CLINICIAN’S APPROACH TO THE CHAMELEON PATIENT

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Old World chameleons are becoming popular as pets. Increased importation over the last ten years, coupled with the successful captive breeding of several different species, has made these lizards readily available.

Anatomical features such as rotating eyes, projectile tongues, zygodactyl feet, and laterally-compressed bodies, make chameleons unique when compared with other lizard species. Veterinarians should have a thorough understanding of the specific husbandry needs of these specialized lizards. Knowledge of proper caging, lighting, temperature requirements, and nutritional needs is critical for chameleons to thrive.

Chameleons are extremely fragile and notoriously difficult to maintain in captivity on a long-term basis. For example, most chameleons need a day/nighttime temperature differential (at least 10-15 degrees F) and require caging with good air flow. There is a direct correlation between the enclosure design and time spent caring for these lizards and their success in captivity. Chameleons should be observed daily for subtle changes in their appearance and behavior, such as a color change, decreased appetite, decreased activity level, or their positioning in the cage. These changes may be the first indication of stress or medical problems. Successfully managing any medical condition in an Old World chameleon requires that the problem be identified early. Waiting until chameleons are visibly ill, as evidenced by dramatic weight loss and dehydration (e.g., enopthalmia), usually results in limited success for both the veterinarian and the owner.

CAPTIVE HUSBANDRY

It is critical for the reptile veterinarian to review the husbandry practices used by the chameleon owner as most of the problems described here are related to poor husbandry. Specific recommendations should be made and proper husbandry should be stressed (de Vosjoli and Ferguson 1995, Stahl 1996, Stahl 1998).

EXAMINATION

In addition to daily visual observations, owners should closely examine every chameleon in their collection at least once a week to look for any signs of problems. Chameleons should be weighed monthly. Consistent weight loss or a sudden 10-15% drop in weight may indicate a problem.

A visual exam, without touching or disturbing the chameleon, should initially be performed. In particular, the lizard’s alertness should be noted. Chameleons are typically very observant and should be keenly aware of your presence. Also note posture, color, and ability to ambulate.

The physical exam should proceed as with any other animal. Use a systematic approach, starting with the head and working toward the posterior:

1. **Eyes:** Eye problems can be early signs of sinus/respiratory infections or nutritional problems. Look for enopthalmia, which is usually an indication of dehydration/emaciation.

2. **Oral cavity:** The tongue, glottis, and the glands at the commissure of the mouth should be examined. Abscesses and stomatitis are common. Look for asymmetry in the mouth as an indication of a problem.

3. **Skin:** Examine for asymmetry, swellings, and ulceration, especially of the mouth, rostral projection (if present), and the feet. The loss of (or damage to) toes and nails may lead to infections. Gently remove any retained shedding skin from the feet, toes and tail.

4. **Musculoskeletal system:** Examine body condition, symmetry, bones and strength of grip. This is an important indicator of nutritional status. Loss of muscle mass is usually seen first over the pelvis and tail base.

DIAGNOSTICS

Fecal exams, bacterial culture and sensitivity, hematometry and biochemistry testing (usually collected from the tail vein), radiographs, ultrasonography and surgical and/or endoscopic biopsy are all beneficial tests that can be utilized to help reach a rapid diagnosis. The sooner a condition can be identified and treated the better chance the chameleon has for a complete recovery. Medical treatment with broad spectrum antibiotics without a diagnosis or at least a narrowed differential list is not recommended (e.g. two week course of enrofloxacin to see if the chameleon improves). Prolonged treatment protocols that involve handling chameleons result in stress. Stress will then affect the lizards eating and drinking regimen leading to a worsening of an underlying condition and death. Perhaps the most useful information is from a thorough necropsy and histopathology on any chameleon that dies. This is especially true when managing a group of chameleons or a breeding colony. The information gained is useful in helping the owner with disease management of other chameleons in the collection and it provides valuable feedback on husbandry practices, such as diet.

NUTRITIONAL SECONDARY HYPERPARATHYROIDISM (NSHP)

Juvenile (growing) and young gravid female chameleons are the most susceptible to NSHP. As with other reptiles, the disease is usually the result of low dietary calcium and/or insufficient vitamin D.

