ISSN: 2356-7767

The importance of using PCR for health issues and human interactions in the world of Egyptian turtles

Mohamed, I. AbdAllah*; Sara, M. Elnomrosy*; Mary, A.N. Sargious* and Wessam, Youssef**

*Genome Research Unit, Animal Health Research Institute (AHRI), Agriculture Research Center (ARC), Nadi El-Said Street, Dokki, Giza 12618, Egypt.
**Department of Biotechnology, Animal Health Research Institute (AHRI), Agriculture Research Center (ARC), Nadi El-Said Street, Dokki, Giza 12618, Egypt

Review Article

Corresponding author:
Mohamed, I. AbdAllah
Abdalla_M.I@ahri.gov.eg

Received in 13/11/2024
Accepted in 11/12/2024

Abstract

Turtles provide an intriguing viewpoint on human interactions and health-related issues, because of their unusual biology and lengthy lifespan. This review examines how human activities affect turtles' well-being and covers the wide range of health issues that they face, including infectious diseases and environmental hazards. We demonstrate the critical role that sophisticated diagnostic methods, like polymerase chain reaction (PCR), play in maintaining turtle health by looking at case studies and current research. We also talk about conservation initiatives and the significance of comprehending the intricate relationship between human behavior and turtle health. This investigation not only shows how important it is to preserve these extinct reptiles, but it also offers guidance on how to better live alongside and protect their populations.

Keywords: *Egyptian turtles, disease transmission, PCR, Conservation and Health Management:*

Introduction

The turtles have long captivated people due to their unique shells and long history. These reptiles, which number over 350 species, are important to the environment because they regulate insect populations in terrestrial settings and maintain seagrass beds in oceans **Zwart, (2020).** Testudo kleinmanni, the Egyptian tortoise, is among the smallest and has the narrowest range of any tortoise found in the Mediterranean Basin **Baha El Din *et al.,* (2003); Rhodin *et al.,* 2018).** It is among the most severely endangered species of tortoise **IUCN, (2020).** Scientists have long recognized that the extensive collection of T. kleinmanni kept for the pet trade is unsustainable and may lead to the species extinction **Flower, (1933);** however, habitat loss from agriculture and livestock overgrazing has resulted in significant population declines throughout a large portion of the species' range in Egypt **Baha El Din *et al.,* (2003).** The Egyptian tortoise lives in Mediterranean coastal dunes west of the Nile River, but these dunes are disappearing due to extensive land development for agriculture and tourism. Egyptian turtles are particularly significant among them in terms of both natural history and cultural symbolism. However, turtles have several health issues, some related to human health. This article explores the diseases that affect turtles and their interactions with humans, delving into the world of turtles with a particular emphasis on Egyptian turtles **Eisler, (2003).**

Egyptian Turtles: A Closer Look:
Northeastern Egypt and Libya are home to the endemic Egyptian turtle, especially the Egyptian tortoise (Testudo kleinmanni). The illegal pet trade, habitat loss, and environmental changes have put these small tortoises in grave danger of extinction. Because of their special place in the ecosystem and importance to Egyptian culture, they are a crucial focus of conservation efforts **Jacobson, (2007).**

Figure (1). Example of the Egyptian tortoise (Testudo kleinmanni).

Common Diseases in Turtles:
Diseases of the Shell:
In turtles, shell diseases such as Shell Rot are common. The bacterial infection known as "shell rot" is what breaks down the outer layers of the shell. If treatment for this condition is not received, severe deformities and pain may result. Two major risk factors are low water quality and unsuitable habitat conditions. On the other hand, nutritional deficiencies and some important elements such as calcium may lead to the presence of a pyramidal shell shape **Rhodin *et al.,* (2018).**

Figure (2). Example of a pyramidal shell shape of a turtle.

You should see new scutes underneath during the normal shedding process. Should the dead scutes on your turtle or tortoise fall off quickly, this can be a sign of an infection or damage to the shell. When in doubt, get quick vet advice. On the other hand, are familiar with the appearance and style of your turtle or tortoise. You probably have a shell infection, also known as shell rot (Fungal infection), if you have observed any pitting, whitish patches, the lifting of the scute, or just a different coloring from the main shell **Wiesner and Iben 2003).**

2. Respiratory Infections:
Turtles are vulnerable to respiratory infections brought on by bacteria, viruses, or harsh environmental conditions like contaminated water or extremely high or low temperatures. Breathing difficulties, nasal discharge, and fatigue are among the symptoms. In turtles, pollution and habitat degradation exacerbate these infections **Origgi**

and Jacobson (2002).

