Veterinary Technician Program

Moderator: Kevin Crandall

Proper Vaccine Handling

Victor S. Cortese, *DVM, PhD, Dipl ABVP (dairy)*
Associate Director – Cattle Immunology, Veterinary Speciality Operations, Pfizer Animal Health, Downington, PA

Abstract

There are many factors involved in a proper immune response, both from the disease and from the vaccine. The proper handling of vaccines, before they are used as well as when they are administered, is necessary if the vaccine is to provide expected immune responses and corresponding efficacy. Vaccines must be protected from extreme temperatures and sunlight. Before using a vaccine, the label should be read to see specific administration directions and warnings.

Introduction

Vaccines are nothing more than a management tool to be used by the veterinarian and animal owner to improve health and prevent disease. As a management tool, it works with all other management in place in the operation to ensure healthy and productive animals. Occasionally disease is seen in animals that have been vaccinated. When this occurs, the vaccine is often blamed for not working properly, and thus the animal was not protected against disease (Figure 1).

Although failure of a vaccine to protect animals is often first blamed in an outbreak, the odds for a vaccine leaving the factory ineffective are very low. Each serial of vaccine undergoes rigorous quality assurance testing before leaving the manufacturing site. These tests are reviewed by the United States Department of Agriculture. However, before a vaccine can be given a chance to work in the animal, proper vaccine management is critical and often overlooked. Vaccine mismanagement can be broken into several areas that can be reviewed with clients and improved upon when needed (Figure 2).

Vaccine Mismanagement

Improper Vaccine Usage

It is very important to read the manufacture's instructions provided by the manufacturer of vaccine. The manufacturer will include dosage, route of administration, and mixing instructions (if applicable). Storage information and requirements for booster doses will be included. Any specific requirements or restrictions for use of the vaccine should also be here. Clients rarely read these and assume they know how to use all vaccines, often leading to vaccination errors. A quick review sheet for each vaccine dispensed and/or recommended by the clinic should be prepared to avoid these mistakes.

a.) Partial dosing is often done with cattle vaccines. This may either be a cost cutting measure, because the user may feel the dose is too high for the size and age of the animal, or due to the fact that the instructions were not read. The vaccine dose is set at a level required to stimulate an immune response in the species. This is generally not size-dependent. When partial dosing is done it not only decreases the immune response, but also increases the risk of future anaphylactic reactions.

b.) The vaccine may be administered by a route not indicated on the label. This may occur due to improper injection techniques or by using the wrong site. Many vaccines are effective only when administered via the labeled route of administration.

c.) The vaccine label must be checked to determine if concurrent antibiotic usage is contraindicated. This is generally not a problem with most vaccines including modified-live viral vaccines. However, it may be a problem with modified live bacterial vaccines.

d.) Many vaccines require a booster dose for peak immunity to be achieved. The administration and timing of this dose is important for the vaccine to work correctly. If the booster dose is given too soon after the initial dose, the immune response is lost in the initial response. If given too long after the initial dose, the number of memory cells from the primary dose have decreased significantly, decreasing the anamnestic response (Graph 1).

e.) The species, age and sex of the animal being vaccinated must be in agreement with label specifica-

