

# Administering chemotherapy

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## What is chemotherapy?

Chemotherapy is the use of drugs to treat cancer. Cancer treatment usually involves a mix of therapies that may include steroids, non-steroidal anti-inflammatory drugs, metronomic therapies, chemotherapy and targeted therapies.

## Cytotoxicity

Cytotoxic agents stop cell proliferation and kill cells. A cytotoxic compound induces cell death via necrosis (accidental cell death) or apoptosis (programmed cell death). The actions of cytotoxic drugs are not specific to only tumour cells, normal cells may also be damaged. Rapidly dividing cells are the most susceptible such as those in cancers, the bone marrow and gastrointestinal tract.

## Administration

Care must be taken administering all chemotherapy drugs. Many chemotherapy agents are well known teratogens (may cause physical defects in a developing embryo), mutagens (causes permanent DNA damage), and carcinogens (cancer causing). Careful planning, knowledge of side effects/warnings, preparation, animal handling, and disposal is required to ensure safety for both patient and administrator. The different methods of administration include intravenous bolus, intravenous infusion, oral, and subcutaneous injection. Full PPE and precautions must be taken with all methods.

**Intravenous administration:** A clean stick catheter should be placed in a suitable vein by experienced personnel. The smallest gauge and shortest length of catheter should be used. An IV pump should be avoided to prevent increased pressure on the vein and possible extravasation. The patient should be restrained in a gentle and comfortable manner. Aggressive or boisterous animals may require sedation. After administration, the IV catheter should be removed and discarded.

**Oral administration (PO):** All chemotherapy drugs given by mouth should be intact, never crushed, split, or tablets opened. PO administration poses the highest risk for environmental and personnel exposure. The tablets should be swallowed whole and not crushed or chewed by the patient.

## Closed system transfer devices (CSTD)

A CSTD such as the PhaSeal system prevents exposure to hazardous injectable drugs, from drug preparation to IV administration. The closed, double membrane system only flows when correctly attached, preventing leakage and drug aerosolisation. These systems greatly reduce the exposure risk of injectable chemotherapy agents, but they do not eliminate it. Drug preparation should still occur in a fume hood when using a CSTD.

Examples of PhaSeal products: N35 injector, C35 adapter, P14 vial adapter



## Chemotherapy check lists

The chemotherapy process is essentially a flow of small tasks that all need to be completed and double checked. A check list is a simple way to ensure nothing gets forgotten!

- Plan made prior to arrival: What bloods are needed, drug, dose, any additional tests?
- History taken: How have they been? Any changes since the last dose?
- Patient weighed
- Patient body surface area calculated
- TPR performed: Don't forget the temperature!
- Bloods taken: ALWAYS a CBC
- Dose calculated AND double checked with veterinarian
- Blood checked with veterinarian
- Dose signed off

## Calculating a dose

Current dosage recommendations are based on body surface area (BSA), m<sup>2</sup>.

Using BSA instead of weight allows for smaller patients to get a higher dose, compensating for their relatively more rapid drug distribution, metabolism, and excretion. For some drugs (such as doxorubicin), the dose may be calculated based on mg/kg below a certain weight.

$$\text{Dog BSA (m}^2\text{)} = 0.101 \times (\text{body weight in kg})^{2/3}$$

$$\text{Cat BSA (m}^2\text{)} = 0.1 \times (\text{body weight in kg})^{2/3}$$

$$\text{Volume} = \frac{\left( \text{m}^2 \times \text{mg/m}^2 \right)}{\text{mg/ml}}$$

Check and double check each calculation. Errors in dosing may be fatal.

## Personal protective equipment (PPE)

PPE is recommended for preparation, administration, spill and waste management, and inventory management.

- Double gloving: purple nitrile gloves with white latex gloves over top
- Long sleeved impermeable gown with back closure
- Face shield/safety glasses
- Mask: N95/P2/respirator

Exposure to personnel can occur via either gross contamination of the environment or microscopic contamination. Gross contamination is the risk of being directly in contact with chemotherapy during drug preparation or administration. Using careful preparation using a closed system transfer device, appropriate PPE, a designated area for drug preparation, and appropriate techniques can minimize the risk of sudden high exposures. Microscopic exposure

is the chronic low-level exposure to drugs, mainly from drug preparation and patient excretions. Risk is minimized by using a closed system transfer device, PPE, and a thorough cleaning schedule.

## ‘Clean stick’ catheters

Only a well-placed intravenous catheter should be used to administer chemotherapy. Do not use an existing catheter. A clean stick means to have continuous blood flow through the hub as you enter the vein and advance the catheter. If the flow was to stop, you may have gone outside the vein and created a hole in the vessel.

## Extravasation

Extravasation is the accidental delivery of any substance outside of the blood vessel into the surrounding tissue. Some chemotherapy drugs are classed as irritants or have a high vesicant risk. The IVC site should be monitored for signs of swelling/redness. Stop if any resistance occurs while infusing or no blood can be withdrawn. Extravasation injury can cause pain, mild erythema, local tissue damage, or extensive necrosis. Being aware of the risks of each drug is crucial in the prevention of injury.

## Handling cytotoxic patients

Drugs can be excreted via urine, faeces, saliva, vomitus and sebum. Excreta from patients who have received chemotherapy should be handled with full PPE. Specific cages/kennels should be used and all materials such as bedding should be disposable or easily cleaned. The patient should toilet in a designated, low traffic area with sunshine exposure or an area that can be cleaned easily. Faeces should be picked up and disposed of as hazardous waste. Urine can be diluted with water. Hands should be washed after handling excreta.

## Cytotoxic spill kits

If administering chemotherapy, a spill kit is required incase of emergency. This should contain full PPE, instructions, caution signs, absorbent pads, hazardous waste bags, disposable scoop, sharps container, and cleaning supplies.

## References

- Bassett JM, et al.** *Clinical Textbook for Veterinary Technicians (9<sup>th</sup> Ed.)*. Elsevier: Missouri, USA, 2018
- Moore A, et al.** *Oncology for Veterinary Technicians and Nurses (1<sup>st</sup> Ed.)*. Blackwell Publishing: Iowa, USA, 2010
- Smith AM, et al.** ACVIM small animal consensus statement on safe use of cytotoxic chemotherapeutics in veterinary practice. *Journal of Veterinary Internal Medicine* 32: 904-913, 2018

