

Supplements for Health - Nutraceutical Medicine

Nutraceutical Medicine is the latest buzzword from the States and is rapidly developing huge interest from those involved in the animal world over here. So what is it, and how does it apply to Dogs and everyday UK Veterinary practice?

The North American Veterinary Nutraceutical Council defines Nutraceutical products as “substances produced in a purified or extracted form that are administered orally to provide or stimulate production of raw materials required for normal bodily functions” (1). This basically means dietary supplements, which have uses to help the body combat or prevent disease states. My interest was sparked some years ago following my attending a medical conference where a paper showed 42 or 43% of cases of Asthma, Eczema, & IBS in children responded positively to a “Stone Age” diet (no Wheat or other grains, no potatoes, refined sugars or processed foods). This is now more commonly known as the “Paleolithic” diet. I began looking closely at Canine and Feline and Equine nutrition as a primary cause of disease seen in my patients.

“Let your food be your medicine” (Hippocrates); as ever there is nothing new under the sun. The advent of modern pharmacy has overshadowed the role of nutrients in enhancing repair mechanisms, the immune response and enhancing metabolic functions. More recently, as the limitations of modern drugs are realised, and as the Veterinary profession loses more and more drug therapies to legislation, interest in Nutraceuticals has increased.

The first thing one encounters when investigating this field is the vast array of advice given out in leaflets, articles and publications, often without any references supporting the claims. One only has to look on the Internet, searching “Minerals and supplements” to find nearly 1 million sites alone. This does nothing to help what I believe will become a valuable addition to the dog owners therapeutic repertoire. The information is out there, but one has to search to find it, and all this marketing on the Net would not have evolved if it didn't have some validity. I began my search as a sceptic, but have now become a total convert to the principles.

Multi-vitamins/minerals

The first line of inquiry has to start with basic Vitamins and Minerals. We get enough via our food – or do we? Animals certainly fare better than humans in the number of these added to their basic diet if fed commercially prepared products, and this is one of the arguments used against natural feeding regimes. However, with all the Nutrients in one form of food only, some Vets feel non-absorption of essential nutrients due to imbalances in the individuals bodily make-up can occur, but that this shouldn't happen if the body gets a variety of foods over time. There are many differing views one comes across, however, the consistent theme is that the RDA's (standard recommended daily allowances) are simply not enough as animals are not the sedentary, unmoving objects - for which RDA's were calculated. There is plenty of research showing optimum levels for each nutrient are far higher than the RDA (2,3,4,5) For example reductions in overall mortality and mortality from Cancer and Cardiovascular disease have been reported in those who take supplements of Vitamins C and E (3). While a massive 15 year study on 13,500 people resulted in the establishment of Suggested Optimal Nutrient Allowances (SONA's) for Vitamins. These levels are often 10 times the RDA! (4). People given the SONA type supplements had less infections, a stronger immune system, and were generally healthier (5). A 75% reduction in birth defects, when SONA type supplements were given to pregnant women, was shown in a study of 22,000 pregnant women (6). If these are the findings being shown in man, we can broadly assume these facts may well be true in animals as well. However, valid information is harder to come by. For example, a while ago megadoses of vitamin C were recommended for pregnant bitches and puppies for two years after their birth to prevent Hip Dysplasia, yet no studies have adequately documented the efficacy of this. Compound the RDA debate with theories about Vitamin requirements being related to the Metabolisable Energy of the diet fed and we

get even more complicated. So the assumption has to be, based on the Human experience, that a well-formulated Multivitamin/mineral supplement has to be a good idea to promote animal health. Certainly the public thinks so with the millions spent on supplements for themselves, for Horses, and often on human supplements for their smaller animals where no other is provided. This will become an increasingly important market with so many people opting to home prepare diets which definitely need appropriate supplementation.

