# A Long Recovery Road for Norrie: Exotic Animal Nutritional Needs and Deficiencies

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# Part I – Welcome Home, Norrie

"She's so cool!" Josh's face lit up as he looked inside the box to see a small green iguana blinking back up at him. "I've been waiting so long for this! I'm going to name her Norrie."

Josh's mom smiled as she brought in the enclosure and heat lamps from the car. She and Josh had just moved to Massachusetts from New York, and it was now legal to own an iguana. Josh's mom thought getting a pet would make the transition easier.

She had purchased Norrie that afternoon at the local pet store. Green iguanas were fairly inexpensive at that location. She wanted to make sure she and Josh were prepared to care for Norrie, so she purchased everything that the store employee had recommended.

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Consider the following two webpages as you answer the questions below. Please cite any other resources you consult.

- Pollock, C. (2012). Basic information sheet: green or common iguana [webpage]. LafeberVet. <a href="https://lafeber.com/vet/basic-information-sheet-for-green-or-common-iguana/">https://lafeber.com/vet/basic-information-sheet-for-green-or-common-iguana/</a>
- Long Island Bird and Exotics Veterinary Clinic. (n.d.). Iguana care guide [webpage]. <a href="https://www.birdexoticsvet.com/iguana-care-tips">https://www.birdexoticsvet.com/iguana-care-tips</a>

#### **Ouestions**

- 1. Describe the natural habitat of a green iguana. Include details about the climate and vegetation of the area in which it normally lives. Describe what features a home enclosure might require to simulate this environment.
- 2. What is meant by the term "exotic pet"? What are the challenges of owning an exotic pet?
- 3. What responsibilities would a pet store have with respect to selling exotic animals? A breeder?
- 4. What responsibilities would accompany anyone purchasing an exotic animal?
- 5. In states such as New York and Hawaii, it is illegal to own iguanas. Many states limit ownership of other exotic pets without the possession of a special permit. Speculate as to why these laws exist.

### Part II — Norrie's Nutritional Needs

"You'll need to give Norrie this reptile food every day and plenty of water," Josh's mom said as she took the bag of IguanaMAX pellets out of the trunk.

"Of course! I'll make sure she has everything she needs. Thanks, Mom!"

Josh was very excited about his new pet and immediately began reading the label on the food his mother had given him. He wanted to know what Norrie should eat and how much. The details of the label are shown below.

### **IguanaMAX**

#### **Guaranteed Analysis**

Crude protein (min)......18%
Crude fat (min)......2%
Crude fiber (max)......16%
Moisture......12%

#### Ingredients

Corn, soybeans, wheat germ, dried apple, calcium carbonate, dicalcium phosphate, salt, ascorbic acid, choline chloride, dried mango, vegetable oil, methionine supplement, vitamin E supplement, ferrous sulfate, potassium chloride, zinc sulfate, zinc oxide, manganese sulfate, niacin, copper sulfate, biotin, vitamin B12 supplement, vitamin A acetate, riboflavin, sodium selenite, thiamine mononitrate, sterol, vitamin K supplement, cobalt carbonate, inositol, folic acid, artificial color, artificial flavor.

#### **Feeding Instructions**

Freely offer Iguana Max in a clean container each day. Iguana Max may be offered moistened or dry. Discard any uneaten moistened food daily. Small amounts of fruit may be offered in addition periodically. Ensure excess water is always available.

When he started examining the food, Josh realized he didn't understand most of the information. He decided he had better start doing some research. He quickly learned that pet food commonly contains proteins, carbohydrates, lipids, vitamins, and minerals.

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Use the following resource to help you answer the questions below:

• Freemoan, L.M. (December 28, 2020). What is guaranteed about the Guaranteed Analysis [webpage]? Cummings School of Veterinary Medicine, Tufts University. <a href="https://vetnutrition.tufts.edu/2020/12/what-is-guaranteed-about-the-guaranteed-analysis/">https://vetnutrition.tufts.edu/2020/12/what-is-guaranteed-analysis/</a>

#### **Ouestions**

- 1. Briefly define and provide a purpose for each element of pet food: proteins, carbohydrates, lipids, vitamins, and minerals.
- 2. For each of the ingredients listed on the label of Norrie's food, determine if it should be primarily categorized as a protein, carbohydrate, lipid, mineral, or vitamin. Some ingredients may fall in multiple categories. Please ignore the artificial color and artificial flavors as their composition is unknown.
- 3. What is the relationship between the guaranteed analysis and the individual ingredients? Do you think pet owners should be more concerned with a pet food's ingredients or guaranteed analysis? Why?
- 4. For each of the following vitamins/minerals (see table on next page), indicate (1) why animals need it, (2) an organ or organ system for which it is vital, and (3) examples of the type of food from which an animal might get this nutrient.

