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<td>Today, the busy clinician will benefit from a philosophy of practice that brings together the best applicable evidence and the experiences of clinical work in an effort to provide the best care for individual patients. Evidence-based medicine (EBM) provides a structured approach that recognizes the contributions of both. An EBM practice will be efficient and effective in meeting the goal of assuring optimum care. The concepts of EBM make sense for veterinary medicine, even if there are limited numbers of randomized, blinded studies, and they can be applied by clinicians in all types of practice.</td>
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<td>Veterinarians have an opportunity to help educate their clients regarding the safety and efficacy of novel ingredients used by their clients. This is no small task because of the lack of acceptable information. Clients should be counseled regarding the lack of scientific evidence and be encouraged to discriminate fact from fiction, including many testimonials. Safety should be of primary concern, and clients should be encouraged not to neglect traditional therapies in lieu of novel ingredients unless clinical evidence of efficacy exists. Quality assurance is equally important and cannot be underestimated. Although skepticism is encouraged regarding any unknown product with medicinal indications, open mindedness should also guide the veterinarian as these products are considered. Indeed, veterinarians should take actions to ensure that the use of these compounds is accomplished within the confines of</td>
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the veterinary-client-patient relationship, thus ensuring the role of the veterinarian in the health and well-being of animals, regardless of the modality of therapy. The veterinary profession should support the development of standards that might guide manufacturers of novel ingredients to meet criteria that protect the consumer. Likewise, we should encourage manufacturers and agencies to fund veterinary clinical trials to provide evidence for the use of these potentially exciting compounds. Above all else, the veterinarian needs to become a credible resource of information about the possible role of these products. The lack of a regulatory mechanism that establishes the safety and efficacy of these products is not justification for ignoring the potential therapeutic benefit of some of these products.

The Natural Activities of Cells, the Role of Reactive Oxygen Species, and their Relation to Antioxidants, Nutraceuticals, Botanicals, and other Biologic Therapies

Lester Mandelker

There is a strong probability that cellular functions and cellular responses that pertain to inflammation, disease, and life and death activity can be modulated with supplementation; however, what works well in one individual or species might work differently in another. The cellular effects of antioxidants and other supplements are well defined and meaningful, and their clinical application looks promising despite individual variations. Combinations of antioxidants are best suited for clinical application in modulating disease and reducing premature aging when caused by excessive free radical accumulation. Clinicians should approach clinical application of these supplements based on the best available scientific research and species-specific information available.

Metabolic, Antioxidant, Nutraceutical, Probiotic, and Herbal Therapies Relating to the Management of Hepatobiliary Disorders

Sharon A. Center

Many nutraceuticals, conditionally essential nutrients, and botanical extracts have been proposed as useful in the management of liver disease. The most studied of these are addressed in terms of proposed mechanisms of action, benefits, hazards, and safe dosing recommendations allowed by current information. While this is an area of soft science, it is important to keep an open and tolerant mind, considering that many major treatment discoveries were in fact serendipitous accidents.

Functional Foods and the Urinary Tract

Scott A. Brown

There is no universally accepted definition of a commonly used term for a functional food: nutraceutical. For the purposes of this article, a nutraceutical is any ingredient found in foods that has a
demonstrated (or proposed) physiologic benefit. Although a nutraceutical is generally taken to be an ingredient that can be isolated or purified from food, plants, or marine products and made available in medicinal form, this article also considers claims of benefit to the urinary tract for foods or food supplements in which the active ingredient has not yet been characterized or isolated.

**Traditional and Nontraditional Effective and Noneffective Therapies for Cardiac Disease in Dogs and Cats**

**Paul D. Pion**

In this article, the author’s perspective of the current state of knowledge addressing the role of traditional and nontraditional therapeutics is presented. The focus is on the nontraditional therapeutics. Among these, the only ones the author currently considers to have any documented value are taurine and, less commonly, L-carnitine. The role of taurine (and likely carnitine) remains limited to cases of documented deficiency. In the case of cats with taurine deficiency–induced myocardial failure, it is now clear that most cases are the result of formulation errors by owners and manufacturers. In dogs, it is less clear if the causes of taurine deficiencies represent manifestations of pathologic conditions or dietary formulations errors. Increasingly, it seems the latter may prove to be the case in most, if not all, circumstances.

**Nutraceuticals, Aging, and Cognitive Dysfunction**

**Elizabeth Head and Steven C. Zicker**

Decline in cognitive function that accompanies aging in dogs might have a biologic basis, and many of the disorders associated with aging in canines might be preventable through dietary modifications that incorporate specific nutraceuticals. Antioxidants might be one class of nutraceutical that benefits aged dogs. Brains of aged dogs accumulate oxidative damage to proteins and lipids, which might lead to dysfunction of neuronal cells. Reducing oxidative damage through food ingredients rich in a broad spectrum of antioxidants significantly improves, or slows the decline of, learning and memory in aged dogs; however, determining which compounds, combinations, dosage ranges, when to initiate intervention, and long-term effects constitute critical gaps in knowledge about this subject.