Bio-availability

The next problem is bio-availability of the product one selects. One of my favourite quotes from the marketing paraphernalia is about America's favourite Multivitamin, which has allegedly blocked up Los Angeles sewerage plants as it goes through pretty well unabsorbed! Bio-availability is affected by a number of factors: Firstly the balance of nutrients supplied in a product; many Vitamins need major minerals in appropriate amounts to be absorbed, and similarly many of these major minerals need adequate levels of trace minerals for their absorption process to run smoothly – all are interconnected and as such over supplementation with one nutrient can lead to iatrogenic deficiencies of another. Secondly bio-availability of different nutrients is greater in one form than another. The current vogue developing in the human field is for oral sprays where all nutrients are in aqueous solution and taken at frequent intervals throughout the day to end the “peak and valley syndrome” of tablet medication (7,8). This presents some obvious practical difficulties with Animals. There are many liquid preparations coming onto the market but my own preference is for powderised colloidal Multi-vitamin/mineral products, and for oil products created into stable powders by spraying the nutrients onto micronised particles of silica mineral under high pressure; the Silica acts as a carrier and also stabiliser of the supplement. With appropriate flavouring powders are highly palatable for pets and have good owner compliance in dosing as they can be added to the food. Some manufacturers have added probiotics to their animal preparations of these powderised products apparently to optimise gut flora activity and further increase absorption.

Multi-minerals

The more people learn about nutrition, the more they appreciate the critical importance of minerals, and especially trace minerals, as the cornerstone of any nutritional supplementation programme. It was the use of Multi-minerals in my practice, which really revolutionised the way I began working. I have found them useful in **Cancer** and **Skin disease**, but most especially am using them for **Musculo-skeletal** and **Arthritis** cases. Many old dogs with Arthritis did not seem to need pain control if supplemented with these types of products, particularly spondylitis sufferers. This made me start questioning the neutering of pets, and wondering how much they suffer the effects if this induced “menopause”. I have even found unstable **Diabetics** which improve on Chromium and Vanadium supplements, and the required insulin dose may even be reduced (9)

“Minerals are the forgotten dietary need. Often deficiencies are neglected whilst vitamins are taken in plenty. Yet most of the world's dog population is mineral deficient” ”Lacking vitamins, the system can make some use of minerals, but lacking minerals, vitamins are useless”(10)

Few parts of the world exist where the human population, let alone dogs, receive adequate minerals in the diet; primarily due to the inadequacies in the soil on which their food grows.”Laboratory tests prove that the fruits, vegetables, grains, eggs and even the milk and meats of today are not what they were a few generations ago.”(10) Much disease and premature death is said to be the result of these sub-clinical mineral deficiencies. Areas, which are not mineral deficient, are said to suffer less **Heart Disease, Cancer, Arthritis, Strokes**, etc. Trace minerals have been shown to act as catalysts at a cellular level, regulating many cell functions including the bulk uptake of the major minerals in the diet that are needed in large quantities, and also all the other ingredients in the diet such as proteins, vitamins and carbohydrates. Other roles include the formation of bones and teeth, the regulation of body fluids and nerve function, as partners for enzymes and involvement in the formation of other body compounds such as iodine in the thyroid gland, chromium in sugar regulation, and iron in blood cells etc. etc. etc.

One of the most important factors in any supplement is achieving a balance of the constituents compatible with the body's own self-regulatory mechanisms and again the bio-availability of the product. Again there are no specific industry standards, although work is in progress on this (1). There is little point supplying individual minerals or incomplete sets of minerals in many cases as this will always lead to imbalance and occasionally deficiency states. For example an excessive iron intake reduces the absorption of copper and zinc which in turn can lead to secondary deficiencies. **Balance is critical, the "key" to health.**

So is mineral deficiency being tackled in the world at large? One of the main reasons for the deficiencies is said to be the changes in modern farming practices. Traditional farming moved onto fresh pastures once land was depleted, allowing longer rooted perennial plants to extract deeper minerals to add to the topsoil. Alternatively organic manure was put back into the soil. Now modern methods add Nitrogen, Phosphorous and Potassium to force plant growth, creating progressively deficient plants and soil unable to regenerate for many years to come. This process is being reversed in countries like Holland where the use of synthetic fertilisers is heavily restricted and organic systems, effectively soil probiotics, are being developed to bring the hardpan back into the soil. Recycling programmes producing composting of waste will eventually benefit us all, but until this is universal (unlikely in the near future) it makes sense to add a trace minerals to an animals diet.

