

## NEUROLOGICAL EXAMINATION AND DIAGNOSTIC TESTING IN BIRDS AND REPTILES

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### Abstract

Neurological dysfunction is a frequently presenting sign in avian and reptile patients. Clinical neurological signs are rarely pathognomonic, often requiring the attending veterinary surgeon to perform more involved diagnostic tests to achieve a diagnosis. Variations in patient anatomy, physiology and demeanour present unique challenges to the veterinarian evaluating the bird or reptile that has neurological disease signs. Despite these challenges, a well-structured physical and neurological examination can often be accomplished with minimal equipment. A structured neurological examination is essential to formulate an appropriate investigative plan and therapeutic regime for these difficult cases and to provide the owner with an accurate prognosis. Copyright 2014 Elsevier Inc. All rights reserved.

**Key words:** avian; examination; neurological; reflex; reptile

**A** basic knowledge of the normal anatomy and physiology of the reptile and avian nervous system is essential to enable the veterinary clinician to accurately diagnose neurological disease in these animals.<sup>1-14</sup> Variations in anatomy, physiology, temperament, and tolerance to handling between the various avian and reptile species can make the neurological examination and localisation of lesions challenging in these patients. Reptiles, being ectothermic, have reflexes that are influenced by body temperature; therefore, reptiles should be examined in an environment that is within their selected body temperature range.

Although there are few exceptions, the neuroanatomy of reptiles and birds is similar to mammals, and the neurological examination may be approached in a similar manner to that described for dogs and cats.<sup>15</sup> Naturally some modifications may be required when performing a neurological examination on a bird or reptile patient owing to differences in anatomy and temperament.

Neurological disease signs in birds and reptiles are often nonspecific, consequently a disease diagnosis using external clinical signs alone is rarely achieved. Birds and reptiles mask illness, or owners are unaware of subtle disease signs until well advanced, resulting in many of these patients being presented to the veterinary clinic in a critical disease state. These critical presentations, with often one or more life-threatening disease

problems, typically require extensive treatment before a full neurological assessment.

Neurological disease in both birds and reptiles is often secondary to inadequate husbandry (e.g., temperature) and nutrition (birds and reptiles) but may be caused by toxins (e.g., heavy metals, organophosphates, pyrethroids, drugs and plants), infection (e.g. viral, parasitic, bacteria and fungus), neoplasia, congenital abnormalities and cardiovascular, hepatic and renal disorders. Metabolic diseases (e.g., hypocalcaemia) and musculoskeletal disorders (metabolic bone disease) often present with similar clinical signs and may be difficult to distinguish from primary neurological disease without further investigation; hypothermia may also mimic neurological disease in reptiles.

The evaluation of neurological disorders in reptiles and birds follows a similar pattern to that

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**TABLE 1. Equipment list**

- (1) Pen torch
- (2) Hypodermic needles
- (3) Mosquito forceps
- (4) Towel
- (5) Gloves
- (6) Perch
- (7) Digital thermometer
- (8) Mouth gags
- (9) Cotton-tipped applicators

used for other species and begins by obtaining a thorough history and performing a detailed external physical examination. Further assessment of the patient will often include one or all of the following diagnostic modalities: haematology and serum biochemistry, radiography, ultrasonography and endoscopy. Additional diagnostic tests such as heavy metal analysis, serology/PCR for infectious diseases and cerebral spinal fluid analysis may be required in select bird or reptile neurological cases. Increasingly, computed tomography and magnetic resonance imaging are becoming more accessible and may give detailed images of the central nervous system, though the small size of many patients can be a limiting factor in the use of these advanced imaging modalities. Electromyography and nerve conduction studies may be useful in selected cases, but these tests are rarely available in the typical veterinary hospital.

## HISTORY

All but the most compromised of avian and reptile patients will have normal behaviour under mild to moderate conditions of stress (e.g., veterinary visit). Observation of patients from afar in a quietened room, preferably after a period of acclimatisation, allows the patient to relax and display abnormal clinical signs, if present, or behaviour, which may otherwise go unnoticed. Whilst the patient is acclimatising, a thorough history may be obtained from the owner, giving the clinician time to evaluate the animal from a distance. This “hands-off” evaluation will allow the veterinarian to ascertain the patient’s ability to cope with restraint and physical examination and/or whether steps should be taken to medically stabilise the patient before handling.

Important aspects of the history pertaining to the neurological patient include nutritional offering (including any supplements), what it is eating from, and what is being fed; the patient’s ability to recognise and obtain food in an appropriate manner for that particular species; access to toxins;

recent administration of medication; provision of appropriate ultraviolet light (many reptiles and some birds); and access to suitable thermal gradients (reptiles).

## CLINICAL EXAMINATION

Much of the neurological examination may be incorporated into a well-structured physical examination. Following the physical examination, the clinician’s goal is to localise the disease process to one or more areas of the nervous system. As stated previously, the natural behaviour of many avian and reptile patients routinely complicates the veterinarians’ ability to accomplish the task of localising the lesion associated with the neurological disease process.

The aim of the neurological examination is to localise any lesion to the brain or 1 of 4 major spinal cord divisions. The spinal cord divisions described in birds and reptiles are the cervical, brachial, thoracic and lumbosacral plexus; snakes and presumably limbless lizards have reduced or absent brachial and sacral plexuses.

Accurate localisation of pathology allows the clinician to determine which diagnostic test will confirm a disease diagnosis. Once a definitive disease diagnosis has been made, the veterinarian can form a prognosis and institute a treatment plan thus avoiding the unnecessary use of sometimes expensive and invasive tests.

## HOW TO PERFORM A NEUROLOGICAL EXAMINATION

Equipment required to perform a proper neurological examination on reptile and avian patients is provided in [Table 1](#). Cranial nerve function tests for birds and reptiles and signs of neurological dysfunction are in [Tables 2 and 3](#), respectively.

*Step-by-step guide for birds:*

(1) Observe the patient from a distance—assess posture and symmetry of the head, facial features and body, demeanour, level of alertness and responsiveness to surroundings ([Fig. 1](#)).

(2) Make a loud noise such as clapping of hands or dropping keys onto floor whilst the bird is otherwise occupied to assess hearing.

(3) Approach patient calmly and evaluate response to determine visual acuity and alertness. *Note:* birds with unilateral blindness often turn the blind side away from the examiner, therefore the blind eye is not easily observed.

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