Table 1. Function and importance of minerals deficient in hay and pasture, Harrison County, Indiana.[1]

Mineral Deficiency	**Function and Importance**	**Symptoms associated with deficiency**	**NRC minimum daily intake[2]**
Copper	Central nervous system, iron metabolism (ceruloplasmin enzyme), cartilage and bone development, copper-dependent antioxidant enzymes	Loss in nerve conduction and coordination, anemia, liver iron overload, abnormalities in bone, cartilage, tendons and ligaments (e.g., developmental orthopedic disease), suboptimal immune function	100 mg
Zinc	Cartilage and bone development, insulin production and release, keratin formation, zinc-dependent antioxidant enzymes	Inhibits bone building/ remodeling and cartilage growth, reduced insulin levels and reduced glucose tolerance, poor-quality hoof horn, poor coat, predisposition to skin infections, suboptimal immune function	400 mg
Sodium	Absorption of nutrients, normal functioning of all nerve and muscle tissues	Fatigue and muscle weakness	10 grams
Selenium	Selenoprotein in skeletal muscle, potent antioxidant, selenium-dependent enzyme converts thyroid hormone T4 to T3, most potent/active	Muscle pain/cramping, suboptimal immune function, low thyroid function	1 mg (higher levels recommended, see Part 3 above)

	hormone		
Iodine	Thyroid gland, production of thyroid hormones	Hyperthyroidism rare, secondary hypothyroidism more common (related to other secondary disorders, such as nutrition, and not to thyroid gland)	3.5 mg

[1] Table based on nutrition course "NRC Plus" offered by Eleanor Kellon, VMD, publications of Kentucky Equine Research, and recommendations of the National Research Council (Nutrient Requirements of Horses, 2007).

[2] Average maintenance level 500 kg (1100 lb) adult horse.