
Antibiotic Use in Sheep Production

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THE judicious use of antimicrobials is critical in the prevention of antimicrobial resistance in bacteria. What is meant by judicious or appropriate use of antimicrobials is:

1. Antibiotic use is confined to only when an antibiotic is needed to treat an animal's condition.
2. The specific antimicrobial product is the most appropriate for that condition. This requires a diagnosis, bacterial identification, and antimicrobial sensitivity.
3. Administering the correct dose.
4. Administering the correct frequency and duration.
5. The antimicrobial is given via the correct route, intramuscular IM, subcutaneously SQ, intravenous IV, orally.

There are few antibiotics approved for use in sheep and goats. In order for a drug to be approved for usage in a species, studies must be conducted to determine if the drug works, what the dose should be, are there any safety issues (reactions) and determine a meat and milk withdrawal time. Because of the cost to conduct all of this testing, pharmaceutical companies are not willing to invest in drugs because they will never sell enough to the small ruminant industry to recoup their costs. As a result, most drugs used in the sheep and goat industries are used in an extralabel fashion.

So what is extra label usage? Extra label usage occurs when a drug is administered in any manner that is not stated on the label. In other words, the use in a species or production class not on the label, use of a different route of administration, indication, frequency, dose, or duration.

If one gives a drug to an animal that the drug is not approved for, is given to treat a condition that the drug is not approved for, given at a different dose, route or frequency listed on the label then that drug is being used in an extra label manner. It is illegal to use drugs in any manner other than what is stated on the label.

Veterinarians can use drugs in an extra label fashion if a set of criteria is met. The first criteria is the veterinarian and client must have a VCPR, veterinary-client-patient-relationship. Criteria for a VCPR is as follows:

1. The licensed veterinarian has assumed the responsibility for making medical judgments regarding the health of the patient(s) and the need for medical therapy and has instructed the client on a course of therapy appropriate to the circumstance.
2. There is sufficient knowledge of the patient(s)

by the veterinarian to initiate at least a general or preliminary diagnosis of the medical condition(s) of the patient(s).

3. The client has agreed to follow the licensed veterinarian's recommendations.
4. The licensed veterinarian is readily available for follow up evaluation or has arranged for:
 - i. Emergency or urgent care coverage, or
 - ii. Continuing care and treatment has been designated by the veterinarian with the prior relationship to a licensed veterinarian who has access to the patient's medical records and/or who can provide reasonable and appropriate medical care.
5. The veterinarian provides oversight of treatment.
6. Such a relationship can exist only when the veterinarian has performed a timely physical examination of the patient(s) or is personally acquainted with the keeping and care of the patient(s) by virtue of medically appropriate and timely visits to the operation where the patient(s) is(are) kept or both.
7. Patient records are maintained.

Because the drugs that will be discussed are used in an extra-label fashion, before using any of these products related to the information contained within this article, **YOU MUST HAVE APPROVAL FROM YOUR VETERINARIAN**. I am not your veterinarian because of item 6 in the criteria for a VCPR.

PENICILLIN

Has been around since 1920. Resistance to this antibiotic was seen in the 1950's and with continued use most bacteria are resistant to the drug. Conditions for which penicillin was initially approved no longer respond to treatment with penicillin, for example pneumonia.

Procaine Penicillin G is an aqueous solution of penicillin and procaine, an anesthetic agent. The amount of Penicillin in 1 mL or cc of Procaine Pen G is 300,000 IU of penicillin. The labeled dosage on the bottle is 3000 IU per pound of body weight, which is equivalent to 1 cc per 100 lb of body weight. It should be given intramuscularly once a day.

Although the labeled dose for penicillin is 1 mL per 100 lb, because of resistance, veterinarians recommend a dosage of 3.3 mL per 100 lb, greater than three times the labeled dose. At this dose, penicillin is being used in an extra label fashion. Veterinarians also often recommend that the penicillin be given twice a day—again extra label

usage of the drug. Injections can be given in the muscle (intramuscularly) or under the skin (subcutaneously). The preferred injection sight is the neck region, in front of the shoulder. The injection site should be different each time an injection is given, and no more than 10 mLs should be given in any one site.

Because of the higher dose and frequency of use, the withdrawal time for meat is 28 days. Milk should be tested for penicillin residue prior to human consumption.

Because of antimicrobial resistance to penicillin, there are a limited number of conditions that will respond to the use of penicillin. These are listed:

- foot rot
- foot scald
- listeriosis
- mastitis
- metritis, uterine infections
- wounds

It is inappropriate to use penicillin for other conditions, because it is very unlikely the penicillin will have any effect and its use could further antimicrobial resistance.

TETRACYCLINE

Brand names include LA 200, Bio-Mycin 200, Noromycin 300, Vetrimycin 100.

Has been available since the early 1950s. Just like penicillin, there is a lot of antimicrobial resistance to tetracycline. I can find no injectable tetracycline product labeled for small ruminants in the United States. Therefore, all use of tetracycline in small ruminants is extra label. There are various products on the market with various concentrations. The good news is that the dose that is listed for cattle on the label is the same dose for small ruminants. Tetracyclines are irritating and do cause muscle damage if injected into the muscle. Most products are labeled for subcutaneous injection. Even when given subcutaneously, it is not unusual to notice a swelling a day or so after the injection at the injection site.

Most products are “long acting,” meaning that the drug blood levels remain high for 2 to 3 days after an injection. Most veterinarians suggest redosing every 48 hours in small ruminants, as they metabolize tetracycline a little faster than cattle.

