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# Guidelines for livestock vaccination campaigns

From collection to injection

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From collection to injection

Authors

**Giancarlo Ferrari and Valeria Mariano**

*Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana, Italy*

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# Introduction

Correct storage, transport, handling, and delivery of vaccines are key to guaranteeing the effectiveness of any vaccination programme. Failure to adequately store, transport, handle, or deliver a vaccine can reduce its efficacy, resulting in inadequate immune response and failure of the overall vaccination campaign. Furthermore, failure in any of these stages may lead to the injection of an ineffective vaccine or poor protection against the disease in question and reduced confidence from livestock farmers.

Vaccines, being fragile biological substances, may become less effective or ineffective when they are:

- exposed to temperature outside the range of the storing temperatures (usually + 2 °C to + 8° C); or
- exposed to direct sunlight or UV light.

**These guidelines indicate best practices to ensure the effective delivery of a vaccine and to avoid adverse reactions to vaccination programmes of public interest.**

The specific focus is on the procedures to be followed once the vaccine is consigned to the vaccinators for injecting.

Vaccination programmes of public interest can be implemented either as a systematic vaccination programme or following a risk-based analysis to reduce the incidence, prevalence, or impact of a disease with a view to prevent, control, or eradicate. In particular



cases, programmes may be implemented to support control measures during outbreaks of certain diseases (emergency vaccinations).

Regardless of the vaccination programme, strategy, or purpose, these guidelines will prove useful whenever the overall management falls under the responsibility of the public sector, even if the field implementation is carried out by the private sector through appropriate public–private arrangements.

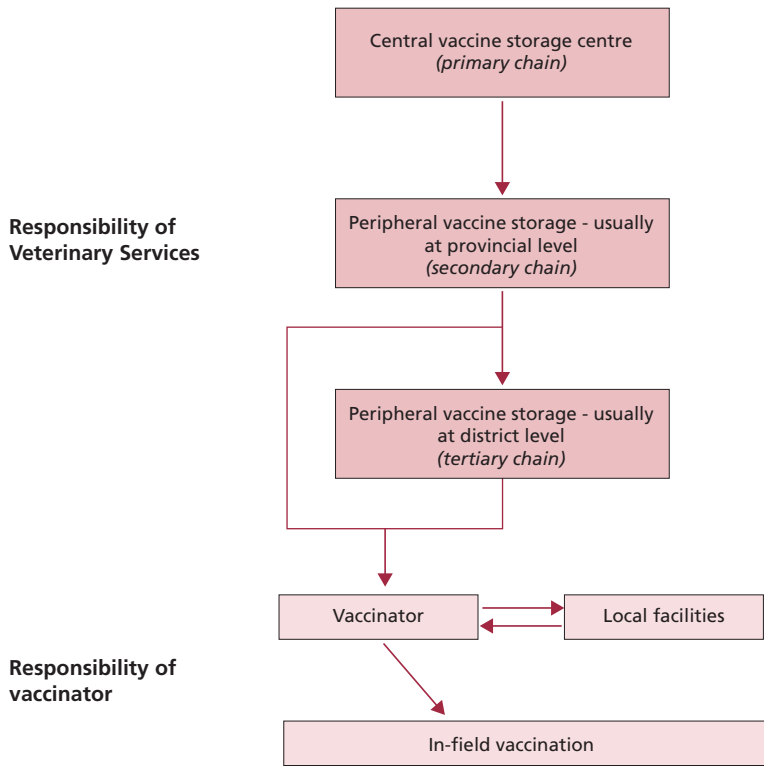
In this scenario, vaccine procurement procedures are usually managed at the national level through a recognized manufacturer that can ensure the purity, safety, efficacy, and quality of production processes, products, and delivery system.

The management of vaccines for animal diseases imported by private distributors, for which national or public programmes are not in place, are excluded from these guidelines. In such circumstances, the public sector still plays an important role because the registration of the imported vaccine remains their primary responsibility. Moreover, the public sector may still play an auditing role in ensuring the private distributors can store and deliver the vaccines properly. In this regard, a private distributor can be assimilated into a secondary or tertiary chain described hereinafter.

The distribution system described in these guidelines assumes the existence (as it usually is) of one or more main hubs (primary chains) where the bulk of the vaccine purchased will be initially stored.

The secondary and tertiary chains are identified with more peripheral vaccine storage centres. For the purpose of these guidelines the secondary chain represents a more peripheral vaccine storage supplying the tertiary chain and from where the vaccine will ultimately be consigned to the vaccinators for injection (although in some circumstances the secondary chain can also function as a supplier to the vaccinator). The last segment of the distribution and delivery chain starts with the vaccinator taking charge (and responsibility) of the vaccine bottles or vials that they will administer to the animals (Figure 1). Vaccinators may (or may not) possess their own refrigerators (indicated in Figure 1 as “Local facilities”).

**FIGURE 1**  
**Vaccine distribution chain and responsibilities**



Source: Authors' elaboration.



# 1. Protocols for vaccine management

Veterinary Services (VS) have the primary responsibility to ensure that authorized vaccines meet specific quality criteria so that animals receive effective vaccines. For this reason, it is vital that management protocols are in place to ensure that the efficacy of the vaccines used is maintained throughout the distribution and delivery chain. Management protocols should ensure that:

- a central vaccine storage centre (one or more hubs defined as primary chains) and peripheral vaccine storage and distribution centres (i.e. secondary and tertiary chains) are well defined and a cold chain is effectively maintained throughout;
- a chain of responsible staff and backups is established for each site;
- contact details of all responsible staff along the main points of the chain are available;
- training for all people responsible for handling vaccines is scheduled;
- instructions on ordering vaccines, registering batches, handling vaccines, maintaining equipment, and monitoring and recording temperature are detailed;
- a contingency plan in case of power failure is established; and
- system audits for managing the vaccine from purchase to injection are planned regularly (at least twice per year).

Documentation of written procedures, contacts, emergency instructions, and logbooks needs to be known and understood by all the staff handling vaccines and available at any time for consultation.





## 2. Requesting and taking charge of vaccines in the secondary and tertiary chains

Ordering of vaccines by the peripheral storage (secondary and tertiary chains) is usually processed through requests forwarded to the primary hubs. The requests should be made at appropriate time intervals in accordance with the storage capacity of the peripheral units of concern.

Once the vaccine is transferred from the primary hubs to a more peripheral storage unit, a minimum set of data should be recorded in a vaccine registration book. An example of a registration book is illustrated in Annex 1, Table A1.1.

The registration book contains two sections to register the INCOMING and OUTGOING vaccine, respectively. The INCOMING section should be filled in whenever vaccine is received and contain at least the following data: (i) Date of load (equal to the date of receipt); (ii) Batch number (or code); (iii) Number of bottles or vials; (iv) Number of doses per bottle or vial; (v) Total number of doses; (vi) Date of expiry; (vii) Complete name of the staff receiving the vaccine at the peripheral unit.

If there are two or more batches of vaccine in the consignment received, it is extremely important that these are recorded in distinct rows of the INCOMING section.

### 2.1 STORAGE OF VACCINES

The bottles or vials of vaccine received at the local distribution centres should be quickly transferred in appropriate refrigerators. Special care should be taken to arrange the batches by positioning the ones with the closest expiry date in front. As indicated, the scope of these guidelines is not to address the management of the cold chain within the central and peripheral storage units, although it is important to highlight some relevant points especially if vaccinators have a storage capacity of their own. In this regard general instructions on how to fill a refrigerator are provided in Annex II, Figures A2.1, A2.2, A2.3, and A2.4.

The **cold chain** is a system applied to maintain vaccines within a safe temperature range, usually +2 °C to +8 °C from manufacturing to delivery. The aim is to keep the vaccine at the intermediate temperature of approximately +5 °C. A breach in the cold chain occurs any time the storage temperatures deviate from the recommended range. **Any deviation below 2 °C must be reported** to the responsible person of the storage centre. Similarly, any deviation above 8 °C should be noted and must be reported if the temperature goes over **12 °C for more than 15 minutes**. A monitoring system should be in place capable to detect such deviations.

