

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 a consequence of a bad or incorrect drug administration.

Failing to follow a good treatment protocol may lead to important economic losses and serious animal welfare problems such as no healing or recovery from the initial disease / injury = inefficacy, or it may lead to several adverse reactions such as formation of abscesses, cystic lumps, necrosis, organ failure and even death. It is still an important task for veterinarians to keep educating farmers, staff and farm advisors on the correct and responsible use of medicines and to keep repeating this message over and over.

We'll explain which elements to take into consideration for a good treatment protocol for ruminants or swine.

Every farm should have a basic treatment protocol, and this should include following elements:

1. **Knowing who is responsible for treatments**
It's best to limit the number of people responsible for treatments to minimize the risks for mistakes.
2. **Knowing which group of animals is being treated**
Pre-weaned and weaned calves, heifers, dry or lactating cows?
Piglets, gilts, gestating sows, lactating sows and finishers?
Medication should be labelled according to the different treatment groups.
3. **Knowing how to perform a basic examination:** temperature, respiration rhythm, rumination, urine sampling, ...
4. **Knowing 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. **Knowing which treatments should be given**
It's best to include a drug administration protocol. Once the diagnose is set and the selected drug choice is known, there must be a sustained commitment to use the drug in the way safety and efficacy have been demonstrated. This requires a proper drug administration protocol and training. These protocols must be submitted to an ongoing evaluation process by the veterinarian, the farmer and his staff.
A good drug administration protocol should contain at least the following subjects:
 - the dose.
 - the administration route
 - frequency/period of administration.
6. **Knowing what the milk and meat withdrawal times are**
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 it important that everybody on the farm understands that administering the right dose is 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 frequently 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.

At the other hand **overdosing** is not good either as it can induce toxicity with organ damage especially in liver and kidneys and sometimes even death.

When we take a closer look at antimicrobials, we see there are two parameters that play an important role in their mode of action: concentration and time.

You can distinguish two major groups in antimicrobials: the concentration-dependent antibiotics and the time-dependent ones.

Some drugs, like e.g. beta-lactams (penicillins, cephalosporins,...), have a **time-dependent** action and no post antimicrobial effect. This means the antibiotics exerts optimal bactericidal effect when drug concentrations are maintained above the minimum inhibitory concentration (MIC). The optimal responses occur when the time that the drug remains 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. Here 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 exhibit 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 determine 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 very important for the resorption process of a drug. Wrong administration routes can not only cause severe tissue damage (necrosis, swelling, ...) and inefficacy, but can also lead to retarded absorption, so the drug may stay longer in the body of the animal. In case of unappropriated injection routes (= off-label use), the withdrawal times on the SPC are no longer valid and the risk of having residues in meat or milk are substantial. Always make sure the injection routes in the protocol correspond with what is mentioned on the SPC.



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

The most common ways for injecting **swine** are subcutaneous (SC), intramuscular (IM) and intra-dermal (ID).

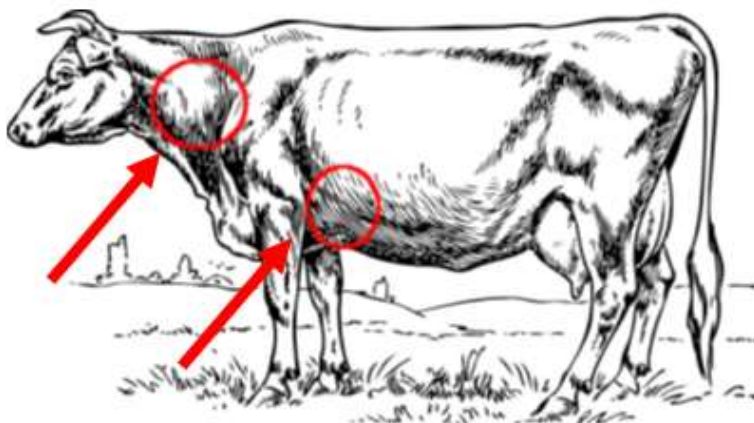
The SPC will always mention which are the correct injection routes. In each country, the laws regarding who can do drug injections and handlings are different. We recommend to check with your vet or local authority and make sure your drug administration protocol is within the legal boundaries. In general, 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



(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 keep in contact with the animal while injecting.

