kela
focus on health

Why is a good treatment & drug administration protocol so important?

The importance of a good treatment protocol

Each year, technical farm advisors encounter multiple and severe clinical cases that are the consequence of bad or incorrect drug administration.
Failing to follow an effective treatment protocol may lead to important economic losses and serious animal welfare problems such as no healing or recovery from the initial disease / injury, or it may lead to several adverse reactions such as formation of abscesses, cystic lumps, necrosis, organ failure and even death. It remains an important task for veterinarians to keep educating farmers, staff and farm advisors on the correct and responsible use of medicines and to repeat this message over and over.
Let's elaborate on which elements to take into consideration for a good treatment protocol for ruminants and swine.

Every farm needs to have a basic treatment protocol which includes the following elements:

1. **Appoint the person(s) responsible for treatments**
   Limit the number of people responsible for treatments to minimize the risks for mistakes.

2. **Describe which group of animals is being treated**
   Are they pre-weaned and weaned calves, heifers, dry or lactating cows? Are they piglets, gilts, gestating sows, lactating sows and finishers? Medication should be labelled according to the different treatment groups.

3. **Learn how to perform a basic examination**
   Measuring temperature, respiration rhythm, rumination frequency, urine sampling, …

4. **Understand what the common signs of a disease are**
   Pigs with *Streptococcus suis meningitis* go through a progression of loss of appetite, reddening of the skin, fever, depression, loss of balance, lameness, paralysis, paddling, shaking and convulsing.
   Also mention when there is a risk for zoonosis!

5. **Know which treatments should be given**
   Develop a drug administration protocol for this purpose. Once the diagnose is set and the right drug is selected, there must be a sustained commitment to use the drug in a safe and effective way.
   This requires the use of a proper drug administration protocol and training. The protocol must continuously be evaluated by the veterinarian, the farmer and his staff and it contains at least the following elements:
   - the dose
   - the administration route(s)
   - frequency/period of administration

6. **Respect the milk and meat withdrawal times**
   Make sure that there is adequate on-site registration of the withdrawal times accessible at any time for consultation when emergencies occur.

The importance of dosage in drug administration protocols

Why is administering the right dose crucial?
Underdosing and overdosing are one of the most seen mistakes in drug administration and they can lead to inefficacy or antimicrobial resistance!

Underdosing is often seen, especially when it concerns an expensive treatment or when the drugs are hard to inject or when the injections are painful for the animal. Underdosing will cause therapy failure or inefficacy and in case of antibiotics, it can also lead to the development of antimicrobial resistance.

On the other hand, overdosing can induce toxicity with organ damage especially in liver and kidneys and sometimes it can even cause death.

Taking a closer look at antimicrobials, two parameters play a key role in their mode of action: concentration and time.

There are two major groups in antimicrobials: the concentration-dependent antibiotics and the time-dependent ones.

Some drugs, like beta-lactams (penicillins, cephalosporins) for instance have a time-dependent action and no post antimicrobial effect. This means the antibiotics have the best bactericidal effects when drug concentrations are kept above the minimum inhibitory concentration (MIC). The best responses occur when the period that the drug stays above the MIC is equal or greater than 50% of the dosing interval. Therefore, respecting the recommended dose interval (single injection, 12 h., 24 h., 48 h., …) is essential to ensure optimal antimicrobial activity.

Other classes of antibiotics, such as aminoglycosides and quinolones, have high concentrations at the binding site which eradicates the microorganism and hence, these drugs are considered to have a different kind of bacterial killing, named concentration-dependent killing. In this case the best responses will occur when the concentrations are > 10 times above the MIC for their target organism(s) at the site of infection. These drugs also show a post-antibiotic effect or persistent suppression of bacterial growth after limited exposure to an antibiotic.

The importance of mode of administration in drug administration protocols

Pharmaceutical companies spend millions of euros to figure out the pharmacokinetics (PK) of a drug.
Pharmacokinetics deal with the movement of a drug from its administration site to the place of its pharmacologic activity and its elimination from the body. The mode of administration is particularly important for the resorption process of a drug. Incorrect administration routes can cause severe tissue damage (necrosis, swelling, …) and inefficacy, but it can also lead to retarded absorption, so the drug may stay longer in the body of the animal. In case of inappropriate injection routes (= off-label use), the withdrawal times on the SPC (Summary of Product Characteristics) are no longer valid and the risk of having residues in meat or milk is high. Always make sure the injection routes in the protocol correspond with what is mentioned on the SPC.

