

## **Ferret Insulinomas**

Insulinomas are insulin-secreting tumors of the pancreas and are considered to be the most common neoplasm in ferrets. Typical signs associated with these tumors are related to the hypoglycemia (low blood sugar) and include lethargy, difficulty in waking from a deep sleep, stuporous staring, collapse, and hind limb weakness. Other signs include nausea as exhibited by pawing at the roof of the mouth and ptyalism (slobbering). Ferrets with severe hypoglycemia may be recumbent or exhibit seizures.

A tentative diagnosis for insulinoma is based on the history, suggestive clinical signs, and hypoglycemia (low blood sugar). Insulinomas are characterized episodic hypoglycemia causing the clinical signs mentioned above and dramatic reversal of these signs by administering glucose or feeding. There are other causes for hypoglycemia and the associated signs that should be considered, such as prolonged anorexia or starvation, sepsis (systemic infection), liver disease, and other neoplasms, such as lymphoma; however, in a ferret, insulinoma is the most likely cause. Ferrets not exhibiting signs for this disease at presentation can be screened by testing a blood sample for glucose concentration collected after a 4- to 6-hour fast.

The choice of medical or surgical management of a ferret suspected of having an insulinoma depends, in part, on age of the patient, presence of other preexisting disease(s), severity of the disease, and owner preferences. The surgical option is the treatment of choice, whereas, the medical option is aimed at controlling clinical signs of hypoglycemia.

It is important to note that medical management of insulinoma does not affect or stop progression of the pancreatic tumor. Prednisone or other glucocorticoids are the drugs of choice in the medical treatment of ferrets with insulinoma. These drugs increase the blood glucose concentration and inhibit insulin metabolism. A liquid oral prednisone suspension is given twice daily. It is common for the effectiveness of prednisone therapy to become progressively less over time and subsequent increases in the dose is required; often with decreasing benefit. Other drugs may be added to the medical treatment on an individual basis.

Surgery is the treatment of choice in ferrets without certain preexisting diseases (except adrenal disease) and when medical therapy fails. Surgery should not be considered curative because many ferrets have diffuse microscopic disease and not all affected tissue can be removed, resulting in persistence or recurrence of clinical signs. However, surgery can temporarily stop or slow the disease progression, resulting in a prolonged disease-free interval. Ferrets treated surgically for insulinoma generally have a mean survival time of 668 days (range: 219 to 1,002 days); whereas those treated solely with medical therapy had a mean survival time of only 186 days (range: 36 to 273 days).

Complications relating to pancreatic surgery are rare in ferrets. Some ferrets continue to have hypoglycemia (low blood sugar) following surgery. Others develop transient hyperglycemia (high blood sugar) that resolves within weeks and typically does not require insulin treatments. Most will develop a recurrence of hypoglycemia (low blood sugar) at some point following surgery.