



The Ancient Egyptian Animalarium: A Connection with Human Health

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Abstract: Learning from ancient cultures is important to face current health challenges and communication in science plays a key role to advance research and education on basic questions in biomedicine and infectious diseases such as the ongoing COVID-19 pandemic. Ancient Egyptian culture is one of the references for the study of human patterns and processes throughout evolution. In particular, the concept of health likely started in ancient Egypt (3300 to 525 B.C.E.) where humans had in-depth knowledge of the animals that lived in the Nile Valley and animal representations were common in culture and divine realm. Paleogenetic studies using ancient DNA analysis of Egyptian human mummies have provided evidence on the presence of infectious diseases. However, is there a connection between ancient Egypt animal representations and human health? In this perspective I address this question by proposing possible relationship between selected animal representations and human health with implications for the control of infectious diseases and the evolution of host-pathogen interactions. Early understanding of potential sources of disease and its relationship to religious icons and burial practices does provide information about moderately ancient understanding of disease processes and their potential causes.

Keywords: Science; Egypt; Health; Evolution; Infection; Art; Ancient; Medicine; Education

1. INTRODUCTION: ANCIENT EGYPT AND HUMAN HEALTH

Communication in science is important to advance research and education on challenges faced by society such as basic questions in biomedicine and infectious diseases such as the ongoing COVID-19 pandemic [1-6]. One of the areas that allows a better understanding of the development of medical interventions is the learning from different cultures such as ancient Egyptians [7, 8]. Ancient Egypt was a civilization that lasted from 3300 to 525 B.C.E. and where probably the concept of health started [Ebers Papyrus; <https://www.ancient-egypt-online.com/ancient-egyptian-medicine.html>].

Animal representations were common in ancient Egypt culture with connection with the Egyptian pantheon of gods and kings filled with divine animals [7, 8] [Figs. 1A-1F]. The animal cults accompany the history of Egypt and ancient Egyptians had in-depth knowledge of the animals that lived in the Nile Valley. These animals and their characteristics were then reflected in the divine realm with gods and kings taking animal forms [i.e., Sobek, crocodile-headed god of the Nile; Sekhmet, leonine goddess of war; Anubis, jackal god of the underworld; Hathor, mother goddess with cow's horns] [7, 8].

However, is there a connection between ancient Egypt animal representations and human health? In this perspective I address this question from a biomedical perspective by proposing possible relationship between selected animal representations and human health with implications in the control of infectious diseases and the evolution of host-pathogen interactions.

2. ANIMAL REPRESENTATIONS AND POSSIBLE RELATION TO HUMAN HEALTH

Lion: Sekhmet, the goddess of healing and medicine. The representation of the lion may be associated with human health through for example the lion-headed goddess of healing and medicine [Fig. 1A].

Falcon: Horus, the god of protection. The representation of the falcon and other birds as in the falcon-headed god Horus may represent protection not only to ensure for example safe travel but may be also from infectious diseases [Fig. 1B].

Cow: Goddesses of birth, fertility, and nourishment. Gods were sometimes depicted in the form of bulls and rams, and cow-headed goddesses were linked with fertility as represented supervising the delivery process during the birth of Isis [Fig. 1C].

Hippopotamus: Opet and Taweret, goddess of protection and nourishing. These goddesses represented by a hippopotamus [Fig. 1D] appear as a combination of deities represented by falcon [Fig. 1B] and cow [Fig. 1C], suggesting the importance than Egyptians gave to the protection and nourishing with implications in human health.

Scarab: symbol of the sun god Ra. *Scarabaeus sacer* [Linnaeus, 1758] was a sacred species and the most popular amulet in ancient Egypt representing the cycle of life and death and a form of protection [Fig. 1E].

Dogs and cats: prominent roles in Egyptian mythology and human protection. Dogs acting in the interests of the dead were the best protection against the jackals represented by jackal-headed gods of mummification, Anubis and Wepwawet [Fig. 1F]. Jackals attack humans and transmit rabies to them as well as to dogs and cats.

Bees: association with prevention of infectious diseases. Bees were associated with Egyptian royalty and pharaoh titles [Fig. 1G]. Beekeeping was practiced in ancient Egypt with moving hives all over the Nile to pollinate flowers in season. Honey was used for preventing infection by being placed on wounds.



