

# Metabolic Bone Disease

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What is metabolic bone disease?

Metabolic bone disease in reptiles is a condition that results from improper calcium metabolism. It has its primary effect on the bones of the body, and can be crippling and even fatal if not treated promptly. Metabolic bone disease may also be referred to as:

- Osteoporosis (thinning of the bones resulting in brittleness and fractures)
- Osteomalacia (softening of the bones, causing them to become misshapen)
- Rickets (softening of the bones in young animals, especially the long bones)
- Fibrous osteodystrophy (softening of the bones and an increase in the amount of supportive connective tissue, most commonly affecting the jaw)
- Secondary nutritional hyperparathyroidism (low levels of calcium in the blood lead to increased production of parathyroid hormone, which removes calcium from the bone)



What causes metabolic bone disease in reptiles?

Calcium and phosphorus are the major mineral components of bones. Although bones may seem solid and unchanging, in reality calcium and phosphorus are continually being added to bones and then reabsorbed. The process is very dynamic.

In a proper diet, the concentration of calcium compared to phosphorus should be 1:1 to 2:1. In addition, there needs to be an adequate amount of Vitamin D3 to help the body absorb and use the calcium. Imbalances that may lead to metabolic bone disease can occur as a result of:

- Low levels of calcium in the diet
- High levels of phosphorus in the diet
- Low or high levels of vitamin D3 in the diet
- Presence of substances in the diet that negatively affect calcium absorption (oxalates, fat)
- Inadequate amounts of protein in the diet
- Insufficient exposure to ultraviolet A (UVA) and ultraviolet B (UVB) which are necessary for the body to produce vitamin D3
- Diseases of other organs that affect the metabolism of calcium, phosphorus and/or vitamin D3 (kidneys, small intestine, parathyroid gland, liver)
- Poor environmental conditions, such as cool temperatures, which impair digestion and calcium absorption



Which reptiles are at risk for metabolic bone disease?

Metabolic bone disease is most commonly seen in reptiles that require ultraviolet light (sunlight) for the production of vitamin D3. These include lizards, especially iguanas, as well as turtles. It is rare in snakes, who do not require ultraviolet light for the synthesis of vitamin D3, and who generally eat whole prey, which provide the proper balance of calcium and phosphorus.

Metabolic bone disease is, by and large, a disease seen when the diet and husbandry needs of the particular species are not being met. Herbivorous lizards fed diets either low in calcium, high in oxalates, or high in phosphates are at risk, as are those who do not have access to UVB light. Carnivorous reptiles can also develop metabolic bone disease if they are fed insects or other foods that are not supplemented with calcium.

What are the signs of metabolic bone disease?

Signs and symptoms of metabolic bone disease in herps include:

- Swollen limbs
- Bowed legs
- Swollen and softened jaw (rubber jaw) and rounded head
- Lameness
- Inability to climb, walk, or lift the trunk of the body off of the ground
- Paralysis (animals may drag their hindquarters)
- Muscle tremors or jerky movements
- Generalized weakness
- Loss of appetite
- Loss of weight

- Lumps or hard bumps on the limbs or along the spine
- Softening of the shell in turtles
- Constipation

How is metabolic bone disease diagnosed?

The diagnosis of metabolic bone disease is based on the findings of the physical exam, and the diet and husbandry history of the animal. Radiographs (x-rays) may help assess the severity of the disease, determine if there are any fractures present, and follow the progress of treatment.

How is metabolic bone disease treated?

The diet and husbandry conditions that led to the development of metabolic bone disease must be corrected.

Adequate and balanced levels of calcium, phosphorus, and protein must be provided. For herbivores, know that lettuce and fruits are generally low in calcium, so concentrate on giving your herp dark green vegetables that are low in oxalates. Usually a calcium supplement will also be necessary. For herps primarily eating insects, feed the insects with calcium-rich supplements prior to feeding them to your herp. In addition, they can be dusted with a calcium supplement. For carnivorous herps, remember that a meat only diet is extremely low in calcium. If possible, offer whole prey items that include the bones. Pinky rats and mice also do not contain sufficient calcium since their bones have not matured. Thus, calcium supplementation would be necessary. Always review your herp's diet with your veterinarian to assure the proper amounts and balance of calcium and phosphorus are being fed.



The reptile should be exposed to 12 hours of UVB light each day. Natural sunlight is best, but the UVB does not penetrate plastic or glass, so mesh screening is required between the light and the animal. Do NOT expose a reptile to direct sunlight while the herp is in a glass or plastic cage, as overheating can quickly develop. If exposure to sunlight is not an option, fluorescent lighting will work. Use only full spectrum-with UVB bulbs designed for herps that have the UVB in the range of 290-320 nanometers. The light should be positioned no less than 18 inches from the animal (12 inches is optimal). Bulbs should be replaced every 6 months. Again, make sure the light is not filtered through plastic or glass.

For diurnal herps, the proper light/dark cycle should be provided. Research the needs of your herp and talk to your veterinarian regarding the optimum cycle.

The proper temperature gradient should be maintained. Again, research what is the optimal temperature gradient for your herp and discuss it with your veterinarian.

Provide room for adequate exercise. If your herp has difficulty moving or your veterinarian says your herp has or is susceptible to fractures, you will need to restrict exercise at first. You may need to remove any branches your herp would attempt to climb. If climbing is restricted, remember your herp will not be as close to the basking light, so be sure to measure the temperature of the basking area to be sure it falls within the optimal gradient.

In very mild cases, the above changes may be sufficient. In more severe cases, oral or injectable calcium supplements such as calcium glubionate (NeoCalglucon), calcium lactate (Calphosan) or calcium gluconate are indicated. In addition, after the serum calcium level is normal, calcitonin may be prescribed. For severe cases, it may be necessary to tube feed the animal until he regains strength.

How is metabolic bone disease prevented?

Metabolic bone disease is very easily prevented by providing the correct diet, adequate exercise, and exposure to UVB light.