Storage and dispensing of medicines

IMPORTANT: Readers should be aware that the regulations are regularly reviewed by the Royal College of Veterinary Surgeons (RCVS) and the Veterinary Medicines Directorate (VMD). This chapter will be updated as new guidance is released. Please see **Guidance** for current information.

Storage

KEY POINTS

- Medicines must only be stored in secure locations
- Medicines must be stored in accordance with their datasheet or summary of product characteristics (SPC)
- Environmental conditions where medicines are stored must be monitored

Premises

To enable the Veterinary Medicines Directorate (VMD) to fulfil its obligations under UK and (in Northern Ireland) European law to maintain and improve traceability of and accountability for veterinary medicines, all premises from which medicines are to be prescribed and supplied must be registered as veterinary practice premises (VPP) with the Royal College of Veterinary Surgeons (RCVS). All registered premises are inspected by the VMD, except those practices who are members of the RCVS Practice Standards Scheme (PSS) which are inspected by the RCVS as part of this scheme.

See also **Registration of premises and inspections**

A VPP must be a permanent building or part of a permanent building, be clean, well maintained and vermin proof. Premises where medicines are held should be capable of being secured to deter intruders. Controlled Drugs (CDs) and injection equipment are attractive not only to drug misusers but also to professional criminals. Professional advice should be obtained on the suitability of the premises, locks, shutters, security alarms and so forth.

Areas of the practice used for the storage or supply of medicines must not be residential, and public access should be denied or controlled to areas where prescription-only medicine – veterinarian (POM-V), prescription-only medicine – veterinarian, pharmacist, suitably qualified persons (POM-VPS) and non-food animal – veterinarian, pharmacist, suitably qualified person (NFA-VPS) medicines are held (they should be 'team only areas'). There should be no smoking, food consumption or storage of food in areas where medicines are stored or supplied, with notices in place informing the team and clients accordingly. Particular attention should be taken with fridges; the storage of medicines alongside food or laboratory samples must be avoided.

A record must be kept at the practice's main premises of all other locations where medicines may be stored (e.g. practice cars or homes where medicines are kept for on call purposes).

Consulting rooms

Medicines stored in consulting rooms should be kept to a minimum and should be placed out of sight in drawers or cupboards. There is no requirement for these cupboards to be locked, but it is considered good practice to do so if clients are left in consulting rooms unsupervised. Medicines subject to abuse should not be held in consulting rooms.

Practice cars

Medicines held in vehicles should be kept to a minimum. Only those used frequently and only sufficient quantities for immediate use should be carried routinely because the temperature within the car may fluctuate greatly causing reduced efficacy of the products. Any medicines that are kept in vehicles should be clean and well organized.

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Cars should be fitted with refrigerated units for temperature-sensitive medicines and the temperature of these monitored to ensure they are maintained between 2–8°C. Temperatures should be monitored in vehicles to ensure that medicines requiring storage at a controlled ambient room temperature are not left in vehicles when temperatures exceed 25°C or go below 8°C.

Precautions against theft such as not storing medicines in the car for long periods of time or overnight, not leaving medicines on display and parking vehicles in secure areas should be considered. CDs should be stored in either a locked glove box or in a separate locked bag, box or case that is removed from the vehicle if it is left unattended for any significant period of time.

See also **Controlled Drugs**

The dispensary

Care should be taken to ensure safe storage of all medicinal products. Medicines must be stored in accordance with the manufacturer's SPC or datasheet. SPCs for all UK authorized veterinary medicines can be found in the VMD product information database ().

To avoid contamination, medicines should not be stored in toilet or washing areas, or laboratories. Medicines to be supplied to clients should not be stored in areas where animals are kept such as kennels, except those medicines already dispensed.

Flammable products must be stored in an appropriate flammables cabinet specifically designed for this purpose, preferably on the floor to prevent breakages.