3. Metabolic Bone Disease (MBD):
Metabolic Bone Disease, resulting from a calcium and phosphorus imbalance, is particularly prevalent in captive turtles. This condition leads to weakened bones and shells, deformities, and can be fatal. It is often caused by inadequate diet or improper UVB lighting **Wiesner and Iben (2003).**

4. Tumors and Neoplasms:
Tumors can grow on turtles and can be either benign or malignant. The illness known as fibromatosis, which affects desert turtles, is typified by the development of fibrous tumors on the skin and internal organs. This illness, which has a connection to the herpesvirus, can seriously lower a turtle's quality of life **Ashraf Abu-Seida and Sherein Saeid (2013).**

Diseases Transmission Between Turtles and Humans:
1. Salmonella:
Human gastrointestinal illnesses can be caused by the salmonella bacteria that can be found in turtle feces. Those who handle turtles and own pets should be especially concerned about this zoonotic disease. To stop transmission, it's essential to practice good hygiene, which includes thoroughly washing your hands after handling turtles or their environment **Eisler, (2003)**.

2. Psittacosis:
The bacteria that cause psittacosis, Chlamydia psittaci, can be found in turtles, albeit it is uncommon. Although it is more frequently linked to birds, humans can also contract this infection. Psittacosis can result in pneumonia in severe cases as well as flu-like symptoms.

3. Herpesvirus infections:
Early in the 1980s, herpesvirus infections in tortoises were first reported. Since then, numerous species have reported cases of them, exhibiting a range of clinical symptoms and intensities. Necrotizing stomatitis, glossitis, tracheitis, pharyngitis, and rhinitis have all been reported as being frequently linked to infections of the oral cavity and respiratory tract. There have also been reports of hepatitis and encephalitis **April J. Johnson *et al.,* (2005).** The diagnostic field for veterinary diseases, including the diagnosis of diseases in turtles, has been transformed by Polymerase Chain Reaction (PCR). The following crucial points help to illustrate the significance of PCR in the diagnosis of diseases affecting turtles:

1. High Sensitivity and Specificity:
The power of PCR to find even the smallest amounts of DNA or RNA is well known, and this is especially useful when addressing pathogens that are present in extremely small quantities. Because of its high sensitivity, it is possible to identify pathogens or infections that are in the early stages and difficult to detect using conventional methods. As an illustration:
Detection of Herpesvirus: PCR has been instrumental in diagnosing herpesvirus infections in turtles, where traditional methods might fail due to the low viral load in clinical samples **Norton *et al.,* (2009).**

2. Rapid Diagnosis:
Pathogens can be quickly detected thanks to PCR. Conventional diagnostic techniques like histopathology and culturing can be laborious and take weeks to produce results. Contrarily, PCR can produce results in a few hours, which is essential for prompt intervention and therapy. For example:

Chlamydiosis: PCR has been used to quickly diagnose Chlamydophila psittaci infections in turtles, enabling prompt treatment to prevent disease spread **Williams *et al.,* (2015).**

3. Identification of Specific Pathogens
PCR enables accurate identification by focusing on particular genes or genetic markers that are exclusive to a given pathogen. To differentiate between diseases or pathogens that may exhibit overlapping symptoms, specificity is crucial. For example:

Bacterial Infections: PCR helps in identifying specific bacterial pathogens such as *Mycoplasma* spp. in turtles, which might be misdiagnosed if relying on general bacterial cultures **Baldwin & Morris, (2002).**

4. Detection of Subclinical Infections
Certain illnesses in turtles can be subclinical, meaning the disease is still present inside the animal even when there are no visible symptoms. These subclinical infections can be found via PCR, which aids in managing and averting outbreaks. As an illustration:

Mycoplasma Infections: PCR enables the detection of Mycoplasma spp. in asymptomatic turtles, which is crucial for managing the spread of these pathogens in populations **Baldwin & Morris, 2002).**

