Nutritional Hazards from Nutrients or Food Additives	Species	Clinical Signs of a Deficiency	Species	Clinical Signs of Toxicity
Minerals/Elements				
Iodine	All	Goiter	Cattle	Decreased feed intake, decreased milk production, rapid breathing, nasal and ocular discharge, dry hair coat and hock lesions
Phosphorus	All	Adverse effects rare	horses and ruminants, especially sheep and cattle	Urinary calculi, blockage of urine flow, secondary hyperparathyroidism in horses
Copper	All	Poor growth: copper used by every cell of the body and there are several important copper-dependent enzymes	Ruminants are the most sensitive: cattle, sheep and goats; dogs: Bedlington Terriers	In ruminants, excess copper causes hemolytic anemia; in dogs: weakness, vomiting, anorexia, weight loss, and neurological signs..
Iron	Newborn piglets	Anemia, dyspnea, anorexia, increased infections and poor growth with some deaths	Piglets and neonatal horses	Pig: Sudden death, gastrointestinal necrosis, depression; neonatal horses: jaundice, weakness and death from liver failure.
Manganese	Horses and dogs	Delayed estrus, reduced fertility and abortions. Foals are born with skeletal deformities and muscle contractures. In dogs, deficiency can cause crooked and shortened soft bones.	Pigs	Pugs: decreased growth, anemia and abdominal discomfort.
Molybdenum	Ruminants	Associated with cooper toxicity in ruminants	Ruminants	Related to deficiencies in copper-containing enzymes; feed refusal, lethargy, weakness and recumbency. Cattle have profuse salivation, ocular discharge, severe diarrhea, poor growth, weight loss, achromotrichias, alopecia, limb deformities, bone fractures, lameness, lack of libido, ataxia and mucoid feces.
Selenium	All	Essential for life as an antioxidant in conjunction with vitamin E.	Cattle, swine poultry and horses.	Bilateral symmetric alopecia, and dystrophic hoof growth. Cattle and horses: anorexia, unthriftyness, liver cirrhosis, nephritis, myocardial necrosis, loss of vitality, and lameness. Swine: reduced growth. Poultry: reduced weight gain and feed efficiency, poor hatchability and deformed, rudimentary, or lack of legs, toes, wings beaks and eyes in the young.

Sodium chloride	All	Hyponatremia	dogs, cattle, swine and poultry.	Swine are the most sensitive when water intake is severely restricted or with high-salt diets and only moderate water restriction. Swine: anorexia, thirst, restlessness, pruritus and constipation; progress to aimless wandering, head pressing, circling, or pivoting around a limb; seizure like activity and assume a dog-sitting position, draw its head back in a jerking motion and fall over on its side. Cattle: gastroenteritis, weakness, dehydration, tremors and ataxia; appear to be blind, and develop seizure like activity or partial paralysis including knuckling over at the fetlocks.. Poultry: depression, weakness, dyspnea and sudden death. Dog: vomiting, diarrhea, muscle tremors and seizure-like activity..
Sulfur	All and especially cats	Cats cannot synthesize taurine from methionine, making it an essential nutrient in their diet. Monograstrics need sulfur to synthesize thiamine, biotin and methionine as essential nutrients.	All species especially cattle	Ruminants: Abdominal pain, colic, rumen stasis, fetid diarrhea, dehydration, metabolic acidosis, tachypnea, recumbency and hydrogen sulfide smell; leading to polioenchephalomalacia. Irritation, edema, and hemorrhage of the gastrointestinal tract and respiratory tract. Monogastrics: decreased egg production in chickens, decreased feed intake and deaths.
Zinc	All	Essential for metalloenzymes.	All	Swine are the least susceptible to intoxication compared with other livestock with clinical signs of reduced rate of gain or decreased milk production that progresses to anemia, and jaundice; exophthalmia, polydipsia, polyphagia and seizures. Most species display some degree of hemolytic anemia with kidney damage, hematuria, urinary casts and proteinuria.

Ionophores				
Monensin, lasalocid, salinomycin, narasin, laidlomycin propionate and maduramicin			Cattle, swine, poultry, dogs, cats and horses. Horses are very susceptible to accidental ionophore (monensin) poisoning due to improper mixing, labeling or cleaning during manufacturing.	Clinical signs are similar in all species where feed refusal in the observed clinical sign, with weakness, ataxia, and incoordination, tremors, stumbling, exaggerated stepping, hesitant to move or turn, tachycardia, congested mucous membranes, hypotension, dyspnea, hyperpnoea, seating, recumbency and death. Death can occur months after a poisoning incident due to residual tissue damage. Horses: present with unthriftyness, poor performance, poor exercise tolerance, arrhythmias pitting edema, hyperpnoea, or death.. Cattle: varying severity from decreased feed intake to severe cardiac, skeletal muscle and gastrointestinal effects. Lasalocid and monensin toxicosis in cattle cause varying degrees of anorexia, depression, muscle tremors, weakness, incoordination and ataxia, tachycardia, tachypnea, labored respiration, watery diarrhea, rumen atony, dehydration and death. Sheep clinical signs mimic cattle. Pigs: gastrointestinal and neuromuscular effects with stiffness, tremors, reluctance to move knuckling, diarrhea, anorexia, lethargy, ataxia, dyspnea, recumbency, myoglobinuria, and death. Dogs: neurologic or muscular with depression, weakness, ataxia, paresis, myoglobinuria, recumbency, paraplegia, quadriplegia, dysuria, fecal and urinary incontinence, partial anorexia, constipation, weight loss, and dyspnea. Cats: displayed weakness, paresis, paralysis, dysphonia, loss of spinal reflexes with intact conscious pain perception, dyspnea and death. Poultry: anorexia, diarrhea, depression, squatting, sternal recumbency, ataxia, drooped heads, drooped wings, weight loss, weakness, proprioceptive deficits, paralysis and death.
Non-protein Nitrogen				
Urea, urea phosphate, biuret, ammonium phosphate, monoammonium phosphate, and ammonium acetate.			Ruminants: mainly cattle but also sheep. Monogastrics: horses	Uneasiness, muscle and skin tremors, dyspnea, tachypnea, frequent urination and defecation, stiffening of the front legs, and prostration. Other signs include colic, rumen atony, bloat, regurgitation, cardiac arrhythmias, cyanosis and marked jugular pulse, and terminal convulsions and death. Head pressing in horses.
Amino Acids				
Methionine and lysine			Poultry	Reduced weight gain, feed efficiency and feed intake.