TRADITION AND MODERNITY IN VETERINARY MEDICINE, 2025, vol. 10, No 2(19): 74–85

PODODERMATITIS IN ZOO ELEPHANTS – MICROBIOLOGICAL STUDIES

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(Submitted: 31 August 2025; Accepted: 6 November 2025; Published: 27 November 2025)

ABSTRACT

Microbiological studies were performed on samples from the feet of elephants with signs of pododermatitis. The patients were the elephant Frostya from the Sofia Zoological park, as well as the elephants Myo and Lesso from the Attica Zoological park. The samples were taken from the contents under the nails and from lesions in interdigital space and on the foot.

From the materials from the elephant Frostya from the Sofia Zoo, the Gram-negative species *Serratia marcescens* and *Hafnia alvei* 2 were isolated. *Staphylococcus warneri* and *Staphylococcus simulans* were also isolated, as well as the oval fungus *Cryptococcus neoformans*. From the elephants Myo and Lesso, the Gram-negative species *Citrobacter freundii* and *Enterobacter agglomerans* 3, three types of staphylococci – *S. warneri* 1, *S. mucilaginosus* and *S. cohnii ssp. urealyticum*, *Corynebacterium* sp., as well as the oval fungus *Candida glabrata* were isolated. In addition, corynebacteria and fungi with colonies characteristic of *Microsporium* sp. were isolated from them.

The isolated microorganisms are conditionally pathogenic and multiply when the nails and skin of the feet are damaged locally. By improving hygiene conditions and providing greater opportunities for walk, which elephants need, conditions would be created to limit and prevent pododermatitis.

Key words: pododermatitis, elephant, microorganisms.

Introduction

Elephants are particularly attractive animals, beloved by zoo visitors. However, the immobility during their life in captivity is one of the main prerequisites for foot diseases, from which they often suffer. Hard surfaces, most often concrete, the presence of moisture, etc. also have a harmful effect on elephants' feet. The type of substrate, whether soil, sand or concrete, can have significant implications for the overall well-being of elephants, including the development of musculoskeletal and skin diseases. When their territory is not cleaned sufficiently and regularly, the problems worsen. Dry substrates can cause cracked feet and brittle toenails, while wet substrates are a breeding ground for bacterial or fungal infections. Thus, ensuring adequate drainage in enclosures is crucial to maintaining respiratory, skin and foot health. Bruises on the feet due to the weight of the animals, as well as overgrowth and cracking of the nails, are also problematic in this aspect. That is why caring for the feet of zoo elephants is a very important task, no less significant than proper nutrition and cleaning (Nigam *et al*., 2025).

The structure of the elephant's foot has some specific features due to the need to support their large body mass. They have five toes on each foot, sunk into soft tissues, but not every toe has a claw. Asian elephants usually have five claws on the front feet and four on the hind feet, while

African elephants have one fewer. Their toes point downward and are further supported by a massive fatty connective tissue on the foot. This acts as a shock absorber and is responsible for the elephant's silent gait (FFCAE, 2025).

Elephants in captivity require regular foot care, including scheduled trimming of their feet, to maintain optimal health. Foot monitoring is the first step in caring for an elephant's feet. The caretaker should inspect the elephant's feet for signs of infection or injury and monitor the healing of previous illnesses. Nails also require periodic attention to prevent overgrowth and crowding, which can lead to complications. Daily inspection of the feet of zoo elephants is an important preventive care. It is performed while the elephant is lying on its side or with its leg elevated. The elephant is monitored for injuries, signs of inflammation, abscesses, infection, cracking of the feet, heels or nails, hyperplasia and other damage. These disorders are a prerequisite for the development of osteomyelitis, which can cause slow painful breakdown of the bones of the legs and the outcome can be fatal. In addition, the elephant's behavior is observed for reluctance to move (a sign of pain) or lameness. Early detection of deviations from the normal condition of the feet is important to prevent the development of serious severe injuries and diseases. Elephant feet can become dry and cracked, especially in dry climates or if the elephant spends a lot of time on hard surfaces. After bathing, applying medicinal oil "Dekamil Oil" to the foot and nails helps prevent cracking and cracking, strengthens cuticles, prevents excessive cuticle growth, acts as a fly repellent, antiseptic to prevent foot rot and abscesses. Preventive veterinary care by monitoring important health parameters is essential in captivity. It is also required to practice light exercises such as walking, swimming, and others to promote mobility, strength, joint health, and weight control, as obesity is often associated with poor foot health (FFCAE, 2025; Nigam *et al*., 2025).

