New approaches that selectively target brain tumor cells may provide a way to treat brain tumors without damaging normal brain tissue.

The new treatments, based on the transfer of DNA to brain tumor cells, are being developed in a pilot program by Dr. Richard LeCouteur of the Neurology/Neurosurgery Service and Dr. Robert Higgins of the Pathology Service of the Veterinary Medical Teaching Hospital at UC Davis. The two scientists and their collaborators aim to determine whether genetically engineered viruses are capable of transferring new genes to canine brain tumor cells. After being genetically modified with the viral DNA, the tumor cells may then be killed by drugs that have no harmful effects on normal brain cells.

Because current treatments for brain tumors have proven to be of limited effectiveness, the outcome for human and veterinary patients with brain tumors has not improved over the last three decades.

Although modern imaging techniques such as CT scanning (computed tomography: computer-generated, three-dimensional X-rays), and MRI (magnetic resonance imaging), allow veterinarians to identify brain tumors in dogs and cats, it is often difficult to completely remove a tumor surgically without causing excessive damage to normal brain tissue. Tumors that are not amenable to surgical removal due to their size or location may currently be treated with radiation and chemotherapy, but since these therapies cannot selectively kill cancer cells, patients must be given lower-than-optimal dosages in order to avoid injury to normal brain cells.

During the past two years, in cooperation with Ohio Medical Instruments, Drs. LeCouteur and Higgins and Dr. Philip Koblik of the Radiology Service have developed a “stereotactic” frame that positions the head of a dog or cat so that, using CT imaging, a fine-needle biopsy of the animal’s brain tumor can be taken. Once the presence of a brain tumor has been confirmed, the genetically engineered virus is injected through the same needle.

In the first phase of developing their new strategy, the researchers are studying whether brain cancer cells, which unlike normal adult brain cells are growing and multiplying, will incorporate the genetically altered material in the virus. Following injection of the virus into the naturally occurring brain tumors of client-owned dogs, each patient’s tumor is removed surgically. The tumor cells are then examined to see if the new genetic material is present. For dogs that have a solitary brain tumor and meet appropriate criteria, most of the client’s costs are covered by a grant.

Everyone involved benefits from this program—the dogs receive the most up-to-date therapy for their brain tumors, costs to the animal owner are reduced, and the investigation of this novel and promising therapy for brain tumors may ultimately benefit both animals and people.

For more information, contact the Neurology/Neurosurgery Service of the Veterinary Medical Teaching Hospital at (530) 752-1393.