Clinical signs of MBD in chameleons include stunted growth, deformed or fractured bones, soft mandibular and maxillary bones, spinal deviations, and paralysis (Stahl, 1997, Stahl, 1996, Jenkins, 1992). Radiographs can be used to identify and characterize fractures and
the severity of bone involvement. Treatment involves increasing the calcium content of the chameleon’s diet by the proper gut-loading and dusting of feeder insects, and ensuring exposure to ultraviolet light (UVB) through natural unfiltered sunlight or full-spectrum bulbs. Patient treatment for MBD is similar to the protocols used for other lizard species as described by Mader (1993). The prognosis can be good depending on severity and duration, however spinal involvement results in a more guarded prognosis.

HYPOVITAMINOSIS A

Clinically, chameleons may present with signs of hypovitaminosis A as described in other reptiles (Stahl, 1997, Stahl, 1996, Jenkins, 1993). These chameleons typically have a history of low preformed vitamin A supplementation. Usually insects are being fed a poor diet and are only being dusted with a calcium/vitamin D supplement or a multivitamin that has beta-carotene but no preformed vitamin A.

Clinical signs of hypovitaminosis A include eye problems, respiratory infections, neurological dysfunction, spinal kinking, dysecdyosis, and increased formation of hemipenal plugs. Research in the panther chameleon fed a restricted vitamin A diet resulted in these same clinical signs (Ferguson et al., 1996). Generally it is recommended to use a multivitamin (for dusting insects) with some pre-formed vitamin A weekly for juvenile (growing) chameleons and every other week in adult chameleons to avoid hypovitaminosis A. Additionally, feeding insects a beta-carotene rich diet, such as green-leafy vegetables, carrots and sweet potato, prior to feeding them to the chameleons, may be beneficial.

Treatment for hypovitaminosis A involves giving a parenteral vitamin A solution (vitamin A palmitate 100,000 IU/ml, vitamin D3 10,000 IU/ml and vitamin E 20 IU/ml). Give 2000 IU vit A/30 gm body weight by mouth every 7 days for 2 doses. The parenteral drug works well orally and may be safer when used in this manner.

HYPERVITAMINOSIS

Organ toxicity associated with the fat-soluble vitamins A and D is a common nutrition-related problem of chameleons. A relationship exists between these two vitamins and their dietary level of supplementation and the amount of ultraviolet exposure (UVB) in chameleons (Ferguson, et al., 1996).

Vitamin A

Excess vitamin A supplementation may interfere with the metabolism of vitamin D3, resulting in metabolic bone disease. It may also lead to organ toxicity (renal, hepatic). Gular edema is a common clinical sign of organ dysfunction in chameleons.

Vitamin D3

Excess vitamin D3 supplementation -- especially in combination with calcium -- may result in organ toxicity. Metastatic calcification and gout are common results.

Gular edema is a common clinical sign. Additionally, pseudo-gout has been noted in veiled chameleons fed a heavily-supplemented vitamin D3- and calcium-based diet in combination with restricted levels of vitamin A (Stahl, 1997). The pseudo-gout (calcium hydroxyapatite) deposits usually appear as irregular firm swellings over joints in the limbs and on ribs. These lesions are similar to those described by Frye (1991) in a chelonian. These swellings must be differentiated from true gout, abscesses/osteomyelitis, and cellulitis. Fine-needle aspirate and cytology or biopsy can be used to reach a diagnosis. Radiology may be useful in screening for metastatic calcification and/or pseudo-gout. Bloodwork may indicate extremely elevated plasma calcium values in cases of hypervitaminosis D. Treatment for hypervitaminosis is difficult because the clinical disease is usually well advanced by the time the chameleon is presented (ex. gular edema with renal failure).