The most common injection routes for ruminants are intra-dermal (ID), subcutaneous (SC), intramuscular (IM), intravenous (IV), intra-abdominal (IP) and intra-articular (IA).

The most common injection routes for swine are subcutaneous (SC), intramuscular (IM) and intradermal (ID).

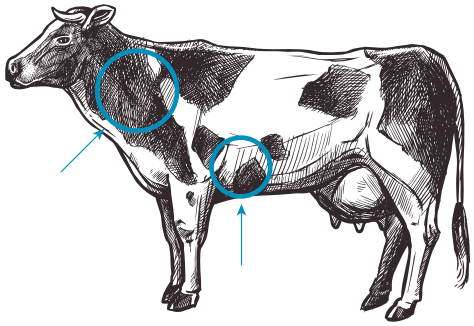
The SPC will always mention the applicable injection routes.

Depending on the country or state, different regulations may apply on people permitted to do therapeutic treatments or administer injections. We recommend to check with your vet or local authority and to make sure your drug administration protocol is within the legal boundaries.
In general, the two most common injection techniques to be performed by farmers and co-workers, are subcutaneous and intramuscular injections.

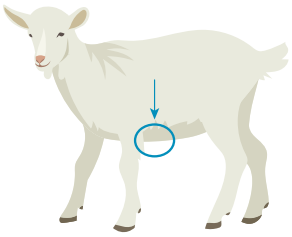
1.1 Subcutaneous injection technique for ruminants and swine

(source: Universiteit Gent faculteit diergeneeskunde Gent: leerpad)

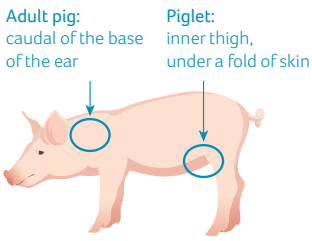
Take the skin between thumb and pointing finger and pull upwards till you get a V shape, inject towards the point of the V with a short needle. A longer needle will have a higher risk to come out at the other side of the skin flap or to go into the muscle or bone. Once the needle is in place (you can check this by moving the needle left and right very easily), release the skin and inject the drug into the animal. Always stay in contact with the animal while injecting.



SC injections lower the risk for scarring or swelling. For cows, it can be done in the neck or behind the axilla. Young calves (especially dairy calves) have a small volume of neck muscles. Therefore, if allowed, a SC administration is preferred.



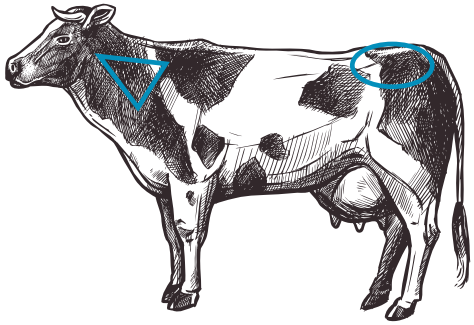
For small ruminants like goats and sheep, it's recommended to inject behind the axilla. Do not point the needle in the direction of the axilla since some products can cause swelling and induce lameness as there is an important nerve plexus in this region.



For swine, it can be done caudal of the ear base in adult pigs and for piglets in the inner thigh, under a fold of skin.

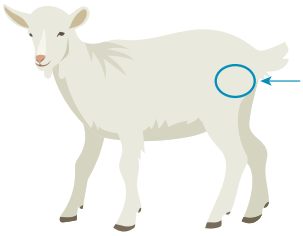
1.2 Intramuscular injection techniques for ruminants and swine

For ruminants : IM injections are preferably given into the neck. Inject cranial to the scapula, dorsal to the spine and ventral to the nuchal ligament = blue triangle on the cow picture.

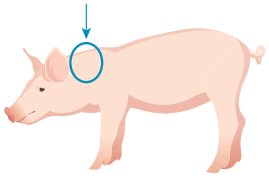


Only when it's not possible in inject in the neck area, you can inject in the gluteus muscle on the back and dorsal pelvis side of the cow (blue circle on picture of cow). This may only be done if the solution is water-based and the volume is low.

