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2. IX / 97



See Circ. 23. for later editions.

CIRCULAR NO. 21.

United States Department of Agriculture,  
BUREAU OF ANIMAL INDUSTRY.

DIRECTIONS FOR USE OF BLACKLEG VACCINE.

The blackleg vaccine, as prepared by this Bureau, consists of a brownish powder, which is put up in packets containing ten doses each. To prepare this powder in such a way that it may be injected hypodermically, it is necessary to obtain certain implements, which, together with the hypodermic syringe, are known as a vaccinating outfit. This consists of a porcelain mortar with pestle, a small glass funnel, and a measuring glass. For filtering the vaccine, we have found absorbent cotton to be most suitable. Fig. 1 is an illustration

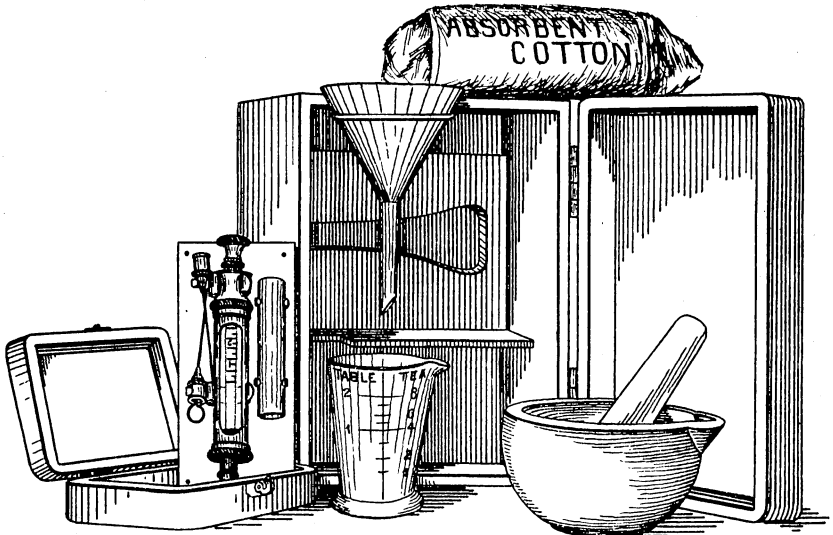
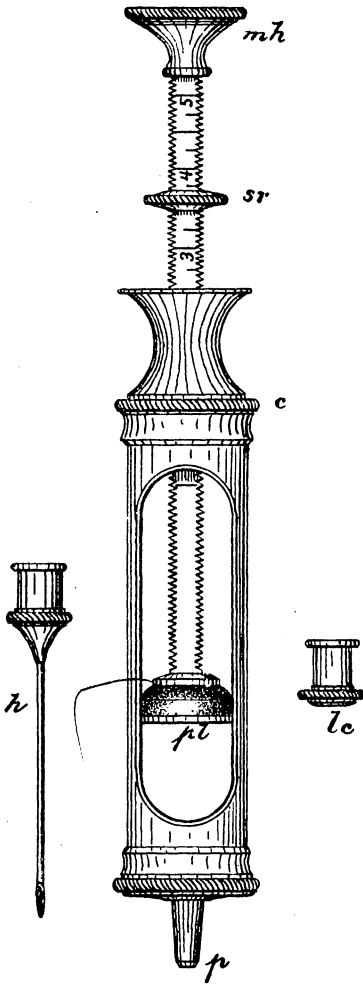


Fig. 1.—Vaccinating outfit.

of the vaccinating outfit recommended by this Bureau. All of the utensils, including the hypodermic syringe and a package of absorbent cotton, are fitted in a strong, polished, oak box, which, by means of an adjustable wire loop, serves also as a support for the funnel when the vaccine is filtered. The syringe, two hypodermic

needles, and an extra glass barrel are packed in a separate small wooden box. The syringe, needles, and glass barrel are, by means of clamps, attached to a loose metal plate which fits snugly into the bottom of the box. This arrangement serves to keep the different things together when the outfit is sterilized.

The syringe (fig. 2) has a capacity of 5 cubic centimeters, and the piston is graduated from one to five, each division being subdivided with half and quarter notches.



