

## LIZARDS AND SNAKES IN VETERINARY PRAXIS

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### INTRODUCTION

The anatomy of the lizard is very similar to mammalian carnivores. Thus orientation during clinical examination is relatively easy. Snakes however are elongate structures. The best way to get acquainted with the anatomy is by post mortem examination of some specimen.

When handling a lizard, do not use the tail as a hold, this may result in autotomy. Grip the head or neck. Put one hand over the pelvis to ensure the hindlegs. The handling of snakes should be with as less force as possible, otherwise the animal will be severely stressed. Handling of snakes must be like a psychological guidance.

### DISEASES OF THE SKIN

#### **Lesions caused by animals given as food.**

In lizards problems may arise with house-cricket (*Gryllus gryllus*) or with the field-cricket (*Gryllus bimaculatus*) roaming in the terrarium. If they get hungry, they may attack animals, cut small holes in the scutes, which may then be infected by fungi or yeasts. Meal-worms may invade cooled animals (wintersleep).

Rats or mice may bite a constricting snake when they were not coiled properly. Debilitated snakes may locally be skinned by a hungry mouse left in the cage as food. Rats may bite snakes severely.

#### **Burns**

Burns may occur in lizards if they position themselves on hot heating pads. In snakes burns generally are caused by unprotected heating bulbs. Bulbs should either be placed outside the terrarium or protected with metal netting. Burns are cleaned with Povidone-iodine solution. The topical application of fatty substances such as vitamin-A ointment or cod-liver ointment is contra-indicated as the fat is highly irritating to the skin. Application of surgical adhesive drape prevents secondary infection and limits the loss of fluid.

#### **Loss and/or amputation of the tail**

Autotomy of the tail occurs in lizards if traction is applied. Amputation is performed in cases of abscessation or necrosis. Amputation is done by making a circular cut onto the bone and breaking the vertebra manually. There is only minimal blood loss. The resulting wound is not sutured as this prevents regeneration. The fresh wound is very resistant to infection and heals

quickly. If infection develops, cleaning and application of an antiseptic solution such as Povidone-Iodine topically generally is sufficient.

#### **Problems with sloughing.**

Problems with sloughing generally are the consequence of a poor condition or a dry atmosphere. On limbs, digits or tail, of lizards, necrosis distal to a retained band of slough may occur. The retained slough should be removed by means of extensive soaking and gentle rubbing with cotton wool. It is especially important to give the animal a thorough examination and to combat diseases present. Supportive therapy in the form of multivitamins is indicated. Of special value is a dosing with Vitamin A (100.000 IU/kg bodyweight) as this enhances sloughing and may even lead to repeated ecdysis ("Häutungsturm").

In snakes and gecko's, if sloughs are retained exclusively over the eyes, these are soaked with physiological saline, vegetable oil or with soft contact-lens wetting solution, before removing it very gently and carefully.

#### **Blister disease**

Blister disease occurs in snakes when they are forced to live in a damp terrarium. Blisters are accumulations of bacteria and inflammatory cells in the horny layers of the skin. If neglected, infections can progress to dermal necrosis. Blisters should be opened and then treated topically with a disinfecting solution. Here again Vitamin A should be dosed to encourage sloughing. Prevention by creating an area where the animals can dry themselves completely is essential.

#### **Dermal papillomas**

Dermal papillomas due to viral infection, are common in the green lizard (*Lacerta viridis*) and in the three lined emerald lizard (*Lacerta trilineata*). They are seen as cauliflower like, well circumscribed brown-black pigmented lesions. They spread slowly in a population and over the body. Secondary bacterial or fungal invasion of the lesions is frequent. The fungi may spread to the surrounding of the lesion.

Treatment is necessary if the lesions are causing problems, and preferably by means of thermocautery under general anaesthesia. If the extent of spread is large then several attempts at removal are advisable or else there is the possibility of inducing shock.

#### **Dry necrosis**

Dry necrosis may also occur especially to the toes and tip of the tail, it is usually self-limiting. It is most commonly seen in iguanas and monitors, and the affected appendage will drop off in about 2 weeks if not amputated first. Wounds should be treated with an antiseptic solution such as Povidone-Iodine.

#### **Abscessation**

Abscesses in lizards on the digits often combined with arthritis of the knee or elbow joint of the affected leg and/or with ulcerative stomatitis, is frequent. In animals living on sand infections are the result of micro-traumata caused by sand grains. Fighting due to overcrowding may also lead to abscessation. (In female Phelsumas, symmetrical swellings on either side of the neck represent calcium deposits, which are of importance in the production of eggs).

