

Handling and storing medicines on beef and dairy farms



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Veterinary medicines that are stored on the majority of UK farms include antimicrobials, anthelmintics, non-steroidal anti-inflammatory drugs and vaccines. All prescription veterinary medicines have storage requirements as directed on the datasheet or summary of product characteristics (SPC) and there are also specific instructions for how, when and where medicines should be administered. Vaccines often have storage and handling instructions on the SPC in addition to those applied to other medications; most also require maintenance of the 'cold chain' consistently between 2 and 8°C and have short shelf lives (usually hours) once bottles have been broached. This article highlights areas where the on-farm handling and storage of medicines (particularly vaccines) could be improved and provides suggestions for how veterinary practices can support clients to ensure that medicines are used to their maximum benefit.

Storage

Health and safety specifications, as well as farm assurance schemes, require that medicines are stored and handled appropriately. This includes keeping them in a secure, lockable cupboard away from domestic, office or public areas. They should not be kept with human or animal food or drink and should be separated from application equipment. Records of stock levels should be kept by the farmer and vaccines and other medicines that require refrigeration must be stored in separate fridges from those containing food (Health and Safety Executive [HSE] 2012, Red Tractor Assurance for Farms 2018).

As part of their role in disease prevention, it is in the interest of vets to ensure that the product sold to a client is as effective as possible when it reaches the animal. The Veterinary Medicines Directorate requires veterinary practices to monitor fridge temperatures daily, with the aim of storing vaccines appropriately up until the point of collection; this should also include fridges and storage used for delivery.

Cold chain

There is a growing body of evidence that medicines are not being stored and handled correctly on beef and dairy farms in the UK (Rees and others 2019). One of the main concerns is the maintenance of the vaccine 'cold chain' – that is, keeping vaccines consistently between 2 and 8°C.

Transportation

In a study carried out in the UK, Meadows (2010) observed that although refrigeration was used before collection of a vaccine and once it arrived on farm, the ability to maintain a chilled temperature during transport (either by farmers or vets) was not available in 89 per cent of cases. As it takes only 20 minutes for vaccines to equilibrate with the ambient environmental temperature (Williams and Paixão 2018), transportation is potentially a key area in the maintenance of the cold chain. Vaccines may be delivered by practice members (eg, vets going out to farm visits) or picked up from a practice by the clients themselves. Veterinary vehicles and veterinary medicine storage compartments

are routinely reported to exceed the temperature storage requirements for most veterinary medicines (Ondrak and others 2015), so providing specific cool storage such as a cool box for the transportation of vaccines, both for vets and clients, would be a cost-effective way of ensuring that the cold chain is maintained until vaccines reach a farm.

On-farm fridges

As well as transport, recommendations for maintenance of the cold chain should also focus on the storage of medicines on a farm. Williams and Paixão (2018) concluded that all 17 on-farm fridges sampled in their study failed to keep the vaccines within the required temperature range for a sustained period (at least during the study) and to such an effect that this compromised the efficacy of the vaccines stored in those fridges. Therefore, as the cold chain is unlikely to be successfully maintained in most farm fridges, it might be helpful to minimise the length of time that vaccines are stored there by only bringing them onto the farm just before a vaccination session.

Considering the observed challenges with fridges on farms, the monitoring of fridge temperatures is important and can be achieved cost effectively by placing a maximum–minimum thermometer in the fridge and checking the temperature on a regular basis. However, this ongoing requirement for regular monitoring may be challenging for farmers who are already time poor. Continuous data loggers with alarms that alert when temperatures approach unacceptable ranges can be helpful and are in use in some veterinary practices (BSAVA 2018) and could be used on farms. Vial monitors, visual freeze indicators and 'shake tests' have been used in human medicine to determine whether vaccines might have been affected by temperature extremes and could potentially be used in the veterinary field (World Health Organization 2015).

Usage and handling Temperature

With vets administering vaccines on farm in only 6 per cent of cases in the UK (Cresswell and others 2014),

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responsibility for the administration of vaccines and other veterinary medicines largely falls on farmers and farm workers. It is unknown how aware farmers are of the need to keep vaccines within specified temperature ranges until they are administered to an animal. For example, some vaccines are required to be brought up to ambient temperatures of 15 to 25°C before administration. Although this information is on the datasheet, Cresswell and others (2014) found that only about one third of farmers refer to the datasheet before starting a vaccination session. Unfortunately, there are limited published data on the actual effect on efficacy of the vaccine when it is not administered at the correct temperature, so more research in this area could help farmers and vets focus on the key areas to improve.

