

# Vaccines: Handle with Care

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A strong vaccination program can have a sizable impact on a cattle herd, both in dollars spent and on the herd's health. The expectation is vaccines will protect cattle from having detrimental health problems due to infectious diseases. Given the importance of vaccines in an animal health program, proper handling is vital to assure that the product is effective. Improper handling can render the product useless.

There are three time periods when proper vaccine handling is crucial: during transportation, on-farm storage, and during use. Some simple best management practices should be implemented to keep vaccines viable to provide adequate immunity for cattle.

## Vaccine transport

Prior to vaccines being stored on-farm, they need to be purchased and transported to the farm. It's important to buy vaccines from a reputable business. A good distributor will maintain a temperature log for their cooler to ensure vaccines are handled properly prior to selling. When buying vaccines locally, ask about storage conditions, and use a cooler with ice packs to transport the vaccine home. When ordering a vaccine to have it shipped to a farm, it should be shipped overnight—not on a weekend—to make sure it will arrive at the proper temperature. When the vaccine arrives, check the temperature of the shipping cooler. If the temperature is above 45°F contact the distributor and arrange to have the vaccine replaced.

## Vaccine storage

Cattle vaccines should be stored at temperatures between 35-45°F and protected from ultraviolet light. Exposure to temperatures outside of this range for extended periods of time will be detrimental to the vaccine, making it less effective. Although killed vaccine products are considered more stable than modified live products, both are susceptible to degradation if exposed to temperatures outside this range.

Freezing is most detrimental to killed vaccine products. Freezing a killed vaccine will change the structure of the adjuvant, which is the part of the vaccine that presents the antigen to the cattle's immune system and initiates a proper immune response. Additionally, freezing may release toxins that are naturally present in clostridial or gram negative vaccines (pasteurella, leptospirosis, etc.) and are normally bound by the adjuvant. Although killed vaccines are fairly tolerant to warmer temperatures, exposure to temperatures above 45°F for longer than one hour is not recommended. In weather above 80°F the time exposed to warm temperatures should be greatly reduced.

Modified live vaccines are fragile after they have been reconstituted (mixed) but the freeze-dried cake is actually very stable until temperatures reach 75°F. Temperatures above 75°F are detrimental to the vaccine in its dried state. Once a modified live product has been reconstituted it should be kept between 35-45°F and used within two hours. It is important to mix only what will be used within this time frame.

Store vaccines in a good refrigerator between 35-45°F. Old refrigerators located in a barn may have inconsistencies in temperature regulation. Ideally the refrigerator should be housed in a temperature controlled environment to reduce the workload of the refrigerator caused by extreme environmental temperatures. A refrigerator in a hot environment will run more often which can lead to intermittent freezing conditions which is detrimental to the vaccine. When storing a vaccine for an extended period of time, a temperature data logger is recommended that will record the minimum and maximum temperature each day. At a minimum, a cheap refrigerator thermometer should be placed in the refrigerator and checked regularly. Vaccines that have undergone temperature cycles above or below the recommended storage temperature will have reduced efficacy and may be completely worthless due to deactivation.

Another important factor to consider is the vaccine's expiration date. Vaccines are approved by the United States Department of Agriculture (USDA) to meet an efficacy standard. Over time, the efficacy of a vaccine will decline. The vaccine manufacturer has determined the timeline from the date of manufacture to the critical loss of efficacy when establishing the expiration date. Prior to use, check the expiration date on the vaccine and discard any expired product. To reduce the risk of a vaccine becoming outdated, buy only enough vaccine to meet immediate needs.

## **Vaccine usage**

The final hurdle to keeping a vaccine viable is during the time of use. The size of an operation will determine the length of time a vaccine is away from a controlled environment and exposed to environmental conditions. Proper planning will assure the vaccine retains the manufacturer's efficacy and results in immunized cattle.

Vaccines should be transported to a working facility in a rigid sided cooler that has been pre-cooled. It will take about an hour for a large cooler at room temperature to cool down to the proper temperature of 35-45°F. Additionally, a smaller pre-cooled personal cooler should be available to store vaccines during use. Repeated opening the large storage cooler can cause temperature fluctuation which may damage any unused vaccine.

Once cattle are ready, mix the amount of vaccine needed for about an hour's worth of use. The amount of vaccine needed will depend on the activities being done. Castrating and dehorning calves takes longer than giving pre-breeding vaccines to cows. Once mixed, a modified live virus (MLV) vaccine will remain viable for two hours if it is well taken care of—kept cool and out of direct sunlight. Reducing the time frame to one hour's work ensures that the vaccine remains efficacious, especially if there are any unexpected delays.

During use, the open bottle of vaccine should be kept on ice in the small cooler. Additionally, syringes should be stored in a cool dark place between uses. Setting a syringe down on a table or tailgate will cause the vaccine to warm up and UV light will cause damage. Coolers with openings or slots to protect vaccine syringes can be purchased or made. (Instructions can be found in this publication.)

When filling a syringe always use a clean needle to go into a bottle. Do not allow a needle that has been used for injecting an animal to go into a bottle. Bacteria and debris on the surface of the needle will be deposited into the bottle contaminating it and the vaccine. Contamination of a MLV can inactivate the vaccine, rendering it useless. Contamination of a killed vaccine can lead to infections at the vaccination site, limiting the immune response and causing abscesses.