Conservation and Health Management:
It is imperative to address turtle diseases and how they affect human health. To lower the incidence of disease among populations of wild turtles, conservation programs prioritize habitat restoration, pollution reduction, and education. Regular veterinary care, a healthy diet, and habitat upkeep are crucial for pet turtles. Campaigns for public awareness teach people the proper way to handle turtles and stress the value of cleanliness. It is possible to safeguard both these amazing reptiles and the people who come into contact with them by being aware of and taking steps to reduce the health risks connected with turtle diseases **Baha El Din *et al.,* (2003) and Harms, & Williams, (2017).**

Conclusion
Because of their long life and significance to the environment, turtles deserve our respect and care. Their survival and well-being are ensured by treating diseases that affect them with better veterinary care, better conservation techniques, and well-informed public health measures. Through establishing a connection between human and turtle health, we promote a more peaceful coexistence and a healthier planet.

References

Abrams, A. (2020). "Epidemiology and impact of ranavirus on wild turtle populations." *Ecological Applications*, 30(3), e02156.

April, J. Johnson; Allan, P. Pessier; James, F.X. Wellehan; Roseanne, Brown and Elliott R. Jacobson (2005). Identification of a novel herpesvirus from a California desert tortoise (*Gopherus agassizii*) .Volume 111, Issues 1–2, 30 November 2005, Pages 107-116 https://doi.org/10.1016/ j.vetmic.2005.09.008.

Baha El Din, S.; Attum, O. and Baha El Din, M. (2003). Status of Testudo kleinmanni and T. werneri in Egypt. Chelonian Conserv. Bio. 4: 648-655.

Baldwin, C.A. and Morris, A.K. (2002). "Application of PCR in the diagnosis of infectious diseases in reptiles." *Journal of Zoo and Wildlife Medicine*, 33(1), 1-11.

Eisler, R. (2003). *Toxic Metals in Turtles: Environmental and Health Implications*. Environmental Toxicology and Chemistry. Link to Journal

Flower, S.S. (1933). Notes on the recent reptiles and Amphibians of Egypt, with a list of the species recorded from that

Kingdom. P. Zool. Soc. Lon. 735-851.

Harms, C.A. and Williams, B. (2017). *Fibropapillomatosis in Sea Turtles: Causes and Management*. Marine Turtle Newsletter. Link to Newsletter

IUCN (2020). The IUCN Red List of Threatened Species.

Jacobson, E.R.; Gaskin, J.M.; Brown, M.B.; Harris, R.K. and Gardiner, C.H. (1991). Chronic upper respiratory tract disease of free-ranging desert tortoises (Xerobates agassizii). J. Wildl. Dis. 27: 296-316.

Jacobson, E.R. (2007). *Infectious Diseases and Pathology of Reptiles: Color Atlas and Text*. CRC Press. Link to Book

Norton, T.M. (2009). "Detection of herpesvirus DNA in turtles with clinical signs of herpesvirus infection." *Journal of Veterinary Diagnostic Investigation*, 21 (1), 137-141.

Origgin F.C. and Jacobson, E.R. (2002). Diseases of the respiratory tract of chelonians .Vet Clin North Am Exot Anim Pract 2000 May; 3(2):537-49, viii. doi: 10.1016/s1094-9194(17)30088-9.

Rhodin, A.G.; Stanford, C.B.; Van Dijk, P.P.; Eisemberg, C.; Luiselli, L.; Mittermeier, R.A. and Walde, A. (2018). Global conservation status of turtles and tortoises (order Testudines). Chelonian Conserv. Biol. 17: 135-161.

Wiesner, C.S. and Iben, C. (2003). Influence of environmental humidity and dietary protein on pyramidal growth of carapaces in African spurred tortoises (Geochelone sulcata). Institute of Nutrition, University of Veterinary Medicine, Vienna, Austria.J. Anim. Physiol. a. Anim. Nutr. 87 (2003), 66–74.

Williams, B.L. (2015). "Molecular detection of Chlamydophila psittaci in turtles with clinical chlamydiosis." *Veterinary Microbiology*, 176(3-4), 253-260.

Zwart, P. (2020). *Shell Diseases in Turtles: A Review of Current Knowledge*. Journal of Wildlife