Cancer chemotherapy in dogs and cats has traditionally involved administration of chemotherapy agents at the maximum tolerated dose. Cytotoxic chemotherapy has an acceptably low risk of serious toxicity, but an obligatory rest period must be included to allow for recovery of drug-sensitive normal cell populations. This rest period can also allow significant recovery of tumor cells. Metronomic chemotherapy is characterized by more frequent administration of lower doses of oral drugs and appears to halt or slow tumor progression through multiple mechanisms. This approach may be at least as effective as conventional chemotherapy with a lower risk of toxicity.

Integrative medicine is the combined use of complementary and alternative medicine with conventional or traditional Western medicine systems. The demand for integrative veterinary medicine is growing, but evidence-based research on its efficacy is limited. In veterinary clinical oncology, such research could be translated to human medicine, because veterinary patients with spontaneous tumors are valuable translational models for human cancers. An overview of specific herbs, botanics, dietary supplements, and acupuncture evaluated in dogs, in vitro canine cells, and other relevant species both in vivo and in vitro is presented for their potential use as integrative therapies in veterinary clinical oncology.

Surgery is a critical component in the treatment of most solid tumors in small animals. Surgery is increasingly combined with adjuvant therapies such as chemotherapy and radiation so surgeons who are treating cancer must have a good understanding of surgical oncology principles, cancer biology, and the roles and potential interactions of surgery, radiation, and chemotherapy. The sequencing plan for these modalities should be determined before treatment is initiated. The surgical oncologist must have a working knowledge of chemotherapy agents and radiation and...
the effect of these treatments on the ability of tissues to heal and the outcome for the patient.

**Cancer Screening Tests for Small Animals**

Stephanie E. Schleis

Cancer is increasingly more common. Several tests for the diagnosis and treatment of cancer in companion animals have been developed. Screening tests discussed include those for lymphoid neoplasia, hemangiosarcoma, and transitional cell carcinoma of the bladder. None of these tests should be used in isolation for diagnosis. Vincristine and doxorubicin are mainstays in the treatment of canine lymphoma. However, it is important and accepted practice to test individuals of predisposed breeds for this mutation before administering these drugs in a lymphoma protocol.

**Antimicrobial Use in the Veterinary Cancer Patient**

Bonnie Boudreaux

This article discusses the clinically relevant uses of antimicrobials in small animal cancer patients. The article focuses on general considerations of antimicrobial use, antimicrobials in the neutropenic patient, prophylactic antimicrobial usage, antimicrobials in radiation therapy, and antimicrobials in metronomic chemotherapy protocols.

**Small Molecule Inhibitors in Veterinary Oncology Practice**

Cheryl A. London

Recent advances in molecular biology have permitted the identification and characterization of specific abnormalities regarding cell signaling and function in cancer cells. Proteins that are found to be dysregulated in cancer cells can serve as relevant targets for therapeutic intervention. Although there are several approaches to block proteins that contribute to cellular dysfunction, the one most commonly used involves a class of therapeutics called small molecule inhibitors. Such inhibitors work by disrupting critical pathways/processes in cancer cells, thereby preventing their ability to grow and survive.

**Advances in Veterinary Radiation Therapy: Targeting Tumors and Improving Patient Comfort**

Susan M. LaRue and James T. Custis

Newer technology, such as intensity-modulated radiation therapy, can dramatically decrease acute radiation side effects, making patients more comfortable during and after treatment. Stereotactic radiation therapy for definitive treatment can be delivered in 1 to 5 fractions, with minimal radiation-associated effects. Image-guided radiation therapy can be used to direct treatment in locations previously not amenable to radiation therapy. Traditional fractionated radiation therapy remains the most commonly available type in veterinary medicine and is the standard of care for many tumors. This article discusses the role of advancements in the treatment of veterinary cancer patients and reviews more traditional radiation treatment.
Tumor immunology and immunotherapy is one of the most exciting and rapidly expanding fields. The immune system is divided into 2 primary components: the innate immune response and the highly specific, but more slowly developing, adaptive or acquired immune response. Immune responses are separated by whether they are induced by exposure to a foreign antigen (active response) or transferred through serum or lymphocytes from an immunized individual (passive response). The ideal cancer immunotherapy agent should discriminate between cancer and normal cells (specificity), be potent enough to kill small or large numbers of tumor cells (sensitivity), and prevent recurrence of a tumor (durability).

Exposure to chemotherapy is a health hazard for all personnel in facilities that store, prepare, or administer antineoplastic agents. Contamination levels have been measured as much as 15 times higher in the veterinary medicine sector than in human facilities. Recent publications in human and veterinary medicine indicate that exposure extends beyond the clinic walls to affect the patient’s home and family. This article provides an update on the advances in chemotherapy safety, the current issues, and the impact on cancer management in veterinary medicine.

Increased discussion on the influence of neutering on cancer development has been recently prompted with several studies that seem to indicate that incidence of some cancers may be increased with castration or spaying in our canine populations. Although the data are thought-provoking, we may not be able to extrapolate findings in single dog breeds to the entire species. Additionally, societal and humane issues related to pet overpopulation, as well as the incidence of other noncancerous diseases, behavior issues, and potentially decreased overall lifespan in unaltered animals must be taken into consideration before wholesale rejection of neutering in pets.

Clinical trials for companion animals are becoming more common and more accessible to pet owners as veterinary oncologists seek to expand their knowledge of tumor biology in companion animal species and improve the way they diagnose and treat cancer for these animals. Many owners enroll their pets because they wish to participate in clinical cancer research that may ultimately benefit pets and people. Understanding the goals,
benefits, and risks of clinical trials participation provides the knowledge needed by primary care veterinarians to counsel their clients as to whether clinical trial participation is a good choice for them and their pets.

Pain Management in Veterinary Patients with Cancer

Timothy M. Fan

Pain is a widespread clinical symptom in companion animals with cancer, and its aggressive management should be a priority. Education and skills can be acquired by health care professionals and caregivers to better understand, recognize, and treat cancer-associated pain. The early and rational institution of multimodality analgesic protocols can be highly effective and maximize the chances of improving quality of life in dogs and cats with cancer. This article describes the pathophysiology of pain in companion animals diagnosed with cancer. The foundational causes of cancer-associated pain and treatment strategies for alleviating discomfort in companion animals with cancer are discussed.