The screw regulator (fig 2, *sr*) may be placed at any mark on the piston, and thus insure that the animal to be vaccinated receives only the exact dose intended for it. The plunger (fig. 2, *pl*) is made of rubber and should fit air-tight in the glass barrel, and still be able to be moved up and down smoothly. By means of the milled head (fig. 2, *mh*) at the free end of the piston, the rubber of the plunger may be expanded or contracted, simply by screwing the head to the right or left. By this arrangement a close fit may always be obtained without taking the syringe apart. If the plunger should become dry, or for other reasons not move smoothly up and down in the barrel, it becomes necessary to unscrew the milled cap, *c*, and pour a drop of glycerine into the barrel. For this purpose a small bottle of glycerine will be furnished with each outfit; oil or grease should never be used, as it destroys the rubber. Extra washers to be placed inside of the cap at each end of the glass barrel will also be found in the syringe box. It is of the greatest importance that the syringe be perfectly tight, in order that not a drop of vaccine may escape, except through the point of the needle.

FIG. 2.—Hypodermic syringe.

If a leak occurs, unscrew the cap of the syringe, withdraw the glass barrel, and replace the old washers with new ones. In order to prevent the plunger and washers from drying out, the small loose cap, *lc*, should always be tightly adjusted to the peg, *p*, when the syringe is not in use.

The hypodermic needles should be kept very sharp at the point, in order to pass easily through the skin, and when not in use should have a fine brass wire passed through each to prevent rusting on the inside. Before using the syringe, it should be thoroughly tested with pure water to ascertain that it is in perfect working order. To this end, fill the syringe slowly by withdrawing the piston. If the syringe is perfectly tight, it should fill completely; if it contains air bubbles, turn it with the point upward and press the piston until the water comes out of the point; then refill. The same precaution must be taken when filling the syringe with vaccine.

#### STERILIZATION OF UTENSILS.

Before preparing the vaccine, all the utensils, together with the hypodermic syringe, must be thoroughly sterilized. This is done by putting the mortar, pestle, measuring glass, and the metal plate, with the syringe and needles attached, in a pan of cold water, placing all over the fire. After boiling for ten minutes the pan with the contents should be allowed to cool off slowly; then remove the utensils from the water and wipe them dry with a clean linen cloth which has been previously boiled. When the vaccine has been prepared the utensils should again be thoroughly cleansed and replaced in the box. After injection, the syringe and needles must be washed with a 5 per cent solution of carbolic acid, carefully wiped, and the brass wire adjusted in the needles.

#### PREPARATION OF THE VACCINE.

Place the contents of one packet of the vaccine in the porcelain mortar and add a few drops of boiled water.<sup>1</sup>

Work the powder thoroughly with the pestle, and then add, little by little, 10 cubic centimeters of boiled water, stirring constantly with the pestle. As the syringe contains exactly 5 cubic centimeters, it may be used for measuring the water. Consequently a packet containing ten doses of the vaccine should be dissolved in two syringes full of water, care being taken that the syringe is full every time. To filter the vaccine, place the wooden box on end, as shown in the illustration, and adjust the wire loop in the two eyelets. Place in the funnel a small piece of absorbent cotton and press it slightly into the upper end of the neck, sufficient to keep it in place, moisten this with a few drops of boiled water and let it drip off. Stir the mixture in the mortar thoroughly, and, before it has had time to settle, pour it into the funnel, under which the measuring glass has been placed. The solution should be of a light-brown color; if perfectly clear, the cotton has been pressed too tightly into the neck of the funnel.

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<sup>1</sup> The water must have been previously boiled and allowed to cool.

Where a large number of animals are to be vaccinated at the same time, three or four packets of the vaccine may be dissolved at once, care being taken that the requisite amount of water is used, as otherwise the solution will be either too strong or too weak. When the vaccine is prepared at home, a small sterilized medicine bottle may be substituted for the measuring glass under the funnel. The stopper of this bottle, which, if cork, must have been thoroughly soaked in boiled water. The vaccine is carried in the bottle to the place of operation, where it may be transferred, a little at a time, to the measuring glass, from which it may conveniently be drawn up into the syringe.

No more vaccine should be prepared at one time than can be used the same day. While the vaccine powder will remain unchanged for more than a year, the solution deteriorates very quickly, and must be used within twenty-four hours after having been dissolved.

#### ANIMALS TO BE VACCINATED.

Calves, as a rule, should not be vaccinated until they are half a year old. Under this age they are practically immune against black-leg, and it has been claimed that when vaccinated before they are half a year old they are liable to lose the artificial immunity induced by means of vaccination and become susceptible again. Animals between one and two years of age are the most susceptible, though quite a number become affected between the ages of one-half year and one year, and between two and two and a half years. Animals more than two and a half years old are very seldom affected, and the mortality among them is so small as to make vaccination unprofitable. Consequently it is the calves between one-half and two and a half years old which should be vaccinated.