In snakes subcutaneous abscesses may occur, either as isolated ones or as an area seeded with small abscesses. Mycotic granulomas can be a result of secondary invasion.

Treatment is by opening or by surgical removal of the abscesses. Retrobulbar abscesses may be opened via the oral cavity. Disinfection with Povidone-Iodine solution and if necessary application of antibiotics based on sensitivity. Prevention by eliminating dirty, coarse bedding and avoiding overcrowding is of great importance.

### **Ectoparasites**

Ectoparasites form a major problem in lizards and snakes. Lizards and snakes captured in the wild are often infected with hard bodied ticks of the Ixodidae family. Removal should be careful, by first anesthetizing the ticks with ether, to avoid leaving of the mouth parts in the animal.

### **Mites**

Mites of several species can be found on lizards and snakes. The most important one is *Ophionyssus natricis*. They generally hide in folds of the skin; for instance in the outer auditory canal or in the armpits of lizards or under scales of snakes.

Therapy is with Neguvon (1.5 g/l water), sprayed in the terrarium - the animals may be left in the terrarium. In snakes, ivermectine can be used in a dosage of 200 mcg/kg body weight. As many mites move around in the terrarium, the animals are put in an emergency terrarium and a Vapona box is placed in the original terrarium which is then covered with plastic, sealed air tight and left at its normal temperature for 4 weeks. The snakes are then given a second injection with ivermectine and returned into the original terrarium. The hospital tank is then treated with Vapona®, in the same way as has been described.

### **Plerocercoids or Cestodes**

Plerocercoids or Cestodes may be found in the subcutis of snakes. They cause soft swellings, which over the days alter in shape. A small incision of the skin reveals the elongate larvae. Antiparasitic substances are ineffective.

## **DISEASES OF THE EAR**

Diseases of the ear are of little importance in lizards. This is because the Eustachian tube is wide and short. If necessary, the middle ear can be reached via the oral cavity, using the slit-like Eustachian tube. Snakes have no ears.

## **DISEASES OF THE EYE**

Conjunctivitis is known in lizards as a consequence of infections with *Aeromonas*, *Pseudomonas*, and *Staphylococci*. Therapy is with antibiotics after cultivation and resistance tests. Abnormalities of the spectacle space may be due to

- 1: blocking of the naso-lacrimal duct (for instance due to a (mycotic) inflammatory process in the mouth);
- 2: ascending infection from the mouth, for instance due to bacteria or flagellates and
- 3: infections of other origin (systemic or penetrating through the spectacle);
- 4: congenital absence of the lacrimal duct.

Therapy: puncture of the spectacle space through the pigmented skin; removal of material, introduction of appropriate medication in the spectacle space. In case of (slight) bacterial infection systemic application of antibiotics is useful.

Absence of the ductus lacrimalis is known as a congenital defect in snakes, it leads to distention of the spectacle space, due to accumulation of lacrimal fluid. There is no therapy. Prevention is by examination and alteration of the environment.

With chameleons, ocular disease or conjunctivitis, prevents the animal from an exact localization of its prey. Such animals stop eating and have to be encouraged to eat by touching the snout with an insect or even have to be force fed.

## DISEASES OF THE RESPIRATORY SYSTEM

**The nose.** Cleft palate is known. Bruising of the nose by jumping to the glass is known in many lizards, but especially in waterdragons (*Physignatus leseurii*). Therapy is topical. Prevention is difficult. A small terrarium prevents the animal from speedy runs and large jumps.

**Inflammation of the nose and the choanae** may occur on basis of bacterial or an occasional mycotic infection. Infections may spread into the orbit or even into the brain and therefore need careful examination and treatment based on an exact diagnosis.

Therapy: as a therapy the nares may be cleaned and the nasal cavity washed with a disinfectant. Bacterial infections are combatted with antibiotics. Mycotic infections can be treated locally with antifungal ointments like Nystatin or Natamycin or combined antibacterial and antifungal ointments like Panalog.

**Tracheitis** is very rare in lizards. In snakes it is seen in association with mouthrot. In cases of goiter in lizards, the trachea may become compressed, which causes dyspnoea.

**Pneumonia** occurs less often in lizards than in snakes. Pneumonias can be caused by viruses (i.e. paramyxovirus), bacteria, helminths or fungi. Rare causes are infestations with pentastomids and mites. The last mentioned infections are found in imported animals only. Sudden falls in temperature are predisposing for opportunistic bacterial infection.