Technical problems can cause cold chain breaches. However, when well-designed quality control procedures are in place, malfunctions are promptly detected and managed before the vaccine is damaged.



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#### Storing vaccines:

- Proper refrigerators with a data logger and an alarm system for temperature control should be dedicated to vaccine storage.
- Refrigerator temperatures must be checked regularly (at least twice a day).
- Temperatures should be recorded and tracked in a dedicated log book.

A contingency plan in case of refrigerator malfunctions should be well defined (e.g. power back-up systems for refrigerators, coolers for emergency transport, alternative refrigerators offsite).

### 3. Management of the outgoing vaccine from the secondary and tertiary chains

Some preliminary actions are necessary before the vaccinator takes charge of the vaccine. It is essential to plan the vaccination at every stage:

- Estimate the number of animals to vaccinate.
- If the initially estimated number of animals to be vaccinated could vary, consider the cost-benefit of asking the peripheral distribution centre for some additional doses. For example, if the livestock premises is close to the distribution centre, a second trip could be more beneficial than asking for more doses initially, considering the potential loss of cold chain. The opposite could be true if the livestock premises is in a remote area.
- Contact the farmer and agree the date and the time for the vaccination, making sure that:
  - the owner or the person responsible for the animals will be present; and
  - all animals eligible for vaccination will be present at the designated enclosure for vaccination.
- Organize the vaccination plan so that the contents of all opened bottles of vaccines are used on the same day.

Secondary and tertiary chains, as already indicated, are the peripheral vaccine storage centres that distribute vaccines to vaccinators. According to vaccination campaign arrangements, vaccinators may also receive other equipment necessary to carry out field operations.

Every time the vaccine is consigned to vaccinators the OUTGOING section (Annex I, Table A1.1) of the registration book must be filled in (obviously only vaccine already registered in the INCOMING section can be indicated in the OUTGOING section). The section is structured into two subsections: (2.a) to register the date of consignment, batch number/code of the vaccine, number of bottles/vials, number of doses consigned, and contact details of the vaccinators; and (2.b) to register the number of empty (or partially empty bottles) returned by the vaccinators, the estimated number of doses returned, and the date of return (assuming that the disposal of empty bottles, or unusable vaccine, will be done by the peripheral distribution centre from where vaccine was received by the vaccinator).

Note: When filling the OUTGOING section of the registration book the number of bottles/vials available (for a specific batch) is kept updated by subtracting the number of bottles/doses consigned from the number available (of the same batch) from the previous consignment. If an electronic worksheet is used this operation can be automatized.

Together with vaccine bottle/vials the following documents should be made available to the vaccinator:

- a document (Annex III, Tables A3.1, A3.2 and A3.3) with one copy retained at the distribution centre) countersigned by the vaccinator indicating basically the same

data as the OUTGOING section of the registration book (Annex I) - the form mirrors subsections 2.a and 2.b of the registration book and must be returned completed by the vaccinator when returning empty bottles or unused doses;

- a checklist for proper packing and monitoring the cooler box (Annex IV, Table A4.1);
- a form to track the temperatures during transportation of the vaccine (Annex V, Table A5.1) to be returned completed by the vaccinator to the centre from where the vaccine was received;
- equipment for in-field vaccination received by the vaccinator (Annex VI, Table A6.1); and
- vaccination cards (Annex VII, Table A7.1) (to be returned completed by the vaccinator to the centre from where the vaccine was received).

Once the vaccinator takes charge of the vaccines, two options may follow (Figure 1):

1. The vaccinator has the capacity to store the vaccine (indicated in Figure 1 as “Local facilities”) and so can be consigned an amount of vaccine exceeding the daily capacity that can be administered. Demonstrated capacity to correctly store the vaccine should be provided to the local distribution centres that can check refrigerators regularly and keep records of these checks.
2. The vaccinator proceeds with the vaccinations in-field.

## 4. Transport of vaccines

Once vaccines are removed from a refrigerator, they must be transported in appropriate cooler boxes as quickly as possible, and either stored in clean, proper refrigerators (local facilities, indicated in previous paragraph as option 1), or delivered directly to the animals in the field (option 2).

Whichever option is chosen, from the moment the vaccine leaves a refrigerator, a strict procedure to maintain the cold chain must be followed.

For vaccine transport in appropriate coolers:

- Pack the cooler carefully following the instructions and checklist (Annex IV, Table A4.1).
- Keep track of the temperature during transportation (Annex V, Table A5.1). If the vaccine freezes, it usually happens within 2 hours of being placed in the cooler, so monitor the temperature more frequently during the first hour (e.g. if possible, every 15 minutes) and hourly afterwards.
- If the vaccine is transferred to a local facility, the vaccinator should follow the general instructions on how to position the bottles/vials in the refrigerator illustrated in Annex II.
- In case of immediate use of the vaccine, it is highly recommended that the vaccine be delivered as quickly as possible, the temperature of the cooler box checked immediately before injecting the animals (Annex V), and the cooler box kept out of direct sunlight and close to the injection site.



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Coolers maintain the cold for a limited time depending on the type of cooler. **Usually, coolers are not adequate for storage over eight 8 or in extremely hot conditions. In those cases, consider using specialized coolers. Polystyrene coolers are only suitable for storing vaccines up to 4 hours.**

More information can be found on the WHO website.<sup>1</sup>

<sup>1</sup> [https://apps.who.int/immunization\\_standards/vaccine\\_quality/pqs\\_catalogue/categorypage.aspx?id\\_cat=18](https://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/categorypage.aspx?id_cat=18)



## 5. Delivery of vaccine at field level

Vaccinators should follow a series of procedures before entering the livestock premises,<sup>2</sup> when entering the livestock premises, and while on the livestock premises. The coordinator of the peripheral distribution centre should make the following suggestions clear to the vaccinators.

Enter the livestock premises following at least the basic biosecurity measures, to avoid cross-contamination between livestock premises (i.e. clean boots or use disposal boot covers, change clothes and use of clean and disinfected equipment).

Depending on the disease and the epidemiological situation, different biosecurity measures or levels may be needed. Applying a minimum biosecurity is especially important when an emergency vaccination is carried out, as the risk of the disease being already present on the premises to be vaccinated may not be negligible.

Make sure that vaccinators comply with these general principles:

1. **Separation.** To prevent contamination, park outside the livestock premises, in a clean area separated from the animals, and change your footwear (or use disposable boot covers) and outer clothes. Create a clean area and a dirty area to change when entering and exiting the livestock premises, respectively. Prepare a plastic bag to wrap all the contaminated materials that cannot be decontaminated onsite. Similarly, if the vaccination is carried out at village level, usually animals congregate in a common area; if not, ensure that when moving from house to house, disposable boot covers, gloves, and gowns at least are changed.
2. **Cleaning.** To remove contamination, eliminate all organic matter by scrubbing your hands and cleanable items, such as boots or vehicle tyres and tools/equipment used for the vaccination. Any materials carried onto the livestock premises should be clean (i.e. free of organic material). Particular care should be taken with footwear and clothes. Remember that effective cleaning can remove up to 90 percent of contaminants.
3. **Disinfection.** Kill any remaining pathogens. In the case of an outbreak, check the appropriate disinfectants recommended for the specific disease. Disinfect any materials carried onto the livestock premises. Footwear and any equipment to be used on animals should be disinfected both before and after use. **Disinfection without appropriate cleaning will not be effective.**

Based on these principles, schedule field visits in accordance with the biosecurity measures specific to the most probable diseases present in the area and the current epidemiological situation. In the case of disease outbreaks, consider the possibilities of using single-use disposable (shoe cover, coats, gloves, and face masks, besides needles and syringes). Furthermore, arrange the order of visits to livestock premises to minimize the risk of the disease spreading from one premises to another, moving first to the livestock premises that does not show any signs of disease and then to others.

