



The Basics of Vaccinating Sheep and Goats

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Developing a vaccination program that improves animals' immunity for common diseases will increase the health, productivity, and value of sheep flocks and goat herds.

Like all livestock, sheep and goats are susceptible to a number of different infectious diseases. Although the risk of an outbreak for any specific disease depends on the time of year, age and location of the herd/flock, and nature of the production system, it is fair to assume that livestock are at constant risk from one or more diseases throughout their lifespan. Thus, developing and implementing a sound vaccination program that best fits their situation and with input from their local veterinarian allows producers to better manage herd/flock health by helping to prevent large outbreaks of infectious diseases that are often expensive and difficult to control. This NebGuide provides producers with fundamental information summarized from extensive research efforts about sheep and goat vaccines, as well as the diseases they help prevent. There is broad variability in production schemes throughout Nebraska, and this article is meant to serve as a reference for developing vaccination programs that are best suited for specific schemes. For more information regarding how vaccines work and the type of immunity they provide, please refer to *Understanding Vaccines* (G1445) at <https://extensionpubs.unl.edu/publication/9000016362682/understanding-vaccines/>. In addition, local veterinarians can provide guidance for choosing vaccines that are best suited for specific production systems.

When developing a vaccination program, it is essential to consider the questions “which vaccine(s)?,” “which animals?,” and “when?” The answers to these questions are often related to the stage of production. As illustrated in Figure 1, traditional programs typically include vaccinations at three main time points: (1) prior to breeding; (2) prior to or at the time of lambing/kidding; and (3) at weaning (in offspring). Young animals and first-time breeders may require additional doses of certain vaccines for maximum protection. When this is the case, such information will be explicit on the vaccine label.

Annual Pre-Breeding Vaccines

Vaccination of breeding stock (both males and females) is necessary to maintain long-term herd/flock immunity against many common diseases. Pregnant females are particularly susceptible to reproductive diseases such as chlamydiosis (chlamydia) and vibriosis. These are difficult to detect and can lead to termination of pregnancy (i.e., abortion or reabsorption of the fetus). Moreover, infectious reproductive diseases can spread quickly, affecting large portions of the herd/flock if infected animals are not quickly isolated.

Chlamydiosis, more commonly known in sheep as enzootic abortion in ewes (EAE), is a highly contagious disease caused by the gram-negative bacteria species *Chlamydia psittaci*. Extensive research has shown that illnesses/diseases involving a gram-negative bacterial