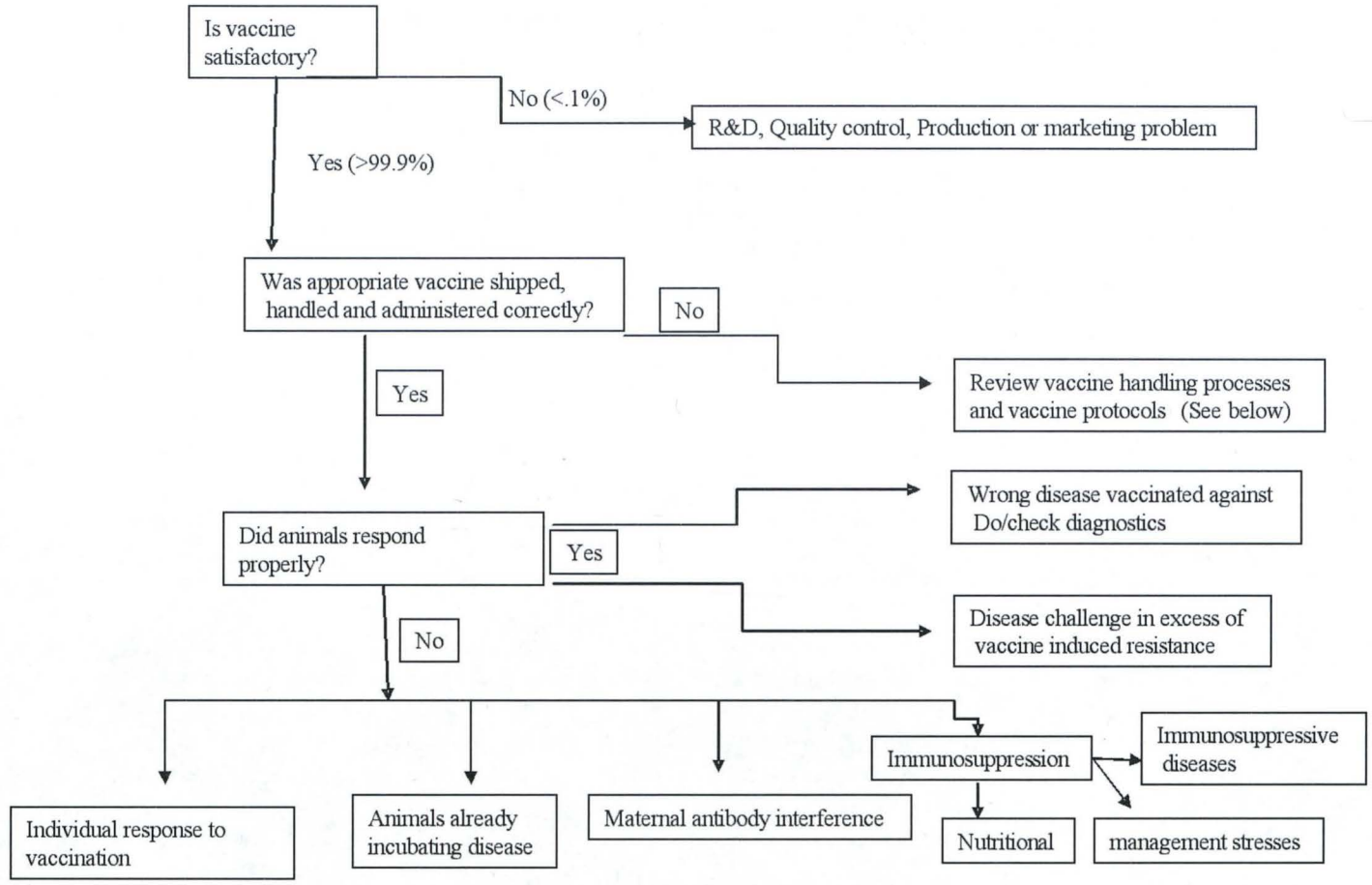


Figure 1. Vaccination failure analysis tree can be used when a lack of efficacy seems to have occurred following vaccination.

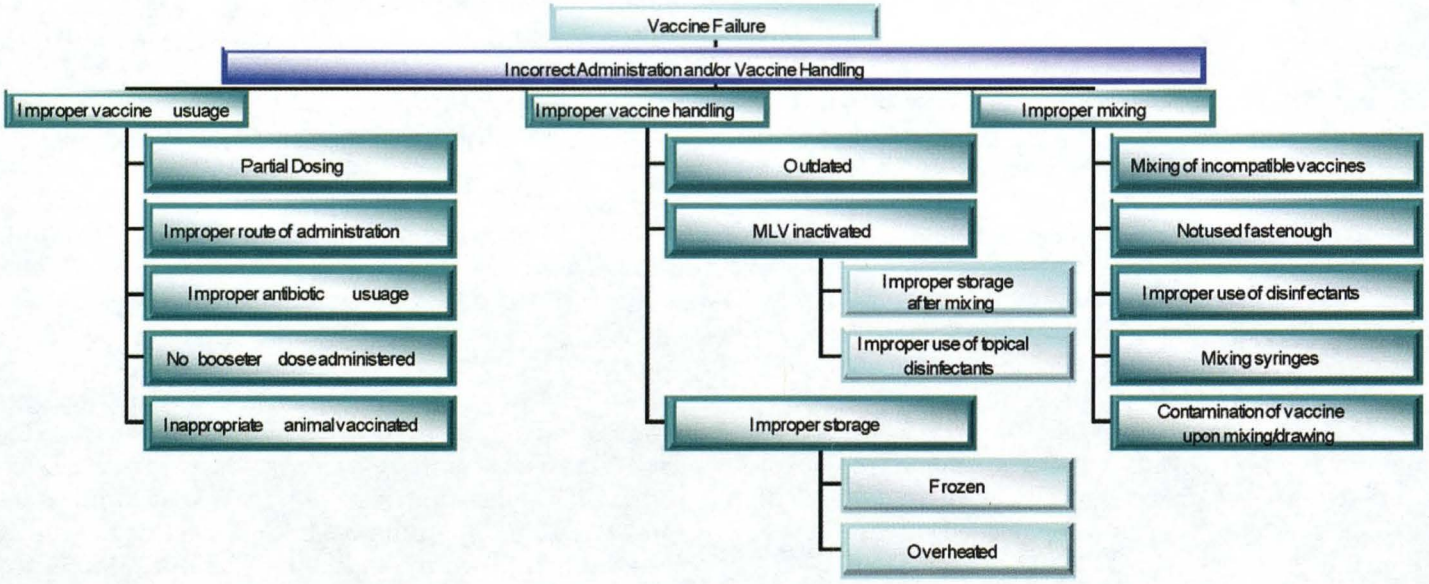
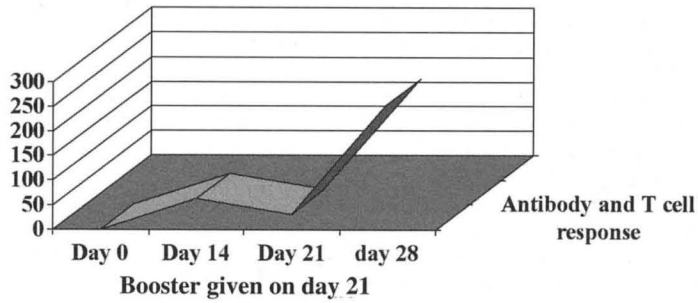


Figure 2. Vaccine handling must be a part of any investigation into perceived lack of efficacy problems with a vaccine.