Nutrient or Vitamin	Why do animals need it?	Vital for which organ/organ system?	Food source?
Calcium			
Iron			
Magnesium			
Manganese			
Phosphorus			
Potassium			
Sodium			
Vitamin A			
Vitamin B12			
Vitamin D			
Vitamin E			
Vitamin K			
Zinc			

5. Calcium is a very important mineral to both humans and iguanas. Veterinarians suggest that most reptiles have a calcium powder dusted on their food once or twice a week. Why might this be necessary for reptiles but not for humans?

## Part III — Norrie's Clinical Presentation

Even after his initial excitement wore off, Josh followed the feeding instructions on the iguana food label diligently. He made sure Norrie's UV/heat lamp was positioned properly and that her tank was kept clean. Despite his care, as the months progressed Norrie began to appear increasingly ill. She was eating, albeit less than normal, and she was lethergic. She seemed to struggle when moving. Josh and his mom decided to take Norrie to a veterinarian.

Josh's mom called several different vets in town. When she explained the situation to the first two, they both expressed concern over Norrie's condition, but told her that they did not see exotic pets. Finally, she found a reptile specialist, Dr. Ibrahim, who agreed to evaluate Norrie that day.

When they arrived in the clinic, they were given a form to fill out that asked a variety of intake questions about Norrie's husbandry. Some of these questions were challenging to answer, which made Josh and his mom extremely nervous. Would Norrie be okay? What was wrong?

View the completed intake form for Norrie now (see next two pages).

Dr. Ibrahim performed Norrie's intake exam and found the following results:

1. Why might a clinician make the decision to see or not to see exotic pets?

- Heart rate: 50 beats per minute (normal: 40–80 bpm)
- Respiratory rate: 4 breaths per minute with normal effort (normal: 5–20 bpm)
- Weight: 0.4 kg (based on Norrie's size, normal: 0.5 kg)
- Body condition score: 3 (scale of 1–9 where 1 indicates emaciated and 9 indicates obese)
- Attitude and appearance: Norrie is a female, green iguana. There is evidence of scoliosis and kyphosis (curvature of the spine). When examined she does not move and lies completely flat on the table. Her mandible seems soft. Presence of stringy mucous in the mouth and sunken eyes indicates dehydration.

After doing a physical exam on Norrie, Dr. Ibrahim expressed concern that Norrie had metabolic bone disease. To confirm the diagnosis, he asked for permission to measure Norrie's calcium level (\$70) and take a radiograph (\$150). Josh and his mom agreed to the procedure.

#### Questions

Thinking back to what you learned in Parts I and II about the husbandry requirements of iguanas, what aspect(s) of Norrie's care may have fallen short? Why?

3. Inadequate husbandry is the most common reason for exotic pets to become ill. Norrie's family educated themselves as best they could, but still did not prevent this illness. If you were the veterinarian, how would you talk to Norrie's family about her husbandry issues?

# Part IV — Treating Norrie

"There are many types of metabolic bone disease that we see in reptiles," Dr. Ibrahim said. "I think Norrie has nutritional secondary hyperparathyroidism, or NSHP. Most often the cause for NSHP is an imbalance of calcium and phosphorus in the animal's diet. It can also be triggered by minimal access to UV-B light or not enough activated vitamin D3. Sometimes it is caused by a combination of all three.

"Unfortunately, we won't be able to replace the bone that Norrie has lost, so we will not be able to return her to normal. Fortunately, she is still capable of eating and moving around well enough on her own such that I believe her quality of life will still be good with long-term management. Moving forward, we can support her for the duration of her life by providing continued calcium supplementation, adequate husbandry, and regular check-ups to make sure that she stays stable and doesn't worsen."

This wasn't the news that Josh and his mom wanted to hear. "Is this my fault for not taking good care of her?" Josh asked, tears welling up in his eyes.

Josh's mom leaned over to console him and asked, "What about the folks at the pet store? They told me I had everything I needed."

"I know you had the best intentions when caring for Norrie, and you did your best to educate yourself on her needs. There's a lot of conflicting information out there on how to care for unusual species, and even vets like me are learning new things about their needs. You did a great job of noticing that she needed to see a veterinarian, and now I can help you learn about what to improve for her care moving forward." As Dr. Ibrahim said this, Josh's shoulders relaxed a bit.

Dr. Ibrahim continued, "Sometimes iguanas arrive to the pet store already in an early state of metabolic bone disease. Additionally, it's really hard to accurately design commercial pet foods for iguanas. They have different needs during different seasons, and their needs change when they are in the wild versus in captivity. Most exotic animal diets haven't even undergone a feeding trial."

"What's a feeding trial?" Josh asked.

"A feeding trial is a kind of scientific experiment where a number of animals are fed the product under controlled conditions for a period of time to make sure they remain healthy and in good condition. The animals are assessed regularly with respect to their health and well-being. Although feeding trials are regularly conducted for cat and dog food, they are not as common for pets like iguanas. You were probably feeding Norrie exactly what IguanaMax said, but the company didn't have enough data to be 100% sure that the diet would keep her healthy."

"So now what do we do?" Josh asked.

