PIGMENT-FORMING TUMORS IN REPTILES: LIGHT REGIME AND ITS DARK SIDES

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ABSTRACT

In the actual study chromatophoromas of 69 reptiles of varying age and species were investigated. Historically, chromatophoromas have been viewed as rarely occurring tumors in the class of reptilia, while actual studies showed that these tumors are much more common than previously assumed. Chromatophoromas are tumors of pigment-producing cells of the skin and are subclassified further based on pigment type. Melanophoromas (so called classic and myxoid type) occurred more often than iridophoromas and erythrophoromas/xantophoromas. The present study aimed to describe the, macroscopic, histopathologic and clinical characteristics and the possible influence of UV radiation of all types of chromatophoromas in reptiles.

Introduction

Pigment forming cells in the skin of reptiles play an important role (camouflage, warning, thermoregulation, blocking of UV-radiation). Three types of pigment cells (chromatophores) occur within the integument of reptiles. Neoplasms of pigment cells are generally referred to as chromatophoromas. They are classified according to their specific chromatophores as melanonphoromas or melanomas (melanin-producing cells), xanthophoromas/erythrophoromas (carotenoid or pteridine-producing cells), or iridophoromas (crystalline purine producing cells containing reflecting platelets of guanine, adenine, hypoxanthine or uric acid). In general, melanophoromas are rarely reported in the class Reptilia. However, recent studies by Heckers et al. suggest that chromatophoromas occur significantly more frequently in sun-loving reptiles that are active during the day, like bearded dragons (Pogona sp.) than in nocturnal, cryptic species. Lighting plays a key role in reptile husbandry. The quality and intensity of the light as well as the duration of the daily light period have a great influence on animal well-being, health, reproduction and forage. A complex lighting system composed of full spectrum and UV bulbs is essential, especially for day active lizards, while these factors seemed to play a minor role in day active snakes and nocturnal reptiles. In addition to visible light and infrared radiation, UV-radiation is very important. The spectrum of UV radiation lies between 100 and 400 nm, whereby wavelength between 280 and 320 nm are important for the synthesis of vitamin D. This study therefore aimed to determine if and to what degree there is a correlation between chromatophoromas of reptiles and UV-lamps used in captive care of reptiles, as well as if these lamps might have a causative role in tumor development.
Methods and Materials

A retrospective study was carried out using 69 chromatophoromas originating from various reptile species of varying age collected over a period of several years. Each tumour originated from a different animal. Most chromatophoromas were excised during surgery, fixed in 4% buffered formalin and submitted to our laboratory for routine histopathologic investigation. Furthermore, bodies of lizards, snakes, and a chelonian were submitted for necropsy.

Table 1 provides an overview of the examined reptile species, their age and the established diagnosis. The formalin fixed biopsies were grossly inspected in detail, size, cut surface, color, consistence and the excision borders were investigated. Representative samples were routinely embedded in paraffin wax and stained with hematoxylin-eosin (HE).

Based on the results of the histologic examination, a retrospective exploratory analysis was attempted by collecting data on whether UV radiation was used in keeping those reptiles suffering from chromatophoromas.

Results

Of 69 cases of chromatophoromas, 53 cases were identified as melanophoromas (lizards n=45, snakes n=7, chelonians n=1), nine as iridophoromas in lizards, five as erythrophoromas (lizards n=1, snakes n=4) and three as mixed tumors (lizards n=3) (Table 1).

Melanophoromas mainly occurred in bearded dragons. Their size varied from 0.2 - 2.0 cm in diameter. The cut surface was grey or mixed white and black. These tumors were composed of spindle shaped tumor cells, which were partially arranged in bundles and streams and separated by fine fibrous septa with a few capillaries. The oval or round nuclei were hyperchromatic and showed mild or moderate anisonucleosis. The number of mitotic figures per high power field (HPF) varied from 0 to 2. The degree of pigmentation was highly variable, in most cases amelanotic cells were interspersed with nests of markedly pigmented cells. In the bearded dragons a “myxoid type” of melanophoroma was found which had a gelatinous consistency and released a jelly-like material. In our study, melanophoromas of the “classic type” in visceral organs were observed in several cases. In all cases a dermal or oral nodule was identified and visceral organs were never solely affected. This supports the assumption of metastases (especially in kidneys, liver, lungs, intestine and fat bodies). Therapy by surgery excision was effective in several cases of melanomas. However, some patients were euthanatized or died shortly after diagnosis due to metastasis, recurrence, or general poor condition.