Shelving should be of sturdy construction and well designed to reduce the possibility of breakage and spillage. It should be designed in such a way to ensure medicines are easy to locate with areas suitable for small and bulk storage (Figure 7.1).

Medicines should be protected from dust and dirt and a regular cleaning schedule should be developed to maintain a high standard of cleanliness. Care should be taken to ensure the floor is clean and clear of any dropped or spilled medicines should patients be able to access the dispensary, particularly since many veterinary medicines have an inviting smell.

The dispensary should be kept tidy and there should be sufficient work bench space and adequate lighting for the dispensing of medicines. The dispensary should be organized in order to reduce errors.

See also **Dispensary management and reducing errors**

Figure 7.1: Sturdy and well designed shelves in a pharmacy.

Stability of medicines

Degradation of medicines may occur through chemical, physical or microbiological means.

- **Chemical instability** usually results in reduced potency, although degradation products may also have adverse effects. Common causes of chemical instability are:
  - Hydrolysis (the breaking of chemical bonds because of a reaction with water)
  - Oxidation (a reaction involving a loss of electrons that is promoted by the presence of oxygen)
  - Photolysis (the breaking of chemical bonds by the transfer of light energy).
- **Physical instability** may result in changes that are purely cosmetic, or they may affect the efficacy of a medicine. Examples include changes in colour, separation of solid and liquid parts of a suspension, or the softening of tablets.
- **Microbiological instability** can become a problem where microorganisms reduce the therapeutic activity of a drug. This commonly occurs over time and with repeated use of a product.

Medicines should be protected from environmental conditions that may damage or degrade them such as light, temperature and humidity. Storing products in their original packaging will give the best protection against environmental damage. The dispensary should also be fitted with blinds on any windows to protect against bright light, and light-sensitive products should be kept in their outer packaging. Ventilation must be adequate and hot water sterilizers and autoclaves should not be used in the dispensary, as they may adversely affect the humidity of the room. Failure to abide by the manufacturers' storage instructions is an offence under the Veterinary Medicines Regulations (VMR).

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Modifying products

If a product needs to be modified to produce a formulation of the required strength or form, any problems with stability, safety or palatability that may arise as a result should be first identified. Tablets may be coated due to a bitter taste that would make administration of a split tablet difficult, to control the site of release of the drug, or to maintain the physical or chemical stability of the drug. For safety reasons, cytotoxic or teratogenic medicines should not be reformulated in-house but should be sent to a specialized reformulating pharmacy instead. Modified-release (MR) tablets and capsules (which may also be called controlled-release (CR), long-acting (LA), sustained-release (SR), enteric coated (EC), or extended-release (XL)), should not generally be split or opened.

More information about the stability of injectable medicines and modified oral medicines may be found in **References and further reading**.

Temperature monitoring

Particular attention should be paid to ensure medicines are stored at the correct temperature in accordance with the SPC. Products to be stored at a controlled ambient room temperature do not require refrigeration and should be kept between 8–25°C. Storage of products at a controlled ambient temperature should be monitored and action taken if the temperature is outside this range or remains unusually high or low for any significant period of time.

Products that require refrigeration such as vaccines, insulin, antisera and some reconstituted antibiotics must be stored in a fridge between 2–8°C. These products should be removed from the delivery cool chain as soon as possible and stored in a fridge. They should only be removed from the refrigerator for **immediate** use.

Care should be taken to ensure the refrigerator maintains a temperature between 2–8°C. Thermometers must be appropriately situated within the fridge (i.e. not touching the chiller plate and not placed in a compartment away from the veterinary medicines). For maximum/minimum thermometers, it is recommended that the probe is put into a buffer or thermal break to reduce the incidence of a temperature spike when the fridge is opened. Temperatures should be monitored and recorded at least daily (Figure 7.2), and this should ideally be the responsibility of a named person(s). Maximum/minimum thermometers and a logbook can be used for this purpose. The thermometers should be reset after the readings have been recorded.

