

## Canine Lymphoma

### WHAT IS LYMPHOMA?

Lymphoma is a cancer of lymphocytes. Lymphocytes are a type of white blood cell. Lymphoma most often affects lymph nodes (glands). It can also affect the liver, spleen, bone marrow, and other sites.

We diagnose lymphoma by inserting a small needle into enlarged lymph nodes and removing some cells. The cells are examined under a microscope. A diagnosis may require a biopsy or collection of cells or fluid from other sites.

Further testing (staging) is recommended. Complete staging includes bloodwork (complete blood count with review of a blood smear and serum chemistry panel), urinalysis, thoracic radiographs (x-rays), abdominal ultrasound, bone marrow aspiration, and phenotyping. These tests provide a baseline for future monitoring. They provide information about the patient's overall health. Results may influence treatment recommendations. They can also help anticipate complications. Staging can help predict prognosis.

Staging is not required for treatment. We do require a diagnosis, recent bloodwork, and a urinalysis.

Stage	Location	Substage
1	Single lymph node	a – Not sick
2	Multiple lymph nodes on same side of the body	
3	Multiple lymph nodes on both sides of body	
4	Liver and/or spleen involvement	b – Sick, fever, uveitis, hypercalcemia
5	Extra-nodal involvement Blood, nervous system, etc.	

### WHAT ARE THE TREATMENT OPTIONS?

Options include chemotherapy, bone marrow transplant, or oral steroids. Treatment selection depends on your goals, your pet's tolerance of visits, cost, and most importantly, quality of life.

During treatment, your dog can continue to go on walks, swim and play the members of their family.

### WHAT IS THE DIFFERENCE BETWEEN B-CELL AND T-CELL LYMPHOMA?

B-cell lymphoma is more common than T-cell. B-cell lymphoma is more responsive to treatment. Dogs with B-cell lymphoma usually survive longer than dogs with T-cell lymphoma. However, individual responses and survival times vary. Some dogs with T-cell lymphoma achieve durable remissions. Some patients with B-cell lymphoma do not.

## **WHAT IS THE PROGNOSIS?**

While chemotherapy is effective, dogs with lymphoma are not cured. With a standard protocol, dogs with B-cell lymphoma have a median survival time of 12 months. Dogs with T-cell lymphoma have a median survival of 6-9 months. Median survival means 50% of pets live less than that time point and 50% live longer.

The prognosis with oral steroids alone is 1-2 months.

## **WHAT ARE THE SIDE EFFECTS OF CHEMOTHERAPY?**

Chemotherapy is well-tolerated in dogs. There is a <25% risk of mild side effects that are manageable at home. The risk of severe side effects requiring veterinary care is <5%.

Side effects include temporary vomiting and/or diarrhea. Temporary decreases in appetite and energy can occur. We provide medications for you to have at home to treat these signs. We recommend starting these medications as soon as signs occur.

Chemotherapy can also cause a temporary decrease in white blood cell counts. This can make your dog susceptible to infection. We will let you know if/when your pet is at risk for this.

Some drugs have specific side effects that are discussed at the time they are given. Some drugs can cause damage if they get outside of a vein.

## **HOW DO I PREPARE?**

We understand this is a difficult time and we are here to support you and your pet. Some owners find it helpful to come to their appointments with a list of questions. Your primary veterinarian can also help you determine what questions to ask.

We will update you as to your dog's status during and after treatment. We will also discuss recommendations depending on your pet's response. Treatment plans can be changed or stopped at any point.

## WHAT IS A BONE MARROW TRANSPLANT?

Dogs with lymphoma can be cured with a bone marrow transplant.

Bone marrow stem cells are found within your dog's bones. They are the source of all the blood cells found in circulation. During a bone marrow transplant, a medication called Neupogen® causes some stem cells to leave the bone and enter the bloodstream. Those stem cells can be collected from blood during a process called apheresis.

During apheresis, dogs are anesthetized for ~4-5 hours. The apheresis machine painlessly takes blood out of the patient. It collects stem cells and returns the remaining blood cells back into the dog.

Dogs then undergo total body radiation therapy to kill lymphoma cells in their body. This treatment also kills the stem cells in their bones. The stem cells collected by apheresis are returned to the dog. They will travel back into the bone and begin replacing healthy blood cells.

Dogs are hospitalized for ~2 weeks to allow for recovery. Dogs are supported through any side effects. A portion of their time is spent in a special ward to protect them from acquiring an infection. Dogs tolerate bone marrow transplant well. Risks include those related to anesthesia, radiation side effects, and infection.

Cure occurs in 33% of dogs with B-cell lymphoma and 19% of dogs with T-cell lymphoma. Dogs should be in remission from chemotherapy before the transplant. Further information is available from our Bone Marrow Transplant Unit under the direction of Dr. Steven Suter.

## GETTING STARTED

Once you have determined the best option, we will work with you to develop an appointment plan.

Appointments for patients undergoing treatments and rechecks must be scheduled in advanced. All appointments are drop-off appointments.

Drop-offs are between 7:30am-8:30 am.

Pick-ups occur by 6:00 pm.

No discharges occur between 2:30-3:30 pm as our oncology team is in rounds.

## NAVIGATING THROUGH MY OPTIONS:

Treatment	Prognosis (median)	Treatment schedule	Approximate cost*
CHOP protocol +/- L-asparaginase	B cell: 12 months  T cell: 6 - 9 months	Week 1: Vincristine in hospital Week 2: Cyclophosphamide at home Week 3: Doxorubicin in hospital Week 4: Off  Repeat for 3 additional cycles	\$400- \$500 per treatment  \$4,500 - \$5,500 over the course of the protocol
Doxorubicin	6 - 8 months	Intravenous chemotherapy every 2 - 3 weeks, for 6 treatments	\$400 - \$500 per treatment
Rabacfosadine (Tanovea ®) alternating with doxorubicin	6.5 months (progression free interval) 7.2 months B-cell 1.4 months T-cell	Alternating intravenous chemotherapy every 3 weeks for 6 treatments	\$ 500 - \$800 per Tanovea \$400 - \$500 per doxorubicin ~\$2700-\$4000 over the course of the protocol
Rabacfosadine (Tanovea ®)	6 months (progression free interval)	Intravenous chemotherapy every 3 weeks for 5 treatments	\$500 - \$800 per treatment
Single-agent CCNU or CCNU and L-asparaginase	2 - 4 months	Oral chemotherapy every 3 weeks, for 6 treatments	\$500 per treatment, L-asparaginase adds ~\$250 to the expected visit cost
Laverdia® (Verdinexor)	< 2 months	Oral chemotherapy twice weekly	\$200-400 per month (Varies based on body weight)
Bone marrow transplant	Cure rate of: 33% B cell 19% T cell	Transplant provided after chemotherapy-induced clinical remission. Total body irradiation and hospitalization with supportive care	\$25,000 one-time treatment
Steroid (prednisone) alone  +/- L-asparaginase	1 - 2 months	Oral medication provided daily at home	\$20 - \$30 per month  \$250 per injection

\*Costs are estimates. Overall cost depends on patient response. Estimates do not include supportive care or hospitalization