Expiry dates and shelf life

Rees and others (2019) found that expired veterinary medicines were stored on 25 of the 27 farms in their study. While some efficacy is assumed after the expiry date of unopened veterinary medicines, large-scale studies and information on specific products are not widely available (Ondrak and others 2015). As it is difficult to assess how the expired products stored on farms are used, this warrants further investigation both from vets in practice as suppliers of veterinary medicines (ie, how often are products being used after the expiry date and why?) and in the wider context (ie, what is the effect of using expired products?). However, from a perspective of appropriate medicines use and to comply with datasheet regulations, expired medicines should be disposed of appropriately.

The same applies to vaccine bottles that have been broached. Most vaccines have short shelf lives once broached or reconstituted and should be used within the time stated on the summary of product characteristics, which, in some cases, is only a couple of hours. Therefore, on-farm storage of open vaccine bottles is unnecessary and should be discouraged. Ensuring that veterinary practices stock smaller pack sizes will enable vaccines to be purchased only for the number of animals that require vaccination and this may help smaller herds or farms with year-round calving patterns where very few animals fit into a specific timing window. Some practices have initiated 'vaccination days' at which clients share bottles of vaccine to vaccinate larger numbers of animals on the same day. When particular attention is paid towards biosecurity in these cases, it can be an effective way to reduce vaccine wastage among smaller herds (Fig 1).

Timing

Many vaccines have specific timing schedules for administration to optimise the immune response of the animal.



Fig 1: Preventing disease in youngstock often includes the use of vaccines; making sure clients handle and store veterinary medicines correctly is part of good veterinary practice

For example, calf vaccine schedules are designed so that the antibody response is not adversely impacted by maternally derived antibodies. Conversely, colostrum vaccines to prevent *Escherichia coli*, rotavirus and coronavirus infections in calves are designed to confer immunity from the cow to the calf when administered at the appropriate interval precalving. It is also often specified that sick animals should be excluded from vaccination so that the animal mounts the appropriate immune response and its health is not compromised further (National Office of Animal Health [NOAH] 2018).

Administration

In a study evaluating farmer compliance with vaccination protocols, 27 per cent of farmers were incorrectly administering vaccines compared to the route of administration described on the datasheet. The most common mistake was the administration of intramuscular vaccines subcutaneously and vice versa (Cresswell and others 2014). In the same study, 31 per cent of farmers were administering vaccines at the incorrect site compared to that recommended on the datasheet, with the majority of injections given in the gluteal region when the neck was recommended. The actual effect on vaccine efficacy when using a different route or site of administration is not described in the published literature. However, considering what is known from the human literature, it can be hypothesised that there will be a detrimental effect on the efficacy and duration of action of the veterinary medicine used, as well as an increased risk of the formation of injection-site lesions (Cresswell and others 2017). In dairy systems, injections are often performed in the milking parlour and are given in the gluteal region but caution should be taken when injecting in this site to avoid damaging the sciatic nerve. Where safety permits and where no injection site is specified, the neck region is always preferable (Kirkwood and others 2018) and appropriate handling systems such as races and feed barriers with self-locking head yokes can help to facilitate this.

A short video on YouTube directed at farmers who regularly inject in the gluteal region indicates key areas to focus on to prevent damage (Wapenaar 2017).

Needle hygiene

Needle hygiene is an important area to focus on to reduce the risk of injection-site lesions. During a vaccination session, the use of one needle for drawing up and another for injecting the animals is good practice to avoid contamination. Changing the needle every few animals is advisable and should be recommended at least between different groups of animals to prevent the possible spread of contamination and disease. This was reportedly carried out by only 27 per cent of farmers in a study by Cresswell and others (2017), despite the risk that diseases such as bovine viral diarrhoea may be transmitted by sharing contaminated needles (Niskanen and Lindberg 2003). The use of multidose injection guns with built-in needle cleaning systems has become more widespread and could help to prevent the spread of contamination and disease via injection.

It is also important to ensure the animal's skin is clean and dry. Gross contamination of the bottle should be prevented, with the top of the bottle kept clean using disinfectant.

In the pig industry needleless intradermal vaccination is becoming more commonplace to help avoid problems such as injection-site lesions that can be associated with vaccination by injection (MSD Animal Health 2018).

