired.

It seems scarcely necessary to point out that by far the largest field of usefulness for these agents is in the prophylaxis of infectious diseases, although there is an important field of usefulness for some in a curative way. Some are useful for diagnostic purposes exclusively; these will not be considered here.

AGENTS OF PROVED WORTH

VIRUS

Smallpox Vaccine.—The only points that need be mentioned here are the form of supplying the agent and the method of applying it. Vaccine virus is supplied (1) on points of celluloid, ivory, glass, or bone; (2) in glass capillary tubes for individual vaccination; and (3) in bulk for multiple vaccination. All of these forms have their advocates. The first is perhaps most generally used, the second the most generally recommended, and the third the most economical when large numbers are to be vaccinated at one time. If the virus is potent, the manner of supplying it is of no consequence.

As to the method of vaccination, linear incision is probably the most satisfactory.

The vital thing in connection with the keeping of vaccine virus is a low temperature; the lower the better. At room temperature the virus is liable soon to lose its potency. If the virus is kept sufficiently cold, the date of expiration given by the manufacturer may be regarded as dependable.

Sterile vaccine prepared by Noguchi's method has not been used extensively enough to justify an opinion as to its value under varied conditions. It seems not to be generally known that much of the regular vaccine virus on the market contains few bacteria. Some packages, indeed, are sterile by the ordinary tests.

As vaccine virus leaves the manufacturer it is generally of a satisfactory quality; but much of that obtained in the usual channels of trade is nearly or quite inert, on account of improper handling and storage.

ANTITOXIC SERUMS

Antidiphtheric Serum.—This product comes into consideration both as a prophylactic and as a curative agent; its value and mode of use are so well known that it need not be mentioned further here.

Antitetanic Serum.—The use of this agent in armies is at present extensive. It is understood that single orders for as many as 500,000 doses have been placed in America by European governments, and enormous quantities are being made in Europe. It has become the rule to give every wounded soldier a prophylactic dose of tetanus antitoxin as soon as possible after the wound is inflicted. During the early part of the war, the dose used was 1,500 American units; but, at least in the English service, this has been reduced to 500 units repeated every seven days "until the wound has healed or become healthy." It was found necessary to repeat the dose on account of the late development of tetanus in cases in which only a single dose was administered.

Dried antitetanic serum as an application to wounds has been recommended, but seems not to have found favor; certainly it has not replaced the subcutaneous use of the fluid serum.

As a curative agent, in the presence of clinical tetanus, 3,000 units of the serum should be administered intraspinally, at the appearance of the first symptoms; 10,000 units in addition should be given intravenously. The intraspinal dose should be repeated daily until improvement sets in, and the blood should be kept antitoxic by further subcutaneous doses of 10,000 units.

The war experience has confirmed what had been learned in civil practice, that as a curative agent the serum is not of great value, at least not unless used early, intraspinally, and in large doses.

ANTIBACTERIAL SERUM

Antimeningococcus Serum.—Some of the earlier reports on the use of this agent during the present war indicated that it had not proved satisfactory; at present, however, it is being used with success. The variability in the strains of meningococci encountered in various cases and in various outbreaks doubtless accounts in part for the failure to secure more uniform results. The lack of a definite potency standard makes it impossible to judge accurately of the value of any given specimen of serum. This is particularly unfortunate, as epidemic meningitis is especially liable to occur in camps in which large numbers of young men are brought together. The serum should be given early and persistently.

BACTERIAL VACCINES

Antityphoid Vaccine.—There seems to be no question about the great value of this agent. In military service it has been highly successful. It appears that, at least for military purposes, it is desirable to use a vaccine containing, in addition to *B. typhosus*, the paratyphoid organisms A and B. In the early part of the war, in some of the armies, the latter organisms were not used; and, in consequence, much paratyphoid occurred.

The administration of antityphoid vaccine varies in different hands. The procedure followed in America is to give 500,000,000 organisms; followed by double that dose in a week or ten days, and a third dose of the same size as the second after a further interval of a week or ten days. This product should be used reasonably fresh, though little is known of the rate of deterioration with age.

The question of the duration of the immunity is an important one. It has been customary in this country to regard the immunity as lasting about four years; but the experience of some of the European armies indicates that this period is too long. It is understood that revaccination is being practiced annually, and under some circumstances even after six or seven months.

AGENTS NOT WELL ESTABLISHED BUT WORTHY OF TRIAL

SERUMS

Antidysentery Serum.—It is well known that dysentery organisms of the Shiga-Kruse type produce toxins, and that it is possible to produce a serum which neutralizes these poisons. The evidence at hand indicates that such a serum should be tried in any case of bacillary dysentery due to organisms of

the Shiga-Kruse type. As high as 80 c.c. have been given at a dose.

If dysentery should prevail to any considerable extent, it probably would be worth while to have serum prepared for the type or types of infection existing in the area in which the serum is to be used.

