Oncology Nursing: Toxins and Barriers

Abstract

This lecture takes a look at chemotherapy in oncology nursing, focusing on the toxicities of chemotherapy and the safety precautions needed when working with cytotoxic drugs and patients undergoing chemotherapy. It looks at safety in practice such as handling the drugs themselves and regarding patient care, and also the considerations for owner safety in the home.

Learning Outcomes

- An understanding of the importance of safety when working with cytotoxic drugs
- Knowledge of safety precautions to take when working with cytotoxic drugs and patients undergoing chemotherapy
- The confidence in ensuring a high standard of Health and Safety in practice

Notes

Introduction:
Cancer is a major cause of death in older dogs and cats (Withrow, 2007). Despite this, there are a number of treatments available, including chemotherapy, to offer pets a good quality of life. Advances in veterinary oncology have increased owner awareness and the readiness of many veterinary practitioners to treat cancer patients, meaning that greater numbers of pets with cancer are being managed long-term. Whilst the use of chemotherapy is a mainstay of treatment of patients with cancer, due to their cytotoxic nature, they pose a risk for patients, staff members and to pet owners, therefore care is required when handling and administering them, and in the day-to-day care of patients which have received these drugs (Withrow, 2007).

Chemotherapy:
Chemotherapy, being a systemic treatment, is most commonly used to treat diffuse cancers, such as lymphoma, leukaemia (Chun, 2007). It may be used in a variety of ways, e.g. as an adjunct to surgery and/or radiotherapy and/or other modalities, in the treatment of solid tumours, e.g. sarcomas, carcinomas, to control microscopic/metastatic disease, with curative or palliative intent - the goal of therapy being maintenance of optimum quality of life (Chun, 2007). In human cancer therapy, chemotherapy is often aggressive, with severe debilitating side effects, including immune suppression, vomiting and diarrhoea, weight loss and total hair loss. Therefore many owners’ first reaction to chemotherapy is “I don’t want to put my pet through that”. In veterinary oncology, quality of life is paramount and chemotherapy protocols are used which are less aggressive than those used for humans – in general the doses used are one third of those used in human medicine, with lesser intensity (i.e. weekly treatments, rather than daily) (Chun et al, 2007). The payback is often limited life-expectancy. Given all of this, adequate time should be spent with owners to counsel them on what to expect during their pet’s chemotherapy, the anticipated chances and duration of remission, potential side-effects and estimated cost of treatment, so that they an informed decision can be made.
Basic Concepts of Chemotherapy:
The goal of chemotherapy is to inhibit the growth of cancer cells with minimum effect on normal cells. Most chemotherapeutic agents either bind directly to genetic material in the cell nucleus or affect a cell’s ability to synthesise protein. This may also damage growth and reproduction of the patient’s normal cells, as both healthy cells and cancer cells go through the same cell division cycle (Argyle et al, 2008).

Treatment dose and schedule depends on the type of cancer and chemotherapy method (Chun et al, 2007). In some cases periodic chemotherapy will be necessary to control the cancer for the rest of the pet’s life (Argyle, 2008). Combining cytotoxic drugs is an effective strategy in chemotherapy, designed to target different parts of the cell cycle to increase the proportion of total tumour cells that are killed at any one treatment time. When drugs are used in combination, they often enhance the activities of each other in both a synergistic and/or additive way. Drugs are also combined to minimise their dose-limiting toxicities and help reduce the development of tumour resistance – cells resistant to one drug may be sensitive to another within that regimen. (Argyle et al, 2008)

There are many instances in which the cancer patient and its nursing staff may be exposed to toxins +/- require barriers.

Patient-related toxins:
Although in skilled hands, the beneficial effects of chemotherapy against cancer generally outweigh the potential side effects, almost all anticancer drugs have side effects. Toxicity is the most significant treatment-limiting factor in cytotoxic drug use. These drugs are not selective in their effect on growing or dividing cells; therefore they commonly affect body systems which include those with rapidly dividing cells, e.g. the gastro-intestine tract, bone marrow, skin/haircoat (Bexfield, 2006).