Dose

For medicines such as antibiotics, anthelmintics and non-steroidal anti-inflammatory drugs, correct dosing of the product is more important than it is for a vaccine as the dose of the medication is based on the animal's weight. Accurate weighing of animals using scales, weigh tapes or precision livestock technologies can ensure that appropriate doses of medicines are administered, as visual estimation has been demonstrated to be inaccurate (Wood and others 2015).

Easier said than done

Much of the handling and storage of medicines on farm occurs with minimal veterinary input. The beef and dairy industry in the UK is in a privileged situation where it has become common practice for vets and non-vets (where suitably qualified persons are prescribing) to dispense vaccines and let farmers vaccinate their own cattle (Fig 2). In the Netherlands, for example, only few veterinary medicines can be left on farm and vaccination is always carried out by vets. Cresswell and others (2014) found that 93 per cent of beef and dairy farmers who were interviewed reported obtaining vaccines from their veterinary

Fig 2: The environment in which clients vaccinate cattle is different from companion animal practice or human medical practice where staff carry out the procedure under clinical supervision and have undergone rigorous training. Farm animal vets can improve adequate practice on farm by ensuring handling and storage requirements are known to everyone administering veterinary medicines



Box 1: 'Top 10' recommendations to improve the handling and storage of medicines

- Provide fridges/cool boxes containing maximum–minimum thermometers in cars used by vets to transport medicines
- Recommend that farmers use cool boxes when collecting vaccines and during vaccinating sessions
- Recommend the use of maximum–minimum thermometers or temperature loggers in farm fridges
- Implement 'medicine storage and fridge health' checks in routine veterinary visits
- Discuss with farm clients how they/their staff are administering medicines and provide readily accessible support/training (annual reviews as part of farm assurance schemes are an excellent opportunity for this)
- Provide flyers with key points to consider when prescribing veterinary medicines
- Recommend the use of weigh tapes or scales to check the correct dosage
- Offer vaccination services carried out by trained practice staff such as technicians
- Include handling and storage of medicines topics in farmer discussion groups, share experiences, invite other sectors (such as pig and poultry farmers) to become involved and promote best practice using examples in practice newsletters/social media
- Challenge research, levy boards and the pharmaceutical industry to investigate and provide evidence for best practice and the effects of non-compliance

surgeon, which suggests that the relationship between farmers and their veterinary surgeons is an important area to focus on when discussing the vaccination of cattle.

However, simple solutions for improving the handling and storage of medicines, as described in this article, are often the most challenging to enact on farm. Studies have shown that encouraging a change to improve compliance requires insight into a client's motivations, values and goals (Kristensen and Jakobsen 2011). **What can you do to help your clients change their current behaviour and check their fridge, expiry dates or injection techniques?** Asking this question is often the best way to access this information but it may take a bit of time for a truthful answer to be given. Explaining the impact of using and handling medicines incorrectly (ie, it may increase the chance of disease and reduce welfare standards) may encourage clients to change their procedures. Others are motivated by money, so explaining that they have just lost £2000 as a result of vaccines being stored inappropriately may encourage a client to initiate investment to ensure, for example, a correct fridge temperature. Some farmers find time to be a barrier and therefore never 'get around' to improving their use and storage of medicines, even though they are aware of the shortcomings.

Most farmers trust their vet and hold them in high regard (Richens and others 2015), so finding out what drives a client can result in the offer of bespoke solutions and support. This could be in the form of providing knowledge transfer through information events, or through more practical solutions such as transport and the administration of vaccines.

Box 1 provides a list of recommendations that can help to improve the handling and storage of medicines.

Summary

Considering the significant attention directed towards the reduction of antimicrobials in the farm animal industry, the focus of this article has been around vaccination, as the uptake of veterinary vaccines is likely to increase in the future as a more preventive approach is taken towards disease control on farms. However, the principles of appropriate storage and usage apply across all veterinary medicines.

It has been repeatedly demonstrated that farmers value veterinary input on their farms (Hall and Wapenaar, 2012, Cresswell and others 2014), particularly with regards to the distribution and administration of vaccines (Richens and others 2015). As practitioners are often regularly on farm and able to view medicine storage and administration, veterinary practices are well placed to provide services and advice in this area. Further research is warranted from levy boards and the pharmaceutical industry to provide evidence for best practice and the effects of non-compliance.

Online resources

The resources below are focused around vaccination practices but include important handling, use and storage information relevant to all veterinary medicines used on farm.