RENEAL DISEASE

One of the most common causes of death in chameleons is renal disease. Renal pathology is commonly noted at necropsy and on histopathology. Similar to the green iguana the etiology for renal disease may be multifactorial and is not yet well understood (Boyer et al., 1996, Divers, 1997, Raiti, 2000, Antinoff, 2000, Rosenthal et al., 2000). Possible causes include imbalances in the fat soluble vitamins A and D, inadequate exposure to UVB irradiation, chronic bacterial infection (possibly from low grade periodontal disease) or exposure to toxins. Additionally, one of the most likely causes of these renal changes could be chronic dehydration. Exposure to low humidity or inadequate watering methods could lead to renal failure, especially in conjunction with these other possible etiologies. Clinical signs are usually vague, but include anorexia, depression, weight loss, and weakness. Other common signs include gular edema, generalized edema, exophthalmia, and enophthalmia. For diagnostic considerations see renal disease in the green iguana section. Ensuring adequate hydration by maintaining proper humidity and providing a method to encourage and monitor water intake is critical. Also, “showering” chameleons with a misting system or on a wooden perch in the bathroom shower for 20-30 minutes once to twice weekly may be helpful in avoiding sub clinical dehydration.

DYSTOICIA

Most chameleons are oviparous (some chameleons are live-bearing, such as the Jackson’s chameleon) and dystocia is a common problem (Stahl, 1997, Stahl, 1996, Jenkins, 1992). There are numerous factors that may predispose females to dystocia, including stress, poor nutritional status, and the lack of a proper nesting site. Providing exposure to ultraviolet light (UVB) and adequate levels of vitamin A and vitamin D3 may be the most important factors in preventing dystocia and other reproductive problems (Ferguson et al., 1996).

Gravid female oviporous chameleons typically present with an enlarged abdomen, and gentle palpation of the
abdomen usually reveals the presence of eggs. Ultrasound or radiographs can be used to confirm the diagnosis. An egg-bound chameleon is usually presented well past her due date and in distress. Retention of eggs will usually result in death, so medical and/or surgical intervention is indicated to avoid the loss of the chameleon.

For diagnostic and therapeutic considerations see reproductive problems and dystocia in the green iguana, bearded dragon and leopard gecko sections.

**RESPIRATORY/SINUS/OCULAR INFECTIONS**

Bacterial infections of the respiratory system are common in chameleons. Signs of respiratory disease include increased mucus in the oral cavity, increased stridor with breathing, open-mouth breathing, and hyperinflation of the lungs. Frequently, the sinuses of the head are involved and bumps or swellings on top of the head between the eyes will often occur. Respiratory and sinus infections are typically associated with eye problems (Stahl, 1997, Stahl, 1996). Discharge from an affected eye(s), swelling in the retrobulbar and periorcular areas, and/or holding the eye(s) closed are all common clinical signs of ocular disease.

Tracheal culture, deep culture of the lining of the involved sinus, or culturing fluid from the sinuses are useful techniques to direct antimicrobial treatment. Treatment of respiratory infections with systemic antimicrobials should be initiated early and combination therapy is recommended. See Table 1. Swellings involving the sinuses should be opened for drainage; and purulent material should be removed when possible. A review of the diet may indicate the need to supplement with vitamin A (see hypovitaminosis A).

**STOMATITIS / PERIODONTAL DISEASE**

Stomatitis in chameleons usually involves the mucous membranes along the lips, the commissures of the mouth, or sometimes the tongue. Clinical signs include anorexia, inability to close the mouth completely, loss of symmetry to the mouth, and inability to use the tongue. Chameleons have acrodont teeth (not rooted, but simply attached to the surface of the mandibular and maxillary bones), which predisposes them to periodontal disease and potentially osteomyelitis (McCraken and Birch, 1994). The prognosis for chameleons with periodontal osteomyelitis and loss of bone is guarded-to-fair depending on severity and progression.

**ABSCESSES/CELLULITIS/OSTEOMYELITIS**

Abscesses are common in chameleons and are typically the result of damage to the skin. Trauma from sharp edges in cage materials, bite wounds, or scratches from cagemates or other animals will often result in abscesses. Damaged nails from screen injuries or from pulling chameleons off branches, or dysecdysis of the toes often results in abscessation of toes, subsequent cellulitis, and osteomyelitis.

See iguana and bearded dragon sections for diagnostic and therapeutic considerations for abscesses.

