

Trace Mineral Requirements for Cattle, Sheep, and Horses

Element	Beef Cattle		Sheep		Horses	
	Reqmt	Maximum Tolerable	Reqmt	Maximum Tolerable	Reqmt	Maximum Tolerable
Co, ppm	0.10	10	0.10-0.20	10	0.05	25
Cu, ppm	10-15	100	7-11	25	10	250
I, ppm	0.50	50	0.10-0.80	50	0.35-0.40	5
Fe, ppm	50	1,000	30-50	500	40-50	500
Mn, ppm	20-40	1,000	20-40	1,000	40	400
Mo, ppm	NA	5	0.5	10	NA	20-100
Se, ppm	0.10	2	0.10-0.20	2	0.10	2
Zn, ppm	30-40	500	20-33	750	40	500

NRC. 1996. Nutrient Requirements of Beef Cattle. (7th Ed.) National Academy Press, Washington, DC.

NRC. 1985. Nutrient Requirements of Sheep. (6th Ed.) National Academy Press, Washington, DC.

NRC. 2007. Nutrient Requirements of Horses. (6th Ed.) National Academy Press, Washington, DC.

1. These requirements are given as concentration of a mineral required in **the total diet DM**. This means you must include all the ingredients the animal is consuming.
2. Notice from the above “Maximum Tolerable” levels, that sheep are much more sensitive to Cu toxicity than are cattle. **DO NOT feed a TM supplement formulated for cattle to sheep**. It may contain too much Cu.
3. Remember, 1 ppm = 1 mg/kg.

Example of how to calculate how much of a mineral an animal is consuming

A cow is consuming on a daily basis: 30 lbs of alfalfa/grass hay (90% DM; 7 ppm Cu DM basis) and 4 oz of a commercial trace mineral mix (97% DM; 500 ppm Cu DM basis).

Let’s calculate Cu supply.

Hay: 30 lbs x 0.90 = 27 lbs DM basis

27 lbs DM basis x 0.454 kg/lb = 12.26 kg hay

12.26 kg hay x 7 ppm (or 7 mg/kg) Cu = 85.8 mg Cu from hay

Mineral mix: 4 oz x 0.97 = 3.9 oz DM basis

3.9 oz DM basis x 28 g/oz = 109.2 g mineral mix
(16 oz in 1 lb, 454 g in 1 lb, 454 g/16 oz = 28 g/oz)
109.2 g mineral mix /1000 = 0.109 kg mineral mix
0.109 kg x 500 ppm (or 500 mg/kg) Cu = 54.5 mg Cu from mineral mix

Total Cu in the diet: 85.8 mg Cu + 54.5 mg Cu = 140.3 mg Cu

Total DM intake by cow: 12.26 kg hay + 0.109 kg mineral mix = 12.37 kg

140.3 mg Cu/12.37 kg DM intake = 11.3 mg/kg Cu or 11.3 ppm Cu

Compare this number to Cu requirement, and to the maximum tolerable level.

Cu requirement = 10-15 ppm, Maximum tolerable Cu = 100 ppm

Cu in the total diet DM = 11.3 ppm

So, the requirement is being met, and the animal is not consuming a toxic level.

Notice:

1. If you just compared the Cu content of the hay (7 ppm) to the requirement (10-15 ppm), you would conclude that the animal was deficient.
2. If you just compared the Cu content of the TM supplement (500 ppm) to the maximum tolerable level (100 ppm), you would conclude that the animal was consuming a toxic amount.