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<sup>2</sup> As the livestock premises is any location where livestock congregate, this should be therefore considered as a vaccination unit – farms, smallholdings, backyard poultry flocks, livestock feedlots, villages, etc.

Move within the livestock premises following the maximum biosecurity protocol, as there is always the risk to potentially move from a clean premises to an infected one.

### INFORMATION TO THE FARMER ON VACCINATION

Inform the farmer of the importance of vaccination, the reason for carrying it out, the type of vaccine being used, the type and number of animals to be vaccinated, the possible adverse reactions to the vaccine, and all measures that can be taken to prevent and manage them.

Give an information leaflet to the farmer along with the contact details of the responsible person delivering the vaccination, who should be reachable if follow-up is necessary.

The leaflet should be written in simple language, allowing the livestock owner to clearly understand the contents.

### 5.1 PROCEDURES FOR VACCINATION ON THE LIVESTOCK PREMISES

Before starting the vaccination procedures, it is important to collect the anamnesis of the animals (i.e. recent and past diseases, previous vaccinations, environmental conditions). A rapid check of the clinical condition of the animals should be performed evaluating the overall physical conditions, body condition, and eventual presence of any signs of diseases.

**Only animals in good condition, not displaying any sign of diseases, should be vaccinated.**



## 5.2 ROUTINE HYGIENE AND PERSONAL PROTECTIVE EQUIPMENT

Wash your hands frequently and wear dedicated clothing such as gloves, aprons (or coveralls) and boots while handling and working around animals. As already specified, to avoid cross-contamination between livestock premises, use clean, disinfected personal protective equipment (PPE) and in the case of disease outbreaks, consider using single-use disposable PPE.

## 5.3 EQUIPMENT FOR VACCINATION

Make sure to have the necessary equipment close while working, paying attention to the following:

- Keep the cooler box out of direct sunlight and close to the vaccination site.
- Take vaccines and diluents (if required) and reconstitute the vaccine just before administering it.
- Do not pre-draw the vaccine before you are ready to inject.
- Use a disposable syringe or a multimode automatic vaccination gun. If using a multimode automatic vaccination gun, ensure it is clean and works appropriately, i.e. the injecting rubber and the spring are in good condition and the gun is not rusty.
- As a golden rule, use a new sterile needle for each injection. This might be difficult to apply under field conditions. The alternative is for the vaccinator to identify homogeneous groups of individuals and change the needle for every group (as a rule of thumb, if the groups are composed of more than ten animals, then subgroups of ten should be identified and the needle changed accordingly). As an example, a commercial dairy farm will consist of different groups of animals: calves, non-pregnant heifers, pregnant heifers, lactating cows, and dry cows, all usually kept and managed separately. At village level, where few animals are kept within individual households, ensure that the needle is changed in every household. If different species to be vaccinated are present within the same households, avoid using the same needle on different species.
- Choose the appropriate sized needles (Table 1), whether single-use syringes or a multiple-dose vaccination gun are used. Inappropriate needle length and gauge can cause the needle to break or harm and cause pain to the animal with associated risks to the vaccinator if the animal is not well restrained.

TABLE 1  
Subcutaneous injections: most common injection sites and needle size per main species

Specie	Site	Size of needle
<b>Bovine</b>	<b>SC:</b> Bovine: laterally on the neck, thorax, axillary region, chest tip	<b>Calves:</b> 18, 20, 22 G 25–30 mm (1–1¼ inch) <b>Adult:</b> 16 or 18 G of 30 mm (½–¾ inch)
<b>Sheep and goat</b>	<b>SC:</b> preferably areas with fleece, such as behind forefront legs or before hind legs <i>Note: The skin around the neck, scapula, or along the thorax seems more prone to producing fastidious abscesses.</i>	<b>Lamb:</b> 20 G 25 mm (1 inch) <b>Adult:</b> 18 G 25 mm (1 inch)
<b>Swine</b>	<b>SC:</b> behind the ears, side, or behind the elbow	<b>Piglet:</b> 18, 20 G 12–16 mm (½–⅝ inch) <b>Weaning:</b> 18, 20 G 20 mm (¾ inch) <b>Adult:</b> 14, 16 G 20–25–40 mm (¾–1½ inch)
<b>Poultry</b>	<b>IM:</b> pectoral muscles <b>SC:</b> slightly used	22-19 G 10–13 mm (⅜–⅝ inch)
<b>Rabbits</b>	<b>SC:</b> dorsal side of the neck or back	25 G 16 mm (⅝ inch)
<b>Equine</b>	<b>SC:</b> laterally on the neck or wherever the skin is loose enough	20–21 G 25–40 mm (1–1½ inch)

## 5.4 BEST PRACTICE IN VACCINE ADMINISTRATION

Always check and follow the vaccine manufacturer's instructions.

### 5.4.1 Preparing the vaccine

Gently shake the vial, pre-filled syringe, or reconstituted vaccine to ensure homogeneous suspension. Check for particulate matter or colour change in the vaccine. If either is apparent, refer to the vaccine product information (ATAGI, 2022).

Reconstitute the vaccine, drawing vaccines and diluents (if required) only just before injection.

Pay close attention to the time allowed for the vaccine to be used after its reconstitution.

### 5.4.2 Positioning and restraining animals for animal welfare and operator safety

Different species respond differently to handling procedures. Before applying any species-specific handling techniques, keep animal behaviours in mind (Table 2 and Figure 2.). Apply this knowledge when restraining the animals: favour the well-being of the animal, and ask if what you are doing will keep it calm and help avoid unexpected reactions of the animals or harm to the vaccinator.

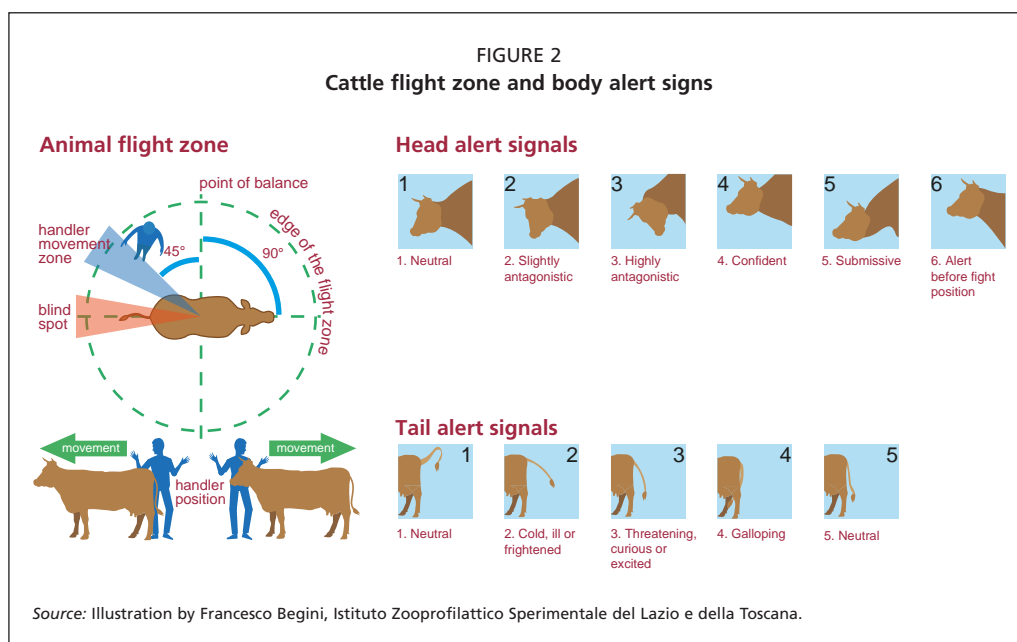
### 5.4.3 Skin cleaning

Make sure to choose a clean part of the animal for the injection from the sites recommended for injections (Table 1).