Injections in the rear leg of cattle leave blemishes in valuable cuts regardless of the age of the animal and should always be avoided. In general injections should not exceed 10 ml per injection side. Check the SPC for the maximum volume per injection site as it is different for each medicine.

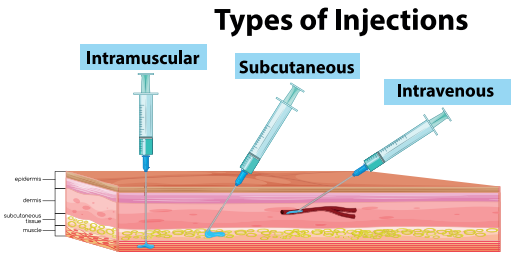


For alpaca and small ruminants, the intramuscular injections can also be given into the gluteus muscle (m. gluteobiceps, butt muscle).



For Swine IM injections are given dorsal in the neck caudal to the base of the ear.

Once the needle is in place, slightly pull the plunger backwards. If there is no blood coming into the syringe, inject the animal by exerting a smooth fluid pressure on the plunger.



Angles IM: 90 , SC: 45 , IV: 25 and ID 10 to 15

The importance of disinfection and needle choice in drug administration protocols

Disinfection of the injection site before giving IM, SC and ID is not always done in ruminants and very rarely in swine.

But be aware, when the skin is dirty, it's strongly recommended to do a physical cleaning and disinfection!

Especially before injecting non-antimicrobial drugs (except for vaccines), better disinfect first. In case of IV, IA, and IP for ruminants, a physical cleaning, shaving and good disinfection are always necessary! For the disinfection, you can use a 70% alcohol solution on a cotton or gauze.

Which needles should be described in the protocol?

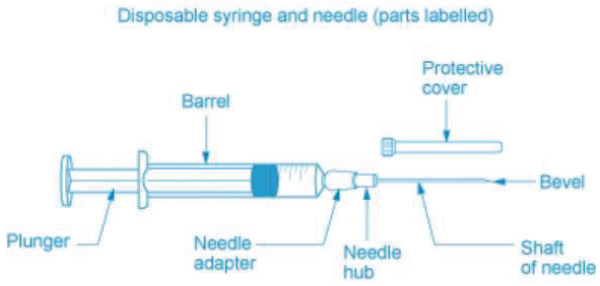
First, you should look at the diameter of needles, expressed in Gauge (G).
For ruminants, you can choose between different variations going from 16 G to 20 G.
For swine, you can choose between different variations going from 14 G to 20 G.

Recommended Needle Sizes and Lengths for Swine				
	Intramuscular (IM)		Subcutaneous (SQ)	
Type of Pig	Needle Gauge	Needle Length	Needle Gauge	Needle Length
Baby pigs	18 or 20	5/8" or 1/2"	-	-
Nursery pigs	16 or 18	3/4" or 5/8"	16 or 18	1/2"
Finishing pigs	16	1"	16	3/4"
Breeding stock	14 or 16	1" or 1 1/2"	14 or 16	1"

Source: NPPC Pork Quality Assurance Guidelines

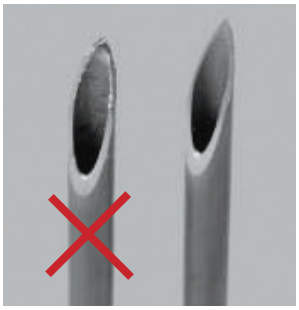
The higher the number, the smaller the diameter:
For instance, a 18 G needle has an inner diameter of 0.84 millimetres and is suited for calves or small ruminants.
A 16 G needle has an inner diameter of 1.2 millimetres and is more suited for larger cattle or drugs with higher viscosity, like oil-based antimicrobials.
Sometimes the SPC will even mention the type of needle you should use for injecting the product (e.g., the SPC of certain florfenicol injections recommend the use of a 16 G needle).

Another parameter for choosing a needle is the length.
For calves and subcutaneous injections, choose a needle of around 1-inch (15-25 mm) and for intramuscular injections in large cattle, choose a needle of around 1.5-inch (30 - 40 mm) length. The length is only referring to the needle shaft and it doesn't include the hub (adaptor).