Figure 1. Animal representations in ancient Egypt culture with connection with human health. (A) Lion: Sekhmet, the goddess of healing and medicine. (B) Falcon: Horus, the god of protection. (C) Cow: Goddesses of birth, fertility, and nourishment. (D) Hippopotamus: Opet and Taweret, goddess of protection and nourishing. (E) Scarab *S. sacer*: symbol of the sun god Ra with protective capacity. (F) Dogs and cats: prominent roles in Egyptian mythology and human protection. (G) Bees: association with prevention of infectious diseases. Images and design by the author.

3. EVIDENCE OF INFECTIOUS DISEASES IN ANCIENT EGYPT

Paleogenetic studies using ancient DNA analysis of Egyptian human mummies have provided evidence on the presence of infectious diseases [recently reviewed by [9]]. These studies presented paleogenomic evidence for the diagnosis of infectious diseases in ancient Egyptian human remains [9, 10][Fig. 2A].

Schistosomiasis caused by *Schistosoma* spp., parasites hosted by freshwater snails living in the Nile River was diagnosed by paleogenomics in a liver sample of an Egyptian mummy and was likely a cause of death in ancient Egypt as still occurs in present days [11-14]. Malaria caused by mosquito-borne *Plasmodium* spp. parasites was common in ancient Egypt with possible co-infections with mycobacteria and without evidence that doctors could treat it [8, 15-18]. The disease likely caused many deaths and currently is one of the infectious diseases with major impact on human health worldwide [19]. Mycobacteria cause chronic diseases such as tuberculosis [*Mycobacterium tuberculosis*] and leprosy [*Mycobacterium leprae*], both of which were diagnosed by paleogenomic evidence of mycobacterial DNA in ancient Egyptian mummies [i.e., 20, 21]. Toxoplasmosis is a zoonotic disease caused by obligate intracellular parasite, *Toxoplasma gondii* and with domestic cats as definitive hosts for pathogen sexual reproduction [22]. Cats played a prominent role in Egyptian mythology with the likely presence of domestic cats with risks of zoonotic transmission of *T. gondii* as evidenced by pathogen identification in human mummies [23, 24]. Evidence of visceral leishmaniasis-causing *Leishmania donovani* mitochondrial DNA was reported in Egyptian mummy samples [25]. In the recent study by Neukamm et al. [21], hepatitis B virus genome was also detected in an Egyptian mummy. Other diseases such as rabies, although the rabies RNA virus has not been identified in mummies, has been described in ancient Egyptian texts [26].