TABLE 2  
Main general animal behaviour facts to bear in mind

Ethological characteristics	Notes
<b>Herd instinct</b>	Farm animals become agitated when isolated from their herd. To calm down an animal, allow it to return to its herd for around half an hour. They notice the behaviour of their fellow animals, as well as that of their owner. If they get agitated, the animal will get agitated too.
<b>Aversion to unfamiliar environment</b>	Removing an animal from their familiar environment will cause agitation.
<b>Maternal instinct</b>	Any mother will protect her offspring and does not feel comfortable being separated from it. Keep offspring close to their mothers when handling them.
<b>Flight zone</b>	Any animal has its own "minimum space" to keep in front of a perceived threat. It depends on the behaviour of the animal. For a calm animal, the distance within which a person can approach an animal before it moves away (flight zone) will be shorter than for an agitated animal (Figure 2).
<b>Fear of objects in their blind area</b>	Ruminants are blind in their forefront and behind their tail, thus they should always be approached from the side. If approached laterally from the front, before the line passing between the eyes, the animal tends to go backward, particularly if the animal has the possibility to move to escape from a situation; if approached laterally but from behind the animal tends to move forward. This should be kept in mind if you need to move the animal (Figure 2).
<b>Sensitivity to contrast</b>	Cattle and swine are colour blind and are extremely sensitive to contrast. They will stop at shadows and in any sudden change of light.
<b>Fear of moving objects</b>	Clothes swinging in the wind may scare animals. Any unnecessary movement should be avoided.
<b>Fear of loud noise</b>	Cattle and horses have good hearing; avoid any abrupt sound and do not shout.
<b>Kicking habit</b>	Cattle kick in forward and then kick out. Usually, cows kick sideways in the case of a painful side. Horses usually kick out their hind legs.

Source: NCERT (National Council of Educational Research and Training). 2018. *Unit 1: Restraining farm animals in animal health worker*. New Delhi, India, NCERT. <https://ncert.nic.in/textbook/pdf/ieww101.pdf>

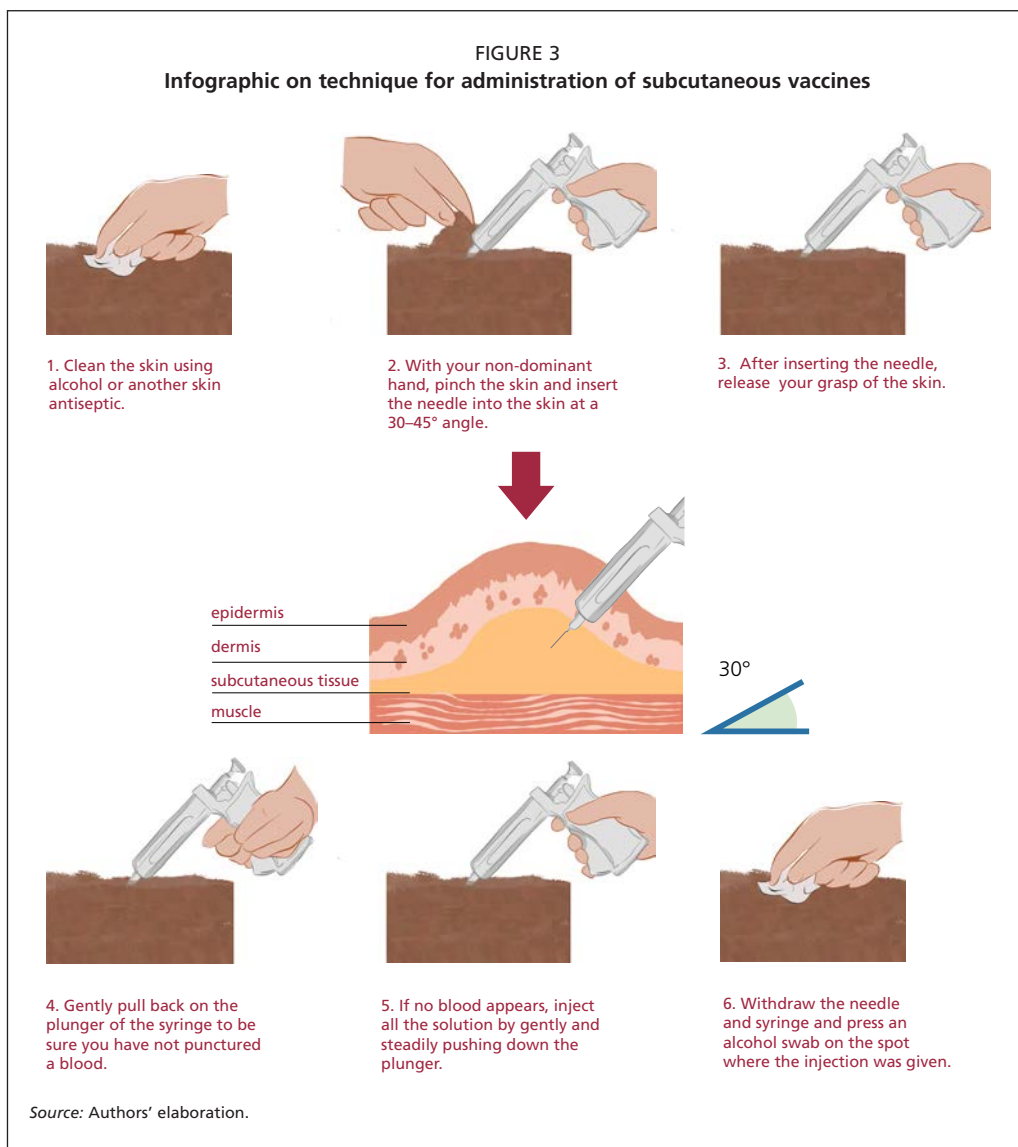


### 5.4.4 Injection techniques

Always follow the manufacturer's recommendations for the route of administration, usually subcutaneous for veterinary vaccines.

Subcutaneous injections may be done whenever it is possible to leverage the skin with the fingers. Figures showing the main recommended sites of injections per species can be found in Annex VIII while Table 1 summarizes the main list of sites and needle size. It is recommended to avoid injection sites which, for any local adverse reaction, may damage future products, e.g. skins and hides.

The techniques for administering vaccines subcutaneously are illustrated in Figure 3.



After using a disposable syringe, dispose of the entire syringe into a “sharps” container, i.e. any official or improvised container that can be used to store used needles and protect people and animals from accidental harm.

### 5.4.5 Other less common routes of vaccine administration

Usually used in poultry, are intramuscular injection (IM); intranasal administration (IN); oral, eye drop, spray (or nebulization); cutaneous scarification; and in ovo injection routes. Please refer to the manufacturer’s recommendations

### 5.4.6 Marking the vaccinated animals

In the case of free range animals that could mix, mark the vaccinated animals to recognize them and avoid vaccinating them twice. Make sure to use non-toxic temporary marker paint for livestock use.

## 5.5 HANDLING AND DISPOSING OF SHARPS

When working with disposable needles, bear the following in mind:

- Never unwrap the sharp object until you are ready to use it.
- Never point the sharp object at someone.
- Keep your fingers away from the sharp tip of the object.
- Never recap or bend a sharp object.
- Never hand a sharp object to someone else.
- Clearly communicate to co-workers if there is a need to put it on a tray for another person to pick up.
- Dispose of the sharp in an appropriate container for sharp objects.
- Close the container and replace it when it is two-thirds full.



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## 5.6 ROUTINE CLEANING OF THE WORK ENVIRONMENT

Any materials carried onto the livestock premises should be disinfected after use. Clean up after the work and do not leave any rubbish on the livestock premises. Any disposable items should be packed, and care should be taken not to cross back from the clean area to the dirty area once cleaning procedures have been finished.

## 5.7 PROPER DISPOSAL OF MATERIALS

Differentiate the waste according to national regulations. Pay particular attention to the disposal of sharps, pharmaceuticals, and contaminated biological materials.

