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Introduction

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Copper is a trace element essential to good health and is involved in the absorption, storage and metabolism of iron, the strengthening of bones, the growth of the young and brain function. It is a malleable mineral that makes bones softer and more flexible, so less likely to break or chip.

Fertilising with 3 kg per hectare of Copper Sulphate (24% elemental copper) stopped young lambs breaking their legs on the steep hills on New Zealand's north island east coast.

Elderly people breaking bones is common, but how many people take Cu, magnesium and boron to soften bones and make them and joints more flexible, rather than brittle, caused by deficiencies or too much calcium? How many doctors even know about this? My guess is not even 1% and they forget because they are in the medical practise of repeated treatment, not prevention. Low copper is associated with joint pain, elevated cholesterol, anaemia, and reduced resistance to infection.

Calcium suppresses magnesium, so take magnesium, zinc, copper, vitamin C, vitamin D and vitamin K, as they all contribute to bone strength in different ways. Never take calcium in New Zealand because we get more than enough from dairy products and 99% of NZ is low in magnesium, which excess calcium suppresses.

Why are some farmers and veterinarians decades ahead of some townies and doctors in so many ways? As a farmer I pioneered facial eczema control in 1960, just by correct liming of the soil. Many farmers followed, but in 2013 most in New Zealand still don't know about it. Research centres are often a decade behind the top farmers. I console myself by remembering that Captain Cook avoided scurvy on his ships by feeding himself and his crew lime fruit (hence the term Limey) 50 years before the British Admiralty did the same on their ships to keep their crew alive. Captain Cook and his crew harvested leaves from the New Zealand cabbage trees to supply greens on the homeward trip.

Why do doctors and specialists still recommend lime (calcium carbonate) to control osteoporosis and claim that bones will be stronger, when unfortunately they become harder and more brittle, so they snap and/or fracture? Copper, magnesium and boron make bones more flexible so less likely to break. See the information about those minerals in the GrazingInfo chapters under 'Elements'.

Excesses and Causes

In humans, copper levels are more often too high than too low and can be toxic. Causes include -

- Copper pipes. People living in houses with Cu gutters and pipes can get an oversupply of copper, so will need more zinc to balance it. Copper lowers the absorption of selenium and zinc, so if your house has copper pipes, fill a jug of drinking water from an outside tap, or after people have showered, and/or use the clothes washer which will have used the water that sits in the copper pipes over night.
- Excess oestrogen in meat (oestrogen was used as a growth hormone in the meat industry, but was discontinued in the 1980s and replaced with testosterone, etc).

- Use of birth control pill.
- Use of prescription medications containing copper.
- Smoking.

Zinc and manganese deficiencies raise copper levels. It can take one to three months to lower high copper levels in the liver by stopping intake and using zinc to lower it.

There are 13 elements that suppress Cu. These and others are shown in the spreadsheet called 'Interactions in blood, soils & pastures' which is one of 50 spreadsheets available from GrazingInfo for just NZ\$200. To see the list of spreadsheets go to the Home Page and [Click here](#) to see the PDF chapters and spreadsheet topics covered.

Physical symptoms of high copper levels include -

- Headaches, nausea and/or vomiting.
- Hypoglycemia.
- Increased heart rate.
- Damage to the kidneys and decreased urine production.
- Anaemia.
- Hair loss in women.
- Abdominal pain and cramps.
- Diarrhoea
- Hypertension
- Stuttering
- Fatigue
- Muscle and joint pain
- Low histamine levels

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Copper deposits in the brain and liver cause damage. Excess copper creates low histamine by decreasing histamine in the brain. Copper contains the enzymes that regulate histamine and too much copper allows histamine degradation to take place. In turn, the lowered histamine levels allow more copper to accumulate.

High copper interferes with zinc, which is needed to manufacture digestive enzymes. Many high copper people dislike protein and are drawn to high-carbohydrate diets because they have difficulty digesting protein foods.¹⁸⁰

High copper levels can also cause health problems such as damaged intestine villi. Selenium helps regrowth, but, if severely damaged by too much Cu for too long, an animal can scour for the rest of its life.