"To start Norrie's treatment, I'd like to give her an injection of calcium today in the hospital as well as fluids under her skin to rehydrate her. I'll send you home with calcium gluconate that you can administer by mouth once daily. You can also dust her food twice per week with additional calcium powder that you can purchase from a pet store.

"I'd also like you to switch food brands to either Mazuri, ZooMed, or Repashy, as these tend to be more nutritionally balanced. For her UV light and heat needs, a combination lamp is fine to use, but be sure to change the bulb every six months, as the heat may continue but the UV effectiveness dies out. Measure the temperature in her tank at the hottest point to make sure she is not being overheated. Also make sure that there are cool spots in her enclosure so that she can cool down if needed. The rest of what you've been doing in terms of enrichment, substrate, and feeding is excellent, so keep up that great work."

Josh and his mom expressed their gratitude for Dr. Ibrahim's assistance. They instituted all of the treatments and changes that were suggested and returned regularly for check-ups. Norrie's condition remained stable, and they were able to support her needs for the remainder of her life.

As you answer the questions below, consider the relationship between phosphorus, vitamin D, UV, and calcium described in the following resource:

• Institute of Medicine (US) Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. (1997). Chapter 7: Vitamin D. In: Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride. Washington (DC): National Academies Press (US). <a href="https://www.ncbi.nlm.nih.gov/books/NBK109831/">https://www.ncbi.nlm.nih.gov/books/NBK109831/</a>

Quest	tions
1. I	How might lack of UV-B exposure for Norrie have caused her to develop metabolic bone disease?
2. I	Do you think it is ethical to sell food without conducting feeding trials? Why or why not?
	Based on what you now know about pet food, what additional information would you like to see on the guanaMax label?
t a l c c c	Design a feeding trial for IguanaMax. You should cite online resources to justify your choices. Be sure to include the following parameters:  a. How many animals will be in your study? Describe their characteristics.  b. For how long will you conduct your study?  c. How will you feed/deliver the IguanaMax to the animals?  d. What will be your control?  e. What parameters will you assess and how often to ensure the quality of the feed?  E. What result will indicate a successful feeding trial for IguanaMax?  g. What ethical considerations must be taken into account for conducting this feeding trial? How will you ensure the animal's welfare during the trial?

# Part V — Nutritional Deficiencies and Other Exotic Species

Nutritional deficiencies are common in exotic pets. Veterinarians are often asked to treat and diagnose many nutritionrelated diseases. This may be challenging for a clinician who normally specializes in dogs and cats.

Some nutritional diseases in exotics include:

- iron storage disease in birds, rhinos, and dolphins;
- vitamin C deficiency (scurvy) in Guinea pigs;
- vitamin A deficiency in birds and reptiles;
- gout in reptiles;
- atherosclerosis in psittacine birds;
- hypocalcemia in African grey parrots;
- calcium carbonate urinary stones in Guinea pigs; and
- iodine deficiency (goiter) in Elasmobranchs (e.g., sharks, other cartilaginous fish).

To answer the questions below, begin by selecting one of the diseases listed above. Then use PubMed to find a peer-

reviewed article that addresses the relationship between a nutritional deficiency and the animal disease you selected. This should not be a review article. Provide the reference. Read the article and answer the following questions.		
Questions		
1. What exotic species is predisposed to the disease you selected? How prevalent is the disease?		
2. Describe the clinical signs observed in animals with this disease.		
3. How is this disease diagnosed?		
J. How is this disease diagnosed.		
4. What is the treatment/prognosis with this disease?		

- 5. How has this disease been studied/researched?
- 6. How might owners prevent this disease?
- 7. What other ethical concerns may be inherent in ownership of this type of exotic?

# Part VI — Exotic Pets as Invasive Species

The maintenance and husbandry of caring for an exotic pet can be challenging for owners, especially during times of financial hardship. Some exotic pets have average life spans that are longer than those of cats or dogs. Green iguanas like Norrie can live up to 30 years in captivity. The veterinary cost of feeding an animal, veterinary care, and treatment of disease can become overwhelming over this long time frame.

Green iguanas, for example, have become an invasive species in Florida, and it is therefore very important that owners no longer able to care for their exotic pet responsibly adopt out the animal to another family or rescue center.

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Read the following article about the invasive nature of green iguanas in Florida.

 Borcyk, P., E. Fortner, N.M. Claunch, & S.A. Johnson. (2021). Florida's introduced reptiles: green iguana (*Iguana iguana*) [webpage]. IFAS Extension, University of Florida. <a href="https://edis.ifas.ufl.edu/publication/UW485">https://edis.ifas.ufl.edu/publication/UW485</a>

#### **Ouestions**

Based on the exotic you selected in Part V, use reliable internet sources to answer the following questions. Include your references.

1. Where is the native home of this animal?

2. Is this animal considered an invasive species in another country/state/location? If so, what impact has it had on the environment?

3. Should people be allowed to own this animal as a pet? Why or why not?