

## SOME BASIC CONSIDERATIONS IN EVALUATING MINERAL NUTRITION

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Diets which are balanced in their nutrient content is key to good nutrition. While reasonable balance is important with all nutrients, proportion or balance is critically sensitive for certain minerals. When feeding diets where dietary mineral composition is unknown, utilizing mineral supplements which contain minerals in proportion to the needs of the species involved will draw the total diet toward balance. Where one can't find any information about the mineral content of foods being fed or where great variation exists, paying for some commercial mineral analyses, which allows one to better balance diets, can prevent unexpected problems. Nutrient requirements for many species are published by the National Research Council and other sources.

### IMPORTANCE OF MINERALS

**The following is a list of the commonly recognized functions:**

- \*\*\* structure
  - \* bones
  - \* teeth
- \*\*\* regulators
  - \* acid base balance
  - \* osmotic pressure
  - \* enzyme systems
- \*\*\* muscle control
- \*\*\* nerve impulses

### FUNCTIONS OF MINERALS NOT FULLY APPRECIATED

Only in recent years has the important role of minerals in *health and immune function* been adequately recognized. The important role of some of the trace minerals in the *antioxidant systems* of the body in counteracting bodily and environmental stresses is becoming increasingly obvious along with some vitamins and various antioxidant compounds.

### VARIATIONS IN DIGESTIBILITY AND BIOAVAILABILITY

The nutritional availability of the inorganic forms of minerals is generally in the order of sulfates=chlorides >carbonates >oxides. Oxides of iron and copper may be almost completely unavailable for some species. Organic forms of many minerals are considered to be more available than the inorganic forms. In many instances where no stress exists and rapid response is unimportant, many forms of the various minerals will function

satisfactorily, if an adequate quantity of available mineral is provided in the diet. In cases of disease, stress, need for rapid response or where antagonistic minerals are present, the most available forms will frequently perform more satisfactorily, possibly justifying their typically higher cost.

## EVALUATING INFORMATION ON MINERAL NUTRITION

**Testimonials.** Such information will commonly be found in fancy, colorful sales brochures, popular magazines, etc. but not in critically reviewed scientific journals. Field observations where claims of great improvements in performance are observed from including Brand X in the diet, where no control diets are fed, is of very limited value in making good judgments about mineral supplements. When numerous testimonials appear with consistency over time and you are provided all results-not just the positive ones, you may want to investigate the product further for potential effectiveness.

**Controlled Experiments.** The results of controlled experiments where several levels of the mineral being tested are compared to another form of the mineral at the same levels and a diet deficient in the test mineral, where statistical tests are applied to the data, provide the best information on which to base mineral decisions. Such information is usually published in peer reviewed scientific journals or educational materials from educational institutions. But even here, there can be many influencing factors, which if not considered can mislead. Some things which should be considered include:

- 1) All information is not transferable across species -much is.
- 2) The beginning mineral status of the animal. Are stores good or deficient? Is the control group made deficient enough long enough to allow differences in evaluation criteria to show up. Usually, the control group should at least be fed to become deficient and for some measures all animals should start deficient.
- 3) The organic minerals should be compared to the more available sulfates or chlorides as opposed to the oxides and some of the carbonates which are known to be of lower availability .
- 4) Factors such as sex, age, pregnancy or lactation, heat or cold stress etc. may influence results especially for minerals heavily involved in the biological function being evaluated.
- 5) When evaluating availability in the presence of antagonisms, enough available mineral for effectiveness, from each source being evaluated, must be fed to overcome the level of antagonism or the results can be misleading.

6) Often changes in blood or liver mineral levels over a short time (2 to 3 months) are used to evaluate mineral sources, the higher levels being claimed to be superior even though both are at physiologically adequate levels. This may not be a very useful way to compare sources when feeding for the long term-years! Of what value are higher and higher levels? At some point the body is going to stop absorbing, excrete excesses or both. You need to have a good understanding of the normal physiological levels of the various minerals in order to properly interpret research results.

### **SOURCES OF INFORMATION**

*ABOUT REQUIREMENTS:* The National Research Council, National Academy Press, Washington, D.C. has published information for: Humans, Recommended Dietary Allowances, 10th Ed.1994; Beef Cattle 1996; Lab Animals 1995; Poultry 1994; Fish 1993; Horses 1989; Dairy Cattle 1989; Swine 1988; Cats 1986; Sheep 1985; Dogs 1985; Mink and Foxes 1982; Goats 1981; Nonhuman Primates 1978; Rabbits 1977.

*ABOUT PHYSIOLOGICAL MINERAL LEVELS-NORMAL VS DEFICIENT:* Mineral Levels in Animal Health, Diagnostic Data and Bibliographies,1994, 2nd Ed. By R. Puis. Published by Sherpa International, PO Box 2256, Clearbrook, BC, V2T 4X2, Canada is excellent but expensive.

*OTHER REFERENCES:* Several good text books on mineral nutrition can be found in Agricultural or Medical School Libraries.