Psychological symptoms of high copper levels include -

- Autism and detachment from reality.
- Senility and mental decline including misperception of the senses, time, body, self and others.
- Stuttering.
- Depression.
- Hallucinations.
- Hyperactivity.
- Insomnia.
- Personality changes, paranoia and psychosis as well as schizophrenic type symptoms.
- Hypomanic states.

Copper has been found at high levels in the blood (I presume repeatedly) of Alzheimer's patients.

Excessive copper in children is associated with hyperactive behaviour, learning disorders, such as dyslexia, and ear infections. Giving children (including our grandson) zinc has quietened them down and stopped them biting their nails.

Wilson's Disease is a condition that causes Cu to accumulate in the tissues and cause extensive damage. It affects 1 in 30,000 people. The liver stops secreting copper into the blood or excreting copper into the bile. The first symptoms are brain damage, tremors, headaches, inability to speak, incoordination and psychosis.

Wilson's disease sufferers can have increased liver copper content, leading to severe liver damage, followed by increased brain copper levels and neurological problems. Copper accumulates in the brains of children with Wilson's disease and produces mental retardation.

Copper excess can be more damaging than copper deficiency.

Deficiencies and Causes

Copper deficiency impairs the formation of the connective tissue of proteins, collagen and elastin. Weak bones and defective arterial walls are the more obvious manifestations.

In the USA at least 20 percent of the population suffers from a deficiency of copper of some sort, yet few people are aware of the health disorders that are associated with copper deficiency:

- Osteoporosis.
- Osteoarthritis and rheumatoid arthritis.
- Cardiovascular disease.
- Chronic conditions involving bone, connective tissue, heart and blood vessels.
- Colon cancer.

Copper deficiency also contributes to increased blood cholesterol levels and results in growth disturbances of the brain. Infants with blocked copper utilisation develop severe brain dysfunction due to defective nerve fibres (Menke's disease).

In infants and children, copper deficiency may result in anaemia, bone abnormalities,

impaired growth, weight gain, frequent infections (colds, flu, pneumonia), poor motor coordination and low energy.

Even a mild copper deficiency, which affects a much larger percentage of the population, can impair health in subtle ways.

Symptoms of mild copper deficiency include:

- Lowered resistance to infection.
- Reproductive problems.
- General fatigue.
- Impaired brain function.

You may get a copper deficiency if you -

- Eat a poor diet.
- Suffer digestive disorders, prolonged bouts of diarrhoea or liver problems.
- Improperly take micronutrient supplements, especially iron and zinc.
- Eat a lot of refined white flour or too much vitamin C. Vitamin B6, folic acid, sulphur and molybdenum are also copper antagonists or binders and can cause low copper levels.
- Eat quickly! Fast eaters tend to have lower levels of Cu. Is that because they make and swallow less saliva, which is the first digestive juice, so absorption is possibly lower.

Be aware that high levels of zinc, iron, calcium and manganese all reduce Cu absorption.

Those who are most susceptible to copper deficiency include -

- The elderly, athletes and those engaged in hard physical work.
- Vegetarians, particularly those who do not consume dairy products.
- Pregnant women and their foetuses.
- Premature infants, especially those with very low birth weights.
- Full-term infants who are fed unfortified formula or cow's milk (which contains low concentrations of copper bound to milk proteins).

In animals, Cu deficiency may result in dramatic death from rupture of a major blood vessel or the heart itself. It is not clear that these events in human pathology are related to copper deficiency, but it suggests that copper intake should be carefully evaluated in patients with cardiovascular disease.

Physical symptoms of low copper levels include -

- Diarrhoea, especially if molybdenum is high, as in some soils and some peats that are low in Cu.
- Not enough oxygen in cells, which then causes breathlessness and suffocation (but this is not likely to be just from low copper).
- Lowered levels of HDL cholesterol.
- Skin problems.
- Swollen ankles.
- Anaemia.
- Hallucinations.

- Depression.
- Abdominal pain and cramps
- Nausea and vomiting
- Diarrhoea.

To prevent copper deficiency, diet is important. The best dietary sources of copper are -

• Seafood, especially oysters and other shellfish. Avoid all seaweeds. The world is polluted and the sea is its sewer.

- Organ meats.
- Whole grains, nuts and raisins.
- Legumes.
- Dark chocolate.