Iridophoromas occurred most frequently in bearded dragons and veiled chameleons. These tumors presented as solitary pale and firm nodules measuring 0.2 cm to 2.0 cm. In HE stained slides, iridophores contained moderate to large amounts of fine to coarse golden-brown to olive-green pigment granules. They showed numerous birefringent, strongly anisotropic granules within the neoplastic cells when examined under polarized light. In five cases, surgical excision led to a complete recovery. One bearded dragon was euthanatized after diagnosis and in two cases no clinical data were available.
The erythrophoromas of garter snakes, characterized by an orange color, as well as the xantophoroma characterized by its intense yellow color, mainly occur on the back. These neoplasias were characterized by mostly epithelioid cells with fuzzy cytoplasmic borders and mildly orange to brown pigmentation. In all cases wide spread metastasis occurred.

The anamnesis showed that UV radiation was used in 60% of the lizards (22 bearded dragons, one veiled chameleon and a green iguana) with melanophoromas. In the other cases, no UV radiation was provided (n=6), or no clinical data were available (n=15).

UV radiation was also used in 5/9 of the animals with iridophoromas and the veiled chameleon with a xanthophoroma. No data were available on the four reptiles in which iridophoromas had been diagnosed. All examined snakes (especially the garter snakes with erythrophoromas) and the Hermann’s tortoise received no artificial UV rays.

Discussion and Conclusions

Contrary to the literature, chromatophoromas seem to affect reptiles commonly, especially bearded dragons. These neoplasias occurred as solitary tumors in the skin of the trunk and showed invasive growth. Recurrence is common due to their invasive growth difficulties in completely excising them. The therapy of choice is the complete surgical extirpation.

A pronounced correlation was shown between the development of chromatophoromas and the use of UV radiation. In human medicine in recent years, increasing numbers of melanomas have been detected, especially in young women who regularly use a solarium. The so called “SUN-Study” showed that the risk of developing cancer rises by 1.8% per time if solariums are frequented regularly. People using sun beds on a regular basis may have a 42% higher risk of developing cancer than people who don’t use sun beds.¹

This trend was apparent in the cases presented as well. What is striking is that the sun-loving, day active lizards such as bearded dragons often develop tumors of the skin in captivity, while these tumors are much more rare in nocturnal, cryptic animals. This suggests that artificial UV light, which has grown increasingly popular in reptile husbandry may induce chromatophoromas. This hypothesis is supported by the clinical data collected in this study, especially in the bearded dragons and veiled chameleons. However, specifics on lighting and UV amounts to which animals were subjected was not available. While UV lamps undoubtedly benefit captive reptiles, the risks associated with these lamps warrant further investigation. Systematical studies that deal with the effects of different amounts of different types of UV light on specific (commonly kept) reptiles are necessary. One goal would be the production of lamps that produce a defined spectrum, providing the light needed for physiologic effects with low carcinogenicity in order to avoid the growing problem of skin cancer in reptiles in captivity.

Lighting provided for reptiles in captivity should be critically analyzed in regards to exposure time, intensity, and the exact distance from the animal as well as amount and wave length of UV radiation. The choice of lamps from the broad product range available for reptiles in captivity is of critical importance.
LITERATURE CITED

Table 1. Distribution of chromatophoromas in the examined reptiles.

<table>
<thead>
<tr>
<th>Animal (Genus species)</th>
<th>Age (yr) (range)</th>
<th>Melano-phoroma</th>
<th>Irido-phoroma</th>
<th>Erythro-/Xantho-phoroma</th>
<th>Mixed tumors (Melano-and Iridophoroma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearded dragon (Pogona vitticeps)</td>
<td>4 (range: 2-8)</td>
<td>classic 22</td>
<td>myxoid 18</td>
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<td>Veiled chameleon (Chamaeleo calyptratus)</td>
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<td>Leopard gecko (Eublepharis macularius)</td>
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<td>Savanna monitor (Varanus exanthematicus)</td>
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<tr>
<td>Green iguana (Iguana iguana)</td>
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<td>Yellow anaconda (Eunectes notaeus)</td>
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<td>Boa constrictor (Boa constrictor)</td>
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<tr>
<td>Garter snake (Thamnophis sirtalis)</td>
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<td>Pigmy rattlesnake (Sistrurus spp.)</td>
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<td>Southern watersnake (Nerodia fasciata)</td>
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<tr>
<td>Hermann`s tortoise (Testudo hermanni)</td>
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