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Use of nutraceuticals for increasing health and productivity in animals

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Abstract

Nutraceuticals are products, which other than nutrition are also used as medicine. A nutraceutical product may be defined as a substance, which has physiological benefit or provides protection against chronic disease. Nutraceuticals may be used to improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure or function of the body.Nowadays, the risk of toxicity or adverse effect of drug has resulted in a worldwide revolution of nutraceuticals. So, nutraceuticals have received considerable interest due to potential nutritional, safety and therapeutic effects.

Keywords: Nutraceuticals, health, nutrition

Introduction

Nutraceuticals is a broad term to describe any food or part of a food that provides health benefits including the prevention and/or treatment of a disease. They are sometimes referred as "functional foods". These nutraceuticals normally contain the required amount of vitamins, lipids, proteins, carbohydrates and minerals.The term nutraceutical was derived from "nutrition" and "pharmaceutical"."Pharmaceuticals" are drugs used mainly to treat diseases, while "nutraceuticals" are those that are intended to prevent diseases. Nutraceuticals may range from isolated nutrients and dietary supplements to genetically engineered designer foods, herbal products and processed foods such as cereals, soups and beverages.

Veterinary nutraceutical medicine has been defined as 'the use of micronutrients, macronutrients and other nutritional supplements as therapeutic agents' (American Veterinary Medical Association, 1999). Integrative veterinary medicine (IVM) blends the use of conventional therapies such as pharmaceuticals with diet and nutraceuticals to address health conditions, as well as to optimize wellness in patients. Nutraceuticals are generally very safe to use having few side effects and may be used as a primary therapy or an adjunct to conventional medicines.

Today, there are some superb nutraceuticals available in the veterinary market which have undergone scientific trials and proven their value. Vitamins, minerals and fatty acids often have a synergistic effect and by supplementing an animal's diet with a good quality nutraceutical helps to ensure optimum health, vitality, immune status, growth, fertility, muscle and tendon strength and recovery. For convalescing animals, adding such a supplement usually helps in improved healing, promotion of weight gain and increased appetite.So here, the old proverb "an apple a day keeps the doctor away" is now replaced by "a nutraceutical a day may keep the doctor away".

Classification of Veterinary Nutraceuticals

- **Glucosamine**

  Glucosamine is an amino sugar that is a precursor to glycosaminoglycans (GAGs) present in the extracellular matrix of articular cartilage. The combination of glucosamine hydrochloride, chondroitin sulfate and manganese ascorbate (GCM) is a commonly used nutraceutical in osteoarthritic companion animals, both to decrease the dose of non-steriodalantiinflammatory drug (NSAID) needed and to slow the progression of the disease. Glucosamine salt supplements are most commonly found as glucosamine hydrochloride, glucosamine sulfate or N-acetyl-D-glucosamine.

- **Anti-Oxidants or Free Radical Scavengers**

  Antioxidants are substances which prevent the body from free radicals. They stabilize the free radicals. Zink and some vitamins are examples of antioxidants. Antioxidants are present in canola oil, corn oil, oat oil and wheat germ.Oxygen-derived free radicals (superoxide, hydrogen peroxide, hydroxyl radical) are produced by oxidative stress as a part of normal metabolism. Oxidative injury leads to cellular damage which ultimately leads to disease. In sick and older animals the free radical load may be excessive as they have lower amounts of endogenous anti-oxidants (superoxide dismutase, glutathione) available to neutralize free radicals. Anti-oxidants provide immune support, aid in the management of dogs suffering from cognitive dysfunction, assist animals with cardiac disease and anaemia associated with renal disease.

  There are several well-known and relatively commonly used anti-oxidants such as vitamin C, vitamin E, carotenoids, s-adenosylmethionine (SAMe), dimethylsulfoxide (DMSO) and those that are less popular in the veterinary field such as coenzyme Q10 and proanthocyanidins/bioflavonols.

(a) Vitamin C (Ascorbic Acid)

Vitamin C carries dual importance as the body's premier water-soluble antioxidant and as a coenzyme essential for collagen synthesis. Vitamin C quenches free radicals, prevents lipid oxidation, and helps to regenerate other anti-oxidants. Although most animals are capable of producing their own vitamin C, supplementation has benefits such as helping to retain cardiovascular health by supporting adrenal function and arterial wall integrity, assisting to protect the liver from environmental toxins and drug metabolites and to produce carnitine, interferon, and prostaglandin E1. It facilitates a healthy immune system, is involved in the intraarticular neutralization of free radicals and supporting hepatic function.

(b) ***Vitamin E***

It is an important lipid soluble anti-oxidant, especially in the cellular membrane. Vitamin E provides hepatic support and it has the ability to increase blood flow and oxygen utilization. It enhances the immune response by activating antibody forming cells. It may be helpful to modulate the inflammatory phase of osteoarthritis by decreasing the production of free radicals.

(c) SAMe (sadenosylmethionine)

SAMe is an anti-oxidant with anti-inflammatory properties assisting osteoarthritis and helps in the management of dogs suffering from behavioral symptoms and cognitive dysfunction. It is naturally synthesized and is integrally important to many hepatic functions as it increases concentrations of glutathione, a potent anti-oxidant protecting the liver from toxins and cellular death. Lower levels are common in older dogs, cats and those with decreased liver function so supplementation is beneficial.