Essential Fatty Acids

Unsaturated fatty acids are an increasingly recognised important part of a dog's diet. They are required for cell membranes and cell function throughout the body. Inadequate levels can have far reaching consequences on cellular, tissue and organ function contributing to many degenerative disorders. As well as this they are necessary precursors for regulatory hormones, particularly the Prostaglandin's which play an important role in inflammation, blood clotting and viscosity, and arthritic pain amongst others (11)

There has been increasing recognition of the potential of these fatty acids in the treatment of dermatological disease, amongst others, in the Veterinary world. Initially with the launch of Evening Primrose Oil supplements, and more recently Borage Oil. Fish Oils have also been deemed important in promoting Neutrophil activity (12,13). Not only is it important to have enough of these oils, but the balance has to be right as well. The body cannot make these "essential" fatty acids for itself. Modern diets have shown a major shift towards high levels of Omega 6, yet Omega 3 is now recognised as an essential nutrient. An optimum ratio of 1:1 seems the most recommended for a supplement yet many diets are as much as 25:1, Omega 6:Omega 3. Since Omega 6 and Omega 3 compete for enzyme pathways, this distorted balance can trigger multiple imbalances affecting neurological, immunological and hormonal balance amongst others (14) In severe disease states it may be necessary to first increase the intake of Omega 3 to redress the balance. One simple way in dogs is to grind one or two dessertspoons of fresh organic flaxseeds (linseeds) and add them to the dog's food just before serving (it must be fresh ground as the oils decay rapidly after grinding the seed). This may be necessary for one or two months to correct imbalance, and thereafter a good supplement with a 1:1 ratio can be used.

It is not enough just to supplement essential fatty acids if they are to be useful in one of their major roles - as a source of precursors for synthesis of prostaglandin. It is necessary also to give various minerals and vitamins, such as Zinc, Magnesium, Vitamins B6 and C. This can be achieved by giving a good multivitamin/mineral supplement. The chart opposite gives just some of the conditions for which Essential fatty acid supplementation is said to be useful.

Omega-3 for:

- ◆ Allergies
- ◆ Arthritis
- ◆ Cancer
- ◆ Cardiovascular
- ◆ Co-ordination
- ◆ Eyesight
- ◆ Immune System
- ◆ Inflammation
- ◆ Liver problems
- ◆ Mental decline
- ◆ Nerve problems
- ◆ Obesity
- ◆ Skin problems
- ◆ Viral illness
- ◆ Weakness

Omega6for:

- ◆ Anaemia
- ◆ Behaviour
- ◆ Cardiovascular
- ◆ Fatigue
- ◆ Fertility
- ◆ Glandular disturbances
- ◆ Hair loss
- ◆ Immune System
- ◆ Liver damage
- ◆ Pyoderma
- ◆ Renal-function
- ◆ Osteo-arthritis
- ◆ Skin problems
- ◆ Viral illness
- ◆ Wound healing

Anti-Oxidants

The last few years have seen an explosion of information about the role of oxidative stress in causing, and the therapeutic role of Antioxidants in preventing, any number of serious diseases.

Free-radical oxidisers are produced in the body and are used in enzymatic processes, hormone production, combating toxins, bacteria, and viruses and in waste elimination. They are essential to life. However, inappropriate free radical levels/attack destroys things by changing molecular structure, and this occurs when the bodies own antioxidant enzymes are overwhelmed. To combat this, dietary Anti-Oxidants are said to be very useful. Excessive levels of free radicals are caused by toxins in food (herbicides, pesticides, antibiotics), pollution in the air (cigarette smoke, industrial smoke etc.), UV light from the sun, illness, radiation, excessive exercise and many more – basically modern life.

Whilst medical research is showing that this proliferating free radical problem is a significant factor in the escalation of degenerative and vascular diseases (15,16,17,18,19,20) (see chart). At a cellular level, free radical damage tends to affect the unsaturated fats in the membranes, preventing cells from efficiently importing nutrients, exporting waste, and resisting bacterial and viral attack. DNA may also be affected, rendering the possibility of the chaotic growth of a tumour. On a larger scale, free radicals injure structural proteins, collagen and elastin with obvious results.