A written plan should be in place detailing the actions to be taken should temperatures in the dispensary or refrigerator fluctuate outside the recommended temperatures. For example, this may include the direction to dispose of insulin if the temperature drops below 2°C or that further information should be sought from the medicine manufacturer if the temperature of the fridge was maintained above 8°C for longer than a few minutes.

Regular cleaning, servicing and stock control in refrigerators should be performed as for other storage areas. It is good practice to have a separate shelf or area available for medicines that have been prepared for collection by an owner or for use by an inpatient.

The use of continuous data loggers to monitor the temperature can be convenient, but these should only be used if an audible alarm or flashing light alarm alerts the user to temperatures deviating from the required range. Weekly downloading of the temperatures into graph format is useful to determine trends in temperature fluctuations, but notice of temperatures outside the required range comes too late to prevent the product being used if an audible alarm is not present. Data loggers should be downloaded at least weekly.

Practice cars should be fitted with refrigeration units and monitored in the same way as the practice fridge.

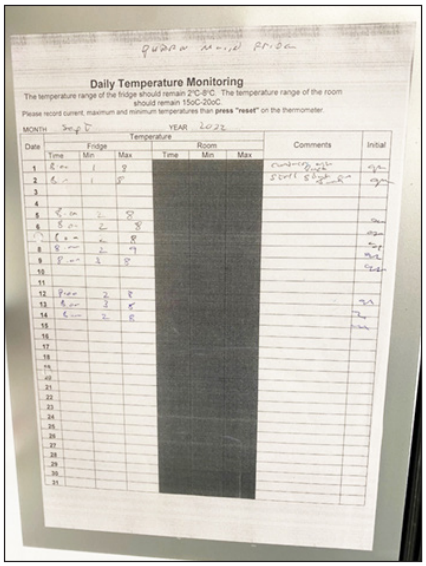

Figure 7.2: An example of a temperature monitoring record.

Medicine containers

A variety of medicine containers should be available for use. When sub-dispensing medicines into new containers, care should be taken to ensure that they comply with the following requirements. They must:

- Protect against all adverse external influences that can alter the properties of the product (e.g. moisture, light, oxygen and temperature variations)
- Protect against biological contamination

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- Protect against physical damage
- Carry the correct information and identification of the product. Sufficient written information (printed hard copy or digitally via a weblink or QR code) should be provided to ensure safe use of the product.

The kind of packaging and the materials used must be chosen in such a way that:

- The packaging itself does not have an adverse effect on the product (e.g. through chemical reactions, leaching of packaging materials or absorption)
- The product does not have an adverse effect on the packaging, changing its properties or affecting its protective function.

In practice, this means airtight, ridged containers should be used for loose tablets and capsules and paper cartons, envelopes or wallets for blister packs and foil strips. Loose tablets or capsules should not be dispensed in plastic bags or paper envelopes. Amber glass or ridged plastic bottles should be used for liquid medicines, with fluted bottles and wide-mouth jars for topical liquids and creams.

Medicines should be dispensed in child-proof containers unless requested otherwise. A sign should be placed in reception notifying owners that they may request non-child-proof containers if required (e.g. for the elderly or infirm who may struggle to open such containers).

Figure 7.3: Dispensing equipment: counting triangle; capsule counter; spatula and measuring cups.

Dispensing equipment

A counting triangle, capsule counter, spatula, measuring cups and scales are basic tools required for most dispensaries (Figure 7.3). All equipment must be cleaned after each use, as cross contamination from different loose tablets or liquids can be dangerous if a patient is sensitive to a particular product (e.g. penicillin) or if contamination of a hazardous medicine occurs.

Stock control

KEY POINTS

- Stock control processes must be in place to ensure medicines are used or disposed of within their shelf-life (including their in-use shelf-life)
- Good stock control will reduce waste and save money
- It is an offence to supply or administer a medicine which has not been correctly stored, or an out of date medicine, including veterinary medicines which have exceeded their in-use shelf-life

Pharmaceutical and consumable supplies represent some of the biggest expenses for a veterinary practice. Efficient stock control ensures that capital is not tied up unnecessarily, protects against problems arising from products being unavailable, and prevents money being wasted.

