

Introduction to Chemotherapy

Most people who are considering chemotherapy for their pet know at least one person who has experienced chemotherapy for the treatment of cancer. The thoughts that first come to mind are negative, usually associating treatment with nausea, vomiting, hair loss, loss of energy and hospitalization. Fortunately for animals, the side effects of chemotherapy are much less severe.

- Quality of life for our patients is our primary concern. The doses are calculated to provide the most effective defense against their type of cancer while minimizing significant side effects.
- Chemotherapeutic medications act in many different ways. The goal of chemotherapy is to kill cancer cells or to slow their growth, while producing minimal negative effects on normal cells
- One of the most effective strategies is using combination chemotherapy for certain cancers. This involves combining 2 or more chemotherapeutics, oral small molecule inhibitors, and/or immunotherapy that attacks tumor cells by different mechanisms to help control disease. Using combination therapy can also reduce the development of tumor resistance and minimize dose-related toxicities.

What happens during my pet's chemotherapy appointment?

For each chemotherapy recheck appointment, you will be asked to respond to a series of questions about your pet's status since their last treatment and any other observations that you feel pertinent to your pet's assessment. Your answers, as well as results from our physical examination, target lesion assessment and any diagnostics pursued will then be used to determine your pet's response to therapy, tolerance to therapy, and if your pet's protocol needs to be adjusted.

- At each chemotherapy visit, your pet will have a physical examination by a doctor, as well as the necessary blood work needed to make sure that he/she is able to receive the scheduled dose of medication.
- In the blood work, we pay special attention to the neutrophil count. Neutrophils are a white blood cell that helps to fight off infections. Certain chemotherapeutic drugs can cause the number of these white blood cells to decrease below what is safe for another dose of chemotherapy. If this occurs and your pet is feeling well, we will typically postpone the scheduled treatment and your pet may or may not be placed on prophylactic antibiotics. However, if your pet is not well during this time, hospitalization will likely be recommended.
- Further diagnostic tests (such as chemistry profile, urinalysis, urine culture, radiographs, ultrasound and echocardiogram) may also be necessary to monitor secondary side effects of the disease, chemotherapy treatment toxicities or to assess the progression of disease.
- Your pet will likely be sent home after the treatment with an anti-emetic (anti-nausea) and/or anti-diarrheal medication that is to be used as needed during his/her treatment.

What potential side effects may come from my pet receiving chemotherapy?

Potential side effects of chemotherapy occur as a result of normal cells being killed by the chemotherapy agents. The side effects are associated with organs that have the fastest turn-over (ie rapidly dividing cells), which in the normal body are the bone marrow and the gastrointestinal tract. Other side effects are possible depending on the specific drug and usually involve an additional organ. Although serious side effects can occur with any chemotherapy, there is a low risk for hospitalization for side effects (10% chance), and less than a 1% chance of life-threatening side effects. Here are examples of commonly encountered side effects from chemotherapy:

- **Reduced White Blood Cell Count:** Many chemotherapeutic agents affect the bone marrow, and the white blood cell that is most rapidly affected is the neutrophil. As discussed above, the neutrophil is the white blood cell that helps fight infection, and a decrease in the number of circulating neutrophils is called

neutropenia. Neutropenia usually occurs 7-10 days after most chemotherapy administration. Should the neutrophil count be too low for chemotherapy, the doctor may wish to perform periodic blood tests (Complete Blood Counts), delay a scheduled therapy, prescribe prophylactic antibiotics to protect against infection or recommend hospitalization for those animals that are sick.