## 5.8 RECORDING THE VACCINES ADMINISTERED

Before exiting the livestock premises, fill in the vaccination card (Annex VII) and have it signed by the owner. Provide contact details in case there is any trouble related to the vaccinations, e.g. adverse reactions, or if the farmer has any further questions, even if you are certain that it will not be required.

## 5.9 MONITORING AND HANDLING ADVERSE REACTIONS

Even if rare, several kinds of adverse reactions may appear in the course of a vaccination. Each vaccine may produce different adverse reactions from small local reactions to systemic ones. Consult the manufacturer's instructions.

The person in charge of the vaccination must report any adverse reaction to the vaccination. Check if the manufacturer provides a specific schedule to report adverse reactions. If not available, a generic form can be found in Annex IX.

The most common adverse reaction is a lump at the site of injection, often related to abscesses, granulomas, or seromas. The majority of lumps may be avoided with hygiene best practices, such as cleaning the injection site before injection and using only a sterile needle for each injection. Temporary drops in milk production have also been reported. Even if rare occurrences, it is possible that the worst adverse reaction may occur, such as a systemic anaphylactic reaction (shock). Be ready to promptly react if this happens.

### **Be prepared to recognize shock symptoms and to deal with them in case of emergency:**

- weakness and depression;
- subnormal body temperature;
- cold extremities;
- elevated heart and respiratory rates; or
- slow capillary refill time with pale and cyanotic mucosa.

## 5.10 TREATING SHOCK SYMPTOMS

Parenteral, IM, or IV administration of a single high dose of corticosteroids as soon as possible:

- **Prednisolone**  
Immediate-acting drug (<1 min) – half-life is 1–2 hours
  - ✓ Equine: 1–2 mg/kg IV or IM
  - ✓ Bovine: 1–4 mg/kg IV or IM
  - ✓ Ovine: 1–4 mg/kg IV or IM
  - ✓ Caprine: 1–4 mg/kg IV or IM
- **Dexamethasone**  
Rapid active drug (5–45 min) – Half life is 3–4 hours
  - ✓ Equine: 2.5–20 mg/kg IV or IM
  - ✓ Bovine: 1–4 mg/kg IV or IM

**IV infusions of fluids** should be started immediately, such as ringer's lactate (1 litre per 25 kg per hour – 300 kg of animal requires 12 litres over a 24-hour period).



**Only in the case of hyperacute anaphylactic reactions with cardiovascular collapse and cardiac arrest:**

- **Adrenaline (Epinephrine)**

Adrenaline is usually sold in vial of 1 mg/ml (1:1000). Adrenaline must be administered with care only as a last attempt to save the life of the animal.

***If using an IV, administer IM diluted 1:10 in saline solution.***

- **Cattle, horses, and pigs**

1 ml/45 kg IM or 0.25–0.5 ml/45 kg IV or intratracheal

Generally, a vial of 4 ml is added to 1 litre of saline solution, generating a final concentration of 4 µg/ml, which is administered slowly IV at 0.1–0.2 µg/kg/minute.

The effect of adrenaline will end 1–2 minutes after the infusion stops.



## 6. Monitoring vaccine delivery

Although it is not within the scope of these guidelines, it is worth mentioning that by using the data collected through the registration book and the vaccination cards it is possible to monitor the vaccine delivery system.

Some examples of simple indicators that can be built using those data can be found in the [Foot-and-mouth disease vaccination and post-vaccination monitoring: Guidelines](#).

However, regardless of the post-monitoring strategy, which may differ from country to country, each local distribution centre is responsible for supervising the correct management of the local vaccination campaign and should regularly update the national vaccination centre.

To facilitate the monitoring of the delivery of vaccines, vaccinators should return unused doses of vaccines and empty bottles/vials to the local vaccination centres, together with the vaccination cards (Annex VII) properly completed. The vaccination cards are a fundamental tool for collecting information from the field and reporting to the vaccination centre over the ongoing vaccination campaign.

Furthermore, a random quality control of the information received should be performed, farmers contacted, and the correct administration of vaccines ensured, as reported by vaccinators.

Data should be periodically analysed, e.g. monthly, and reported by the local vaccination campaign supervisor to the responsible person of the national vaccination centre.





## 7. Links to specific vaccination guidelines for the most common vaccination campaigns

Specific information on recommendations applicable to the main animal diseases of importance for international trade can be found in the OIE Terrestrial Animal Health Code:

[www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access](http://www.oie.int/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access)

Other guidelines can be found through the following links:

- Contagious bovine pleuropneumonia (CBPP)
  - Early reaction contingency planning for a CBPP emergency  
[www.fao.org/3/Y4143E/y4143e09.htm#bm09.7](http://www.fao.org/3/Y4143E/y4143e09.htm#bm09.7)
- Foot-and-mouth (FMD)
  - Foot-and-mouth disease vaccination and post-vaccination monitoring: Guidelines  
[www.fao.org/3/i5975e/i5975e.pdf](http://www.fao.org/3/i5975e/i5975e.pdf)
- Highly pathogenic avian influenza (HPAI)
  - Avian influenza vaccination – OIE information documents – Verona recommendations  
[https://old.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/A\\_Guidelines\\_on\\_AI\\_vaccination.pdf](https://old.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/A_Guidelines_on_AI_vaccination.pdf)
  - Rational use of vaccination for control and prevention of H5 HPAI (EMPRES FOCUS ON)  
[www.fao.org/documents/card/en/c/d6c311de-50f3-456b-bbff-f21a3a0c436b](http://www.fao.org/documents/card/en/c/d6c311de-50f3-456b-bbff-f21a3a0c436b)
  - Improving biosecurity practices to control HPAI  
[www.fao.org/3/an168e/an168e.pdf](http://www.fao.org/3/an168e/an168e.pdf)
- Peste des petits ruminants (PPR)
  - Global strategy for the control and eradication of PPR  
[www.fao.org/documents/card/en/c/6d14cbc5-b7c1-4213-bb1f-78690e805c95](http://www.fao.org/documents/card/en/c/6d14cbc5-b7c1-4213-bb1f-78690e805c95)
- Rift Valley fever (RVF)
  - Early reaction contingency planning for a Rift Valley fever emergency  
[www.fao.org/3/Y4140E/y4140e08.htm#P6\\_854](http://www.fao.org/3/Y4140E/y4140e08.htm#P6_854)



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# Annexes







## Annex II

# Tips for best vaccine storage in temporary refrigerators

If it is not possible to buy a vaccine refrigerator to store the vaccines locally, it is worth noting how to best adapt domestic refrigerators available at local level.

Unfortunately, such refrigerators do not provide stable, uniform, controlled temperatures. The temperatures also vary between different compartments within the refrigerator. These temperatures may differ from fridge to fridge.

Thus, it is of paramount importance to know the fridge in use, place it properly, temperature-check the different sections within the fridge before using it, and correctly fill the fridge to minimize temperatures variations.

### Main types of refrigerators:

#### a. Domestic frost type refrigerators

The fan units pump cold air from the freezer to the fridge. This air could freeze the vaccine. Thus, **do not place the vaccine close to the air flowing from the fan**.