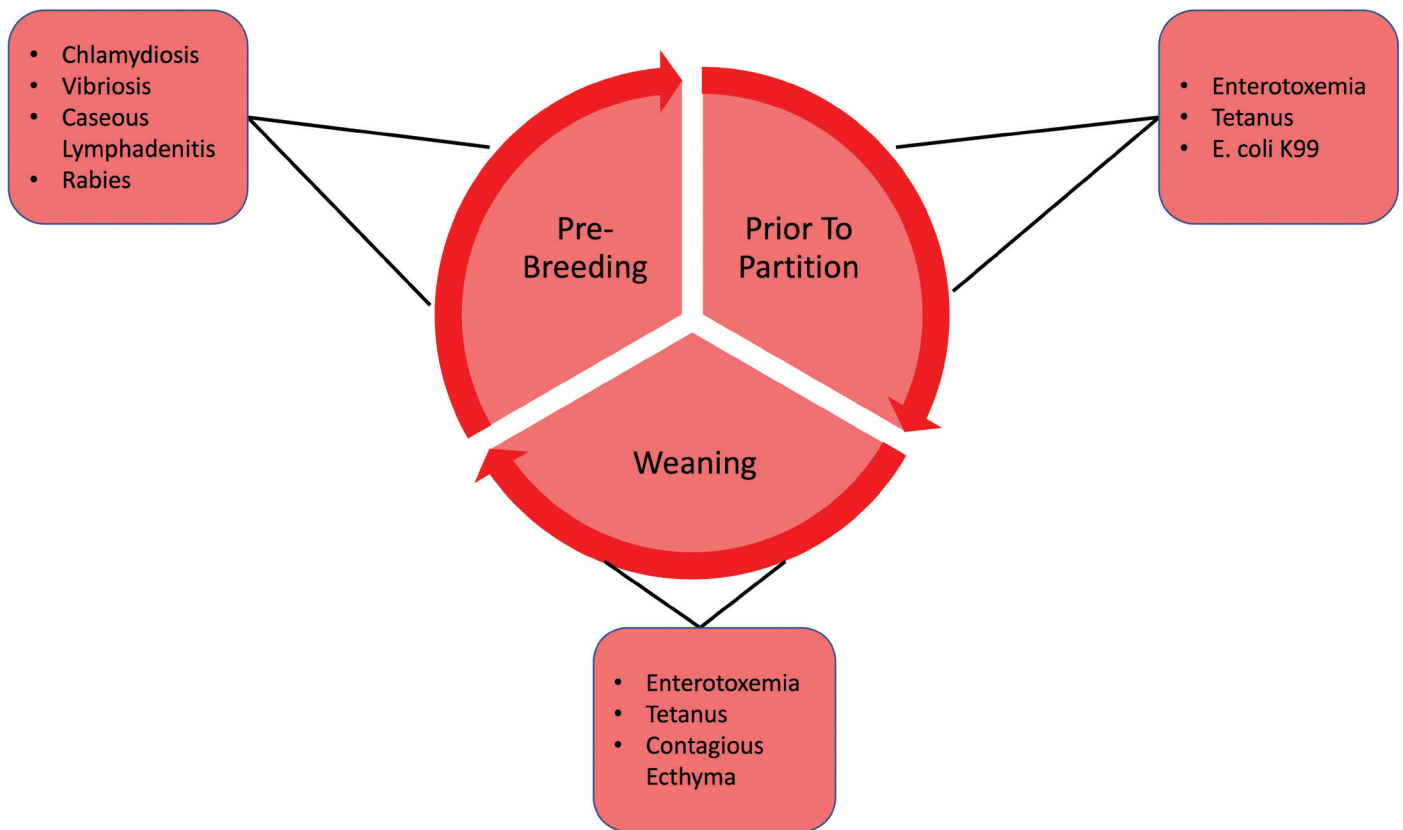


Figure 1. The three main time points at which vaccines are delivered in typical sheep and goat vaccination programs.

species are especially difficult to control due to their particularly high resistance to antibiotic treatments. Chlamydia infections in livestock most commonly originate from inadvertent ingestion of bird droppings that carry *C. psittaci*. Infections are then propagated to other herd mates through contact with the aborted tissues and fluids from infected females. Chlamydiosis typically leads to late-term abortion 60 to 90 days after infection. The rather long bacterial incubation time coupled with minimal clinical symptoms prior to pregnancy termination make early diagnosis of chlamydiosis extremely difficult. Thus, most protocols dictate that all females be vaccinated with the anti-abortive *C. psittaci* bacterin vaccine every year, regardless of previous herd/flock history with the disease. Moreover, new females should be vaccinated twice, once at 60 days prior to breeding and again at 30 days prior to breeding. These females can be vaccinated once annually thereafter. The chlamydia vaccine can be purchased over the counter and, based on 2022 pricing, the estimated annual cost of this vaccine (not including labor and supplies) is \$2 to \$2.50 per head for replacement females, and \$1 to \$1.50 per head for established females.

Vibriosis, more commonly known as vibrio, is another common reproductive disease in sheep and goats. Much like chlamydiosis, vibriosis is a bacterial infection that is transmitted via ingestion of contaminated fecal matter, dirt, and/or infected fetal/placental tissues. This leads to late-term abortions with few prior symptoms. In unvaccinated herds/flocks, vibriosis infection rates can quickly reach 2/3rd or more of the animals. Either of two strains of campylobacter (*Campylobacter jejuni* and *C. fetus*) can cause vibriosis in sheep and goats, and it is important to note that these strains are distinct from the strains that cause vibriosis in cattle. This means that there is no transmission of vibriosis between sheep/goats and cattle, but also that multi-species operations must use species-specific vaccines. Bacterial incubation time is much shorter for vibriosis than for chlamydiosis, and fetal abortion or reabsorption typically occurs within 14 days of the infection. If the bacteria are ingested near-term, offspring may be born weak and typically do not survive. A hallmark feature of vibriosis that can be used to distinguish it from other abortive diseases is the appearance of a brown, foul-smelling vaginal discharge that can persist for up to 3 weeks after abortion. The annual

two-dose vibriosis vaccine, which provides immunity for both *C. jejuni* and *C. fetus*, should be administered 2 to 4 weeks apart and prior to breeding. This vaccine can also be purchased over the counter and, based on 2022 pricing, the estimated annual cost of the vibriosis vaccine (not including labor and supplies necessary for administration) is \$0.66 to \$1 per animal.