Toxicities may manifest at any time during chemotherapy treatment - with some having immediate effect, and others being acute or per-acute. Many are transient and are managed symptomatically; whilst others are irreversible. Some toxicities are related to the effect of the drug on the patient’s physiology; others are due to bacterial toxicity which may result during myelosuppression.

Chemotherapy - nursing precautions:
In 1979, the British journal, Lancet, first reported evidence that humans handling anti-neoplastic agents may be at risk. Researchers reported mutagenic activity in the urine of nurses working in a human oncology unit and proposed that the cause was related to exposure to anti-neoplastic agents. Much subsequent research has shown multiple potential dangers to staff handling cytotoxic drugs, including increased chromosomal alterations, hepatotoxicity and abnormal reproductive outcomes to be associated with exposure to various chemotherapeutic drugs. For these reasons, it is important that written safety protocols be established and followed in the any veterinary clinic administering chemotherapy. There must also be written instructions to pet owners for at-home administration, handling of drugs and for dealing with drug-contaminated excreta, and laundering of contaminated bedding.

Potential Hazards in Veterinary Practice:
Whilst cytotoxic drugs can be life saving for patients with cancer, they not only pose a risk for patients, but also to staff members who handle and administer them, as well as to pet owners. They are cytotoxic and potentially carcinogenic (cancer causing), mutagenic (damaging to DNA) and teratogenic (damaging to unborn foetuses) (Bexfield 2006). They are irritant to the skin and mucous membranes (Bexfield 2006). It is important that written safety protocols are established and followed in any veterinary clinic administering chemotherapy.
and that cytotoxic drug products are handled with extreme caution and awareness of their potential danger. Staff under 16 years of age, those who are pregnant, or trying to become so, or who have compromised immune function should not be involved in chemotherapy – administration, clearing up, care of patients, laundering contaminated bedding.

Exposure to cytotoxic drugs can occur by:
- Skin exposure – direct or indirect contact
- Ingestion
- Aerosolisation
- Accidental inoculation
- Exposure to metabolites - present in patients’ excreta for 48-72 hours after administration

**Rules and Regulations:**
Guidelines exist on the safe use of cytotoxics in the workplace. These are defined by the Control of Substances Hazardous to Health Regulations 2002 (COSHH). Drugs considered carcinogenic are subject to Appendix 1 of the COSHH Approved Code of Practice (ACOP). Further information can be found at [www.hse.gov.uk/coshh](http://www.hse.gov.uk/coshh). All staff involved in the use of these drugs should have read and understood these guidelines. Veterinary staff working outside the United Kingdom must consult the relevant legislation and codes of practice for the safe handling of cytotoxic drugs in their specific region.

### Safe Preparation and Administration of Chemotherapy Drugs:
Before the administration of chemotherapy, both the nurse and the veterinary surgeon should review the patient’s file/chemotherapy protocol. Time should be taken to double check dose calculations of the cytotoxic to be given. It is advisable to use flow sheets to track a patient through:
- The overall course of chemotherapy - this consolidates the pertinent information from each visit into a single chart for easy reference.