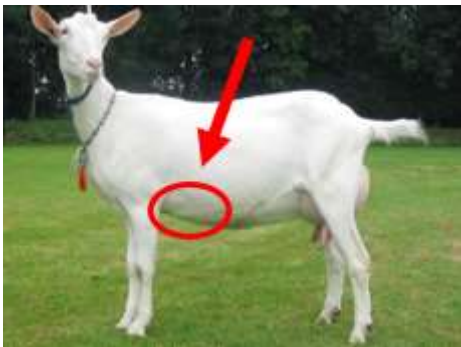


source: Universiteit Gent faculteit diergeneeskunde Gent: leerpad)



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 beef calves) have a small volume of neck muscles. 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 because there is an important nerve plexus in this region.

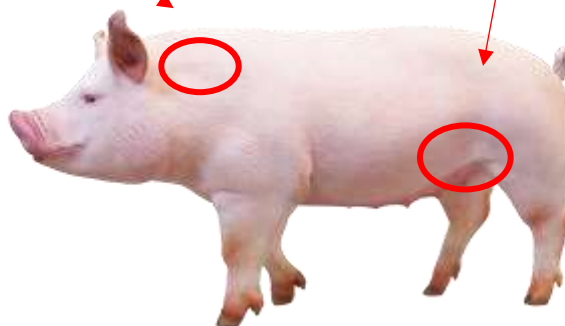


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For swine it can be done caudal of the base of the ear in adult pigs and in the inner thigh, under a fold of skin in piglets.

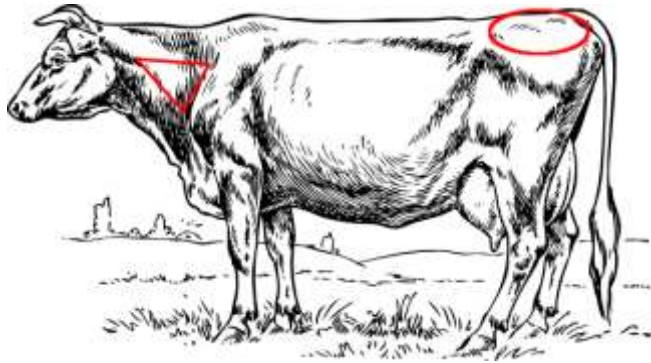
Adult pig: caudal of the base of the ear

Piglet: inner thigh, under a fold of skin



1.2 Intramuscular injection techniques for ruminants

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



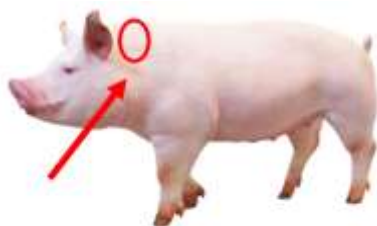
(source: Universiteit Gent faculteit diergeneeskunde Gent: leerpad)

Only when it's not possible to inject in the neck area, you can inject in the gluteus muscle on the back and dorsal pelvis side of the cow (red 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 irregardless of the age of the animal and should be avoided at all time. In general injections should not exceed 10 ml per injection site. Check the SPC for the maximum allowed volume per injection site as it is different for each medicine.

