



Clinical Management of Shell Rot Associated with Fungal Infection in Red Eared Slider: A Case Study

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ABSTRACT: The diseases of the shell are one of the important disorders that might affect the survival of chelonians. They are more often found in aquatic species kept in captivity and are usually caused by poor environmental conditions. Also, bites and accidents that hurt the shell are factors that allow pathogenic organisms, such as bacteria, fungi, or even algae, to colonize and penetrate the shell. This can lead to conditions called septicemic cutaneous ulcerative disease, which causes deep ulcerations. In present case six red eared sliders weighing 400- 500gm were presented to Nandanvan jungle safari, Nava Raipur C.G. with history of gradually increasing discoloration of shell since a week. After proper restrain detailed clinical and physical examination was carried out that revealed irregular white spots spread across the dorsal aspect of the carapace (shell) although the shell was free from cracks and major wound. The turtle had a normal appetite and was fed commercial turtle feed. The turtle had normal appetite and commercial turtle feed was provided to all of them. Swabs were taken from the carapace and water of the terrarium for culture that revealed mixed infection of *Escherichia coli* and *Staphylococcus* spp. As per the antibiotic sensitivity testing and recommendations of the other researcher's therapeutic management was carried out with Oxytetracycline @ 25 mg/kg BW IM for 3 days, Metronidazole oral suspension 50mg/kg BW PO for 10 days and povidone-iodine applied over the shell for 10 minutes daily followed by topical application of clobetasol propionate, ofloxacin, Miconazole nitrate & zinc sulphate skin lotion (ALMIZOL-pet) on white spots for 15 days. The treatment showed marked clinical improvement with respect to improvement in shell texture and appearance.

Keywords: Shell rot, Mixed infection, Turtle, Fungal infection.

INTRODUCTION

Today, more than 50% of 360 ascertained living species of turtles and tortoises are categorized as endangered or vulnerable by the International Union for Conservation of Nature. Moreover, many other taxa, namely, marine and freshwater turtles, could be predicted to become extinct during the present century (Rhodin *et al.*, 2018; Stanford *et al.*, 2020). However, available data, mostly regarding the sanitary status of sea turtles, are fragmentary, concerning the difficult-to-retrieve diseased animals and carcasses in the wild. Thus, in a lot of cases, it is difficult to correlate morbidity rate with mortality (Mashkour *et al.*, 2020).

The red-eared turtle, commonly called the red-eared slider or red-eared terrapin, is one of the most popular pet turtles in recent years and belongs to the family Emydidae, species *Trachemys scripta elegans*. These freshwater turtles are native of south-eastern United

States (Teillac-Deschamps *et al.*, 2008). Shell of the turtle being the primary defence needs necessary care and management and dermatological problems have been reported in captive turtle due to improper management and lack of knowledge related to their housing pattern. Environmental factors such as high humidity and low temperatures, along with poor nutrition, inadequate husbandry practices, an unhygienic environment (dirty water or mouldy bedding), and skin injuries are potential contributors that compromise shell health in turtles (Das *et al.*, 2018). Bites and accidents that hurt the shell are factors that allow pathogenic organisms, such as bacteria, fungi, or even algae, to colonize and penetrate the shell. This can lead to conditions called septicemic cutaneous ulcerative disease, which causes deep ulcerations (Vieira and Costa 2006).

Shell rot, also known as Septicemic Cutaneous Ulcerative Disease (SCUD), is a common condition in aquatic turtles and some reptiles, caused by bacterial or fungal infections originating from unhygienic environments such as dirty water or mouldy bedding (Khan *et al.*, 2019). Because red-eared turtles spend most of their time in water, any pre-existing shell injury increases their susceptibility to shell infections, particularly by gram-negative bacteria that are naturally present in the environment (Kasim *et al.*, 2017). Shell mycoses was confirmed by culture of *Fusarium solani* through severe erosive and ulcerative lesions in the carapace of *Graptemys ouachitensis*, involving skin also (Brilhante-Simoes *et al.*, 2023; Garcia-Hartmann *et al.*, 2017). Turtles and tortoises seem to be prone to skin mycoses involving keratin layers of stratum corneum only, with no shell involvement. Mycotic granulomas, possibly caused by *F. falciforme*, *F. keratoplasticum*, and *Fusarium crassum* were isolated from stranded post-hatchling *C. caretta* in South Africa (Greeff-Laubscher *et al.*, 2022). Deep, mostly pulmonary mycosis was reported to be more frequent in tortoises rather than in turtles (Horgan *et al.*, 2022).

HISTORY AND CLINICAL EXAMINATION

Six red eared sliders weighing 400- 500gm were presented to Nandanvan jungle safari, Nava Raipur Chhattisgarh with history of gradually increasing

discoloration of shell since a week. After proper restrain detailed clinical and physical examination was carried out that revealed irregular white spots spread across the dorsal aspect of the carapace (shell) although the shell was free from cracks and wound. The turtle had a normal appetite and was fed commercial turtle feed. The turtle had normal appetite and commercial turtle feed was provided to all of them.

