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## GASTRIC ENDONEUROCRINE CARCINOMA (SOMATOSTATINOMA) IN A BEARDED DRAGON, *Pogona vitticeps*

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**ABSTRACT:** A 2.5-year-old male bearded dragon presented with a 1-week history of anorexia and lethargy. The owner had force fed the patient 1 hour before presentation. Physical examination revealed a slightly depressed reptile in good body condition with moderate dehydration. Coelomic palpation revealed a bloated stomach with a possible mass in the center. Blood for a CBC and Blood Chemistry profile was taken and 10 cc lactated ringers was given intracoelomically. The owners declined radiographs. The patient was prescribed amikacin 5 mg/kg subcutaneously every other day while bloodwork was pending.

The following day the blood profile showed anemia and a mild leukocytosis with lymphopenia and monocytosis. Significant blood chemistry findings included hyperglycemia and a bile acids level within the ambiguous range (30-60  $\mu\text{mol/l}$ ) (Table 1).

The CBC demonstrated a chronic inflammatory reaction suggestive of infection or neoplasia. The bile acids were suggestive of hepatic involvement. The most alarming finding was the severe hyperglycemia which could have been the result of diabetes mellitus (rare in reptiles), stress, pancreatitis, or hormonally active neoplasia (somatostatin or glucagon). The owner was contacted and a coelomic ultrasound was suggested along with the possibility of insulin therapy. The owner claimed the patient was acting better and declined.

Three days later, the bearded dragon presented again with vomiting of 24 hours duration. An anterior coelomic mass in the area of the stomach was easily palpable at this time. An in-house glucometer reading was greater than 500 mg/dl. An intraosseous needle was placed in the proximal tibia 0.9% NaCl was administered. Radiography revealed a large intraluminal mass in the stomach region. Ultrasonography demonstrated no signs of metastasis. Regular insulin was given subcutaneously at 0.25 units/kg.

That afternoon, the patient was anesthetized with sevoflurane given through face mask and prepped for surgery. A paramedian incision was made and the coelom explored. A larger intraluminal mass in the stomach was discovered and multiple white masses of less than 1 mm in diameter were visualized in the liver. A gastrotomy was performed and the intraluminal mass was removed to relieve luminal obstruction. Hepatic biopsies were obtained and the stomach was closed with an inverting layer of 4-0 vicryl and the coelomic wall and skin were closed with 3-0 monofilament nylon. Meloxicam at 0.2 mg/kg was given postoperatively for pain control. A postoperative blood glucose was still greater than 500. Despite a routine anesthetic recovery, the patient died early the following morning.

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Histopathology of the gastric mass revealed a neuroendocrine gastric carcinoma with hepatic metastasis. Immunohistopathologic staining was strongly positive for somatostatin and slightly positive for glucagon.

## DISCUSSION

Somatostatinoma is a recently discovered syndrome seen in bearded dragons (Ritter et al., 2009; Lyons et al., 2010). Neuroendocrine gastric carcinomas can be well or poorly differentiated histologically. The most clinically significant aspect of these tumors is the immunohistochemical demonstration of large reservoirs of somatostatin in the tissues. Somatostatin suppresses the pancreatic secretion of insulin and lowers insulin receptor sensitivity, resulting in the hyperglycemia seen in this syndrome. Other causes of hyperglycemia in reptiles are stress associated hyperglycemia, starvation, and hyperglycemia during the breeding season (Mader, 2006). These etiologies rarely cause a marked or persistent hyperglycemia as the ones seen in this case. At this time, true diabetes mellitus has never been proven to naturally occur in reptiles.

Interestingly, gastric neuroendocrine carcinomas in bearded dragons have been shown to be low in neurofibromin expression, a protein associated with the suppressor gene for somatostatinomas (von Recklinghausen disease) in humans (Klöppel and Anlauf, 2005). This suggests a possible genetic etiology for this disease in bearded dragons.

In this case the ultrasound probably did not demonstrate the hepatic metastasis due to the size of the tumors being below the sensitivity of the instrument.

## SUMMARY

Somatostatinoma is an emerging syndrome in bearded dragons. All reported cases have been young (less than 3.5 years old) and severe hyperglycemia is the most significant clinical sign. The neoplasm metastasizes aggressively and prognosis is poor.

**KEY WORDS:** gastric endoneurocrine carcinoma, somatostatinoma, bearded dragon

## REFERENCES

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**Table 1.** Blood chemistry findings on an anorexic male bearded dragon.

Parameter	Results	Reference Range
WBC estimate	11,000	400-10,000
RBC morphology	Normal	Normal
Blood parasites	None Seen	None Seen
Heterophils	50%	40-70%
Bands	0%	0%
Lymphocytes	8%	18-50%
Monocytes	0%	0-3%
Eosinophils	0%	0-2%
Basophils	0%	0-1%
Toxic changes	None	None
Thrombocyte estimate	Adequate	Adequate
HCT	29%	42-55%
SGOT	161 IU/L	20-350 IUI/L
Total protein	5.8 g/dl	3.0-5.5 g/dl
Calcium	10.3 mg/dl	7.6-12 mg/dl
Glucose	1623 mg/dl	180-350 mg/dl
Uric acid	2.1 gm/dl	2.0-10 gm/dl
LDH	3193 IU/L	50-350 IU/L
Bile acids resting	53.8 umol/L	20-40 umol/L