Also good are -

- Whole grain cereals.
- Yamso potatoes.
- Peas.
- Red meat.
- Dark green leafy vegetables
- Fruits, such as coconuts, papayas, apples, cherries and prunes
- Poultry.
- Soybeans.
- Tofu.
- Maple syrup. O'Canada 100% pure maple syrup has the best Chris Rhodes compatibility rating and has 30 ppm copper. I get my copper requirements from it as the only sweetener I take.

• Copper supplements can prevent copper deficiency, but they should be taken only under a specialist's supervision. A doctor may prescribe copper supplements for patients who - have illnesses that reduce digestion, are unable to eat sufficient quantities of food, are taking medications that block the absorption of copper (such as antacids and some prescription drugs), are recovering from other serious illness or injury, are at risk for osteoporosis, to protect infants from copper deficiency (under a doctor's supervision).

- Pregnant and nursing women should increase their dietary intake of copper.
- Nursing during the first six to twelve months of life is the best way of delivering copper to newborns.
- If infants are fed fortified milk, they should have a correct set of nutrients, especially copper, zinc and calcium.
- If infants are given cow's milk, copper supplementation is essential (since cow's milk does not contain essential copper).
- Copper supplementation may be needed for premature and low birth-weight infants and for infants with diarrhoea and frequent infections.

Remember . . . A mild copper deficiency is difficult to diagnose, yet the condition can increase the risk of many health problems, particularly among the very young and the elderly. If you think you or your child may require a copper supplement, discuss this with your doctor.

Copper has been used successfully to treat -

- Auditory Hallucinations.
- Depression.
- Schizophrenia.
- Hair going grey.

But be warned, as with all elements, you must be careful with dosage. At Weston Agricultural College in 1947/48 the sheep tutor got us all together every second year and injected the normal amount of Cu for good health twice into an old cull ewe and within minutes she dropped dead. This demonstration was to engrave in our minds how careful we had to be with copper, that is, not to inject an animal twice by mistake, or ourselves even once.

In 2008, dairy farmer Bruce Paton was able to give up injecting his 1,800 dairy cows with Cu and B12 after he fertilised with Cu and cobalt. He was leaning over the rails injecting Cu with one hand and vitamin B12 with the other, at 200 an hour, when he dropped the Cu injector and it swung down on its hose and into his knee. The knee became painful, so Bruce phoned his doctor, who had no experience with such an injury, so phoned the local vet club, who phoned the supplier, who said that he would need surgery, and soon. The injector had been set up to put 2 ml of calcium copper edetate under the neck skin of each cow and Bruce estimated he had received about 0.5 ml when the needle jabbed him - far short of the 2 grams he had heard would be a lethal dose. The surgeon removed flesh around the needle entry point and cut a hole in the knee to insert a camera to check no Cu had penetrated the joint.

Other farmers have given themselves accidental Cu injections. One, who had injected his finger and got it lanced a few hours later, was told that he would have lost his finger if treatment had been left much longer.

The manufacturers said most farmers failed to read the fine print which had a health warning that Cu livestock injections can cause severe tissue degeneration or even gangrene in humans.

Fertilising according to pasture analyses and feeding a good soluble mineral mix in the water could have avoided the injecting and the danger and given healthier animals.

Copper in animals

I apologise for discussing animals, but they show deficiencies more quickly because most get only ryegrass with a little clover, whereas humans eat a wide variety of food from many areas and sometimes from several countries and many soil types. Trials by feeding minerals in drinking water is also easier with animals.

Both of the farms we owned were peat, which has almost no Cu, so soils and animals

had to be supplemented. Just fertilising pastures with the recommended 3 kg per hectare per annum of Cu Sulphate was not enough, it also had to be supplemented. Supplying it through a dispenser into the drinking water is the best way because, like some minerals and vitamin C, the body needs it all day, not just at meals.

In 1990, the calves pictured were our sharemilkers' worst. Hundreds were the same across Waikato peat farms. By then we knew about Cu, so it was fertilised and supplemented. The clean tails showed they had no internal parasites and weren't lacking selenium. The raised hair on their necks indicated they were low in cobalt. Horses have manes, but cattle don't, unless low in cobalt. The hair on the crown of the head indicated low zinc. Nervousness also indicated mineral deficiencies.