Vaccination has no ill effect on calves under half a year old, but it should be a rule that when very young animals are vaccinated they should be revaccinated the following year.

#### THE DOSE TO BE INJECTED.

Animals one year old or over are injected with a full dose of vaccine, that is, one cubic centimeter of the solution. Under this age the dose may be reduced to one-half to three-fourths of a full dose, according to the size and development of the animal. Less than one-half a dose should never be injected. In determining the dose for each animal more consideration should be given to the size and development of the animal than to its exact age.

#### HOW TO VACCINATE.

When the animals to be vaccinated are gentle and accustomed to being handled, vaccination may be performed on the standing animal. Range cattle or other half-wild animals must be thrown or secured in a dehorning chute.

The most convenient place to inoculate is on the side of the neck, just in front of the shoulder where the skin is loose and rather thin. If the animals are secured in a dehorning chute, it is easier to vaccinate them on the side of the chest just behind the shoulder.

All animals should be vaccinated on the same side and marked in such a way that they may be easily recognized. The best way to mark them is to use a small branding iron in the shape of a **V**, or to fasten a metal tag in the ear.

When the animal is secured, fill the syringe with vaccine and ascertain that it contains no air bubbles, then insert the hypodermic needle by grasping a fold of the loose skin between the thumb and forefinger of the left hand, and pushing the needle through the skin. The operator now adjusts the peg of the syringe tightly in the cap of the needle, and injects the dose, which has been previously limited by the screw regulator on the piston. The needle is then withdrawn without detaching the syringe, and, to prevent any of the vaccine from escaping through the hole of injection, the skin is pressed tightly around the receding needle. The latter is then detached, the regulator screwed back to its proper place, according to the size and age of the animal to be next vaccinated, and the operation repeated.

When a large number of cattle are to be vaccinated, it is of importance to have a sufficient number of assistants, as otherwise the process becomes exceedingly tiresome and fatiguing both to the operator and to the assistants. The herd to be treated is confined in a pen, from which a small number, from five to ten, according to the number of assistants at hand, are driven into a smaller pen, where the assistants throw them and hold them down. Very wild range cattle must be lassoed, but graded or fine stock, being less unmanageable, should be seized by the head and thrown. The first method requires a larger pen, but when the assistants are skillful in handling the lasso it is by far the quickest way. The animals should all be thrown on the same side. One assistant sits across the side of the thrown animal, with his face toward its head and holding the upper foreleg pulled back and up. When secured in this way it is almost impossible for a well-grown yearling to free itself. With older and stronger animals it is safer to have two men to hold each one, as an animal that succeeds in getting up before all have been injected and marked, will frequently make things very unpleasant for the operator and assistants, chasing them from the pen, and necessitating a repetition of the whole process. The operator should have an assistant to insert the needle, while he himself adjusts the regulator. After inserting the needle, the assistant lifts the skin fold, presenting the cap of the needle so that the operator may easily grasp it and attach the syringe. In this way from 90 to 100 head of yearling calves may be vaccinated in one hour, with ten

men to handle the animals and one assistant to insert the needle, but it is needless to say that such a rate can only be maintained for a limited time without changing the men. With one set of men not more than 400 to 500 head should be vaccinated in one day, according to the age and size of the animals. Where a dehorning chute is used a much larger number may be vaccinated in one day.

#### SYNOPSIS OF VACCINATION PROCESS.

1. Sterilize outfit by boiling.
2. Place one powder in the mortar and add a few drops of water.
3. Work the mixture well with pestle.
4. Add two syringes full of water, and stir well.
5. Place cotton in glass funnel and moisten it with water.
6. Filter vaccine and gather in glass or bottle.
7. Secure the animal to be injected.
8. Insert the needle through the skin.
9. Fill the syringe and adjust the screw regulator on the piston. If first animal is a yearling or older, place regulator at No. 1.
10. Fit the peg of the syringe into the cap of the needle and inject the dose.
11. Withdraw syringe and needle *together*. If the syringe be removed from the needle before this has been drawn out of the skin, some of the injected vaccine will flow back through the needle and be lost. The animal does not get its full dose and will be insufficiently protected.

