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# Molybdenum and Animal Health in New Zealand

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## SUMMARY.

**T**HOUGH molybdenum has essential functions in plant metabolism there is as yet very little known of essential functions for animals. Molybdenum is a constituent of xanthine oxidase, one of the actions of which is to convert purines to uric acid, and molybdenum assisted by inorganic sulphate causes the excretion of copper from animals.

The present importance of molybdenum to farm animals in New Zealand is in the toxic effects from too much molybdenum in the diet. Such effects have so far been found to occur when copper intake is low and can be corrected by supplying extra copper.

Toxic amounts of molybdenum occur on peat soils and other soils where molybdenum is naturally high.

Dangerous levels of molybdenum could be reached by careless use of molybdate fertilizers, by their use on soils on which the pasture molybdenum response is abnormally high and on pastures with low copper content.

Pastures from the main soil types in New Zealand have been examined and soil types identified:

1. Which produce pastures high in molybdenum.
2. On which topdressing with small amounts of molybdate produce abnormally high pasture molybdenum.
3. Which produce pastures low in copper.

Lists of these soil types and maps showing their location are given in N.J. J. Agric. 1955: Vol. 90, pp. 196-202. The article, moreover, elaborates the points mentioned above.

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## Joint Discussion

Mr. ANDREWS: Is the effect of tungsten due to tungsten per se, or a substitution of tungsten for molybdenum?

Dr. DAVIES: In plot trials near Outram on a Molybdenum responsive soils there were equal responses from tungsten and molybdenum. The reaction is not simple and the mechanism is not known but is being followed up.

Mr. SEARS: Is there any risk from applying an excess of lime on some soils.

Dr. DAVIES: The molybdenum uptake of clovers rose with a rise in pH above neutrality. It would require enormous quantities of lime.

Dr. CUNNINGHAM: The liming of peat soils that have pastures high in molybdenum increases the severity of scouring disease.

Dr. MELVILLE: Does any practical problem now exist? We appear to know how to overcome molybdenum toxicity by topdressing with copper or supplying sulphate and the use of these or other methods might enable us to handle problem areas. Are such methods available.

Dr. DAVIES: Gypsum topdressing could be employed to reduce the molybdenum uptake by plants as shown at Ahuriri lagoon but the cost is high.

Dr. CUNNINGHAM: Many areas cannot be topdressed by hand; therefore the application of copper is not simple. Aerial topdressing with copper sulphate is avoided by topdressing companies because of damage to aircraft. The use of copper oxychloride as an alternative appears hopeful. Direct injection of copper into deficient stock might be the simplest and cheapest method and it is under trial.

Dr. FILMER: There is some danger in the suggestion that we topdress substances on to farm lands to correct these effects on copper and molybdenum metabolism. We know so little about the interactions of these substances, that we may do considerable harm. Molybdenum appears to interact with copper, manganese, inorganic phosphate and possibly cobalt. It may be involved in Enzootic Icterus where there is an abnormal retention of copper. In Britain there are areas where copper deficiency symptoms occur on fodder containing normal amounts of copper but where any effect from molybdenum is excluded. Thus factors other than molybdenum will interfere with copper metabolism and our efforts to correct existing defects may precipitate others.

Mr. McKENZIE: Is the uptake by pasture more rapid at any time of the year, especially during the spring flush?

Dr. CUNNINGHAM: Uptake is the highest in the spring, but it is also high in the autumn. Assays are always done on spring pasture. Further molybdenum in green grass is more readily available to the animal.

Dr. WALKER: At Lincoln we have been studying the response of white clover under several sets of conditions. High manganese affects the growth of white clover and though the molybdenum content of the soil is normal, there is a molybdenum response. There is a better correlation with nitrogen fixation in the case of Manganese than there is with Molybdenum. There is a low inorganic sulphate in tussock grasses and molybdenum might be used instead of lime in aerial topdressing.

Dr. HEALY: Manganese-molybdenum relationship may be a soil or a plant effect or it may be a pH effect, high manganese and low pH giving high molybdenum.

Dr. WALKER: On highly leached soils manganese may be leached out. There may be a low manganese and a low pH. The use of superphosphate may increase the uptake of Manganese. In white clover manganese may be immobilising molybdenum in the plant and not affecting uptake from the soil as suggested by Mulder.

Dr. MITCHELL: Does sulphate occur in excess in any of our soils?

Dr. DAVIES: It is most likely to occur in glasshouse soil but even there there is no trouble due to sulphate excess.

Col. DURRANT: Does molybdenum present any toxic hazards to man from topdressing of garden soils?

Dr. CUNNINGHAM: This is unlikely even where dressings are very heavy since our food comes from such a wide variety of sources.

Mr. ANDREWS: Molybdenum toxicity may be overcome in bacteria and mice by vitamin B12. It may be that molybdenum could produce a cobalt deficiency in inhibiting cobalt uptake.