These five runts were the worst from a group of 40, lacking sodium, cobalt and selenium.

A year after engaging consultant the late Tony Donnelly, who added the deficient minerals to fertilisers and recommended salt in the water, there were no runts, which was rare on peat farms. However, they still had rough dead looking hair which showed they needed more Cu, salt and zinc. Tony identified this from a distance of about 30 metres and our sharemilker said he had run out of salt.

Peat has no sodium, so we fertilised with it, as well as cobalt and zinc, but even then the pasture can't supply the amount needed by animals (especially young stock), except for salt when within a hundred metres of the sea. It has to be added to the water through a dispenser, so animals get it evenly day and night.

On our second farm, bought in 1984, I helped develop and market a dispenser and developed a soluble mineral mix over four years of trial and adjustment, then sold the recipe to DeLaval in 1988, where it sold to farmers very well without the need for changing. I do not receive a commission on this product, so am not promoting for profit, but for the benefit of farmers.

It was analysed and copied by vets and others, but all made some serious mistakes. Two added manganese which is in excess in most New Zealand soils, partly because lime is lacking. See Elements > Manganese. Others didn't know that the analyses figures were elemental, not total percentages.

Our son-in-law and daughter, Ian and Sue Dobbs, share-farmed for us and reared 160 calves each year. They divided the group in half, gave one mob the soluble minerals, while

the other mob got none. Both mobs were on correctly fertilised pastures which included, Cu, cobalt, magnesium and selenium (but not boron) because soils and pastures need them and can then supply animals enough through the pasture.



After six months they were then run in one mob. In this photo, the front steer had been fed minerals in the water, while the one behind hadn't. The one behind had a slight pot belly from lacking cobalt which causes low vitamin B12, so poor digestion. The dung on its tail indicates internal parasites and/or needing selenium. The front one was 20% larger and lacked nothing, because of getting minerals in the water.

Ian was measuring the pasture before and after grazing and found that those getting supplementary minerals were eating less pasture and didn't need treating for parasites.

Back to humans

As hinted above, copper is related to hair colour. Premature greying of hair is an indicator of low copper which is associated with a high likelihood of osteoporosis. This applies to premature greying, but possibly not to old age greying. At age 78, after taking 2 mg of Cu every second day for two months, some of my hair colour improved to its original light brown. The once grey hair on my arms has also returned to a dark brown colour.

Adults needing cobalt to strengthen and ease joint pains can take a 3 mg capsule once or twice a day. Thank you to Dr Ricky Gorringer for recommending it. My wife's and my knees stopped hurting a decade ago.

What is taken can affect the absorption of other elements. Zinc is one example, as it suppresses the absorption of both copper and selenium. If taking zinc, selenium and copper, take the Zn in the morning, away from food and the copper and selenium in the evening, or vice versa. Excess copper also destroys Vitamin C, so take them apart from each other.

Measuring levels in people should be done by a hair analysis or, in emergencies, liver, which stores copper. Blood is only a carrier of copper, so analyses of it **ARE NOT** very useful and will vary depending on what was recently eaten. In animals they measure it in the livers of culled animals.

Copper is actively transported through the intestinal wall, carried in a special protein in the blood and stored in the liver.

Copper is necessary for the absorption of iron and to soften bones to reduce the chance of fractures.

In the USA the recommended daily intake of Cu is 0.9 milligrams, but their soils vary so much from the low copper peat in the south-east, to incredibly low areas in the dry north-west, east of the mountains, that recommending one level for all is not much use.

Dr. Robyn Jackson recommended copper when I was taking the very high zinc supplements she prescribed to help my prostate, after my PSA figure doubled. It dropped again aided by treatment from Dr Gorringer and I discovered that the PSA figure decreased after abstaining for two weeks. I wonder how many know this? A low figure keeps your

doctor off your back and a surgeon from getting into it.

A copper supplement is Dr Vera's Pure Innovation copper gluconate 4.3 mg and equals 2 mg of elemental copper, from Robyn Jackson N.D, Natural Diagnostics, 8 McNicol St, Hamilton. Phone 07-853-7080. robyn.jackson.nd@xtra.co.nz