## **Cold weather usage**

Although much attention is paid to keeping vaccines cool during hot weather, freezing conditions are also harmful to vaccines. As discussed, freezing a killed vaccine product can damage the adjuvant and release endotoxins from bacterins, potentially causing adverse reactions in the animal. Once a MLV has been reconstituted, those live viruses can be damaged by freezing. Extreme cold temperatures can cause the vaccine to freeze in the syringe or needle making it impossible to vaccinate cattle. If needed, the temperature in a cooler can be adjusted with hot packs to maintain the storage temperature between 35-45°F.

## **Cleaning syringes**

It is important to sanitize syringes following use. Syringes used for administration of killed vaccines can be cleaned using soaps or disinfectants and hot water, making sure to rinse all the residue away. Soaps and disinfectants can kill or deactivate the MLV and should be avoided. Instead, syringes used to administer MLV should be cleaned and sanitized using hot or boiling water.

## Syringe cooler modification instructions

A syringe cooler will keep a vaccine cool during use, protect the vaccine from UV radiation, and keep syringes safe. Commercial syringe coolers are available, but can also be made with a few basic tools and supplies.

Although opened vaccine bottles can be stored in the syringe cooler, continual opening of the cooler to fill syringes will make maintaining temperature difficult.

Gather the following materials and tools:

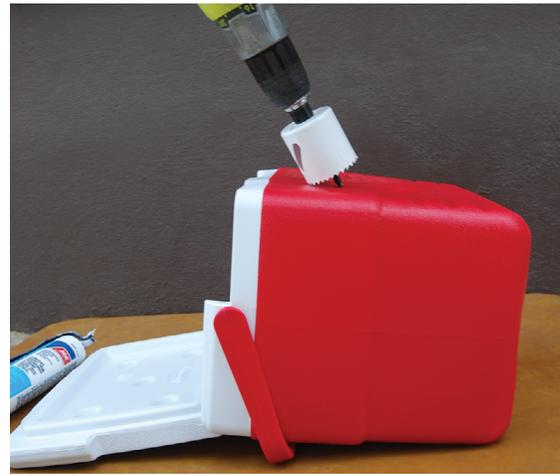
- Small rigid cooler large enough to hold the number of syringes normally used.
- 1.5 inch interior diameter PVC pipe
- Hole saw. The exterior diameter of schedule 40 PVC pipe, is 1.9 inches; a 2 inch hole saw will be needed.
- The exterior diameter of drain pipe (a flanged tailpiece works well) is 1.75 inches; a correspondingly-sized hole saw will be needed.
- Drill and drill bit



**Figure 1.**  
Syringe cooler supplies.

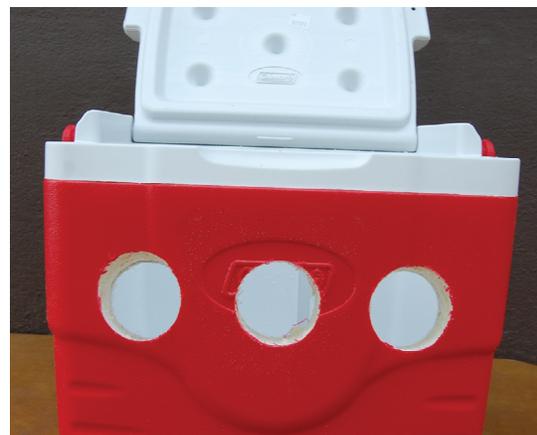
Measure and mark the placement of holes. Allow at least 1 inch of space between the interior side wall and the PVC pipe to allow air to circulate.

Drill at a downward angle toward the inside of the cooler so the slope of the pipe prevents the syringes from falling out and assures any leakage drains out of the pipe (Figure 2).



**Figure 2.**  
Drilling at an angle with hole saw.

To allow easy access to syringes during use, space holes evenly across the front of the cooler (Figure 3).



**Figure 3.**  
Holes drilled in cooler.

The purpose of the syringe cooler is to keep syringes filled with vaccine at the proper temperature and protected from UV light. To facilitate a continuous proper temperature between 35-45°F, holes should be drilled through the pipe to allow air circulation. Without holes, the pipes will maintain dead air space that does not cool well (Figure 4). Colored tape can be used to mark each tube and syringes can be labeled to match.



**Figure 4.**  
Holes drilled in PVC pipe.

Drill a small hole in the upper part of the cooler to insert a probe thermometer to measure the air temperature inside the cooler (Figure 5).



**Figure 5.**  
**Inside of syringe cooler with probe thermometer in center.**

The PVC pipe can be stabilized with a large head screw on the back wall that the pipe can rest on and then be secured with polyurethane glue. Once the PVC is secured, use silicone caulk to seal around the hole where the pipe passes through the cooler wall. See the finished cooler in Figure 6.



**Figure 6.**  
**Finished syringe cooler.**

When using the syringe cooler, it is important that the syringes are maintained at the proper temperature. It can take more than an hour for the temperature to drop from room temperature to 45°F if just one ice pack is placed in the bottom of the cooler.

The best way to make sure a cooler is ready for use is to slide one or two thawed ice packs under the PVC pipe, place the unit in a freezer, let the ice packs freeze. When ready to use, place another ice pack on top of the PVC to ensure the syringes stay cold. If ice is used, make sure the water level from melting ice does not reach the bottom of the PVC pipe and contaminate the needle ends.

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