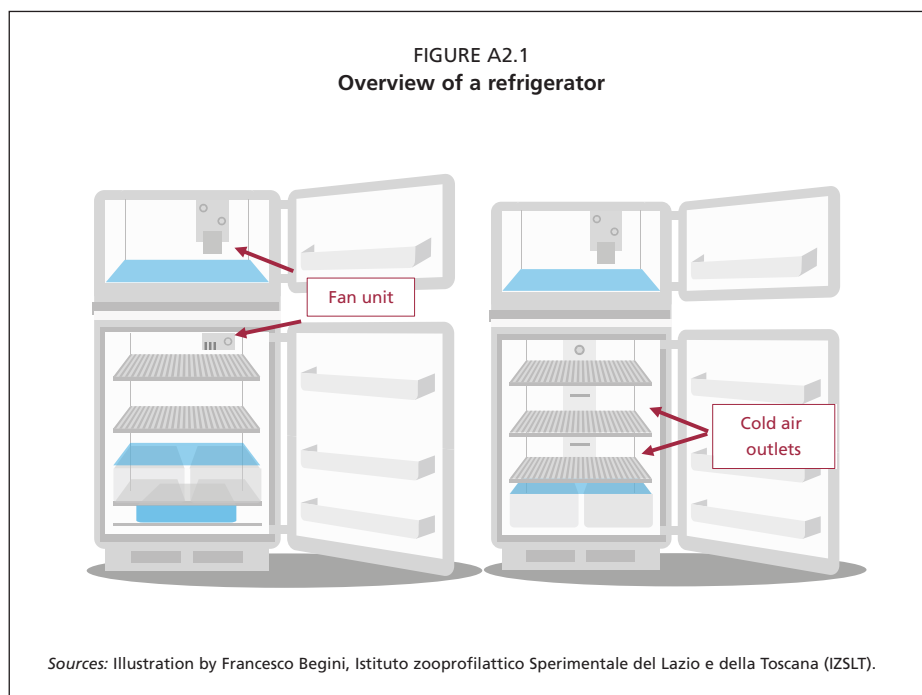
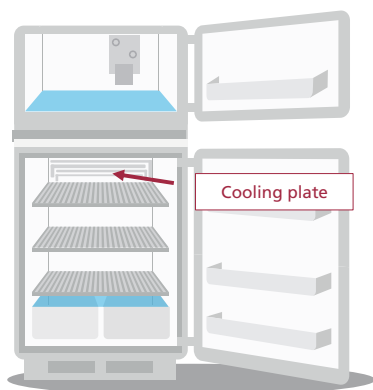
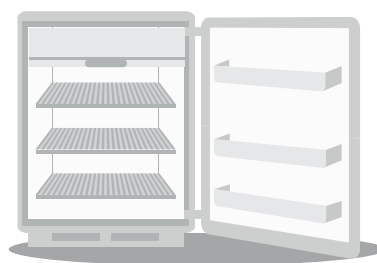


FIGURE A2.2  
Different types of refrigerators



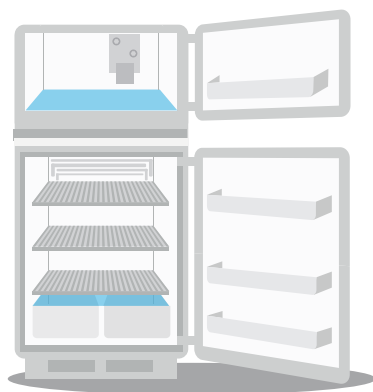
**a. Refrigerators with a cooling plate inside**

This kind of refrigerator is **not recommended** for vaccine storage. The area close to the cooling plate may freeze the vaccine, while areas far away may be warm.



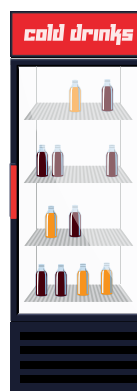
**b. Mini-bar-style refrigerators**

When the freezer is located within the fridge, the temperature can be highly unstable with the risk of freezing the vaccine. Thus, they should not be used to store vaccines.



**c. Multi-mode refrigerators**

Check the temperature setting and place the vaccine far from the walls or the floor of the refrigerator.



**d. Drinks refrigerators**

Usually these refrigerators have a transparent door that keeps temperatures between 0°C and 5°C. Thus they are not recommended for vaccine storage. However, sometimes it may be possible to **modify the temperature settings** to between 2 °C and 8 °C by following the manufacturer's instructions.

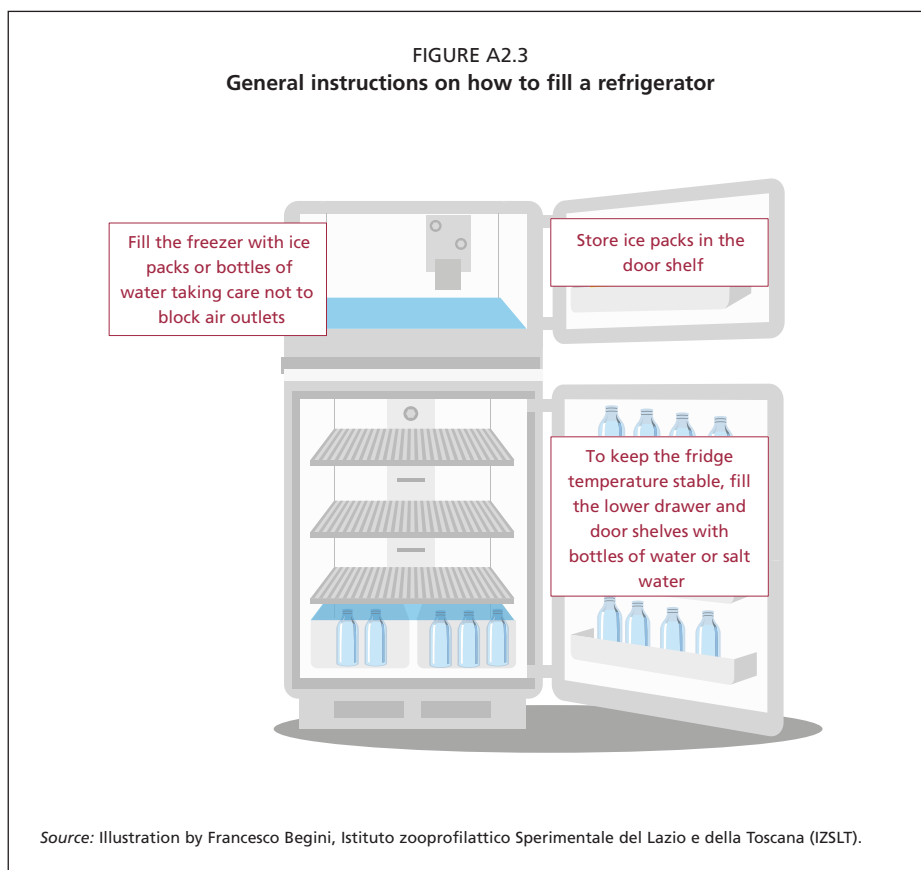
Source: Illustration by Francesco Begini, Istituto zooprofilattico Sperimentale del Lazio e della Toscana (IZSLT).

### General instruction for any type of fridge

1. Situate the refrigerators properly:

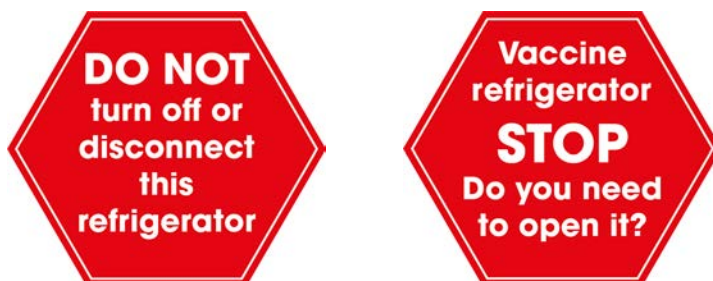
- a. Place the refrigerator in a ventilated room, away from direct sunlight, away from external walls, and away from any source of heat that can influence variation in temperatures.

- b. Make sure there is space around the refrigerator. Do not cover the motor; instead leave at least 10 cm of empty space from the motor compartment (usually on the back) to the wall.
  - c. Level the legs keeping the bottom of the refrigerator at least at 2.5–5 cm from the floor.
2. Fill the parts of the refrigerator that are not going to host vaccine with bottles of water, as in Figure A2.3, a few days prior to inserting the vaccine. This will provide a cold mass useful to stabilize the internal temperature. Always put bottles of water in the door shelves; no vaccine should be stored in these areas. Leave empty space between the bottles to allow air to circulate.