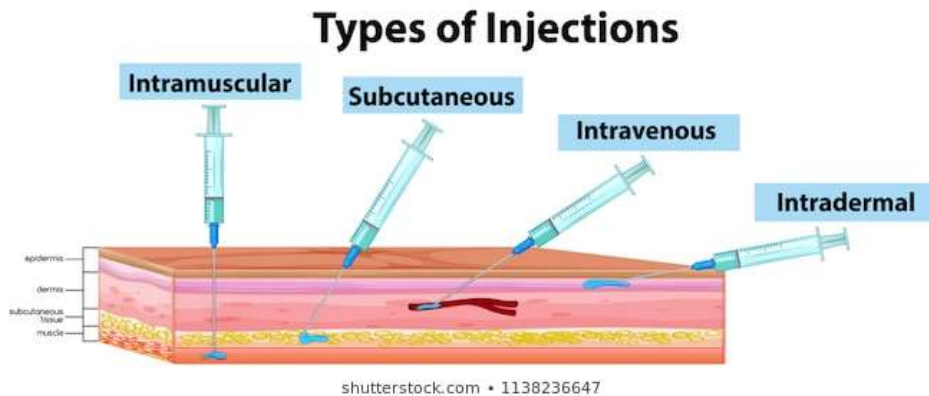
For alpaca and small ruminants, the intramuscular injections can be given into the gluteus muscle (m. gluteobiceps, butt muscle).



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



Once the needle is in place you should slightly pull the plunger backwards to see if there is no blood coming into the syringe. If no blood is seen, you can be sure you didn't penetrate a blood vessel and 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 covered with dirt and/or faeces it's strongly recommended to do a physical cleaning and disinfection!

Especially when you inject a non-antimicrobial drug (except for vaccines) you better do a [disinfection](#). In case of IV, IA, and IP for ruminants a physical cleaning, shaving and good disinfection are always needed! 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.



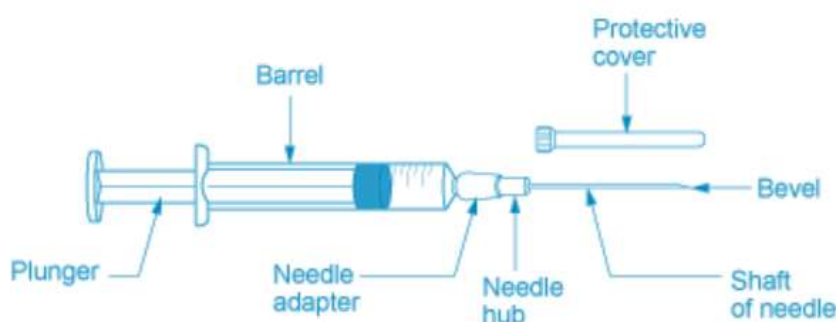
Recommended Needle Sizes and Lengths for Swine*				
Type of Pig	Intramuscular (IM)		Subcutaneous (SQ)	
	Needle Gauge	Needle Length	Needle Gauge	Needle Length
Baby pigs	18 or 20	5/8" or 1/2"	--	--
Nursery pigs	16 or 18	3/4" or 5/8"	16 or 18	1/2"
Finishing pigs	16	1"	16	3/4"
Breeding stock	14 or 16	1"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

*Source: NPPC Pork Quality Assurance Guidelines

The higher the number the smaller the diameter: e.g. a 18 G needle has an inner diameter of 0.84 millimetres and is suited for calves or small ruminants. 16 G needles have an inner diameter of 1.2 millimetres and are 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. SPC of most florfenicol injections mention to use a 16 G needle).

The other important parameter when looking for a needle is the length. For calves and subcutaneous injections best choose a needle of around 1-inch (15-25 mm) and for intramuscular injection in large cattle take best a needle around 1.5-inch (30 - 40 mm) length. The length is only referring to the needle shaft and doesn't include the hub (adaptor).

Disposable syringe and needle (parts labelled)

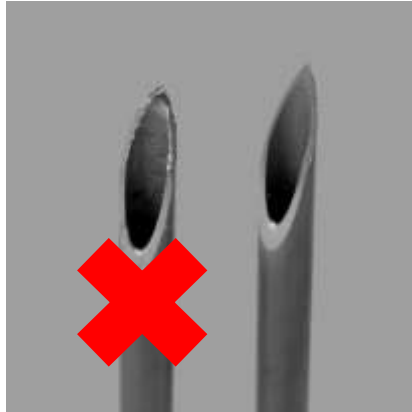


When you need to treat a group of animals, multiple use, all metal needles are an option, make sure to sterilise the needles before you want to use them again by boiling them for 20 minutes in water. This sterilisation should be well described in the treatment protocol as a dirty needle passing through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

Never insert a dirty used needle into a medicine bottle, use a clean needle or a transfer needle. Never leave a needle in a pierced vial.



