Hind Leg Paralysis

By Suz Enyedy

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Also known as HLP, secondary metabolic bone disease, hypocalcemia, or calcium deficiency, hind leg paralysis is the body's inability to properly synthesize calcium, resulting in the bones not getting enough calcium. In severe cases, the calcium is also leached from the muscles, causing paralysis of the hind legs. Although a diagnosis of HLP used to be considered an automatic death sentence, if caught early and treated properly, HLP can be healed and the sugar glider can continue to lead a long and productive life.

Pika's rear leg is unusually angled at 90º because of HLP.
If you look closely, you can also see that her knuckles are swollen.

Symptoms:

- Severe shaking
- Apparent dizziness
- Lack of coordination
- Lethargy
- Limping
- Weakness
- Loss of use of hind legs (dragging one or both legs)
- Swollen toes and/or fingers
- Sudden broken bones with no apparent cause
- Joint stiffness
- Sudden, inexplicable weight loss

These pictures show Pika's swollen fingers and toes - our first indication that something was wrong with her.

Please note that many of these symptoms listed can also be indicative of other serious health issues. Self-diagnosis of any medical condition can be harmful to your glider. Make sure that if you see any of these symptoms in your glider, immediate veterinary care is obtained for proper diagnosis and treatment.

Causes:

- Primary bacterial or parasitic infection
- Not enough calcium in the diet
- Mineral imbalance in the diet
- Too much protein in the diet

The complete diet of the glider should be evaluated to determine whether it might be the cause of HLP. Make sure that your glider is being given a nutritionally complete diet with a balanced calcium-to-phosphorus ratio of 2:1, and that all components of the diet are being eaten. If a glider is picking and choosing its foods and not eating one of the components, the nutritional balance can be thrown off. This was the case with Pika. She would only eat the proteins being provided and did not eat her fruits and vegetables very much. This over-balance of protein in her diet actually inhibited her body's ability to synthesize the calcium so that although her blood level of calcium was elevated above the normal level, her bones were not receiving that calcium and HLP was the result.

The calcium-to-phosphorus ratio of the diet is not the only concern. Many vitamins can react adversely with each other. Some will prevent the absorption of certain minerals and vice versa. Too much Vitamin C, for example, will prevent the absorption of calcium.

In addition, it should be noted that too much calcium is just as harmful as not enough. When too much calcium is given to a sugar glider, the result can be kidney stones, crystals in the urine, gallstones and/or calcium deposits on the bones, joints, muscles, and organs.

There are several proven diets available. These diets have been devised in consultation with veterinarians and nutritionists to ensure overall nutritional and mineral balances for the complete health of sugar gliders. Any of the proven diets should be followed exactly and you should not "pick & choose" from the various diets and combine them because this will throw off the nutritional balance of the diet. Some of the proven diets available for sugar gliders include:

- Back to Basics BML (Bourbon's Modified Leadbeater's Mix)
- Darcy's Diet
- HPW (High Protein Wambaroo) Diet
- PML (Pocket's Modified Leadbeater's)
- Suncoast Diet
- The Sugar Glider Exotic Diet

Diagnosis:

Veterinary diagnosis is needed to determine whether a glider does or does not have HLP. A number of tests need to be run at the time of the veterinary examination. The most important tests include:

- X-ray to look for calcification of the joints or weak joints. In a glider with HLP, the joints will appear cloudy and indistinct as shown in this x-ray of Pika.

This Xray was taken of Pika during her follow up appointment for HLP in January, 2006.