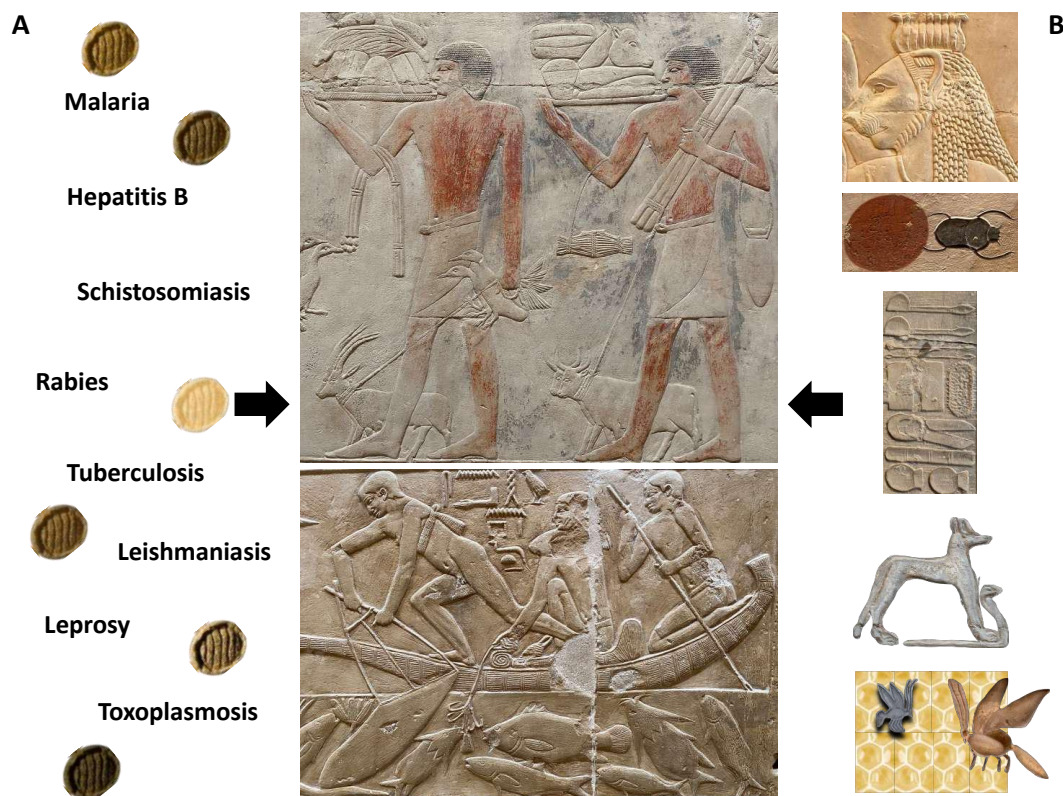


Figure 2. Ancient Egyptian interventions for the control of infectious diseases and the evolution of host-pathogen interactions. (A) Infectious diseases in ancient Egypt. (B) Role of animal-headed goddesses and gods and animals together with other medical interventions in healing medicine, birth, fertility, protection and nourishment for the prevention and treatment of infectious diseases. Images and design by the author.

4. POSSIBLE CONTROL INTERVENTIONS AGAINST INFECTIOUS DISEASES

Ancient Egyptians were in close contact with animals with risks of exposure to infectious diseases [Fig. 2 central panel]. Based on the records in ancient Egyptian texts and culture, support exists for the role of animal-headed goddesses and gods in healing medicine, birth, fertility, and nourishment [Figs. 1A-1C and 2B]. Animals such as hippopotamus, scarabs, dogs and cats were recognized with a protective role to humans [Figs. 1D-1F and 2B]. Other animal species such as bees were associated with prevention of infectious diseases through the application of honey on wounds [Figs. 1F and 2B]. Additionally, honey is a functional food with probiotic therapeutic potential [27]. Other medical interventions were also recorded and were associated with the ancient Egyptian believe that human body consisted of passages then when blocked the person was sick [8] [Fig. 2B].

5. CONCLUSIONS

These evidence suggest that indeed exists a relationship between selected animal representations in ancient Egyptian animalarium and human health. This information advances our understanding of ancient interventions for the control of infectious diseases and the evolution of host-pathogen interactions and supports ancient Egyptian culture as a reference for the study of human patterns and processes throughout evolution. Early understanding of potential sources of disease and its relationship to religious icons and burial practices does provide information about moderately ancient understanding of disease processes and their potential causes. Nevertheless, the ancient view of Egyptians by combining human health with animal [i.e., dogs or bees] and environmental interventions [i.e., pollination of flowers in season] provide the initial evidence of the One Health approach.

6. ACKNOWLEDGMENTS

This work was partially supported by the Junta de Comunidades de Castilla-La Mancha (JCCM), Spain and EU-FEDER (grant GALINFEC SBPLY/17/180501/000185). To my wife, Karella Deulofeu, for organizing the visit to Egypt for her 60th birthday. I acknowledge the Egyptologist, Mohamed Soliman (Wisdom Tours & Travel, Egypt), for his guidance and education in ancient Egyptian culture. I thank Dr. Mona S. Mahmoud, Head of Veterinary Research Division at National Research Center (Giza, Egypt) for the invitation to the 9th International Conference of Veterinary Research Division on Animal Health for Global Health Security, Egypt, 2021"

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Citation: José de la Fuente. "The Ancient Egyptian Animalarium: A Connection with Human Health" *International Journal of Humanities Social Sciences and Education (IJHSSE)*, vol 8, no. 10, 2021, pp. 164-168. doi: <https://doi.org/10.20431/2349-0381.0810015>.

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