It is good practice to:

- Set stock levels to allow accurate stock holding
- Have a named person(s) responsible for stock control
- Store products in original packaging, in a logical order
- Supply a product leaflet or SPC with all products dispensed
- Dispense products with the shortest expiry date first
- Store products with different batch numbers together.

Dates of deliveries and items delivered from manufacturers or wholesalers should be recorded unless this information is on the retained invoice or delivery note. Packs with damaged or defaced packaging and out of date

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stock should be stored separately while awaiting disposal. Once stock has been dispensed and taken from the practice premises it should not be accepted back into the dispensary unless correct storage during this time can be guaranteed. The batch number of products dispensed for administration to food-producing animals must be recorded on the case file for batch tracking purposes. For small animals it is enough to record the date of first usage of each box or bottle.

Which medicines to stock?

Many practices find that the selection of products in their dispensary has evolved organically rather than being thoughtfully considered. Rationalizing the stock held can both save the practice money and improve patient care. A smaller, more consistent product range makes it easier for all of the team, including locums, to become familiar with the products stocked. Less storage space is required, and with quicker turnover and increased purchases of a small range of products, the practice prevents medicines from going out of date and may gain access to better manufacturer discounts. A smaller range also allows the practice to ensure they have printed product information leaflets to hand for medicines that are commonly sub-dispensed out of their original packaging.

By reviewing past use of medicines, the practice can identify those that must be kept in stock at all times for use in an emergency, those that should be stocked for routine use, medicines that should no longer be stocked, and new products to be brought in.

When deciding between brands, practices should also consider:

- In-use shelf-life
- Licensed indication and species
- Dosage form flexibility
- Adverse effects profile
- Palatability
- Cost.

There are some instances where it is not advisable to switch brands after treatment has begun. Drugs with a narrow therapeutic range and some anti-epileptics should generally not be switched. In addition, brand continuity may be important in products that require a specific administration technique, or where an excipient in a particular brand may cause toxicity (e.g. human liquid formulations that may contain ethanol or xylitol).

Determining which drugs and brands to stock should always involve the prescribers in the practice and should ensure that sufficient stock is held to allow that practice to operate safely and efficiently. A practice formulary or prescribing policies may be useful in standardizing prescribing practices. The RCVS PSS requires all practices to have a written policy regarding the prescribing of critically important antibiotics.

See also **Antibacterials**

Stocking levels

In order to perform stock control effectively, stock order levels (maximum/minimum) must be set for every product. This could be done using a small card placed on the products at the correct place, a sticker on the shelf or a fully automated system. Any system will require information, including product description, order up to level (OUTL), reorder point (ROP), supplier and item code.

Using the just-in-time method, the amount of stock to be kept can be calculated using this basic equation:

OUTL = D x L (where D = daily demand; L = lead time)

In practice, however, average daily demand is very difficult to calculate accurately and does not take weekends, public holidays or periods of exceptional use into account. It may be better to work on a principle of 1 or 2 weeks cover so the average daily demand becomes the average demand for 1 or 2 weeks. This will allow sufficient stock to cover for any emergencies. It may be wise to keep 2 weeks cover of any medicines used in emergency situations but only 1 week for routine products where the consequences of not having a bottle in stock are not so high. If the item is seasonal, extra consideration will be needed to set an OUTL which may be different for specific seasons. An added benefit of increasing the volume held and, therefore reducing the number of orders placed, is the benefit to the environment. Fewer deliveries mean less vehicles on the road and a reduction in carbon dioxide emissions. However, this must be balanced against the risk of having too much capital tied up in stock.