The aim of this work is to perform microbiological studies to isolate and identify microorganisms from the affected areas of legs of elephants from the zoos in Sofia and Athens in order to establish the causes of the chronic lesions under the nails and on the skin of the interdigital space and foot of elephants.

Materials and Methods

Materials for microbiological studies

Nine samples (three from each animal) were tested. They were taken in sterile tubes with transport medium (sterile semi solid agar gel, MDD + IVD, suitable for aerobes and anaerobes, Nuova Aptaca S.r.l.) from nails (after cleaning of dirt, at the border with healthy tissue), from skin between the toes (also in depth, after cleaning) and from erosions on the foot (after cleaning of the surface layer). Zoo elephants develop local lesions on the feet and under the nails, where they tend to accumulate dirt with a black color and a bad specific odor. These affected areas need periodic cleaning and disinfection. After such routine grooming (mechanical cleaning and washing) before disinfection, the materials for laboratory research were taken. They were transported to the microbiology laboratory on the same day (from the Sofia Zoo) and within 24 hours (from Athens) in a refrigerated bag.

Animals studied

The samples were taken from three Asian elephants, living in two zoos - the Attica Zoological Park in Greece and the Sofia Zoo in Bulgaria, members of European association of zoos and aquariums (EAZA).

- The elephant Frostya is a newcomer to the Sofia Zoo, arrived with her sister in 2023 after the death of the elephant Artaida, who was the emblem of the zoo for many years. The samples were received on 23.10.2024.

The same types of samples were taken from two elephants from the Athens Zoo on 12.03.2025:

- Elephant Myo – male, 19 years old - materials from the frontal left leg – 1) nail (hole); 2) between nails; 3) paw. • Elephant Lesso – male, 19 years old - materials from the frontal left leg – 1) nail (hole); 2) between nails; 3) paw.

In Attica Zoological Park are accommodated these two male Asian elephants. They are both born in a zoo in Emmen in Netherlands (Wildlands). In the age of 5 years old they moved to the Zoo Plock in Poland and in the autumn of 2015 they moved to Attica Zoological Park. Lesso was born in 06.06.2005 and Myo was born in 07.08.2005. Physically they are both around 3.500 kg with Myo being a bit bigger and with more musculature than Lesso and he has tusks, while Lesso belongs to the 30% of Asian male elephants who doesn't have tusks. Their hierarchy is not so clear but the dominance is leaning towards Myo without any problems with their co-habitation.

Housing

In Attica Zoological Park their enclosure is divided in an outside area of 32 decares and an inside area consisted of two rooms for them and one training room. The outside area is covered with hard soil and rocks of different size. In three different spots is places sand for their needs. There is a big pond for their bath (with some waterfowl birds) and a huge space with shadow. Also the outside area is equipped with different feeding spots. The inside area is covered with cement. The rooms are equipped with heaters for the winter and every room has its own water source. The food is placed on two metal boxes which has holes and placed above the doors for the rooms in order to work as a slow feeder.

In Sofia Zoo are accommodated two female Asian elephants. Louisa who is 49 years old and Frostya who is 42. They arrived in Sofia last year (2023) from Augsburg (Germany). Before that they were in Tierpark in Berlin. For many years these two elephants live together and with other members of elephants in these zoos. Their relationship is very strong. Louisa is the dominant female.

Housing

In Sofia Zoo their enclosure also has an outside area and the inside rooms. The outside area is covered by sand and it has a pond for their bathing and many feeders. The inside area includes one main room which is visible also for the visitors of the zoo and two more rooms for their isolation or relaxing during the night. The floor of the rooms is made by bricks and its surface is covered with sand mostly in the rooms. Because of their age the sand piles are very important in the area where they sleep because they lay on it and after is easier for them to get up. The main room is used for their training as well and their foot care.