- **Gastrointestinal Discomfort:** Patients experience some form of GI discomfort typically 2-7 days after chemotherapy. These signs tend to be self-limiting and mild. Many times, changing to a bland diet, offering smaller meals throughout the day and the use of medications to help with the signs of discomfort is sufficient. We typically prescribe medications to address anticipated gastrointestinal signs in advance of therapy, or we will supplement with these medications if side effects have been encountered:
 - *Nausea:* Signs of nausea include: lip-smacking, drooling, eating grass (unless this is normal for your pet), or loss of appetite but interest in food. Medications: Cerenia, Zofran (Ondansetron), Reglan (Metoclopramide)
 - *Vomiting:* This may occur, but is usually self-limiting. Typically, this will resolve after 1-3 episodes. Medications: Cerenia, Zofran (Ondansetron), Reglan (Metoclopramide)
 - *Loss of Appetite:* This is typically transient and is usually accompanied with other gastrointestinal signs (ie nausea). Sometimes this can also be due to the tumor itself. Medications used to manage this include those used for nausea and vomiting (see above) as well as mirtazapine or cyproheptadine.
 - *Diarrhea:* If your pet develops diarrhea, we can prescribe a medication to address this. Again, this is commonly transient, and should only last for 24-48 hours. Occasionally, this can be accompanied by signs of frank blood, mucous and staining that are consistent with colitis. Medications used to manage diarrhea include Flagyl (Metronidazole), Tylan (Tylosin), Probiotics (FortiFlora, Propectalin) and increased fiber in the diet (ie sweet potato, pumpkin).
- **Tissue Damage:** If some chemotherapy agents (ie vinca drugs, Doxorubicin) leak outside the vein, severe tissue reactions can result and include pain/irritation at the injection site, redness, swelling, bruising and in some cases, extensive tissue death.
- **Allergic Reactions:** this side effect is rare, but can occur with certain chemotherapeutic agents (ie L-asparaginase, Doxorubicin). Pre-emptive therapy with Benadryl +/- steroids may be recommended.
- **Heart (Cardiac) Damage:** Some chemotherapy agents (ie doxorubicin), in some rare cases can cause irreversible damage to the heart muscle. This is typically a cumulative dose effect therefore we limit the maximum total dose that your pet receives or recommend a cardiac screening prior/during therapy if signs/concerns arise. Less than 5% of patients develop heart disease as a result of chemotherapy.
- **Kidney (Renal) Damage:** This side effect is species specific as well as drug specific (ie Cisplatin in dogs, Doxorubicin in cats: Carboplatin and oral non-steroidal anti-inflammatory drugs in both species). Routine evaluations of blood work as well as urine samples help for us to monitor for this toxicity.
- **Hair Loss (Alopecia):** Pets rarely lose their hair while undergoing chemotherapy, but if they do, they are not bothered by it. The pets most at risk are animals that have hair that continually grows (ie Poodles, Old English Sheepdogs). Cats may lose their whiskers, and occasionally patchy hair loss can also occur. Typically if an animal loses his/her hair during treatment, it will grow back once treatment has been discontinued and in some cases, may be a different color or texture.

How should you take care of your pet after their chemotherapy treatment?

After treatment, trace amounts of active chemotherapy may be excreted by the body (ie saliva, urine, feces). Health risks that may be linked to such trace exposures are likely most significant if repeated over long periods (months or years) and are not related to short term exposures. People who should exert greater precautions are pregnant women, children, the elderly and individuals who are immunosuppressed. We recommend that you take precautions to minimize direct contact with urine, vomit and feces from your pet while they are receiving chemotherapy. We also recommend the following safety tips:

1. Wear gloves when handling all excrement or vomitus. Place the waste in a sealed trash bag and discard in appropriate disposal areas. Wash your hands with soap and water.
2. If your pet receives a tablet formulation of chemotherapy (ie CCNU, Cytoxan, Leukeran) and vomiting has occurred within 4 hours of treatment, check to see if the tablet is readily identifiable and contact The Oncology Service for further instruction. Do not pick up the tablet without wearing gloves.

3. If administering home chemotherapy (ie Leukeran, Cytoxan), study medications, or small molecule inhibitors (ie Palladia, Kinavet), always read the dosing and handling instructions prior to administration. Wear gloves and avoid direct contact with the medications. Wash your hands with soap and water after handling.
4. Walk your pet in areas of low traffic, especially avoiding areas where children and other pets may frequent. The trace amounts of chemotherapy in urine and feces will break down spontaneously in the environment and do not pose an environmental risk.
5. It is reasonable to minimize the opportunities for your pet to excessively lick you, your children and family immediately after treatment.
6. Allow your pet the opportunity to have free access to water and frequent walks to use the restroom in order to minimize risk of accidents in the house.
7. You do NOT need to have separate feeding bowls, water bowls, bedding or litter boxes for your other pets as long as these are well maintained.