Bulk orders can be a cost-effective and planet-friendly way of ordering stock for frequently used products. It must be recognized; however, that the product will have been bought and paid for within a month. Until enough

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stock is sold to cover what has been paid, the practice will be out of pocket. If just 2–4 weeks supply is ordered, then the stock should have been sold on by the time the wholesaler requires payment for it, which helps with cash flow.

Products subject to intermittent use will not fit into the OUTL calculation (e.g. some emergency medicines are used infrequently, but when required large volumes may be used). This needs to be considered when OUTLs are set.

Stock control is an ongoing process. Stock levels should be altered as new products are brought to the market or preferences change. The 'A-B-C' analysis is a great tool for prioritization. Each product is placed into a category based on its monetary worth, intrinsic value and potential for revenue (Figure 7.4). Practitioners should begin by setting OUTLs and ROPs for the roughly 20% of products that fall into category A, then move on to categories B and C.

Category	Type of product	Examples
A – the top 20% of revenue	High value, high volume pharmaceuticals	Vaccines, flea treatments, wormers, non-steroidal anti-inflammatory drugs (NSAIDs). A sub-category AA contains essential drugs (life-saving, euthanasia, pain relief). There should be no more than 10–20 AA products
B – the next 30% of revenue	Mid value, mid volume pharmaceuticals and high volume consumables	Prescription diets, chronic medications, intravenous giving sets
C – the remaining 50% of revenue	Low value, low volume pharmaceuticals and consumables	Most consumables, 'just-in-case' medicines

Figure 7.4: The 'A-B-C' analysis tool.

Stock rotation

Products with the shortest expiry date should be dispensed first to reduce the number of products going out of date. This can generally be achieved by ensuring that all new stock from deliveries is placed at the bottom or back of current stock, but it is useful to double check that the expiry dates of the newly delivered stock are longer than current stock, particularly if orders are placed with different companies.

Stock loss and annual stocktake

There are a number of reasons for stock loss within a veterinary practice. These include:

- Products going out of date
- Broken or damaged stock
- Items mistakenly not charged for
- Theft
- Items charged for by wholesalers but not received
- Wholesaler credit for goods returned or missing not received
- Consumable wastage.

Products going out of date means money lost to the practice. Setting appropriate ROPs and OUTLs will reduce stockholding and lead to fewer products going out of date. Monthly date checking should be performed to ensure products are used before they expire (where clinically appropriate).

The VMD requires all practices to perform an annual stocktake where incoming and outgoing medicinal products are reconciled. Any missing items must be accounted for. Out of date products are considered 'stock' until they are removed from the stock file. In the annual stocktake, all products that have gone out of date must be accounted for or they will be assumed to be missing. Broken or damaged stock should also be recorded for stocktaking purposes. A system should be put in place to ensure all items used are charged for appropriately. This will ensure not only that the practice maximizes their income, but that purchases and sales of each product can be reconciled for the annual stocktake.

See also **Record keeping and audits**

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To prevent the theft of medicines, food and pet products, it should be ensured that clients do not have access to medicine cupboards when left alone in the consulting room and that any waiting room displays are within sight of the reception team. Regular stocktakes of vulnerable items should be performed to check for discrepancies.

Medicines received from wholesalers should always be checked against delivery notes and any missing or damaged goods claimed for at the time of receipt. Once a claim has been made, practitioners should ensure that the credit is received by reconciling credit notes against returns books.

It is advised that practices set up a dummy client called 'Disposal' on their practice management system and record all medicines that are unusable. This can help the practice identify where medicines are being wasted and also help with reconciling stock during audits.

Medicine returns

As correct storage conditions (and therefore safety and effectiveness) of medicines returned by owners cannot be guaranteed, such products should be disposed of and not accepted back into stock unless the practice can guarantee that the product has been stored according to its SPC. All returned medicines (with the exception of CDs) should be kept in their inner container and placed into a pharmaceutical waste bin. Mixing loose tablets/capsules and liquids may cause a chemical reaction which can lead to fire. Returned CDs must be denatured before disposal. See **Controlled Drugs** for further details. Products dispensed for animals on the premises that have not left the practice can be accepted back into stock, providing the storage conditions are known to be acceptable and they are not contaminated in any way (e.g. by using the same syringe to withdraw multiple oral doses from a bottle of liquid medicine).