3. Check the temperature in the different compartments.
4. Store the vaccine, appropriately packed in baskets or trays, only in the compartment where the temperature can be kept between 2 °C and 8 °C.
5. Do not overstock the fridge. Allow space among items to facilitate air circulation.

FIGURE A2.4  
Warning messages



Source: Illustrations by Francesco Begini, Istituto zooprofilattico Sperimentale del Lazio e della Toscana (IZSLT).

6. Avoid opening the fridge unless necessary. Use the fridge only for vaccines and stick a note (e.g. Figure A2.4) on the fridge door to inform other personnel not to open the fridge unless authorized.

## Annex III

# Paper forms to manage empty, partially empty bottles/vials and unused vaccine consigned to and returned by the vaccinator

TABLE A3.1

**Proof of receipt of vaccine by the vaccinator**  
(equivalent to the OUTGOING section 2.a of the registration book)

Distribution centre: Vaccination campaign for:					Logo:	
Date of consignment	Batch number/ code of the vaccine <sup>3</sup>	Number of bottles/vials consigned	Total number of doses consigned	Staff consigning the vaccine <i>Full name</i>	Delivered to the vaccinator <i>Full name</i>	Contact details of the vaccinator

Signature of the staff consigning the vaccine: \_\_\_\_\_

Signature of the vaccinator receiving the vaccine: \_\_\_\_\_

TABLE A3.2

**Proof of returning full, empty, partially empty bottles/vials or unused vaccine to the local distribution centre**  
(equivalent to the OUTGOING section 2.b of the Registration Book)

Date of return	Batch number/ code of the vaccine returned	Number of bottles/vials returned	Estimated number of doses returned	Staff receiving the vaccine returned <i>Full name</i>	Vaccinator <i>Full name</i>

Signature of the staff receiving the unused, empty or partially empty bottles/vials:  
\_\_\_\_\_

Signature of the vaccinator consigning the unused, empty or partially empty bottles/vials:  
\_\_\_\_\_

<sup>3</sup> If more than one batch is delivered to the vaccinator ensure that a single form is used for each batch.

When the vaccines are returned to the refrigerator after any transport:

TABLE A3.3

**Checklist when vaccines are returned to a refrigerator**

Step	What to do	Check if done
1	Always ensure that the refrigerator temperature is between +2 °C and +8 °C before placing vaccine inside.	<input type="checkbox"/>
2	Transfer vaccine to the refrigerator.	<input type="checkbox"/>
3	Check the cold chain tracking document or, if a data logger has been transported with the vaccine, download the data.	<input type="checkbox"/>
4	Check the temperatures of the transport. If the temperature is outside the +2 °C to +8 °C range, isolate the vaccines. Clearly mark them "Do not use". Keep them refrigerated between +2 °C and +8 °C and report it to your supervisor.	<input type="checkbox"/>

Date	Signature

## Annex IV

# Instructions and checklist for properly packing vaccines in cooler boxes

TABLE A4.1

Checklist for packing vaccines in cooler boxes

Step	What to do	Check if done
1	Condition ice pack before use: <ul style="list-style-type: none"> <li>Remove ice packs from the freezer.</li> <li>Place them in a single row, leaving at least 5 cm between each one.</li> </ul> The ice pack is conditioned as soon as water starts to melt slightly inside the ice pack. Examples of time for conditioning: <ul style="list-style-type: none"> <li>Ice pack: around 1 hour at +20 °C.</li> <li>Gel pack more than 750 g: around 1 hour at temperatures over 15° C.</li> <li>Gel pack less than 750 g: around 15 minutes at temperatures over 15° C.</li> </ul>	<input type="checkbox"/>
2	Place the ice packs/gel packs in the cooler to chill.	<input type="checkbox"/>
3	Reset the minimum/maximum thermometer and insert the thermometer probe inside an empty vaccine box with the product information intact.	<input type="checkbox"/>
4	Make sure the minimum/maximum temperature is between +2 °C and +8 °C when the vaccines are placed in the cooler.	<input type="checkbox"/>
5	Place polystyrene chips (preferable as they promote air circulation) or bubble wrap on the bottom of the cooler	<input type="checkbox"/>
6	Place the vaccine stock in the cooler with the box containing the thermometer probe in the centre. Note: All vaccine should remain in their original packaging until they are administered or returned to a purpose-built vaccine refrigerator – this prevents damage from exposure to light and thermic shocks.	<input type="checkbox"/>
7	Surround the vaccine with packing material and place conditioned ice packs/gel packs on the top before closing the cooler.	<input type="checkbox"/>
8	Place the ice pack/gel pack on top of the insulating material.	<input type="checkbox"/>
9	Ensure that the vaccine stock is not in direct contact with the ice packs/gel packs, to minimize the risk of freezing.	<input type="checkbox"/>
10	Close the cooler lid and, if available, fix the digital thermometer display to the outside of the cooler. Note: Keep the cooler out of direct sunlight.	<input type="checkbox"/>
11	Record the date, time, and minimum and maximum temperatures on the temperature cold chain tracking document (Annex V, Table A5.1): Record temperatures at the following times: <ul style="list-style-type: none"> <li>every 15 minutes for the first hour; and</li> <li>hourly thereafter, provided the conditions are stable.</li> </ul> Note: Vaccine freezing occurs most commonly in the first 2 hours of storage in a cooler.	<input type="checkbox"/>
12	Ensure that ice packs/gel packs do not become displaced and have direct contact with vaccines – this may freeze the vaccines and render them unviable.	<input type="checkbox"/>
13	Remove vaccine from the cooler just before vaccination.	<input type="checkbox"/>

Note: Change the thermometer battery whenever needed. If used for more than a year, keep a second battery at hand. Record the date when you change the battery.

Test the accuracy of the thermometer using the slush test\* method every 12 months and record when the accuracy check is done.

\* Slush test: Place a polystyrene or plastic cup filled with water into a freezer for 2–3 hours. Take it out when a fine layer of ice has formed (0 °C is reached). Place the thermometer probe into the middle of the container and check if the temperature after 2 minutes is 0 °C.



## Annex V

# Cold chain tracking document for transport of vaccines in cooler boxes

(To be completed by vaccinators and returned to the local distribution centre from where vaccine was received.)

Batch/es of vaccine:

Transported from \_\_\_\_\_ to \_\_\_\_\_

TABLE A5.1

**Cold chain tracking form for transport of vaccines**

Date	Monitoring stage*	Time	Temperature inside the vaccine storage container	Is temperature outside the range +2 °C to +8 °C? Yes*/No <i>**If yes, must be notified**</i>

\* Legend for monitoring stage

P = vaccines packed

T = transportation

ALP = arrived in the livestock premise (ID/name farm)

Signature of the vaccinator \_\_\_\_\_

Signature of the farmer \_\_\_\_\_

\*\* Contact number of responsible person for state or territory Veterinary Service/vaccination campaign:

tel \_\_\_\_\_ email \_\_\_\_\_



## Annex VI

# Equipment for in-field vaccination received by vaccinators

TABLE A6.1  
List of equipment received

Equipment	Check if present	Number of units received
<b>A) Container for personal protective equipment (PPE) and other useful materials</b> The container should be made of durable material, suitable to transport and easy to wash and disinfect.	<input type="checkbox"/>	
<b>A.1 PPE</b>		
Boxes of disposable, non-sterile examination nitrile or latex gloves	<input type="checkbox"/>	
Boots	<input type="checkbox"/>	
Disposable covers for boots	<input type="checkbox"/>	
Personal covers (aprons, disposable coveralls)	<input type="checkbox"/>	
Goggles (if needed)	<input type="checkbox"/>	
Disinfectant	<input type="checkbox"/>	
Soap	<input type="checkbox"/>	
Multise cleaning paper	<input type="checkbox"/>	
Number of plastic bags for waste management	<input type="checkbox"/>	
Medical sharps container	<input type="checkbox"/>	
<b>A.2 Vaccination equipment</b>		
Markers to differentiate vaccinated animals	<input type="checkbox"/>	
Thermometers	<input type="checkbox"/>	
Syringes of appropriate volume	<input type="checkbox"/>	
Appropriate injecting needles	<input type="checkbox"/>	
Appropriate drawing-up more needle	<input type="checkbox"/>	
<b>A.3 General</b>		
Any useful equipment to restrain the animal if necessary	<input type="checkbox"/>	
Marker pens	<input type="checkbox"/>	
Temporary markers for livestock use	<input type="checkbox"/>	
Notebook and pen	<input type="checkbox"/>	
Saline solution and infusion kit	<input type="checkbox"/>	
Ringer lactate and infusion kit	<input type="checkbox"/>	
Corticosteroids (prednisolone or dexamethasone)	<input type="checkbox"/>	
Adrenaline	<input type="checkbox"/>	
Haemostatic lace	<input type="checkbox"/>	

(Cont.)