The dose for the 200 mg/mL preparations are 4.5 mL/100 lb subcutaneously. Injections should be given in the neck area in front of the shoulder, no more than 5 mLs in one spot.

Withdrawal period: 35 days from last injection.
Appropriate diseases to treat with tetracycline:

- foot rot, foot scald

- listeria
- wounds, cuts
- chlamydial abortion
- pinkeye

Although tetracycline is labeled for pneumonia, the organisms involved are now resistant to the tetracyclines. There is very little if any success in treating pneumonia with tetracycline.

Tylosin (Tylan 200) is an antibiotic used mainly in swine but can be used in cattle. It is labeled for respiratory disease and foot rot. Most respiratory bacteria are resistant to tylosin. It may be effective for mycoplasma pneumonia, but mycoplasma pneumonia is only a problem in goats, not sheep. Because of the narrow scope of use of tylosin, penicillin and tetracyclines would be better options.

CEFTIOFUR

General considerations: Its trade name is Naxcel, Excenel or Excede. It is a cephalosporin, and is approved for sheep (Naxcel) to treat respiratory disease. Naxcel must be refrigerated, reconstituted, and has a short shelf life (7 days). It is given daily. Excenel is a suspension, has a relative long shelf life and is given daily. Excede is similar to Excenel but is administered every 7 days. It must be shaken vigorously to resuspend the drug. Dose: 0.5 to 1 mg per pound body weight, or 1 cc per 50–100 lb body weight once a day for Naxcel IM and Excenel, SQ. Excede is 1.5 mL per 100 lb, SQ at base of ear. Naxcel withdrawal time is 5 days, Excenel withdrawal time is 21 days, Excede is 28 days.

Appropriate diseases to treat with:

- lamb diarrhea less than 5 days of age
- pneumonia
- uterine infections (in my opinion, penicillin works better)

FLORFENICOL

Trade name: Nuflor. It came on the market in 1996, and is related to chloramphenicol, but does not have the negative side effects. Is an extra label use in sheep. It stings, especially in goats. Resflor is a combination of Nuflor and Banamine.

Dose is 3 mL/100 lb every 48 hours for 2 injections and it is given intramuscularly or 6 mL/100 lb subcutaneously. Withdrawal time is 42 days for sheep. (For cattle it is 38 days.)

Appropriate diseases to treat with:

- pneumonia
- foot rot, foot scald
- peritonitis

- swollen joints
- bone infections
- listeriosis
- diarrhea, if animal has a fever above 103 f
- encephalitis

Tulathromycin, Gamithromycin, and Tildipirosin

These drugs are in the class called macrolides. They have a very long milk withdrawal time and should not be used in dairy animals. Also, these drugs are designed to concentrate in lung tissue and so are specifically made for respiratory disease.

Tulathromycin. Trade name: Draxin. Around 2008, there was an article about using Draxin for the treatment of Caseous lymphadenitis (CL). The bottom line was that it didn't perform any better than using penicillin or just lancing the abscess. In other words, there is no real treatment for CL.

Dose: 1.1 mL/100 lb subcutaneously, one time.
Withdrawal time: 54 days

Appropriate diseases to treat with: pneumonia.

GAMITHROMYCIN

Trade name: Zactran. Around 2017, an article from Germany described the use of Zactran to eliminate foot rot from a flock of sheep. Zactran works well in treating foot rot but is expensive.

Dose: 2 mL/100 lb, subcutaneously, one time – it lasts for 10 days. The withdrawal period: is 90 days. Appropriate diseases to treat with: Pneumonia and foot rot.

Tildipirosin. Trade name is Zuprevo. Dose is 1 mL/100 lb. Withdrawal period is 54 days. Appropriate diseases to treat with: pneumonia.

THE FATE OF OVER-THE-COUNTER DRUGS

In 2017, due to the amount of unregulated use of antibiotics in feed and the concern for antimicrobial resistance, the FDA instituted a voluntary ban on

subtherapeutic use of antibiotics in feed. Feed companies complied by removing the use of subtherapeutic antibiotics off of their drug labels. Only antibiotics that have a label for use in feed can be added to feed—there is no extra label use. Antibiotics used in a subtherapeutic way were utilized for growth promotion, not disease prevention or treatment.

Also, the FDA wanted some type of oversight in the use of therapeutic, medically important antibiotics in feed. The FDA gave this role of oversight to veterinarians. As a result, in order to have a medically important antibiotic added to feed, a veterinarian must write a Veterinary Feed Directive (VFD). The VFD is then taken to the feed mill and feed can be mixed according to the VFD or the producer can acquire feed grade antibiotic to mix their own feed. In order for a VFD to be written, a veterinary-client patient relationship must exist. The VFD is valid for 6 months. The feed mill and the veterinarian are required to keep records of the VFD for 2 years.

The FDA has concern not only about antibiotics in feed but also the use of medically important antibiotic usage as a whole. The FDA's goal is to remove all over-the-counter (OTC) antibiotics by 2023. Canada removed all OTC drugs around 2017. In 2018, California did the same and, currently a prescription from a California-licensed veterinarian (within a valid veterinarian-client-patient relationship [VCPR]) is required for the use of all medically important antibiotics in California livestock.

So what does this mean? tylosin, penicillin, and tetracycline will no longer be available for purchase unless one has a prescription from a veterinarian. Producers needing to purchase antibiotics will need to obtain them from their veterinarian or have their veterinarian write a prescription and producers can decide where they want to purchase the antibiotics.

The requirements for a VCPR were listed at the beginning of this article. One other aspect is: A drug cannot be prescribed for a period of time longer than one year from the date the veterinarian examined the animal(s) without examining the animal or the premises again.

December 28, 2020

