-Mineral-Salt Block-Efficient and Unique Supplemental Method of Trace Mineral for Cattle in Japan

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Introduction

"KOEN (Mineral-salt block)" is a kind of synonymous with cattle salt licks in Japan. This was marketed to the Japanese livestock industry in 1958, and has been the most successful product. It was used in almost of dairy and beef farms to supply macrominerals [1], trace minerals [2] and vitamins [3] to cattle. The solidified salt can be handled easily and insures uniformity of supplying ingredients to cattle. This group of solidified salts is devided in 4 categories;

1. "*KOEN E-100*" and "*KOEN E-250*" contains vitamin E and selenium for antioxidant.
2. "*FOOTBIO*" contains biotin and Zinc for maintaining healthy hooves.
3. "ALKALIX" contains sodium bicarbonate for preventing rumen acidosis.
4. "COWSTONE A" contains ammonium chloride for preventing urolithiasis.

Trace Mineral Excretion

The mineral-salt blocks supply many kind of nutrients to cattle; Ca/P/Mg/Mn/Cu for bone development, P/S/Zn/Se for muscle development, Ca/P/Mg/Zn for milk production [4]. Recently we are striving to reduce the trace mineral excretion to prevent environmental pollution [5] (Fig.1).

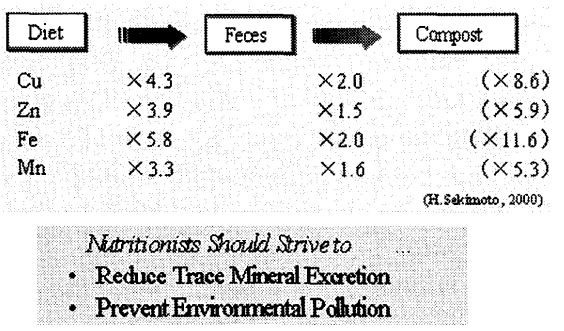

Fig.1 Trace Mineral Excretion and Concentration (Swine)

There are some strategies to reduce the trace mineral excretion from cattle fed with the mineral-salt block. One of the strategies is to increase bioavailability of trace minerals. It means metabolic improvement of the mineral-salt block. Second one is to use trace minerals with higher bioavailability. Organic trace minerals are the best candidates [6].

Licking mineral-salt block for cattle has advantage in metabolic improvement [7] (Fig. 2-4). It promote salivary secretion and rumen movement, and improve digestion rate to increase bioavailability of trace minerals.

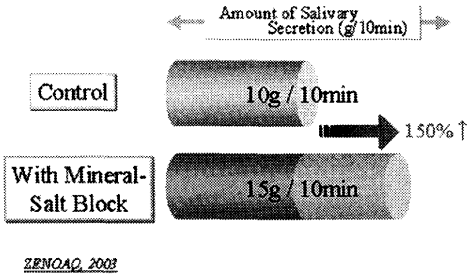

Fig. 2 Promotion of Salivary Secretion

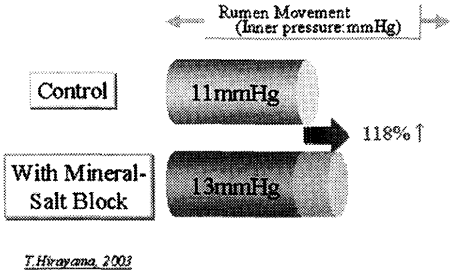

Fig. 3 Promotion of Rumen Movement

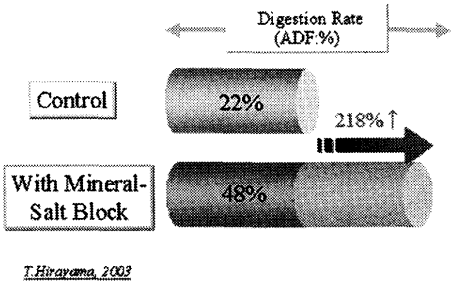

Fig. 4 Improvement in the Digestion Rate

Organic trace minerals have following advantages; 1) They avoide the antagonistic action of other cation. 2) They are absorbed directly. 3) They can be used at lower level than inorganic sources (Fig. 5-6, Table 1). The largest advantage of organic trace minerals is the reduction of the level of trace mineral excretion.

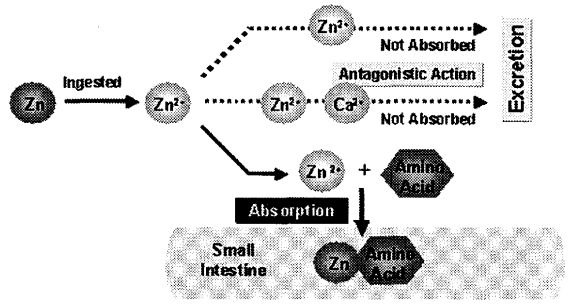

Fig. 5 Proposed Theory of *Inorganic* Trace Mineral Absorption

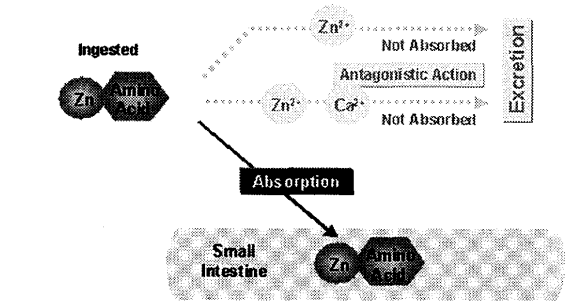

Fig. 6 Proposed Theory of *Organic* Trace Mineral Absorption

Table 1. Effect of Copper Source and Level on Copper Balance in Cattle

Item	Copper Sulfate[1)]	Copper-Amino Acid Complex[2)]
Copper intake, mg/d	92.5	125.5
Fecal Cu excretion, mg/d	83.8[y]	81.3[y]
Fecal Cu excretion, % of intake	90.3[y]	65.8[z]
Cu retention, mg/d	6.9[x]	40.4[y]
Cu retention, % of intake	7.8[y]	32.7[z]
Cu absorption, %	9.8[y]	34.2[z]

1) 125 mg Cu/d from Copper Sulfate
2) 125 mg Cu/d from Copper Amino Acid complex

xyz) Means within a row lacking a common superscript differ ($P < 0.05$)

Conclusion

"KOEN (Mineral salt block)" was originally developed as the mineral supplement, but recent modification of the components gave the potential activity to the product to contribute for preventing environmental pollution of trace minerals. They were modified to increase bioavailability of trace minerals by metabolic improvement (improvement of salivary secretion, rumen movement and digestion rate). They can supply organic trace minerals with higher bioavailability, and reduce the level of trace mineral supplementation and excretion.

References

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