The outlined areas show key areas of concern. Note that the top of the image is her left side and the bottom is her right side. Starting with her tail, and then proceeding clockwise, the concerns were:

    - **Disjointed vertebrae in tail**
    - **Cloudiness of joints in right foot, indicative of deterioration of joints**
    - **Bone spur on right shin, indicative of possible previous break that did not heal properly**
    - **Extreme cloudiness of right knee, indicative of advanced deterioration of joint and bone matter**
    - **Cloudiness of right elbow, indicative of deterioration of joint**
    - **Cloudiness of right shoulder, indicative of deterioration of joint**
    - **Cloudiness of left elbow, indicative of deterioration of joint**
    - **Cloudiness of joints in left foot, indicative of deterioration of joints**

- Urinalysis to determine whether a urinary tract infection (UTI) is present, which could be the underlying cause.
- Fecal float and smear to determine whether a parasitic infection is present, which could be the underlying cause.

Another test that may be run is a complete blood analysis. One of the things that the veterinarian will evaluate from the results is the overall calcium-to-phosphorus ratio. Blood testing can be difficult with gliders, because a maximum of 1% of the total glider's mass can be safely withdrawn, so for a 100-gram glider, only 1 gram of blood can be taken. Gliders often lose weight quickly after the onset of HLP, and if the glider is not heavy enough, it is possible that not enough blood will be obtained for the tests to be run.

In addition, because of this weight loss, sometimes the arteries will collapse as the veterinarian tries to withdraw blood from the normal areas; in that situation, the veterinarian may attempt to withdraw blood directly from the vena cava (the main artery to the heart), which is a very risky procedure.

The onset time of the symptoms noticed can be indicative of the cause of the HLP. If the symptoms set in gradually, then the HLP is related to the diet. If the onset of symptoms is immediate (overnight), then it is imperative that other things are checked, such as x-rays for injury and testing for bacterial or parasitic infection. Also, if the onset is immediate, then blood tests will be inconclusive because the mass infection or parasite will inhibit the nutrients from being absorbed into the system as needed. The blood test results will then show a serious deficiency, giving a false indication of diet being the cause of the HLP. When immediate onset symptoms are exhibited, a bacterial culture and sensitivity (C&S) should be run with an antibiotic (Baytril®) and an antiparasitic (Metro®) being administered until the test results come in. Please note, however, that all tests MUST be run before antibiotics are administered. If the antibiotics are administered before the bacterial C&S, the results of the test will be skewed and it may never be determined what type of bacteria was present and which meds are the correct ones to be administered.

Treatment:

Gliders that have been diagnosed as having HLP should be treated with an oral calcium supplement, such as Neocalglucon® (only available through a licensed veterinarian). The actual amount administered is determined by the veterinarian and is based on the glider's weight. Normal course of treatment with oral calcium supplement is two weeks, although this time may be extended in severe cases. In some cases, the veterinarian will administer an injection of calcium to jump-start the healing process.

In addition, an antibiotic should be prescribed. If a specific infection has been found during veterinary examination, an appropriate antibiotic will be prescribed accordingly. If no infection can be found, a broad-spectrum antibiotic (such as Baytril®, SMZ-TMP® or Clavamox®) should still be prescribed as a prophylactic for a course of 7-10 days, because primary infection is the leading cause of HLP in sugar gliders. Again, the veterinarian will determine the dosage based on the glider's weight. Along with the antibiotic, an antiparasitic should be prescribed (such as Metro®) in case the infection is parasitic rather than bacterial.

The veterinarian will continue to examine the glider regularly to monitor its progress. All appointments for follow-up care should be kept. Follow-up x-rays should be performed 2-3 months from the beginning of treatment to analyze the progress of treatment. Other diagnostic procedures may also be performed at the recommendation of the treating veterinarian.

Pika is pictured here at Thanksgiving, 2006, just a year after her initial diagnosis of HLP. Although her mobility was limited by the permanent damage to her hind legs, she did very well in getting around. Pika passed away on March 12, 2007, from an unrelated neurological problem. I will forever miss her and her gentle, loving nature. This article was written as a tribute to my beautiful Pika.

If you feel your glider is sick, please seek immediate veterinary assistance. The information on this page and in the correlating articles is for general educational purposes and is not intended to replace proper vet care.

Please do not try to self-diagnose or self-treat your glider.

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