- **Essential Fatty Acids (EFA's)**

This group of fatty acids is considered essential because the body is incapable of producing them. Deficiencies may cause growth retardation, skin lesions, organ failure, impaired fertility and many other problems. The primary EFA's are omega-6 linoleic acid and its derivative gamma linolenic acid as well as the omega-3 alpha-linolenic acid and its derivatives eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA). EFA's are important components of the cell membrane. They help to increase cellular oxygenation and therefore provide basic physiological support. Omega-3 and omega-6 fatty acids are the biosynthetic precursors of eicosanoids (prostaglandins, thromboxanes, leukotrienes) involved in the inflammatory pathway. The ratio of omega-3 to omega-6 supplied in the diet is imperative to their therapeutic efficacy. If the ratio of omega 6 is too high, it shifts the inflammatory cascade in a pro-inflammatory direction leading to greater free radical production and likely cellular damage.

- **Vitamin-B Complex**

  Vitamin B's are fundamental to energy production, metabolism, growth, and maintenance of healthy tissues. They are a useful aid to reduce nervousness and general stress, treating muscle fatigue, supporting appetite as well as treating debility, anorexia and anemia.

- **Glutamine**

  It is an amino acid which supports the immune system and provides nourishment for epithelial enterocytes. It is supplemented during diseases of gastrointestinal tract i.e. parvo-virus diarrhoea, enteritis, etc.

- **Dimethylsulfoxide (DMSO)**

  It is used as a topical agent for treating musculoskeletal problems and has the ability to penetrate most tissues, including skin. Topical application of 20 ml/day of DMSO (70-90% solution) every 6 to 8 hours for up to 14 days has been recommended to treat local inflammation. Side effects with topical use are minimal, but include a garlic odor to the breath.

- **Probiotics**

  Probiotics have been defined as "*A live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance*". Probiotics are considered as growth and health stimulators and are used extensively in animal feeding, especially in pig and poultry production. Probiotics should lead to beneficial effects for the host animal due to an improvement of the intestinal microbial balance or of the properties of the indigenous micro-flora. There are also many mechanisms by probiotics enhance intestinal health, including stimulation of immunity, competition for limited nutrients, inhibition of epithelial and mucosal adherence, inhibition of epithelial invasion and production of antimicrobial substances. Significant positive effects of probiotics on performance, health, vitality, gut ecology as well digestibility are observed in many studies, although the mode of action of probiotics is not still completely explained. Currently, the best studied probiotics are the lactic acid bacteria, particularly Lactobacillus sp. and Bifidobacterium sp.

- **Prebiotics**

  Prebiotics defined as "*A non-digestible compound that, through its metabolization by microorganisms in the gut, modulates the composition and/or activity of the gut microbiota, thus, conferring a beneficial physiological effect on the host*". Many different nutrients, such as pectins, cellulose and xylanes, favour development of various intestinal microorganisms. Prebiotics should not be extensively metabolised, but should induce targeted metabolic processes, thus bringing health benefits to the host's ecosystem.

- **Synbiotic**

  Synbiotic have been defined as *"a mixture of probiotics and prebiotics that beneficially affects the host by improving the survival and implantation of live microbial dietary supplements in the GI tract, by selectively stimulating the growth and/or activating the metabolism of one or a limited number of health-promoting*

*bacteria, and thus improving host welfare".*The principal purpose of that type of combination is improvement of survival of probiotic microorganisms in the gastrointestinal tract. Synbiotics have both probiotic and prebiotic properties and were created in order to overcome some possible difficulties in survival of probiotics in the gastrointestinal tract. Probiotics beneficially influence the intestinal equilibrium, and constitute a protective barrier for the alimentary tract. Prebiotics, on the other hand, supply energy and nutrients for probiotic bacteria. Therefore, an appropriate combination of both components in a single product should ensure a superior effect, compared to the activity of the probiotic or prebiotic alone. The health effect of synbiotics is probably associated with the individual combination of a probiotic and prebiotic.

- **Minerals**

  Calcium- Essential for bone growth and teeth
  Iron- Energy production
  Magnesium- For healthy muscle and nerve formation
  Phosphorous- Energy production, bone strength and importantfor production of energy
  Cobalt- Component of vitamin B-12 & its coenzymes 12
  Iodine- Proper function of thyroid gland
  Chromium- Convert carbohydrates and fat into energy with the help of insulin
  Selenium- Antioxidant and part of GPX enzyme
  Zink- Help in wound healing and Neonates body organ formation and cell reproduction

- **Herbs**

  Aloe-Vera-Anti-inflammatory and help in wound healing
  Garlic- Anti bacterial and anti-inflammatory effects
  Ginger- Carminative, antiemetic and also cure dizziness
  Ginseng- Antioxidant and enhance humoral and cell mediated immunity

Conclusion

Nutraceuticals represent the fastest growing segment of today's food industry. They are important in veterinary field as they offer additional health benefits beyond basic nutrition. Their correct supplementation provides better quality of life and cures diseases with reduced side effects. In future, diseases are expected to increase in number but one of the solutions is to change the diet of animals. Nutraceuticals should contribute to prevention of such diseases.