Symptoms often are unapparent. In characteristic cases generalized disease and labored breathing occurs. In snakes an early and distinct clinical finding is the fremitus felt at respiration when the neck of the snake rests quietly on the fingertips. In paramyxovirus-infections haemorrhagic sputum may be produced in the end-stage.

For a diagnosis, inspection of the tracheal opening and examination of the tracheal exudate is of importance. Tracheal swabs are useful for bacteriologic examination. Faecal examination may reveal eggs/or larvae of lung-nematodes or eggs of pentastomids. Treatment depends on the causative agent. Ampicillin, Amoxycillin, Baytril and others are effective in bacterial infections. Lung-nematodes are combatted with L-Ripercol (20 mg/kg), *Acanthocephala* can be treated with Ivermectine (200 mg/kg body weight).

## DISEASES OF THE DIGESTIVE TRACT

**Anorexia** is a common finding and is often multifactorial. In many species of snakes it is absolutely physiologic during pregnancy. A diagnosis should be made as good as possible. Faecal examination is obligatory in such cases.

**Stomatitis** or canker of mouth is frequent in snakes, but also occurs in lizards. The mucosae may be covered with exudate and necrotic material. Neglected cases may progress till osteomyelitis. The treatment starts with mechanical debridement, then the mouth is flushed with hydrogenic peroxide 3% and a few moments later again with acidified water (pH 2.4 - 2.6) prepared by adding 6 ml HCl 1 normal to 1 liter of water. Finally an antibiotic is applied.

**Flukes** are occasionally seen in the mouth of snakes. They are rarely of clinical significance and can be manually removed or Praziquantel (Droncit) can be used at 5 mg / kg. It is even sufficient to flush the mouth with Droncit pro injection

**Regurgitation** may occur if a snake is handled too soon after feeding, or is kept at low temperatures or has a gastritis.

## PARASITES

**Ascaroideas** may be present both in the stomach and the small intestine. In Pythons larger Ascaroideas penetrate deeply into the gastric mucosa and cause excessive abscessation in the wall. Ascaroideas can have both a direct and indirect life cycle, which can involve mice. Treatment is by the use of Panacur® or Oxfendazole®.

**Flagellate** (*Monocercomonas sp.*) infections are very frequent in snakes and when present in large numbers cause anorexia, regurgitation and enteritis. Faeces may be mucous, prolapsus recti may occur. Diagnosis is by examining wet smears of faeces or rectal lavage, for flagellates. Treatment is with Ronidazol dosed 10 mg/kg daily, over a period of 10 days. Another possibility is Flagyl® 75 mg/kg daily during 10 days or 200 mg/kg BW as a single dosis (in large sanctuaries).

**Amoebae** (*Entamoeba invadens*) is still important in snakes, but may also occur in lizards such as green iguanas (*Iguana iguana*). The clinical signs are usually limited to the terminal stages of the disease when there is a swollen colon which can easily be palpated in the living snake. The cloaca may be swollen firm and blood stained. The snake is anorexic and polydipsia is often a feature, as is weight loss, and diarrhoea. It may take several weeks for death to occur.

Diagnosis is made on seeing the amoeboid trophozoites and cysts in the faeces. Cultivation of the amoebae is a more reliable diagnostic method. Treatment is by attention to hygiene and the use of metronidazole (Flagyl®) at 160 mg/kg for 3 days. It is also possible to use Ronidazol 10 mg/kg body weight daily over a period of 10 days. Attention should be given that the snakes have no opportunity to wash out their mouth. All contact snakes should be treated.

**Cestodes**, usually *Bothridium sp.*, are seen in snakes. They are encountered especially in wild caught animals. The diagnosis is based on faecal examination, which reveals eggs with hexacanth embryos. Therapy: Droncit® (Praziquantel) 10 mg/kg orally (1x).

**Strongylids** can cause anorexia, weight loss, diarrhoea and respiratory signs as the larva are migratory, but this is only very seldom a problem. Treatment is with 1: Panacur® (Fenbendazole) at an oral dose of 10 mg/kg on three successive days, or 2: Systamex® (Oxfendazole) at a dose of 3 ml/kg by stomach tube, or 3: Ripercol L® (Tetramisole HCl) at a dose of 20 mg/kg preferably by intracoelomic injection. Often supportive therapy is also required.

**Coccidiosis** is frequent in chameleons. Treatment is with Sulphadimidine at 50 mg/kg by stomach tube for 3 days. In snakes coccidiosis is rare. In examining faeces of snakes it must be kept in mind that coccidia from food-animals such as rabbits may be passed with the faeces.