**Modulation of Immune Response through Nutraceutical Interventions: Implications for Canine and Feline Health**

**Michael G. Hayek, Stefan P. Massimino, and Michael A. Ceddia**

Mounting research demonstrates that certain nutraceutical compounds interact with the immune system. These interactions may be positive or negative depending on the compound or dose administered to the individual. Understanding the mechanisms by which these compounds work should provide opportunities to design nutritional interventions to bolster the health of dogs and cats.
The high prevalence of nutraceutical use among human patients with cancer suggests that the use of nutraceuticals in pet animals with cancer is probably common. Dogs with a wide variety of malignant diseases have significant alterations in carbohydrate, protein, and fat metabolism. These metabolic alterations may be ameliorated by using functional foods relatively low in soluble carbohydrate, moderate amounts of protein that includes sources of arginine, and moderate amounts of fat supplemented with ω-3 long-chain polyunsaturated fatty acids. Well-controlled clinical studies in a variety of species with cancer, including rodents, people, and dogs, have documented that increased dietary and serum levels of ω-3 fatty acids are associated with a number of health benefits, including improved disease-free interval, survival time, and quality of life. Other nutraceuticals of interest in patients with cancer include antioxidant vitamins, trace minerals, glutamine, protease inhibitors, garlic, tea polyphenols, vitamin A, and shark cartilage.

Use of Nutraceuticals and Chondroprotectants in Osteoarthritic Dogs and Cats
Brian S. Beale

Chondroprotectants and nutraceuticals have become attractive adjunctive or alternative treatments for cats and dogs suffering from osteoarthritis. Osteoarthritic patients can be managed satisfactorily in most situations with optimization of body condition, exercise modification, anti-inflammatory therapy, and the use of chondroprotectants agents. Presently, recommendations cannot be made as to which chondroprotectant is best for each dog and cat afflicted with osteoarthritis. Head-to-head comparisons of these products have not been made, and it is not known when the different mediators of osteoarthritis play an important role. Currently, the best recommendation is to use products that have well-designed experimental and clinical research evaluating efficacy and safety, and products that are manufactured under the high quality standards practiced by the pharmaceutical industry.

Pharmacognosy: Phytomedicines and their Mechanisms
Nicholas Larkins and Susan Wynn

Phytochemicals, archetypal plant constituents, are recognized as secondary plant metabolites that do not appear to be necessary to sustain life. However, they have functions that increase the ongoing survival prospects of the plant in its natural environment. Do these secondary plant metabolites have biologic activity in animals? Enzymes, for example, in animals can share a common ancestry with enzymes and proteins in plants. This evolutionary relationship, when combined with the multiple structural similarities between plant and animal substrates for such constituents,
helps explain the hormone-like or hormone-modulating effects of several phytochemicals in animals. Phytomedicines from these phytochemicals provide valuable therapeutic tools in disease management and control.

**Regulatory Issues of Functional Foods, Feeds, and Nutraceuticals**  
Maureen L. Storey

The United States has a sophisticated and complex infrastructure of policymaking that regulates the food, drug, and cosmetics industries. The Federal Food, Drug, and Cosmetic Act of 1938 gave the US Food and Drug Administration (FDA) the authority to develop and enforce rules governing these industries. There is no separate regulatory category for functional foods or nutraceuticals; this industry is regulated in the same way as foods and dietary supplements by the FDA, which operates within the Department of Health and Human Services. Several recent laws now allow the food industry greater latitude to make several types of claims about food, ingredients, or nutrients that may promote health or prevent disease. The future of the functional foods and nutraceuticals industry will depend on regulations that are flexible enough to (1) protect the public health, (2) encourage research and development of innovative food products, and (3) communicate the benefits of those products to the public.

**Cellular Effects of Common Nutraceuticals and Natural Food Substances**  
Lester Mandelker and Susan Wynn

Tabular information of proposed cellular effects regarding the use of certain nutraceuticals (including antioxidants, phytonutrients, and other biological therapies) and herbs, compiled from scientific sources and experimental research, is provided.

**Cellular Effects of Various Herbs and Botanicals**  
Lester Mandelker and Susan Wynn

Tabular information of proposed cellular effects regarding the use of certain nutraceuticals (including antioxidants, phytonutrients, and other biologic therapies) and herbs, compiled from scientific sources and experimental research, is provided.

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