AHDB DAIRY (2014) Technical information for vaccination of cattle. <https://dairy.ahdb.org.uk/technical-information/animal-health-welfare/vaccination/#.XA-k9WdLFD8>. Accessed April 25, 2019

AHDB DAIRY (2018) Vaccinating cattle safely and effectively. www.youtube.com/watch?v=7171UNHUjrs&feature=youtu.be. Accessed April 25, 2019

AHDB DAIRY (2019) Vaccination quiz. Vaccinating cattle safely and effectively. <https://dairy.ahdb.org.uk/technical-information/animal-health-welfare/vaccination/vaccination-quiz/#.We4hgFuPKCg>. Accessed April 25, 2019

AHDB DAIRY (2018) Best practice for vaccination of beef and dairy cattle. Top 10 vaccination tips. https://youtu.be/m6Mr01CacB4?list=PLbxhW7-AcgGWbM_ghrkza5VHAARM57LCg. Accessed April 25, 2019

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HALL, J. & WAPENAAR, W. (2012) Opinions and practices of veterinarians and dairy farmers towards herd health management in the UK. *Veterinary Record* doi: 10.1136/vr.100318

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KRISTENSEN, E. & JAKOBSEN, E. B. (2011) Challenging the myth of the irrational dairy farmer: understanding decision-making related to herd health. *New Zealand Veterinary Journal* **59**, 1-7

MEADOWS, D. (2010) A study to investigate the use and application of BVDV vaccine in UK cattle. *Cattle Practice* **18**, 202-209

MSD ANIMAL HEALTH (2018) IDAL intradermal vaccination.

www.msd-animal-health.co.uk/pigs/idal.aspx. Accessed April 25, 2019

NISKANEN, R. & LINDBERG, A. (2003) Transmission of bovine viral diarrhoea virus by unhygienic vaccination procedures, ambient air, and from contaminated pens. *Veterinary Journal* **165**, 125-130

NOAH (2018) Compendium of Data Sheets for Animal Medicines. NOAH. p 800

ONDRAK, J. D., JONES, M. L. & FAJT, V. R. (2015) Temperatures of storage areas in large animal veterinary practice vehicles in the summer and comparison with drug manufacturers' storage recommendations. *BMC Veterinary Research* **11**, 248

RED TRACTOR ASSURANCE FOR FARMS (2018) Dairy Standards. Version 4.1. https://assurance.redtractor.org.uk/contentfiles/Farmers-6802.pdf?_=636645923445796065. Accessed April 25, 2019

REES, G. M., BARRETT, D. C., BULLER, H., MILLS, H. L. & REYHER, K. K. (2019) Storage of prescription veterinary medicines on UK dairy farms: a cross-sectional study. *Veterinary Record* doi: 10.1136/vr.105041

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WOOD, S., REYHER, K. K. & BARRETT, D. C. (2015) Comparison of visual assessment and heart girth tape measurement for estimating the weight of cattle in clinical practice. *Veterinary Journal* **203**, 337-338

WORLD HEALTH ORGANIZATION (2015) Immunization in practice – a practical guide for health staff. Module 2: the vaccine cold chain. www.who.int/immunization/documents/IIP2015_Module2.pdf?ua=1. Accessed April 25, 2019

Self-assessment quizzes

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Self assessment: Handling and storing medicines on beef and dairy farms

- At what temperature should most vaccines should be stored?
 - 0 to 1°C
 - 2 to 8°C
 - 9 to 15°C
 - 16 to 20°C
- What percentage of beef and dairy farmers obtain vaccines from their veterinary surgeon?
 - 93 per cent
 - 73 per cent
 - 53 per cent
 - 23 per cent
- What percentage of farmers report that they read the datasheet instructions before they start vaccinating?
 - 84 per cent
 - 53 per cent
 - 33 per cent
 - 15 per cent
- In a study monitoring farm fridges (Williams and Paixão 2018), what percentage of fridges maintained a temperature within the storage range required for vaccines over the study period?
 - 0 per cent
 - 20 per cent
 - 40 per cent
 - 60 per cent
- What percentage of farmers changed the needle between each group of animals? (Cresswell and others 2014)
 - 0 per cent
 - 16 per cent
 - 27 per cent
 - 52 per cent
- In a study investigating vaccination compliance (Cresswell and others 2014), what percentage of farmers were injecting vaccines at the incorrect site when compared to datasheet recommendations?
 - 16 per cent
 - 31 per cent
 - 54 per cent
 - 73 per cent

Answers: (1) b, (2) a, (3) c, (4) b, (5) c, (6) b