Caseous lymphadenitis and **rabies** are sheep and goat diseases that are not directly related to reproduction, but that can be managed with annual vaccines. Caseous lymphadenitis, or CL, is a bacterial infection that presents as abscesses surrounding lymph nodes in the head, neck, and flank of infected animals. Internal abscesses can also develop, which will devalue the carcass at harvest. This disease, caused by the bacterial species *Corynebacterium pseudotuberculosis*, can lead to serious secondary respiratory issues, often resulting in death. The vaccine for this disease, which contains the *C. pseudotuberculosis* toxoid, requires veterinary approval. Thus, producers would need to work with their veterinarian to diagnosis CL and to establish a vaccination protocol for their herd/flock. Based on 2022 pricing, the estimated annual cost (not including vet consultation, labor, or supplies) of the CL vaccine is \$0.70 to \$1 per animal.

In areas where rabies is prominent, producers might benefit from vaccinating their herds/flocks with the inactivated or “killed” rabies vaccine annually. This prescription-only vaccine can be quite expensive (up to \$10 per head per year), and thus producers should discuss their risk level with their local veterinarian to determine if the rabies vaccine is appropriate.

Vaccinations for Diseases in Offspring

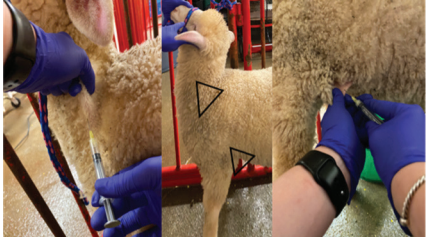

Offspring are at greatest risk for disease in the first few months following birth, as their immune systems are still developing at this early stage. Prepartum vaccines (i.e., delivered before birth by administering to pregnant females) provide offspring with immunity to several diseases that are common early in life. Offspring acquire immunity from prepartum vaccines through the consumption of colostrum (i.e., “first milk”) in the first 12 to 36 hours following birth. For proper protection, it is therefore essential that offspring consume adequate amounts of colostrum (research studies indicate at least 5% of their body weight, or 6 to 10 oz. for lambs weighing 8 to 12 lbs.) within the first 12 hours after birth. To ensure lambs and kids are receiving adequate colostrum consumption, udder confirmation and teat function should be confirmed prior to birth. Weak (low

vigor) offspring and offspring of ewes/does producing inadequate milk due to teat conformation or function should be supplemented with frozen or commercially-available powdered colostrum replacement.

Enterotoxaemia, more commonly known as overeating disease, is the most common ailment impacting sheep and goat production. This disease is caused by opportunistic overgrowth of two bacterial populations that are always present in the digestive system, but that are toxic at elevated numbers. Increases in *C. perfringens* type C and type D most commonly stem from sudden changes in the diet. Sheep and goat offspring are at elevated risk for enterotoxaemia during weaning, when they are transitioned to high concentrate diets. Rapid changes in forage quality during grazing periods can also induce enterotoxaemia. Many producers opt to vaccinate against *Clostridium perfringens* types C & D in pregnant females 2 to 4 weeks before lambing/kidding to help prevent **enterotoxaemia** and **tetanus** in offspring. After birth, offspring should also receive a dose of the same vaccine at approximately 45 days of age (i.e., about 2 weeks prior to weaning). Some producers administer yet another booster dose at weaning, but this is not explicitly instructed by the label; thus, any such use should first be discussed with a local veterinarian. Producers may find it convenient to administer the vaccines for tetanus at the same time points by using the combination vaccine, *C. perfringens* types C & D-tetanus toxoid. Vaccinating against tetanus is particularly important for protecting animals during events such as docking, castrating, and dehorning. This vaccine can also be purchased over-the-counter and, based on 2022 pricing, the estimated annual cost (not including labor and supplies) of the two-dose C & D-tetanus vaccine is \$0.48 to \$1 per head per year.

Contagious ecthyma, commonly known as sore mouth, is a highly contagious viral skin infection that can be difficult to eradicate once present in a herd/flock. Sore mouth presents as scabs or sores on the face (i.e., lips, ears, nose) that can spread rapidly to other areas of the skin via direct contact. There are few treatment options available, although repeatedly applying iodine to the infected areas can help. Vaccinating for sore mouth is typically only recommended for herds/flocks that have experienced a recent (or current) outbreak. Vaccinating animals on farms where sore mouth has not recently occurred may not be recommended, as the modified live virus vaccine introduces the disease into the flock/herd for controlled immunity when there is an elevated risk of exposure. When appropriate, the vaccine is typically administered by “scratching” the skin on the inside of the rear flank with an applicator that

Table 1. Common routes for administering injectable vaccines.