When you need to treat a group of animals, you can use metal needles multiple times within the group. Make sure to sterilise the needles before you want to use them again by boiling them for 20 minutes in water. This sterilisation should be well described in the treatment protocol. When a dirty needle passes through the skin, it can bring infection into the injection site or it can spread diseases like bovine leucosis. Use a new needle for each piglet litter to prevent transmission of germs.

Never insert a dirty and used needle into a medicine bottle! Use a clean needle or a transfer needle. Do not leave a needle in a pierced vial for storage.

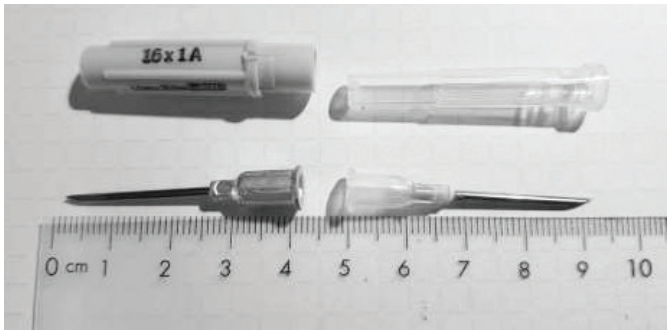


blunt needle sharp needle

After a certain number of injections, the needles will get blunt and need to be replaced, otherwise they cause too much muscle trauma with scarification. For individual treatments, use disposable sterile needles. It's recommended to take needles with aluminium hubs, they are less likely to break compared to plastic ones.

If the needle breaks and you can't remove it, mark the animal.

Consult your vet on which needle should be used in different situations and for different treatment groups and describe it in the protocol.



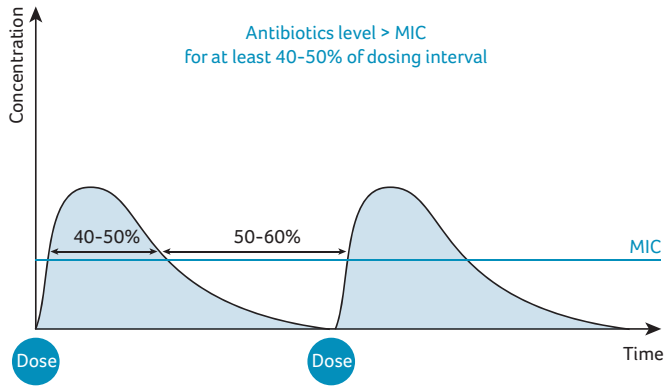
Picture: example of an aluminium and a plastic hub 1.6 mm (16 G) x 25.4 mm (1 inch) single use needle.

The importance of dose interval and duration of treatment in drug administration

A good drug administration protocol covers many different aspects, but by evaluating and adapting it on a regular basis, you will create an essential document for the farm.

It will encourage responsible drug use, improve animal welfare, and reduce economic losses! A critical element in the drug administration protocol is the dose interval and the duration of the treatment.

Especially for time-dependent antimicrobials (e.g., Beta-lactams or macrolides) the dose interval (frequency) is crucial. The best response occurs when the time that the drug stays above the MIC is equal or greater than 40 to 50% of the dosing interval.



Each drug has its own specifications and although it may belong to the same group or even have a similar molecular structure, the frequency and the time interval between injections can be different!

Always follow the SPC guidelines for the dose interval and the duration of the treatment. For example, for certain anti-inflammatory drugs, a treatment that is too long can cause severe gastric ulcerations, bleedings, and immune suppression.

In case of antimicrobials, the SPC sometimes mentions a certain timeframe, e.g., keep administering till 24 hours after the symptoms are gone with a maximum of 5 days.

When you stop the antimicrobial treatment too early, not all the bacteria were killed or inactivated and chances are extremely high that the animal will have a relapse = inefficacy. On the other hand when the treatment is too long, the chance for bacteria to develop AM resistance increases significantly. If there is no improvement after the maximum recommended treatment days, you should review the treatment with your vet.

When a treatment takes several days or weeks it's important to alternate the injection sites (e.g., left/right neck) to minimize the risk for swelling and irritation. Do not forget to clearly note the day, the volume, and the injection side into the drug administration register.

Interested in more information about this topic?

Feel free to talk to our Technical Service & Product Managers, Wouter Germis (DVM, specialised in ruminants) wouter.germis@kela.health or Frank Vermeiren (DVM, specialised in swine) frank.vermeiren@kela.health

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