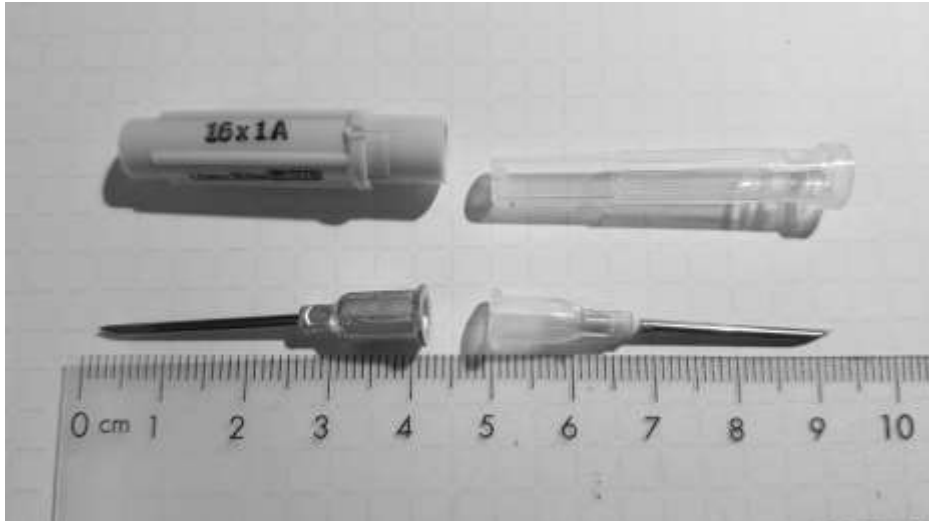
After a certain number of injections, these needles will get blunt and need to be replaced, otherwise they will cause to much muscle trauma with scarification.



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 (see picture).

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

Consult with your vet which needle you should be used for different situations and animal groups.



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

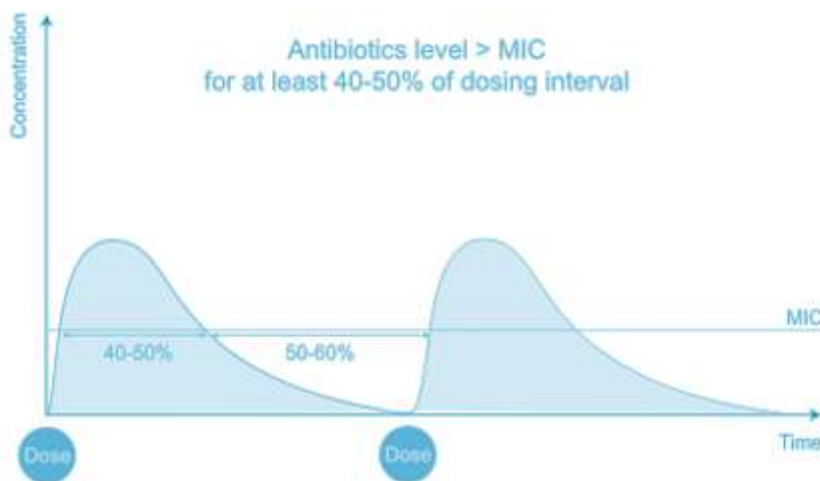
The importance of dose interval and duration of treatment in drug administration

Setting up a good drug administration protocol should cover many different aspects, but by doing so and by reviewing 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 bullet in the drug administration protocol is the dose interval and the duration of the treatment.

A good drug administration protocol needs to contain information on the dosage, the dose interval and the duration of a treatment.

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



Each drug has its own specifications and although they may belong to the same group or even have a similar molecular structure, the frequency of daily injections can be different! Always follow the SPC guidelines not only for the dose interval but also regarding 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 can mention 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 will be killed, and chances are very high that the animal will have a relapse = inefficacy. At the other hand when 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 developing 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,
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