**Foreign bodies** such as stones or other materials from the terrarium can be eaten, especially if they have a smell derived from the food. Clinical signs are swellings or perforations in snakes and anorexia in lizards. They can be removed with liquid paraffin or, if causing an obstruction, by surgery.

**Obstruction of the “prepuce”** in male lizards and snakes is caused by cell-debris accumulating in the “prepuces”. It is seen as a (usually symmetrical) elongated swelling over some distance on the ventro-lateral sides of the base of the tail.

Therapy is by removing the plug; the tip of which can usually be grasped with a forceps.

**Prolapse of the cloaca** occasionally occurs in case of an enteritis. Therapy is by reposition or amputation.

#### DISEASES OF THE URINARY TRACT

**Nephritis** in lizards and snakes, is frequent, however difficult to access clinically. In Elaphid snakes a specific interstitial nephritis is found characterized by enormous enlargement of the kidney(s) and the presence of giant cells in the interstice.

In some cases gout is produced, which in thin-skinned animals such as gecko's can be recognised as whitish deposits around the joints. In snakes deposits of urates are occasionally found under the oral mucosa. In all other cases diagnosis is by examination of the blood. Uric acid values in excess of 25 mg% (1485  $\mu$ mol) are indicative of gout.

**Tubulonephrosis** occurs in green iguanas aged 5-6 years. This may lead to disturbance in the calcium metabolism, with metastatic calcification of especially the large vessels near the heart (in which case X ray examination is a useful diagnostic tool)and elsewhere in the body, but also of the stomach fundus. The latter is recognised because the animal refuses to eat or even vomits, while food force fed is excreted in a poorly digested state. Calcium-deposits in the heart muscle may lead to stasis of bloodflow. Degeneration and calcification of peripheral muscles may occur.

#### DISEASES OF THE GENITAL TRACT

**Egg binding** can occur in lizards and snakes. Stress, as caused by transportation or competition among the animals may lead to psychogenic egg binding. Prevention is of utmost importance. Nesting areas should not be disturbed and if a female is defending her nest, she can be taken away and kept apart for some days. Physical egg binding is mainly associated with metabolic disturbances and occasionally with infections of the oviducts. In snakes which produce eggs, in many cases retained eggs can be seen as local distentions of the abdomen. In other instances echography can be used to make a diagnosis.

Therapy: In the case of egg binding, it is wise to first bring the oviductal musculature in a better state or even to contractions with an injection of about 100 mg  $\text{Ca}^{2+}$  per 100 gram body weight (Calcium Sandoz or calcium-gluconate or calcium borogluconate). This is especially of importance in reptiles fed on insects or meat. If dosing of calcium has no effect, 24 hours later Oxytocin at a dose of 2-4 units per kg body weight can be administered. A second dose may be given after 24 hours. If no success is reached, then surgery can be performed.

**Chronic salpingitis** especially occurs in snakes, though cases have also been noted in chameleons and other squamata. In the anamnesis the situation is mainly characterized as a prolonged pregnancy. The animal stays heavy while eggs are not produced. Occasionally ovoid masses of proteinaceous material are voided from the cloaca. The process may lead to an inflammation of the serosa of the oviduct. In rare instances the regional production of megalymphatics may be a complication in salpingitis. Therapy is by surgery and removal of the oviducts with their contents.

#### DISEASES OF THE SKELETON

**Mineral imbalance** in the diet is the main cause of diseases of the skeleton. Is occurs frequently in lizards. The most usual mineral imbalance is caused by a relative or absolute deficiency of

calcium as a result of feeding foodstuffs which are low in calcium. This can predispose to fractures of the long bones or the spine. Whenever a limbed reptile is presented with a fracture, the degree of calcification of the skeleton should be assessed radiographically and the calcium content of the diet estimated.

Fractures of reptiles mainly affect the limbs, although fractures of the spine are known in decalcified lizards and in snakes suffering from congenital abnormalities of the spine. The surgical approach to fractures is much the same as this described in domestic pets. For internal fixation threaded or plain intramedullary pins can be used. Plating may prove impossible because of the shape of the long bones. Internal fixation may have to be considered relatively frequent. For small lizards casts made of plastic drinking straws are useful. Underlying metabolic bone disease should be treated before an attempt at restoration is undertaken.

In some neglected fractures or in cases of severe abscessation, the leg may have to be amputated.

Spinal fractures occur in decalcified skinks and iguanids. In snakes spinal fractures generally are due to trauma. A spastic paralysis of the posterior part may occur. The clinical examination revealing overactive direct reflexes of the posterior part is useful. Radiographic examination on some occasions brings the clue. Confinement and multivitamin and mineral supplementation of the diet may prove effective.