**PARASITIC INFECTIONS**

Nematodes, cestodes, coccidia, flagellates, and amoebae are all intestinal parasites commonly found in chameleons (Stahl, 1997, Stahl, 1996, Barrie, et al, 1993). Clinical signs of parasitism include weight loss, anorexia, regurgitation and vomiting, and malformed and malodorous stools. Parasitic infections are not seen as often in the more commonly captive-bred species, such as veiled chameleons and Jackson's chameleons. But nematodes (primarily oxyurids) and coccidia can still be found in these captive-born animals, and fecal exams should be performed. Flagellates, amoebae, and other nematodes may also be present in captive chameleons that live in mixed collections or facilities with poor isolation and quarantine practices. See Table 2.

A case of cryptosporidia was described in a panther chameleon and this organism will likely will be found in other species of chameleons (Klingen, 1996). Screening fecal samples for cryptosporidia, especially in animals showing signs of gastrointestinal disease, is recommended (see leopard gecko section). Currently no effective drug exists to treat cryptosporidiosis in lizards and infected chameleons should be isolated or removed from the collection.

References available from the author upon request.
**Table 1. Commonly Used Antibiotics in Chameleons**

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dosage</th>
<th>Route</th>
<th>Frequency</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Amikacin (Amyglide-V)</td>
<td>2.5-5.0 mg/kg i.m. or s.c.</td>
<td>q 48-72 hr.</td>
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<td>Ensure that the animal is well-hydrated prior to and during treatment.</td>
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<tr>
<td>Enrofloxacin (Baytril)</td>
<td>5-10 mg/kg i.m., s.c., or p.o.</td>
<td>q 24-48 hrs.</td>
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<td>Subcutaneous or the intramuscular route initially followed by oral treatment seems to be the most effective method. Be aware that parenteral dosing may cause damage to the skin and/or muscle resulting in skin color changes. Giving an injection of subcutaneous fluid then placing the initial injection of baytril into the fluids will help to minimize tissue damage.</td>
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<tr>
<td>Ceftazidime (Fortaz)</td>
<td>20-40 mg/kg i.m. or s.c.</td>
<td>q 48-72 hrs.</td>
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<tr>
<td>Carbenicillin (Geopen)</td>
<td>100 mg/kg i.m.</td>
<td>q 24 hr.</td>
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<tr>
<td>Metronidazole</td>
<td>20 mg/kg po q 24-48 hrs.</td>
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<tr>
<td>Trimethoprim sulfa</td>
<td>30 mg/kg q 24-48 hrs.</td>
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The author often uses combination therapy if culture and sensitivities indicate it is necessary or to gain a broader spectrum (e.g. enrofloxacin and ceftazidime or amikacin and ceftazidime).

**Table 2. Commonly Used Antiparasitic Agents in Chameleons**

<table>
<thead>
<tr>
<th>Antiparasitic Agent</th>
<th>Dosage</th>
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<th>Notes</th>
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<tbody>
<tr>
<td>Fenbendazole (Panacur)</td>
<td>50-100 mg/kg q 7 days x 3-4 doses.</td>
<td>For nematodes.</td>
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<tr>
<td>Ivermectin (Ivomec)</td>
<td>0.2 mg/kg p.o. q 10-14 days x 2-3 doses.</td>
<td>For attempting to treat lungworms, such as pentastomids, or migrating nemtodes, such as filarids. In most cases, fenbendazole is safer and just as effective for other nematode infections. There have been reports of deaths in chameleons given this drug, so it should be used with caution (Barrie, et al, 1993).</td>
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<tr>
<td>Praziquantel (Droncit)</td>
<td>8-10 mg/kg s.c. q 14 days x 2-3 doses.</td>
<td>Forcestodes.</td>
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<tr>
<td>Metronidazole (Metronidazole Benzoate)</td>
<td>40-60 mg/kg p.o. q 7 days x 2-3 doses.</td>
<td>For flagellates and amoebae.</td>
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<tr>
<td>Sulfadimethoxine (Albon)</td>
<td>90 mg/kg (first day) p.o. followed by 45 mg/kg p.o. s.i.d. x 9 days.</td>
<td>For coccidia.</td>
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