So what Antioxidants are available? We have all heard of the role of Vitamins E and C as Antioxidants, and certainly they are useful (14,15) but there have been discoveries of so called Super Antioxidants, the leaders in the field being Oligomeric Proanthocyanidins (OPC's) derived from grape seeds. OPC's are present in good levels in diets which contain plenty of sun-ripened fruit and Veg. However, now much fruit is picked unripe for transportation and so does not have the chance to manufacture OPC in the sun ripening process, a supplement is almost always necessary for humans, and especially for dogs which rarely receive fresh unprocessed food at all. OPC's from grape seed extract are said to be more than 40 times more effective than Vitamin E!! No self-respecting Antioxidant preparation would now be worth it's salt without good levels of OPC's.

Antioxidants are now used extensively in the US and France, and I have used them to help patients with Cancer, Allergies, Diabetes, Arthritis and generally find them useful for assisting recovery after serious illness.

What conditions can Antioxidants help?

- ◆ Allergies
- ◆ Arthritis
- ◆ Asthma
- ◆ Cancer
- ◆ Blood Vessels
- ◆ Cataracts
- ◆ Cardiovascular function
- ◆ Diabetes
- ◆ Eczema
- ◆ Fatigue
- ◆ Fluid imbalance
- ◆ Gum disease
- ◆ Immune status
- ◆ Injuries
- ◆ Liver degeneration
- ◆ Mental ageing
- ◆ Muscular function
- ◆ Prostrate problems
- ◆ Radiation sickness
- ◆ Strokes
- ◆ Toxic states
- ◆ Viral Infection
- ◆ Wound healing

Chondroitin, Glucosamine and Type 2 Collagen

These three products are now being used widely for the management of degenerative joint disease and tissue injuries, particularly now it has been recognised that anti-inflammatory drugs can suppress symptoms of arthritis but accelerate the progression of the disease (21). It is worth mentioning here that there is also the possibility of using Shark Cartilage supplements, but generally these have not been so popular due to environmental and ethical considerations, and the development of poultry sourced type 2 Collagen supplements are arguably better therapeutically. It is probably best to consider these supplements individually:

Glucosamine. This naturally occurring substance, found in high concentrations in joint structures, is a rate-limiting step in glycosaminoglycan (GAG) synthesis and joint cartilage repair. Thus, when given as a supplement it is said to stimulate the manufacture of cartilage components and the incorporation of sulphur into cartilage, thereby producing the substances necessary for proper joint function and for stimulating joint repair (as far as this is possible) (22,23); This addresses the cause rather than suppressing symptoms. Numerous studies have shown Glucosamine sulphate produces much better long-term results compared to placebos in relieving the symptoms of Osteo-arthritis.

Chondroitin sulphate. These are long chain polymers, which are the major GAGs found in cartilage. Oral administration of this as a supplement was found to have similar results to Glucosamine (22). It is an effective and direct inhibitor of degradative enzyme activity and long term trials have shown supplementation to slow the progression of Osteoarthritis, to improve joint mobility, reduce pain and radiographic evidence of reversal has been seen (22) This is often given in combination with Glucosamine.

Type 2 Collagen. This is a more recent player in this field, superseding the Shark cartilage on environmental grounds (it is derived from chicken carcasses) and bioavailability (it is claimed to be significantly better absorbed). In people with rheumatoid arthritis there is selective destruction of type 2 collagen via an immunological response. Supplementation with type 2 Collagen has been shown to affect the immune response, stopping the body attacking its own collagen type 2, causing a proliferation of T-suppressor cells and ultimately decreasing the number of inflammatory cytokines that are partly responsible for the inflammatory reaction in arthritis (24,25). Whether this works exactly the same way in animals, which rarely get rheumatoid arthritis, is not established adequately, but type 2 collagen seem to be beneficial in many cases. It is often given with Glucosamine and Chondroitin.

A note or two of caution. There is a thought that dogs can develop Diabetes if given excessive amounts of Glucosamine and Chondroitin, and I have found that much more than 500mg per 30Kg bodyweight doesn't really effect a better result so don't waste money giving your pet ever increasing doses.