## NUTRITIONAL DISEASES

**Generalized hypovitaminosis** occurs supposedly when snakes have not been eating for several weeks or months. It was found useful to support these animals with injections of a vitamin B complex preparation. High doses of vitamin C may also prove effective, more especially if the skin is affected and ruptures easily. Injections of larger amounts of fluid with a preparation containing amino-acids, sucrose and electrolytes is also important.

### **Avitaminosis-D<sub>3</sub> (Rickets)**

Rickets occurs in lizards and is unknown in snakes. Relative deficiency in calcium can result in extended incubation periods, late embryonic death, poor hatching and deformity of young lizards. To prevent disease, insect-eating reptiles can adequately be dosed with vitamin D<sub>3</sub> by powdering the insects with a multivitamin-mineral mixture and in addition by adding daily 10.000 IU vitamin D<sub>3</sub> aquosum + 4 g Calcium lactate/l water are supplied.

In patients suffering from rickets, calcium should also be supplement; either orally or by injections of Calcium borogluconate or Calcium Sandoz.

### **Hypervitaminosis D**

Hypervitaminosis D is known in lizards receiving concentrates of vitamin D<sub>3</sub>, for instance such preparations intended for small children. The continuous application to the food of a multivitamin - mineral - preparation containing 500.000 IU vit. A + 200.000 IU vit. D<sub>3</sub> / kg resulted in calcification of soft tissues and larger arteries in the green iguana (*Iguana iguana*). Although vitamin D<sub>3</sub> is indispensable, it should be dosed carefully. Dosing 2% of an M-V preparation containing 20.000 IU vit D<sub>3</sub> and 10% Ca/kg to the food appears to be an adequate dosage.

### **Hypovitaminosis B<sub>1</sub>**

Hypovitaminosis B<sub>1</sub> occurs in snakes which are fed exclusively on fish-meat containing thiaminase. The disease leads to opisthotonus; the head and neck are drawn backwards.

Therapy is by injecting vitamin B<sub>1</sub> 80 mg/kg body weight, twice within 48 hours.

## MINERAL DEFICIENCIES

**Calcium deficiency** is frequent in reptiles fed a larger percentage of meat in their diet or fed mainly on insects. Calcium is essential for many functions in the body. Large amounts of calcium are needed during egg-production or the internal development of embryos. The difficulty with meat is the extremely low Ca : P ratio. Insects too are too low in calcium to provide an adequate diet for growing or reproductive reptiles.

The provision of calcium is an intellectual challenge to combine its chemical characteristics with the physiology of the reptiles and their live food. Next to insects, geckos are fond of sweet fruit juices or honey; this may be used by adding a multivitamin-mineral (V - M) mixture to the minced fruits or to the honey. Many reptiles are calciphagous and take small pieces of cuttle-fishbone, crushed egg-shells and others. Calcium can be added to the drinking water in the form of 4 g calcium lactate/l water. Meat can be mixed with an V - M preparation.

### Ca : P ratio of some main foods for reptiles

| Food item |                       | Ca : P     |
|-----------|-----------------------|------------|
| Salad     |                       | 1 : 1.3    |
| Apple     |                       | 1 : 1      |
| Tomato    |                       | 1 : 2      |
| Earthworm |                       | 1 : 1.4    |
| Mealworm  | <i>T. molitor</i>     | 1 : 3-14   |
| Locust    | <i>L. migratoria</i>  | 1 : 7.5    |
| Cricket   | <i>G. bimaculatus</i> | 1 : 3      |
| Fly-larva | <i>Calliphora sp.</i> | 1 : 3-10   |
| Meat      |                       | 1 : 20-200 |

Slowly progressing demineralization of the skeleton can be observed if animals producing frequent or excessively large clutches of eggs or young.

Osteodystrophia fibrosa is known in green Iguanas, leading to a thickening of long bones due to an excessive production of connective tissue and cartilage around the demineralized original bone.

### Iodine deficiency

Iodine deficiency is especially seen in lizards; the thyroid gland of which is situated ventrally in the neck. Hypertrophy of the thyroid may even lead to dyspnea. Prevention is by supplying M.V.-preparations containing 50 mg Iodine per kg, or by iodizing the drinking water. A recipe used for many years for humans is: A stock solution is produced by adding 200 mg KI per litre of water. Add 1 ml of this stock solution to every litre of drinking or sprinkling water used in the terrarium.