#### THE RECORD TO BE PRESERVED.

A blank will be sent to you next spring for recording the results of your experiment. You will therefore please keep an accurate account of the number of animals vaccinated; their ages; the number, if any, of those which die from the vaccination, and the number of vaccinated animals which die from blackleg.

Very respectfully,

D. E. SALMON,  
*Chief of Bureau of Animal Industry.*

Approved:

J. H. BRIGHAM,  
*Acting Secretary.*

WASHINGTON, D. C., *August 3, 1897.*

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As a matter of convenience B. A. I. Circular No. 20 is reproduced on the pages following.

## PREVENTIVE VACCINATION AGAINST BLACKLEG.

For several years frequent reports have come to this Bureau concerning the great mortality from blackleg among young stock in many widely separated districts of the United States. In some of the Southern and Western States especially, the annual losses from this fatal disease have been so great as to equal or exceed the losses of cattle from all other causes combined. These losses have been particularly felt by the progressive stock owners, as by far the largest percentage of the calves which became affected were either full blood or highly graded animals, which seem to be more susceptible to this disease than the ordinary common-bred stock. As the continued existence of this disease has a very detrimental effect upon the cattle industry in general, and especially upon those stock owners who, through untiring efforts and great expense, have endeavored to improve their herds, an investigation has been made by this Bureau with a view to devising some measure through which the steadily increasing losses might be arrested, or reduced as much as possible.

In Europe, where this disease has long prevailed, the annual losses in certain badly infected districts became so disastrous that cattle raising had to be abandoned. About fifteen years ago, three French scientists, Arloing, Cornevin, and Thomas, succeeded in producing a vaccine against blackleg, which is now extensively used in many countries where the disease prevails to a serious extent. The method consists in injecting into each calf two doses of highly attenuated blackleg virus, with an interval of ten days between the two inoculations. The first inoculation is made with a very mild vaccine, the so-called "First Lymph," and the subsequent one with a stronger virus, the "Second Lymph," and in each case the vaccine is introduced by means of a hypodermic syringe under the skin of the lower part of the tail. This method, which is very inconvenient, especially where a large number of animals are to be treated, was later modified by a German scientist, Kitt, who reduced the process to a single injection with less attenuated virus, and who chose the loose skin on the side of the chest, just behind the shoulder, for the point of inoculation. Kitt's method has been adopted to a very large extent in Eastern Europe and Northern Africa with very satisfactory results, and it has, for that reason and on account of its simplicity, been taken as the foundation for the investigations made by this Bureau.

A "single vaccine" has been prepared in the pathological laboratory, and subsequently tested on a large number of calves in Texas, both common and high-grade stock, and the results warrant the conclusion that this vaccine is in every way satisfactory. It is desired, however, before distributing the vaccine to stock owners in general, to obtain



a record of several thousand successful vaccinations. For this purpose a quantity of vaccine will be distributed to such parties as may desire to make preliminary vaccinations and report the results to this Bureau. Those stock owners will be preferred who already have experience in vaccinating stock for blackleg, and are in possession of a vaccinating outfit. Explicit instructions will, however, be sent with the vaccine to secure uniformity of operation and to assist those without previous experience in the vaccinations. Persons lacking the necessary outfit should procure one if they propose to test the vaccine. It consists of a graduated 5 c. c. syringe with detachable needles, a small porcelain mortar and pestle, a glass funnel, and some filters. This outfit can not be supplied by the Department, but must be purchased of some house which supplies such articles.<sup>1</sup>

Upon applying to this Bureau for vaccine please answer the following questions:

1. To what extent does blackleg prevail in your part of the country, and how great is your annual loss from this disease?
2. What experience have you had in vaccinating calves against blackleg?
3. How many head do you wish to vaccinate, and what class of cattle are they, common, graded, or full blood?
4. What is your express office?

Name, .....

P. O. address, .....

D. E. SALMON,  
*Chief of Bureau of Animal Industry.*

WASHINGTON, D. C., *June 22, 1897.*

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<sup>1</sup>A complete vaccinating outfit, including hypodermic syringe, can be obtained from Z. D. Gilman, 627 Pennsylvania avenue N. W., Washington, D. C., for the sum of \$4. The outfit is prepared by the firm named in accordance with the plans of this Bureau, to meet the temporary demand that may arise in introducing this vaccine. If vaccination should be extensively adopted as a preventive of this disease, similar outfits will, no doubt, be for sale by other dealers furnishing this class of supplies. Until this may be the case, the unusual course of mentioning a dealer by name in a Department publication is followed.