In Summary

The whole field of Nutraceutical therapy is a rapidly evolving, yet complex one, with a plethora of products coming onto the market, only a few of which I have been able touch upon here. The best way forward for anyone wishing to utilise this type of therapy is to seek information from manufacturers of these products and to explore the vast array of information available on the Internet, and obviously to try them out.

Useful Website www.petnutrition.co.uk

References:

1. D. Delmar, Food supplements for joint disorders in small animals. *Veterinary Times* Feb 1998, 14.
2. Hernila et al, Vitamin C and the common cold: a retrospective analysis of Chalmers review. *J.Am.Coll.Nut.* Vol. 114, No2, 116-123, 1995.
3. Enstrom et al, Mortality among health conscious elderly Californians. *Proc.Natl.Acad.Sci.* Vol.79, 6023-6027, 1982.
4. Cheraskin and Ringsdorf, Establishing a SONA, and what is the Optimum, *Optimum Nutrition* 7,2: 46-47, 1994.
5. Chandra R.K. Study of Multivitamin/Mineral Supplementation in Elderly, *Lancet* 1992
6. Milunsky, Multivitamin/Folic acid supplementation in early pregnancy reduces the prevalence of neural tube defects, *JAMA*, November 24, 1989, Vol 262 No.20, 2847-2852.
7. Ansel Dr.H. Introduction to pharmaceutical dosage forms, 2nd Ed 1976
8. Levine et al. Mechanisms of drug absorption and excretion. Passage of drugs out of and into the gastrointestinal tract. *A.Rev.Pharmac.* 4, 68-84, 1964.
9. Philpot W.H & Dwight K.K. Victory over Diabetes 1983
10. US Senate Document 264, 1936
11. Harvey R. Borage oil: theory and potential. *Veterinary Times* July 1997, 15.
12. Reinhart GA. Review of Omega-3 Fatty Acids and dietary influences on tissue concentrations. *Proceedings, Iams International Symposium* 235-242. 1996
13. Vaughn et al. Evaluation of dietary n-6 to n-3 fatty acid ratios in Leukotriene B synthesis in Dog Skin and Neutrophils. *Proc 12th Am ACVIM Forum* 968. 1996
14. Holman R. Hypothesis involving Competitive Inhibitions in the metabolism of Polyunsaturated fatty Acids. *Acta Chem Scand* 17:584-590, 1963.
15. Gey K. Prospects for the prevention of free radical disease, regarding Cancer and Cardiovascular disease. *Br.Med.Bull* 49, 679-699, 1993.
16. Rim et al. Vitamin E consumption and the risk of coronary disease in men. *New.Eng.J.Med* 328, 1450-1456, 1993.
17. Flagg et al. Epidemiological studies of antioxidants and Cancer in humans. *J.Am.Coll.Nutr.* 14. 419-427, 1995.
18. Wiseman et al. Damage to DNA by reactive oxygen and nitrogen species: role in inflammatory disease and progression to cancer. *Biochem.J* 313, 17-29, 1996.
19. Paolisso et al, Metabolic benefits deriving from chronic vitamin C supplementation in aged non-insulin dependant diabetics. *J.Am Coll.Nutr.* 14, 387-392, 1995.
20. Goode et al, Free radicals and antioxidants in sepsis. *Crit Care Med.* 21, 1770-1776, 1993.
21. Lees P et al. Pharmacology and therapeutics of NSAIDs in the Dog and Cat. *JSAP* Vol 32. 4 183-193, 1991.
22. Hanson R. Mode of Action of Oral Chondroprotective agents. *Canine Practice*, 21,2 pp24 1996.
23. Holt S. Nutraceuticals and Angiogenesis: New Therapeutic Horizons. *Alternative and Complementary Therapies* 1: 243-247, 1995.
24. Thompson et al. Suppression of Collagen induced arthritis by oral administration of type 2 collagen. *Autoimmunity* 16, 189-199, 1993.
25. Tentham et al. Autoimmunity to type 2 collagen: An experimental model of arthritis. *J.Exp.Med.* 146, 857-868, 1997.