# Influence of trace mineral source, SQM versus sulfates, on mineral digestibility in dogs.


**Summary**

All animals have a nutritional requirement for trace minerals, without which, illness and death can result. The exact requirement differs among species and can even differ among breed within species. Inorganic trace mineral sources are often included in animal diets to meet this need. Unfortunately, the bioavailability of inorganic trace minerals can be negatively influenced by a number of factors, including, but not limited to, other dietary components. Organic trace minerals, on the other hand, do not suffer this same disadvantage. They are manufactured in such a way that they are protected from this antagonism and yet still available to the animal. Numerous experiments across species have proven that organic trace minerals are more bioavailable than inorganic trace minerals. The majority of this research has been conducted in livestock, with very little attention on the companion animal species. Therefore, it was the objective of this experiment to evaluate the bioavailability of SQM polysaccharide organic trace mineral sources in dog foods as compared with inorganic sulfated trace mineral sources.


**Materials and methods**

The following experiment was conducted at Summit Ridge farms in PA, a kennel facility registered with the USDA. All kennels had a 12-hour-light/12-hour-dark cycle with temperature range from 50°F to 85°F in accordance with the Animal Welfare Act.

A metabolism experiment utilizing a crossover design was conducted with ten beagle dogs (3 male and 7 female) split into two groups of five and individually housed. One group of dogs was then designated as the control treatment and fed a diet in which the zinc, copper, and manganese came from sulfated sources. The other group (SQM) received a diet where the zinc, copper, and manganese were provided by protected SQM polysaccharide complexes. Each dog was presented with the test diet at the same time each day, once daily. Cages and bowls were cleaned and sanitized daily in accordance with the Animal Welfare Act. The ingredient composition of the test diet is shown in Table 1. Individual treatments were administered through the liquid coating applied to the dry extruded kibble. The trace minerals supplied in this manner were of sufficient quantity to meet AAFCO regulations for dog foods.

The experiment consisted of four total periods with groups of dogs switching treatments at the conclusion of the preceding period. During each period, diet and fecal samples were obtained and stored for later analysis of dry matter, zinc, copper, and manganese concentration.

The testing period consisted of a five day acclimation, a 24-hour fast, and a fecal collection period. The feed offered following the 24-hour fast contained a chromium oxide marker that turned the feces green. Feces were collected as long as there were feces containing the green marker.

Statistical analysis was conducted using NCSS with individual dog ID, treatment, and replication in the model.

**Table 1.** Ingredient composition of test diet.

| Ingredient | % |
|---|---|
| Corn flour | 41.86 |
| Corn gluten meal | 6.51 |
| Wheat flour | 21.40 |
| Poultry meal | 9.30 |
| Soybean meal | 13.95 |
| Liquid coating/ trace mineral mix[a] | 6.98 |

[a]The trace mineral mix was distributed within the liquid coating and formulated to provide: zinc (120 mg/kg), copper (7.3 mg/kg), manganese (5 mg/kg), iodine (1.5 mg/kg), selenium ( 0.11 mg/kg), and iron (80 mg/kg).

**Results**

The results of this experiment are shown in Table 2. Dry matter digestibility was increased ($P < 0.02$) 4.83% when dogs received the diets containing SQM trace minerals compared with dogs consuming sulfated trace minerals. Zinc digestibility was greatest ($P < 0.013$) and fecal zinc the lowest ($P < 0.04$) for dogs receiving the SQM treatment. Dogs fed the SQM treatment actually consumed more ($P < 0.01$) copper than dogs fed the control treatment; however, copper digestibility was still improved ($P < 0.014$) when the SQM treatment was fed. Results for manganese are similar to those of zinc. Fecal manganese decreased ($P < 0.02$) when dogs were fed the SQM treatment and manganese digestibility was increased ($P < 0.024$).

**Conclusion**

The results of this trial indicate that SQM polysaccharide trace minerals are more bioavailable than their sulfated counterparts and can effectively be used in dog food diets. This increase in bioavailability means that more of the zinc, copper, and manganese are getting into the animal where they may be used for their various functions. These results also indicate that it may be possible to feed lower concentrations of the organic trace minerals and achieve the same health and performance as increased concentrations of the inorganic trace minerals. Finally, the increase in overall dry matter digestibility correlates to decreased stool size.

**Table 2**. Effect of zinc source on diet and trace mineral digestibility.

| Item | Control | SQM | SE | P-value |
|---|---|---|---|---|
| *Diet digestibility* | | | | |
| Food intake, g | 238.97 | 246.38 | 7.26 | 0.47 |
| Fecal output, g | 45.01 | 38.33 | 2.97 | 0.12 |
| Digestibility, % | 80.54 | 84.43 | 1.11 | 0.02 |
| *Zinc digestibility* | | | | |
| Zinc intake, mg | 34.69 | 35.95 | 1.06 | 0.42 |
| Fecal zinc, mg | 7.37 | 5.68 | 0.55 | 0.04 |
| Digestibility, % | 76.98 | 83.88 | 1.83 | 0.013 |
| *Copper digestibility* | | | | |
| Copper intake, mg | 2.81 | 3.41 | 0.09 | 0.01 |
| Fecal copper, mg | 0.93 | 0.72 | 0.13 | 0.24 |
| Digestibility, % | 66.06 | 79.49 | 3.89 | 0.014 |
| *Manganese digestibility* | | | | |
| Manganese intake, mg | 7.40 | 7.08 | 0.22 | 0.32 |
| Fecal manganese, mg | 1.64 | 1.22 | 0.12 | 0.02 |
| Digestibility, % | 76.10 | 82.41 | 1.87 | 0.024 |

Study location
This study was conducted at Summit Ridge Farms in Susquehanna, PA.

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