Swabs from the carapace and the water sample from terrarium were collected for the identification of infectious agent. Culture and antibiotic sensitivity test were performed to formulate treatment protocol. The result of culture showed mixed infection of *E. coli* and *Staphylococcus* spp.

Treatment. As per the antibiotic sensitivity testing and findings of the other researchers, therapeutic management was carried out with enrofloxacin bath (5mg/l) for 30min twice daily for a week, Metronidazole oral suspension 50mg/kg BW PO for 10 days and povidone-iodine applied over the shell for 10 minutes daily followed by topical application of clobetasol propionate, ofloxacin, Miconazole nitrate & zinc sulphate skin lotion (ALMIZOL-pet) on white spots for 15 days (Fig. 2). The treatment showed marked clinical improvement with respect to improvement in shell texture and appearance (Kasim *et al.*, 2017).



Fig. 1. Before treatment Irregular white spots in dorsal.



Fig. 2. During treatment and ventral aspects of shell.

RESULT AND DISCUSSION

The therapeutic management of shell rot carried out for 15 days showed marked clinical effect with respect to improvement in shell texture and appearance. Shell is the primary defense of turtles against any attack by predators and also gives protection from environmental stressors (Polocavia *et al.*, 2008). Traumatic injuries resulting from bites by other turtles or predators can damage the outer keratin layer of the shell and cause burns. Additionally, bacterial or fungal infections may also result in ulcer formation on the shell (Wyneken *et al.*, 2006). In general, Gram-negative bacteria from the environment are known to be the main causes of bacterial shell rot and SCUD (). For aquatic turtles in particular, a strong filtration system is necessary, as water contamination can cause bacterial contamination (Zajmi *et al.*, 2022). Shell rot, or SCUD, is a common condition in aquatic turtles and is often reported due to poor management practices or unhygienic environments, such as dirty water or mouldy bedding. These conditions

predispose the shell to bacterial or fungal infections, particularly by gram-negative bacteria that are naturally present in the environment (Kasim *et al.*, 2017). Clinical findings such as soft areas of the shell and hyperaemia of the carapace have also been reported by Fowler and Miller (2008). They noted that the early stages of infection are characterized by soft spots on the shell, which later progress to cutaneous ulceration and the deposition of fibrin on the shell surface (Fig. 1). Cytologically, heterophilic inflammation and the proliferation of Gram-negative bacteria were observed simultaneously, tentatively confirming that the isolated bacteria were causing the infection. All isolates are strains commonly isolated from water and are opportunistically pathogenic to human or animals (Dziuban *et al.*, 2018; Weese *et al.*, 2023). As per the antibiotic sensitivity testing and findings of the other researchers, marked clinical improvement with respect to improvement in shell texture and appearance. Hoppmann and Barron (2007) recommended the use of

povidone-iodine solution soaked in cotton gauze, twice daily until lesions resolved.

Similar results were observed by Khan *et al.* (2019) by treatment with enrofloxacin bath (5mg/l) for 30 min. twice daily with metronidazole orally at 50mg/kg body wt. for 10 days for treating shell lesions in red eared sliders. Application of povidone-iodine and silver sulfadiazine for treating shell rot with good results fall in agreement with Jadhav *et al.* (2020); Kasim *et al.* (2017). Jadhav *et al.* (2020) reported successful treatment of shell rot in a one-year-old female red-eared turtle by gently scraping the affected shell areas, followed by daily soaking in povidone-iodine for 10 minutes and subsequent topical application of silver sulfadiazine ointment (Jadhav *et al.*, 2020; Khan *et al.*, 2019) successfully treated shell rot in a turtle with enrofloxacin bath and topical application of chlorhexidine gel for 7 days.



Fig. 3. After treatment Disappearance of white spots and healing of the dorsal aspect of the shell.

CONCLUSIONS

The present case report discusses the successful therapeutic management of shell rot infection in a turtle (Fig. 3). Ambient temperature with regular water exchange is essential for proper management of turtles under captivity. Enrofloxacin and Ketoconazole are proved to be effective therapeutic agents in treating white spots and shell rot in chelonians.

FUTURE SCOPE

Although it is difficult to determine the exact origin of the bacteria, it is thought that the bacteria came from the food, the components within the breeding tank (e.g., aquatic plants), or the turtle's intestinal microbiota. Since there has been no research on compositions of intestinal microbiota of Mata mata and shell rot, further research into its intestinal microbiota compositions needs to be conducted. The genus *Elizabethkingia* is a rare pathogen that infects humans and animals, but has recently emerged as a nosocomial pathogen in humans (Van *et al.*, 2019). The pathogenicity in animals is not yet well known, in this case, cytology and culture suggest that infection by this bacterium occurred, but it is unclear to what extent this bacterium played a role in shell rot.

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