Unwanted or mistakenly ordered medicines should be returned to wholesalers as soon as possible. There may be restrictions on such returns as returned medicinal products may be destroyed.

Expiry dates and in-use shelf-life

It is illegal to supply or administer a medicine after the expiry date detailed on the pack or to obscure the expiry date on the packaging of any medicine. Requirements in European Union (EU) and national legislation to ensure the stability and safety of the medicine mean that some products such as injectable drugs have an in-use shelf-life.

Any medicine which is stipulated to be used within a given timeframe should be marked with the date of opening and use by date. This is the length of time after which the product must be disposed of upon opening. For most multidose injectables, the in-use shelf-life is usually, but not always, 28 days, thus making it an offence to administer the product after 28 days of opening (unless the expiry date of the product itself is shorter; the bottle should be checked for details).

Multidose vials should be marked with the date of first opening and the use by date. Bright stickers can be useful to draw attention (Figure 7.5), but all multidose vials with an in-use shelf-life now have a space to write this information. Any medicine left in the vial after the specified time must be discarded. For single-use ampoules, the required dose should be withdrawn immediately and the remainder disposed of. Oral liquids should generally be disposed of 6 months after opening, although some may specify a shorter in-use shelf-life. Care should also be taken with some medicines that are sensitive to humidity as these may have an in-use shelf-life stated on the SPC.

A named person(s) should be in charge of date checking the medicine store once a month and a log should be kept of this check. When date checking, short-dated stock should be marked as such and brought to the front of the shelf to be used first. Any stock that has gone out of date should be separated and recorded before destruction.

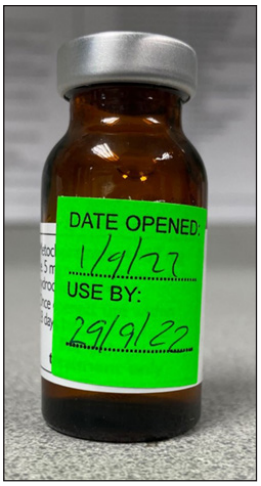

Figure 7.5: Bright stickers can be applied to opened multidose vials with the date of opening and discard date.

Broken or damaged medicines

Any medicine with a broken or damaged container should be segregated immediately for safe disposal. Care should be taken with spilled or leaked medicines. The SPC and Control of Substances Hazardous to Health (COSHH) assessments should be checked to identify whether the medicinal product is hazardous before cleaning takes place and appropriate personal protective equipment used if advised. A spill kit should contain gloves, absorbent material and a laminated copy of the standard operating procedure (SOP) for dealing with spillages. Spill kits for cytotoxic drugs should contain overshoes, gloves, a gown, 'chemosorb pads', disposable bags and a step-by-step user guide.

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QUESTIONS

1. Unless otherwise specified, what is the usual recommended in-use shelf-life for oral liquids?
   a. 12 months
   b. 28 days
   c. 3 months
   d. 6 months
2. What is the name of the chemical reaction that involves a loss of electrons that is promoted by the presence of oxygen?
   a. Combustion
   b. Neutralization
   c. Hydrolysis
   d. Oxidation
3. When performing an 'A-B-C' analysis of the dispensary inventory, what percentage of products should be in category A?
   a. 20%
   b. 15%
   c. 50%
   d. 5%
4. What is the correct procedure for handling medicines returned to the practice?
   a. Dispose of into the general waste stream
   b. Credit the client and return the item to the shelf for re-use
   c. Dispose of into the pharmaceutical waste stream
   d. Offer the medicine free of charge to another client who might use it

ANSWERS 1 – d; 2 – d; 3 – a; 4 – c

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