

CHAPTER I

INTRODUCTION AND AIMS

Zinc (Zn), a micromineral, presents in the body and the diet at level less than 100 ppm (Hellman and Carlson, 2003). It is widely distributed in many tissues of the body. High concentrations of Zn have been found in hair, wool, and skin of animals (McDonald, 1995). Zinc is important for normal carbohydrate, lipid, protein, and nucleic acid metabolism, and necessary for the maintenance of normal epidermal integrity, taste acuity, and immunological function. Many metalloenzymes, enzymes which have metal, such as carbonic anhydrase, alkaline phosphatase, and aminopeptidase contain Zn (Case et al., 2000).

Zinc deficiency occur in the dogs from several causes such as genetic defect that results in diminished intestinal Zn absorption, rapidly growing puppies fed Zn-deficient diet or diets containing substances which prevents the absorption and utilization of Zn, dog food that produced from raw materials which have low amount Zn and varies, and raw materials containing an antinutrition factor such as phytic acids. The first clinical signs of Zn deficiency have been described as alopecia, dull, coarse hair coat, and focal erythema encircle the eyes, ears, nose, mouth and pressure points. Other clinical signs include anorexia, growth retardation, gastrointestinal disturbances, and impaired reproductive performance (Case et al., 2000; Colombini, 1999). Therefore, Zn is added to most commercial dog foods to meet the animal requirement.

Zinc has a role in three key functions in the keratinization process (Tomlinson et al., 2004). Marsh et al. (2000) reported that Zn supplementation improved hair coat, gloss, and decreased transepidermal water loss. Because hair is important in thermal insulation, sensory perception, and as a barrier against chemical, microbial, and physical injury to the skin, and great aesthetic importance to owners (Tscharner and Halliwell, 1990). There are two form of Zn supplement

used in dog foods, organic and inorganic forms. These forms can have influence on the absorption of Zn. At present, inorganic Zn such as ZnSO_4 or ZnO are the popular forms use in most dog food. However, these forms can dissociate to Zn^{2+} in the gastrointestinal tract (GIT) and interact with other substances (e.g., phytic acid) resulting in the formation of strong and insoluble complexes that animal cannot absorb (Wilaison, 2002). Moreover, divalent cations (e.g., Ca^{2+} , Cu^{2+} , and Fe^{2+}) can inhibit Zn absorption possibly due to these cations compete one another for binding ligands in the intestinal lumen or within the cell as well as for receptor sites on the brush border of the enterocytes (Gropper et al., 2005). Organic Zn is found in several forms with different chemical structures also with different chemical properties (Scrimgeour III, 2004). Only organic mineral in chelated form is stable in a wide pH range encountered within the different segments of the digestive tract and so it does not dissociate before reaching the absorption site (Vandergrift, 1994). It can be absorbed as an intact molecule (Ashmead, 1992). An amino acid which is bound to mineral and acts as a carrier is used to transport that mineral across the intestinal enterocyte and into the circulation.

Nowadays, most animal feed industries are interesting in organic Zn including dog foods industries. However, a research study organic Zn supplementation for dog foods are limited. The hypothesis of the present study is that Zn methionylglycinate could be utilized more efficiently than ZnSO_4 . Therefore, the dogs supplemented with Zn methionylglycinate should have better hair coat characteristics, greater Zn concentration in plasma and hair, greater Zn absorption, but lower Zn excretion in feces than the dogs supplemented with Zn sulfate. The objectives of this experiment were:

1. To study the effects of Zn methionylglycinate supplement compared to Zn sulfate supplement on hair coat characteristics and Zn concentration in plasma, hair, and feces of dogs.
2. To study the appropriate level of Zn supplementation in commercial dog foods that result in great hair coat characteristics and Zn concentration in plasma and hair, and less fecal Zn of dogs.