Equipment	Check if present	Number of units received
Antiseptic solution (e.g. chlorhexidine...)	<input type="checkbox"/>	
Alcohol	<input type="checkbox"/>	
<b>B) Cooler box or boxes</b>		
Cooler boxes	<input type="checkbox"/>	
Icepacks or gel-packs	<input type="checkbox"/>	
Diluent if the vaccine needs reconstitution	<input type="checkbox"/>	
Thermometer or data logger	<input type="checkbox"/>	
Bubble wrap or polystyrene chips	<input type="checkbox"/>	

Date	Signature

## Annex VII

# Vaccination card

FIGURE A7.1  
Example of a vaccination card

**VACCINATION CARD**

Name of the owner: .....

Address: .....

Village: ..... District: ..... Province: .....

**Section 1 (to be filled during the six-monthly vaccination visit)**

(1) Date of vaccination visit: .... / .... / ....

(2) Field operator: .....

(3) Vaccination campaign no.: .....

**Table 1: Demographic of the unit at the time of the visit and number of animals vaccinated and left unvaccinated**

Age group	Species A			Species B			Species C		
	(4) Number present	(5) Number vaccinated	(6) Number left unvaccinated	Number present	Number vaccinated	Number left unvaccinated	Number present	Number vaccinated	Number left unvaccinated
< 6 m									
6–12 m									
12–24 m									
> 24 m									

(7) Batch of vaccine used\*: .....

(8) Expiry date .... / .... / ....

\*If more than one batch of vaccine has been used, please indicate below the additional batches and expiry dates.

(9) If in any of the age groups (other than the age group < 6 m) considered there were animals left unvaccinated, please provide the reasons among those indicated below (more than one reason can be indicated):

Animal was sick     Animal was too aggressive and difficult to restrain     Other reasons (please specify) .....

Source: Ferrari, G., Paton, D., Duffy, S., Bartels, C. & Knight-Jones, T. 2016. *Foot and mouth disease vaccination and post-vaccination monitoring: Guidelines*. Rome, Italy, FAO. [www.fao.org/3/i5975e/i5975e.pdf](http://www.fao.org/3/i5975e/i5975e.pdf).

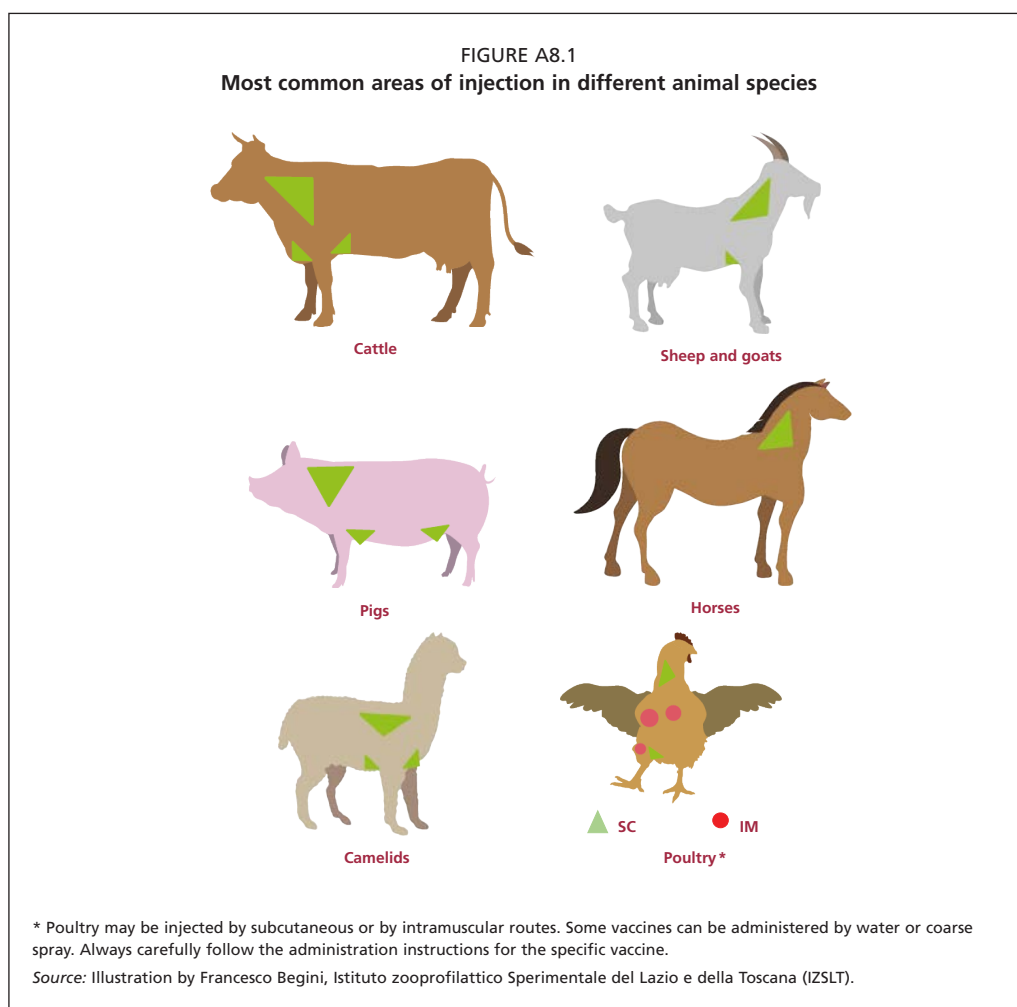
Vaccinator	Owner of the animals
Signature	Signature



## Annex VIII

# Recommended subcutaneous injection sites in different animal species

The majority of livestock vaccinations can be done through the subcutaneous route. It is recommended to carefully follow the manufacturer's instructions.





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## Annex IX

# Report of adverse vaccine reactions

To: \_\_\_\_\_  
*(Insert address of the person to whom to report adverse reactions)*

I, *(surname and name)* \_\_\_\_\_

tel \_\_\_\_\_ email \_\_\_\_\_

### **report the adverse reaction described below**

Type of vaccine: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

Batch number: \_\_\_\_\_

Date of administration: \_\_\_\_\_

Type and number of animals vaccinated: \_\_\_\_\_

Description of adverse reaction: \_\_\_\_\_

Number of animals affected: \_\_\_\_\_

Date and location of adverse reaction: \_\_\_\_\_

**Reporting person** \_\_\_\_\_

*(Date and signature)*



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\* Out of print  
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Vaccination is one of the main pillars in disease prevention. However, its effectiveness largely depends on appropriate delivery, such as adequate cold chain and hygienic injection. The success of large vaccination campaigns is in such details that will ensure appropriate immunity and prevent livestock diseases. The guidelines presented here offer in a concise and succinct way the most important aspects for consideration when planning and executing livestock vaccination campaigns.

The information provided in these guidelines will be easy to take into the field and implement, and by this contribute to the fight against the spread of livestock diseases including zoonotic ones.

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