### Preparation, Storage and Disposal:
(ECVIM Guidelines, 2007; Chun et al, 2007)
- Keep cytotoxics locked in a designated cupboard or refrigerator and clearly labelled. No foodstuff should be stored in the vicinity.
- There should be no eating and drinking and no through-traffic in the chemotherapy preparation/administration area.
- Keep door closed and display warning sign to ensure no disturbances – it is important that staff or patients are not disturbed.
- Protective clothing must be worn when handling, preparing or administering chemotherapy drugs – by the person handling the drug and any assistants (*Figure 2*). This consists of a minimum of 2 pairs of latex gloves, full-length long-sleeved impermeable gown, mask and goggles. Clients or untrained staff should not assist.
- Drugs should ideally be prepared in a fume hood (*Figure 3*).
- If not available, use of a vented dispensing pins or closed systems, such as Phaseal® (*Figure 4*) is recommended.
- Drugs should always be prepared on a plastic-backed absorbent pad.
- Use screw-on luer-lock syringes and “T”-connectors / giving sets.
- When reconstituting powder, tap the vial gently to loosen impactions – this will prevent the need for vigorous shaking of drug mixture.
Prevention of aerosolisation of drugs is vital. Do not allow pressure to build up in vials - never push air / drug back into vial (or into the environment) and wrap a swab around junction of needle/vial (Figure 5).

Do not re-cap needles – this creates a risk of self-inoculation.

Label syringes with drug and patient name – keep in the fume hood / locked cupboard until administration.

Never split tablets / capsules – it poses a safety risk (spills/aerosolisation) and accurate dosing cannot be guaranteed.

If spillage / personal contamination occurs, contain the spill and prevent through-traffic, soak up with paper towel, incontinence pads or dust-free cat litter and wash the area with copious water / disinfectant, clean with paper towels. Do not use sprays/shower heads as they risk aerosolising the drug.

All contaminated waste should be disposed in a designated sharps bin or clinical waste bin. Protective clothing should be worn to handle waste. Cytotoxic waste should be placed in a solid container, clearly labelled and sealed, ready for collection. Wear protective clothing to handle all waste.

A chemotherapy spill kit should be kept close to hand – this should contain latex gloves, a gown, mask and eye protection; incontinence pads; cat litter and a large zip-lock bag for waste disposal.

If dispensing tablets / capsules to clients, label “Cytotoxic - Wear Gloves” and give written information on safe administration.

Regular and thorough cleaning of all surfaces within the chemotherapy preparation/administration area is essential.

If chemotherapy patients remain in hospital it is important to clearly label the kennels of treated patients and ensure that all ward staff are aware of safety protocols for: a) dealing with the patient; and b) handling waste products (Figure 6).

There should be clear instructions to pet owners for at-home administration and handling of the drugs and for dealing with drug-contaminated urine and faeces. While it is important to point out potential hazards associated with human exposure to metabolites of these drugs, it is equally important not to frighten people. Chemotherapy patients’ excretions may be hazardous, but, with the right precautions, it is safe for pets to take part in normal interaction with family members, which is important for both. Owners should be advised to follow similar precautions (to those followed in the hospital) at home, i.e. they should wear gloves to clear up their pets’ excreta, which should be disposed of as cytotoxic waste themselves. They should keep a plentiful supply of disposable plastic-backed absorbent pads, disposable gloves, large zip-lock bags and disposable towels to hand. Solid matter and/or disposable materials which have absorbed liquid excreta may either be flushed down the toilet (although not in large quantities), or placed into two leak-proof plastic zip-lock bags, each sealed individually, before being placed into their domestic waste, then stored in a solid container, e.g. a wheelee bin, to await collection. In the event of “accidents” in the home environment, gross contamination should first be removed, and then the area repeatedly cleaned with a bleach based disinfectant, according to manufacturers’ instructions, taking care not to spread or aerosolise the contaminants. Receptacles which have contained cytotoxic drugs should be sealed into zip-lock bags, labelled as hazardous and returned to the hospital for disposal.
Conclusion:
Veterinary nurses have a vital role to play in the care of chemotherapy patients and in maintaining the health and safety of both patient, client and staff. Careful administration of cytotoxics drugs and subsequent patient monitoring should avoid many potential complications of using these drugs. If guidelines are followed, the safe use of cytotoxic drugs should be possible for the majority of veterinary practices, with minimal risk to all staff involved. Practices and personnel should always keep the risks of cytotoxic drug use at the forefront of their minds, with regular risk assessments and updates to best working practices being performed.

Bibliography and References: