Comparative Avian Anatomy and Physiology – Why are Birds Different?

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Avian medicine requires numerous anatomical and physiological avian peculiarities to be considered in order to successfully perform efficient diagnostics and therapy.

STRESS AND INCREASED SHOCK RISK IN BIRDS

Most birds - especially canaries, small finches but also larger birds like falcons or capercaillies - are very much susceptible to handling induced stress and consecutive cardiac failure. This originates from a most often very high heart rate (ranging from approx. 70 bpm in ostriches, 170 bpm in pigeons, 300 bpm in common raptors, 300-500 in large psittacine birds, 800- 900 in canaries and up to 1200 in hummingbirds) and a flight reflex-dominated behaviour. Thus adequate handling techniques including optical blinding to avoid excessive stress situations are indispensable in birds.

BODY TEMPERATURE

Body temperature is between 40-42.8°C in most pet birds. Even adequate handling may raise the body temperature of the patient within very short time periods. Thus measurement of the body temperature in birds is not of any value and therefore not included in the routine examination procedure. Within avian anesthesia close attention will have to be payed to peri- and post-anaesthetic thermal support as well as to hyperthermia in the summer months (with patients transported to the veterinary practice by car). An efficient method of increasing or decreasing body temperature, hot packs or cold water applied to the non-feathered feet, may be used.

RESPIRATION

Birds lack a diaphragm. Respiratory movements are solely bound to the musculature between the ribs. Thus pressure to the breast and abdomen has to be avoided under all circumstances in order not to fix the patient in an exhaling status following suffocation. Following anaesthesia the patient should be positioned in ventral recumbency as soon as possible, as the weight of the GI-tracts supports the inhaling procedure.

PHYSIOLOGICAL (BLOOD) VALUES

Physiological (blood) values usually cover a comparative wide range due to species specific differences. Additionally many values are altered on a rapid basis due to exogenous stress for example induced by handling. Thus in avian medicine physiological (blood) ranges rather than physiological values as in mammals are used. Besides, certain parameters, such as the PCV, are much higher in birds than in mammals due to the red blood cells covering a cell nucleus and the blood being much more

viscous than in mammals. Thus normal PCV ranges from 45 to 56 in various bird species.

PAIN AND ANALGESIA

For a long time birds have been considered not to be able to feel pain. This misunderstanding is bound to the very much reflex-orientated behaviour of birds as well as showing almost no signs of pain and disease. It is easy to understand, that a wild bird will have to cover any condition of illness in order not to end up as a prey for predators. The absence of almost any disease symptoms and not recognizing discrete hints at a disease in birds by the patient owner (such as anorexia, absent respond to external stimuli, fluffing of feathers) are the reason, that birds usually will be presented as a patient at an almost very late stage of the disease. This results quite often in poor chances of successfully diagnosing and curing a bird patient. In regard to this fact at an overall view, the rate of losses (death) of bird patients in veterinary practice is a commonly observed fact, even if handling and diagnosis protocols are adequate. At the same time these circumstances point out, that efficient diagnostic (micro) methods and critical care protocols are indispensable in bird medicine. Finally most recent studies show, that birds are able to feel pain such as domestic animals and human beings with the so-called nidopallium serving as the cerebral pain center.

OPHTHALMOLOGICAL ASPECTS

Fully functional vision is one of the most important senses for the bird, as this limits the ability to fly. Even partly visual impairment may result in an indication for euthanasia (such as in wild birds). In contrast to most domestic mammals and human beings most diurnal birds have the ability to perceive within the ultraviolet light spectrum as well as being able to detect high flicker rates (up to 160 frames/sec compared to 18-80 in the human eye depending on light intensity and image contrast). Ultraviolet sensitivity is necessary for sex determination due to UV feather reflection in birds, which may appear monomorphic (as most psittacine birds), assessment of fruit ripeness, detection of prey patches and rearing. The ability to detect high flicker rates (flicker fusion frequency) is indispensable to detect fast flying objects (prey and predators). Keeping of birds under artificial light sources thus demands use of light sources emitting within the ultraviolet spectrum (320-400 mn) as well as flicker-free light sources (with switching AC to DC using electronic control gears). Conventional light sources do not meet requirements of the avian eye and therefor specific light sources will have to be used. Certain LED light sources will meet these requirements as the light source of the future. Additionally the avian eye includes a so-called pecten at the posterior part (fundus) of the eye, being very susceptible to trauma, following intraocular haemorrhage in more than 35 % of all traumatized birds. As these haemorrhages are not visible at the anterior eye chamber, ophthalmoscopy (i.e., examination of the inner eye structures) is indispensable.

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