Graph 1. Booster doses must be given according to label directions if maximum protection is desired.

tions. Some pathogens and virulence factors are species-specific, and using a vaccine in the inappropriate species may not confer the desired protection. The age restrictions give a clue as to how young the animals in the vaccine research were, and whether or not maternal antibody interference occurs.

Improper Vaccine handling

The method in which vaccines are handled prior to their use is an important component of proper vaccination. Often overlooked, this is an area of common abuse among both veterinarians and their clients, so review of this area is vital.

a.) When a vaccine is developed, efficacy is performed using an established minimum immunizing dose (MID). The MID is the minimum amount of antigen required to instill desired immunity when the vaccine is administered appropriately. The MID then becomes the amount of antigen guaranteed to be in the vaccine at the expiration date on the vaccine. As the vaccine outdates, the antigenic mass continues to decrease and may not be high enough to establish protection. Constant rotation of vaccine inventory should help minimize the risk of vaccine becoming outdated. If a vaccine is outdated, it should not be used.

b.) Modified-live vaccines require some specific handling after the vaccine is reconstituted. These vaccines are sensitive to sunlight and heat, and should be protected and keep cool. These vaccines are to be used as soon after mixing as possible and cannot be stored for future use once rehydration has occurred. They are also extremely sensitive to disinfectants, and any contact with disinfectants must be avoided in order to preserve the viability of the vaccine.

c.) Vaccines need to be stored according to the label instructions, and should not be used if they have been frozen or exposed to high temperatures. Freezing of vaccine will disrupt the integrity of the antigens and may degrade the adjuvant. Overheating can have the same effect. Thawing frozen vaccines or re-cooling overheated vaccines does not ensure that the vaccine integrity will be restored, and should be avoided. If there is any doubt about the storage of a vaccine, then it shouldn't be used.

Improper Mixing

Many mistakes in vaccine handling occur as the vaccine is used. Mistakes at this time not only can decrease the effectiveness of the vaccines, but may also lead to unwanted adverse reactions and injection site problems.

a.) Combination vaccines are tested to ensure that all components work together and that there is no interference. Many vaccines are virucidal (killing any live viruses) either due to the adjuvant used, or disinfectants used for inactivation and storage of the vaccine. When mixed with modified-live vaccines they inactivate the attenuated viruses, making them ineffective. There are also incompatibility issues with adjuvants. Mixing of vaccines with different adjuvant systems may not only decrease immune responses, but have the potential to increase injection site lesions. Combine only approved vaccines and diluents.

b.) All vaccines have on the label that once the vaccine is opened it should be used immediately. As opened vaccines are stored, the risk of contaminants growing in the bottle increases and degradation of the vaccine may also occur. Certainly all modified-live vaccines must be used immediately, and this is a good rule for all vaccines.

c.) Even small amounts of disinfectant can inactivate modified-live vaccines, and harsh disinfectants may break down antigens in inactivated vaccines. Syringes need to be clean or new. No disinfecting agents can be in the syringe or on the needles. If a disinfectant is used at the end of vaccinating animals, then thorough rinsing with sterile water is needed to remove any traces of disinfectant.

d.) It is important that when multiple vaccines are administered simultaneously, the syringes are identified for each vaccine. Putting vaccine in a syringe previously used for another vaccine can lead to all of the problems listed above with mixing of incompatible vaccines.

e.) The equipment used for mixing and drawing of vaccines out of the bottle must be sterile. Modified-live (MLV) vaccines must be mixed up, ensuring sterility and avoiding introduction of any disinfectant. Transfer needles are recommended for mixing vaccines that require rehydration. Vaccine should always be drawn out of the bottle using a new sterile needle and never with the needle used for vaccinating animals.

f.) New needles are recommended for every animal to decrease the likelihood of disease transmission and post-vaccination abscesses. While this is often impractical in large herds, a minimum needle replacement of every 10 animals is required to meet Beef Quality Assurance recommendations.

Summary

Many factors are involved in a proper immune response, both from the disease and from the vaccine. Whenever there is a disease outbreak in vaccinated animals, then the various factors listed above must all be considered. Training and communication regarding proper vaccine handling can eliminate one potential area of perceived vaccine failure. This is important not only for understanding the current problem, but also to stop a similar problem from arising in the future.

Additional Reading

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