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Project funded by

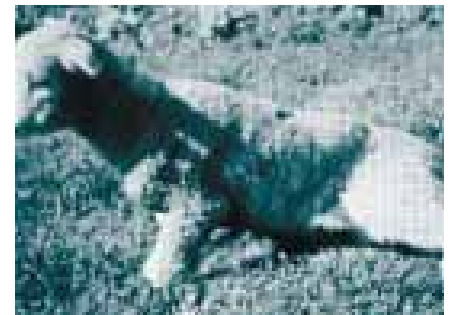
from 1994 to 1996

Contractor: AgResearch



## Effect of sulphur intake and trace element interaction on the absorption and storage of copper in grazing sheep

- Why do sheep need copper and how do they usually get their copper requirements?
- Does applying sulphur fertiliser affect the copper status of grazing sheep?
- Does adding copper to sulphur fertiliser affect the sheep's copper status?



Lamb with sway back

### Copper deficiency a problem

This project, jointly funded by Meat New Zealand and the Government (PGSF), looked at the relationship between dietary sulphur (S) and copper (Cu) in lambs.

Copper deficiency is a significant problem in ruminants. As sheep and cattle become Cu deficient, their **liver Cu stores** become depleted. Signs of the resulting Cu deficiency include diarrhoea and reproduction problems.

Signs of copper deficiencies in sheep and cattle:

- bone fragility and sway back (lambs)
- wool defects (sheep)
- ill thrift (calves)
- scouring (cattle)
- infertility (cattle)

### Survey of East Coast

A survey in the Wairoa region in 1996 showed that Cu deficiencies in cattle and sheep were 'potentially widespread'. The most common method of treating Cu deficiencies was with Cu supplements to the animal.



Cu supplements were **used on 90%** of survey farms between September 1994 and August 1995. 36% of farmers reported possible Cu deficiency in lambs during this period.

### What is the effect of high sulphur intake on the **Cu status** of my lambs?

This project aimed to see if increased sulphur intake (primarily through sulphur **fertilisers**) had a negative effect on animal health by increasing the incidence of Cu deficiency.

#### This was studied in two experiments.

In Year 1, the project monitored the effects of increasing S intake on the Cu status and metabolism of lambs.

42 lambs were grazed on ryegrass/white clover pasture. Each kilogram of dry matter contained:

- 2.6 grams of sulphur (S)
- 6.2 mg of copper (Cu)
- < 0.5 mg of molybdenum (Mo)

The scientists:

- increased S intake levels in some lambs from 3.9 to 7.9 grams/day (through dosing with elemental S capsules).
- gave lambs different doses of S, Cu and iron (Fe) in a capsule.
- analysed the chemical interactions of Cu in the gastrointestinal tract and measured Cu levels in the liver, blood plasma and digesta.
- monitored the Mo, S and Fe levels in the digesta.
- **compared results** with lambs that were given no supplementary S or Cu.

## RESULTS - Increasing dietary sulphur had little effect on copper status

Increasing dietary S intake as elemental S, when there was **low Mo** (< 0.5 mg/kg DM), had no significant effect on liver copper stores in the lamb.

Growth rates were not significantly affected.

However, when **Mo is high** (>2 mg/kg DM), sulphur does have a **marked effect on Cu** absorption and storage. This has negative consequences for animal production.

### What about sulphur fertiliser?

The above results indicate that the use of sulphur fertiliser is **not significantly associated with reducing liver copper levels**. There is **little need to change recommendations** for the use of sulphur fertiliser.

## What effect does adding copper to sulphur fertilisers have on the Cu status of sheep?

In Year 2, the project examined the **effect top-dressing** sulphur fertilisers with added copper has on the Cu status of lambs.

In the survey of farmers in Wairoa, only 4% of farmers used copper fertiliser on all or part of their farms in 1995. However 15% of these farmers requested information on the effectiveness of copper fertiliser compared to copper injections.

The project involved:

- **topdressing** pasture with either 30 or 90 kilograms of S/hectare.
- topdressing either 0.4 or 4 kilograms of Cu/hectare on the same pastures.
- **set-stocking** 15 lambs per hectare on the topdressed pasture.
- measuring Cu levels in the liver and plasma of the lambs.
- measuring the growth rates of the lambs.

## RESULTS - Top dressing with Cu and high S fertilisers increased and maintained the Cu status of sheep for at least eight months

Copper sulphate (which contains 25% copper) costs about \$1945 a ton (*September 1998*).

At an application rate of 6.25 kg/ha, it costs about **\$12.16 per hectare to apply** (excluding transport costs). About **1.6 kg** of copper is applied per hectare.

Topdressing low Cu pastures (5 mg Cu/kg DM) at the rate of **1.6 kg** Cu/hectare can increase pasture Cu (to between 15 -25 mg Cu/kg DM) for five to nine months.

**However, the uptake of copper by pasture is variable.** It depends on season, rainfall, herbage composition and soil type for example. Applying copper sulphate is an **effective and safe way** of increasing the Cu status of sheep. Copper injections or copper oxide needles are also an option.

## What a lamb requires

For a 30 kg **lamb** gaining 150 grams/day, the **dietary Cu requirement** to meet Cu demands is **3.7 mg Cu/day** (Grace, 1994). This can be achieved by grazing pastures containing between **5 - 6 mg Cu/kg DM** (where Mo is low i.e. <1 mg Mo/kg DM).

**Cattle** need to graze pastures containing between **8-10 mg Cu/kg DM** to get their copper requirements (where Mo is low).

The results have been used to make recommendations on the use of S fertilisers. **Vets** and farmers have used the information to develop strategies to manage and prevent Cu deficiency.



## Points to Remember

- **Topdressing with high sulphur fertilisers is okay.** The use of high S fertilisers should not increase the incidence of Cu deficiency in grazing livestock. However, increasing intakes of Mo, in the presence of sulphur, decreases the absorption and storage of copper in the liver of grazing ruminants.
- **Monitor Mo, Cu, S and Fe levels** by analysing clover herbage during spring and autumn. Monitor liver Cu concentrations in your main livestock classes.
- Current studies on the Cu and Mo interactions in sheep and cattle grazing low and high Mo pastures are being **funded** by Meat New Zealand.

## Contacts

### for more information

- For free project report phone 0800 696 328, free fax 0800 187 781 or email help@meatnz.co.nz and quote reference number **29**.
- **Scientific contact:** Neville Grace and Julian Lee, AgResearch, (06) 356 8019.
- **Contractor:** AgResearch.
- Funded by Meat New Zealand and the Government (PGSF).
- Contact your vet for more information on copper deficiencies.
- Meat New Zealand contact: Mark Aspin phone 0800 696 328 or direct dial (04) 474 0836.