

Canine Melanoma and the Melanoma Vaccine

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Overview of melanoma

Melanoma is a cancer of the pigment-producing cells of the body called melanocytes. Unlike people, who develop malignant melanoma most frequently in their skin, the most common site for melanoma to occur in the dog is in the mouth. In fact, most skin melanomas in dogs are benign. Oral melanoma, however, is a very malignant disease in dogs. Tumors can grow to be very large before they are even detected by an owner or veterinarian, and often invade deeply into the surrounding bone. Oral melanomas also have a high chance of metastasizing (spreading) to other parts of the body. The most common locations for oral melanoma to spread are regional lymph nodes within the head and neck and the lungs. Certain breeds are more likely to develop melanoma tumors than others, including poodles, dachshunds, Scottish terriers, and golden retrievers.

The size of the tumor is extremely important in considering the overall prognosis for canine oral melanomas. Veterinary medicine has adopted the World Health Organization staging system where Stage I disease is represented by a tumor less than 2 cm in diameter, Stage II is represented by tumors 2 – 4 cm in diameter, and Stage III tumors are 4 cm or larger or any tumor with local lymph node involvement. Stage IV disease includes any tumor with evidence of distant spread.

Median survival times for oral melanoma are variable, but have been reported as:

Stage I: approximately one year

Stage II: approximately 6 months (with surgery)

Stage III: approximately 3 months (with surgery)

Stage IV: approximately 1 month

Treatment

The treatment of choice for oral melanoma in dogs is surgery and the obvious goal of this procedure is to remove the entire tumor. Since the tumors are extremely locally invasive (e.g. into bone), even with very aggressive surgical measures, complete resection is often not possible. When the tumor cannot be completely removed and/or it has spread to local lymph nodes of the head and neck but not beyond, then radiation therapy becomes important in the treatment of this disease. Remission rates with radiation therapy are up to 70% in some studies. However, recurrence of disease or more distant spread can occur following this type of therapy, and survival times rarely exceed 5-7 months.

It seems logical that chemotherapy would be an effective form of treatment for cases of oral melanoma that have spread to distant sites like the lungs since these drugs are able to be carried all over the body via the circulatory system. Unfortunately, melanoma seems to be inherently resistant to chemotherapeutic drugs, and response rates and durations are disappointing. Chemotherapy also has not been shown to afford survival benefit for dogs that had been treated with aggressive surgery and/or radiation therapy.

The Melanoma Vaccine

Recent technological advancements have allowed the development of a DNA-based vaccine for canine oral melanoma. This form of treatment is called immunotherapy and is based upon the concept of using the body's own immune system to control the growth of, or potentially even eradicate, tumor cells.

The melanoma vaccine works in a similar way to the other vaccinations your veterinarian administers to safeguard your dog from contracting various infectious diseases (e.g. rabies virus). These conventional vaccines typically contain a small amount of disease-causing organisms that have been weakened and modified in such a way that when they are injected into the dog, they are unable to cause disease. However, the organisms still contain proteins that the dog's immune system can detect as being foreign from proteins found in their own body. These foreign proteins will cause the dog to generate an immune response that is effective in killing the actual active form of the organism should they become exposed to it in the future.

The melanoma vaccine contains the human DNA sequence that encodes a specific protein that is only found within melanocytes called tyrosinase. Tyrosinase is an enzyme that is crucial to the melanocyte's ability to produce melanin (pigment) and also to the survival of the melanocyte itself. Once injected into the dog, the human DNA is able to be processed so that the dog's body actually generates small amounts of the human tyrosinase protein. Just like the proteins from the weakened disease-causing organisms in a conventional vaccination, the human tyrosinase protein is recognized by the dog's immune system as being a foreign protein. Subsequently, the dog's immune system will generate a response towards the human tyrosinase protein that will destroy it. However, the human tyrosinase protein is similar enough in structure to the dog's own natural tyrosinase protein that this very same immune response will be effective in attacking the tyrosinase present in its own melanoma cells. The end result is destruction of the tyrosinase in the cancerous melanoma cells, and ultimately, the inability of the tumor cells to survive.

The melanoma vaccine is currently only available only through veterinary oncology specialists. The vaccine is initially administered every two weeks for a total of four doses. Booster vaccinations are administered every six months for the remainder of life of the dog. The vaccine is currently conditionally licensed for use in dogs with stage 2 and stage 3 oral melanoma that has been adequately locally controlled (e.g. with surgery and or radiation therapy). This means the vaccine is not a replacement for existing conventional therapies used to treat melanoma in dogs, but rather is best used in

conjunction with these other treatment modalities. Side effects are very uncommon. Most importantly, the life expectancy of dogs with oral melanoma that would have usually had a very guarded to poor prognosis has been extended to over one year in many cases.

The canine melanoma vaccine represents an exciting new technological advancement within the field of veterinary medicine. Not only can we see benefits for our canine patients, but information from results of studies with dogs that are treated with this vaccine are being used to help generate novel treatments for people with this melanoma, reminding us once again of the unyielding power and limitless potential of the human-animal bond.

Dr. Joanne Intile earned her DVM degree from Cornell University College of Veterinary Medicine in 2005. Following graduation, she completed an internship in small animal medicine and surgery, and a residency in oncology. Dr. Intile has professional interests in clinical chemotherapy trials, the use of Vitamin D for anti-cancer therapy, and hospice care/pain relief for cancer patients. For more information about oncology and the services offered at Veterinary Specialists and Emergency Service please visit www.vetspecialistsofrochester.com.