

Effects on Body Weight and Clinical Signs in Pigs in Experimentally Induced Hypothyroidism



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ABSTRACT

Goitrogens are agents that reduce the production of thyroxin. There are naturally available goitrogens like cabbage, cassava and rubber seed meal, inclusion of which in feed for longer period can cause harmful effects in animals. A study was conducted taking pig as a model to evaluate the effects of goitrogen. Thiourea was used for inducing hypothyroidism in pigs and the effects of inclusion at @ 50 mg/ kg body weight in the basal ration were studied in male pigs.

Introduction

Goitrogenic substances are widely distributed in nature and a sub-clinical hypothyroid state influences the health and growth of man and animals. Kelly and Snedden (1960) have identified certain regions of India including coastal areas of Kerala as endemic zones of goiter. More over heavy rain fall and application of nitrogenous fertilizers injudiciously in the field precipitate chances of hypothyroidism in animals in the state. Incorporation of goitrogenic substances such as cassava, rubber seed meal and sorghum as feed ingredients is a common practice among pig farmers. Other than fattening effects, other consequences of feeding such ingredients are not well studied in pigs. Thiourea (TU) and related compounds are known for their goitrogenic effects and hence an experiment was designed to study the effects of hypothyroidism using TU.

Materials and methods

Design of Experiment

Twelve clinically healthy 2-3 months old, male Large white Yorkshire piglets with an average body weight of 8-15kg were selected. The pigs were maintained in two groups of six each on basal ration and ad libitum water. The experimental group was fed with Thiourea, TU (H_2NCSNH_2 , Sarabhai Chemicals) in the basal ration @ 50mg/kg body weight daily for three months.

Techniques

The live body weight of all the animals were recorded on commencement of the experiment and at every fifteen days intervals. Any clinical sign developed in the experimental group was recorded periodically. The pigs were sacrificed at the end of three months, weighed the carcass and conducted detailed post mortem examination following standard autopsy procedures. Immediately after slaughter, the thyroid, pituitary and adrenals were dissected out and weighed after removing the loose fat and fascia.

Results and Discussion

The present study was unique among series of other studies on hypothyroidism since different parameters were studied in pigs which were fed with thiourea, a feed additive known for its goitrogenic activity.

Body weight gain

All the experimental animals were recorded gradual increase (average gain in body weight 0.008kg per day) in body weight during the first one month. Subsequently there was gradual, progressive but less significant reduction in body weight (average loss in body weight 0.007 kg per day) until slaughter at the end of three months. Control animals recorded progressive increase in body weight gain of 0.25kg per day on an average (Fig 1 & 2).

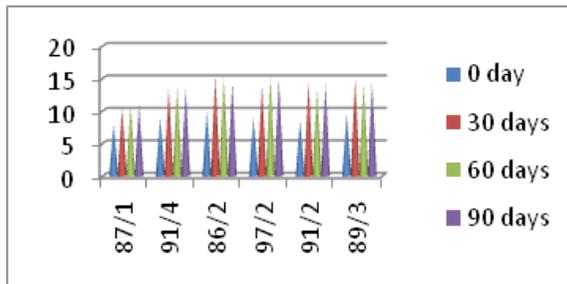


Fig 1. Live body weight of control animals

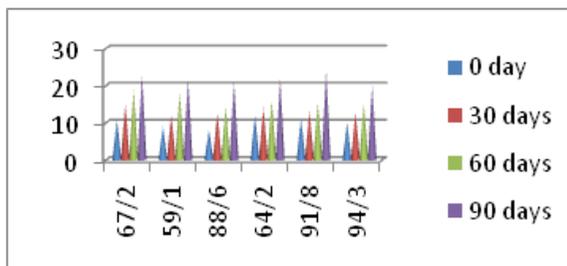


Fig 2. Live body weight in TU fed animals

The weight gain in the first one month of the study was suggestive of anabolic effect at a lower dose level of thiourea. There was slow onset of hypothyroidism and lowering of BMR that resulted in reduction in catabolism of protein and energy utilization for body functions. Pearson *et al.* (1966) reported that thiourea in low doses help fattening in pigs. According to Gupta *et al.* (1990) TU was more effective in inducing hypothyroidism in goats than thiouracil.

Clinical Signs

The experimental animals fed thiourea were active and clinically normal for the first one month. There after their body condition gradually deteriorated and hair coat became rough. Moderate degree of alopecia developed on the lateral side of neck, snout, ears, shoulder and thigh regions (Fig 3). All animals in this group showed progressive weakness. Control animals did not show any clinical signs. Goitrogens were found to retard growth rate in sheep (Lasscelles and Setchelle, 1959).

Fig 3 Alopecia in hypothyroid pigs

. Retardation of growth was attributed to the defective synthesis of protein (Metzger and Freinkel, 1971). Kimberg (1971) reported diminution of absorption of nutrients in human beings in the absence of thyroxin and this in turn led to retarded growth.

The retardation of growth and reduction in weight gain could be due to physiological effects of TU on metabolism. Studies conducted in different species of animals showed that growth was much depended on production of thyroid hormone in the body (Sreekumaran, 1976; Abraham, 1986; Ratnakumar, 1989).

The hair coat of the TU fed animals was rough and there was moderate alopecia. As explained by Freedberg (1971) this could be due to hyperkeratosis, acanthosis and diffuse oedema in the epidermis and dermis.

Conclusion

Thiourea which was considered as a less palatable feed additive was used as a goitrogen incorporated in feed of pigs. Inclusion of goitrogen in feed for a short period at lower dose could result in body weight gain. If continuously given in the diet, led to hypothyroidism reduced weight gain, retarded growth, alopecia and progressive weakness.

This is to be viewed seriously in field conditions where in retarded growth and low weight gain in pigs is attributed to many diseases including parasitosis. So both quality and quantity of feed has to be checked and inclusion of any unconventional goitrogenic feed ingredients for long term need to be rule out.

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