Route	Location	Administration
Subcutaneous (SQ)	Front Flank or Base of Neck 	<ul style="list-style-type: none"> • Gently pull on the skin, and place the tip of the needle directly under the skin at a 30–45° angle. • Take care to ensure that the needle does not poke through-and-through the skin fold.
Intramuscular (IM)	Base of Neck 	<ul style="list-style-type: none"> • Insert needle perpendicular to the skin, directly into the muscle. • Before injecting, gently pull back on the plunger of the syringe. <p>If blood appears in the syringe, the tip of the needle may have inadvertently entered a blood vessel and should be withdrawn and moved over slightly.</p>

is included with the purchase of the vaccine. Administering the vaccine in this area reduces the likelihood of exposing people and other herd mates through direct contact. Nevertheless, producers should take caution to avoid contact with the vaccination site, as sore mouth is zoonotic (i.e., transmittable to humans). Sore mouth can be transmitted to lactating females by their unvaccinated offspring; thus, all offspring in high-risk herds/flocks should be vaccinated at approximately 30 days of age. Immunity lasts about three years, and adults may need to be revaccinated at this time. This vaccine is available over the counter and, based on 2022 pricing, the estimated annual cost (not including labor and supplies) of vaccinating for sore mouth in endemic herds is \$0.34 to \$0.50 per offspring.

Escherichia coli K99 is a common gastrointestinal disease characterized by persistent scours in a large portion of the herd/flock's offspring. *E. coli* K99 vaccines can be effective in curbing the occurrence in lambs and kids, thus improving their pre-weaning survival rates. Producers should work with a local veterinarian to determine if such approaches are warranted. Typically, this pre-partum vaccine is administered maternally 3 to 4 weeks prior to parturition, but it can be administered directly to offspring immediately following birth. This vaccine can be purchased over the counter and, based on 2022 pricing, the estimated

annual cost (not including vet consultation, labor, and supplies) of vaccinating for *E. coli* K99 is \$1.50 to \$2 per head.

Administering a Vaccine

The effectiveness of any vaccine is dependent upon correct administration and dosage. Carefully reading vaccine labels in their entirety will help ensure proper use and storage, which is essential in maintaining vaccine efficacy. Additionally, expired vaccines should not be used, and instead should be properly discarded. Proper disposal is vaccine-specific, but as a general practice used and/or expired vaccines and supplies should be incinerated by a medical waste disposal company. Local veterinarians can offer further information on vaccine disposal. Proper routes for administration of vaccines are directed by the label: the most common routes are subcutaneous (SQ) and intramuscular (IM) injections, as summarized in Table 1. SQ injections are given directly under the skin, usually in the flank or neck region. IM injections are commonly administered into the muscles of the neck, away from high-value cuts of meat. Intravenous (IV) injections are not common for vaccinations. Injectable sheep and goat vaccines should be administered with an 18-gauge, 5/8-inch needle, unless otherwise directed. These can be pur-

chased at feed stores or from a veterinarian. New needles should be used for each animal, as hypodermic needles are designed for single use and dull substantially after even just one pass through skin. Moreover, reusing needles for multiple animals can potentially spread infections. Generally, reusing syringes is also inadvisable, and vaccines or other medications should never be drawn into a “dirty” syringe. Although proper techniques for washing syringes exist, it should be noted that the use of soaps or detergents that are not explicitly designed for this purpose can be harmful to animals. Thus, purchasing adequate quantities of syringes and needles to ensure single use is safer and is not typically cost-prohibitive. For more tips on administering and storing vaccines, refer to the article “Ten tips to better

handling and administering of vaccines,” at <https://beef.unl.edu/cattleproduction/vaccines2008>

Additional Resources

- Common Diseases and Health Problems in Sheep and Goats. AS-595-W. Purdue University Cooperative Extension Service. <https://www.extension.purdue.edu/extmedia/as/as-595-commondiseases.pdf>
- Tizard I. R. (2021). Sheep and goat vaccines. *Vaccines for Veterinarians*, 215–224.e1. <https://doi.org/10.1016/B978-0-323-68299-2.00026-5>
- Sheep Production Handbook. American Sheep Industry Association INC. 2015 Edition, Vol. 8. <https://www.sheepusa.org/product/2015-sheep-production-handbook-volume-8-order-up-to-2-books-here>

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