Antipneumococcus Serum.—The work done in recent years on the separation of pneumococci into groups, and the results of a specific treatment, indicate that antipneumococcus serum, potent against organisms of Group 1, may be expected to be of value in infections due to this type. On account of the difficulty and delay that may be incurred in arriving at a type diagnosis, not to mention the impossibility of this under many circumstances, some students of the subject recommend the use of a Group 1 serum in any case of pneumonia, recognizing, of course, that it will be of no value in many cases, but believing that the benefits of its early use in Group 1 infections justify this somewhat unscientific procedure. It seems clear that no serum other than that against Group 1 organisms is of value.

BACTERIAL VACCINES

Vaccines against bacillary dysentery have been employed in a prophylactic way, but the evidence as to their value is not established; at least such evidence has not been published. It appears to be difficult to prepare a vaccine which does not produce unduly severe reactions and yet gives promise of being effective. Dosage is one half, or less, that of antityphoid vaccine.

Anticholera vaccine is reported to have given satisfactory protection, and the data at hand warrant its use as a prophylactic. The doses are 500,000,000, and 1 billion organisms, with an interval of one week.

Meningococcus vaccine has been used, but with inconclusive results. A vaccine, prepared from the organisms occurring in the epidemic prevailing, would in all probability prove more useful than one made from stock strains. The dosage is about the same as for antityphoid vaccine.

Combined vaccines, consisting of the typhoid bacillus, the two paratyphoid, the dysentery bacillus and sometimes the cholera vibrio, have been used to some extent. There appears to be justification for the use of such combinations as preventives under special conditions.

Prophylactic and therapeutic vaccinations against wound infections have been carried on, but the results do not appear to be encouraging.

ANAPHYLAXIS

The danger of anaphylactic shock, ensuing when it becomes necessary to administer horse serum to a person who has been inoculated with horse serum at an earlier date, must be mentioned. The consensus of opinion is, however, that this consideration should not interfere with the use of any prophylactic or curative serum which may be required. It has been recommended that, when hypersensitiveness is suspected, a small dose (0.1 c.c.) of serum should be given half an hour prior to the full dose, the object being to desensitize the susceptible individual. Increasing doses should be given at half-hour intervals.

Clinical Notes, Suggestions, and New Instruments

A LIGATURE KNOT TIER

HENRY R. BOETTCHER, M.D., CHICAGO

This instrument facilitates the tying of ligatures at points which the fingers cannot easily reach.

An assistant holds the handle of the forceps in the usual way for removal. The operator takes a ligature, ties a simple overhand knot around the handle of the forceps and brings the ends of the ligature down astride the handle, holding them between the first three fingers of the left hand. Then the tier is hooked on the end of the ligature nearest the right hand, from the under side, and given two turns to the right, which will put the ligature within the spiral or head of the

A ligature knot tier.

instrument. The spiral is now pushed up to the knot, and the end of the ligature is held against the handle of the tier by the thumb or first finger, the other end being held by the left hand.

The knot is now pushed down the handle and over the tip of the forceps. The left end of the ligature should be kept well under the handle of the forceps, which helps to keep the knot over the tip, when the tying force is applied. This is now done, the forceps are removed, and a second knot is tied and pushed down.

In tonsil work, forceps with a tapering handle are the easiest to tie over, and plain sterilized catgut Nos. 1 and 0 are the best strengths to use.

It is well not to cut the ligature too close to the knot.

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PELLAGRA WITH ERYTHEMA OF SCROTUM AS INITIAL SKIN MANIFESTATION

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D. R. T., man, aged 31, mill hand, married, first came under my care early in June, 1916, with symptoms of nephritis which readily improved under treatment. June 15, I was called to see him and found him suffering with acute appendicitis, for which he was immediately removed to a hospital and operated on.

August 15, he came to my office complaining of burning and itching of the scrotum. Examination revealed an intense reddening and slight thickening over an area about an inch in diameter on each side of the lower portion of the front of the scrotum. It was separated by a longitudinal strip of normal skin along the median raphe, and the erythematous area on the right side was somewhat larger and more intensified than that on the left. The junction of the reddened area with the normal adjacent skin formed a distinct line of demarcation, the two areas being essentially bilateral as regards the median raphe with no communication at any point. These areas later underwent the changes characteristic of pellagrous skin lesions, ending with complete desquamation.

In about two weeks the mouth became sore and red. This condition later developed into a typical pellagrous stomatitis which was followed, about five days later, by a severe diarrhea necessitating constant access to stool.

About September 15 a mild erythema was noticed on the knuckles of both hands which, a few days later, extended to cover the backs of both hands and lower portion of the dorsums of both wrists. These areas were sharply outlined by definite lines of demarcation and later terminated in the usual desquamation.

The patient stated that since returning from the hospital he had lived almost exclusively on bread and molasses. 17e