Nutrient media

For the isolation of microorganisms, samples were cultured on elective and selective media (Biolab Zrt. H-1141, Budapest Ov. utra 43). Mueller Hinton agar, Columbia blood agar, as well as selective and differentiating media were used: Colorex Chromogenic Orientation agar (Ridacom-Sofia), Chapman Stone agar for staphylococci, EMV agar for Gram-negative bacteria, Cetrimide agar for *P. aeruginosa* and Sabouraud dextrose agar with chloramphenicol (Antisel – Sharlau

Chemie S. A., Spain) for fungi. For the isolation and cultivation of strict anaerobes, Tarotsi's broth (BUL-BIO NCIPD, Sofia) was used.

Microbiological studies were performed by culturing the studied samples on elective and selective media. The results were reported after incubation under aerobic and anaerobic conditions at 37°C for 48 – 72 hours.

Microscopic studies of microorganisms were performed under immersion at a magnification of x 1000 after staining according to the classical Gram and Pfeiffer methods of the studied materials. A digital microscope with a camera, model B-190TV, Optika, Italy, was used.

The taxonomic identification of the isolated microorganisms was performed by conventional methods according to the 9th edition of Bergey Manual of Determintive Bacteriology (Holt *et al.*, 1994). It was carried out by microscopic examination of preparations stained by various methods, recording their cultural and hemolytic properties on solid and liquid media, as well as biochemical identification. The isolated Gram-negative aerobic and facultative anaerobic bacteria were identified by Polymicrotest (BUL-BIO-NCIPD-Sofia). We prepared suspensions in distilled water from 24-hour bacterial cultures of the isolated on Eosin Methylene Blue agar microorganisms. We homogenized the suspensions well on Vortex and brought them to a turbidity of 2 according to the McFarland standard. We inoculated by 0.1 ml into all microtubes on the plate. In wells 3-8, we placed by 2 drops of sterile paraffin oil to create an anaerobic environment. We placed the plates in a thermostat at 37 ℃ for 4 hours and read the results after adding reagents to the first 4 tubes using the test table and recorded the data. We performed the reading and interpretation of the results using the Bergey Manual of Determintive Bacteriology (Holt *et al.*, 1994).

The species determination of staphylococci isolated from the samples on Chapman Stone agar was carried out using MICROLATEST STAPHYtest 24, which is designed to identify microorganisms of the genus Staphylococcus and related Gram-positive catalase-positive cocci. We worked with 24-hour cultures, from which we prepared suspensions in saline solution with a density of 2 according to McFarland. We homogenized them well on a Vortex and inoculated 0.1 microliters into all wells of the plates. We placed by 2 drops of sterile paraffin oil in wells H, G and F of the first row. We incubated the prepared plates at 37 ℃. for 24 hours and reported the results according to the color code for the test, and after determining the eight-digit codes of the strains, we found the corresponding species in the code book for the test.

To identify the isolated oval fungi from the samples on Sabouraud agar, we used MICROLATEST CANDIDA-Screen, designed for the identification of the most common clinically significant species of oval fungi. According to the instructions for performing and reporting the test, we prepared suspensions in saline solution from 24-hour cultures with a turbidity of 3 McFarland, which we homogenized well on a Vortex. We inoculated by 100 microliters into the wells of the plates, then placed by 3-4 drops of sterile paraffin oil in all inoculated wells. We placed the prepared plates in a thermostat for 24 hours. We reported the results by comparing the color reactions with the color index and identified the species using the test table index.

Results and Discussion

The data from the microbiological tests performed on the materials from the elephant Frostya are presented in Table 1. Some of the test results can also be seen in Figures 1 – 3.

Table 1: Microorganisms isolated from the tested materials from the elephant Frostya

Microorganisms	Tested material		
	Under the nails	**Between the fingers**	**Foot lesion**
Gram-negative bacteria	*Serratia marcescens, Hafnia alvei* 2	*Serratia marcescens, Hafnia alvei* 2	*Serratia marcescens, Hafnia alvei* 2
Gram-positive bacteria	*Staphylococcus warneri*	*Staphylococcus warneri*	*Staphylococcus simulans*
Fungi	*Cryptococcus neoformans*	*Cryptococcus neoformans*	*Cryptococcus neoformans*

We identified the Gram-negative bacteria isolated from the elephant Frostya as *Serratia marcescens* and *Hafnia alvei* 2.

From the material under the nails and between the fingers, we isolated *Staphylococcus warneri*, and from the skin lesion – *Staphylococcus simulans*.

From the three materials, we isolated the oval fungus *Cryptococcus neoformans*. We did not detect any filamentous fungi.

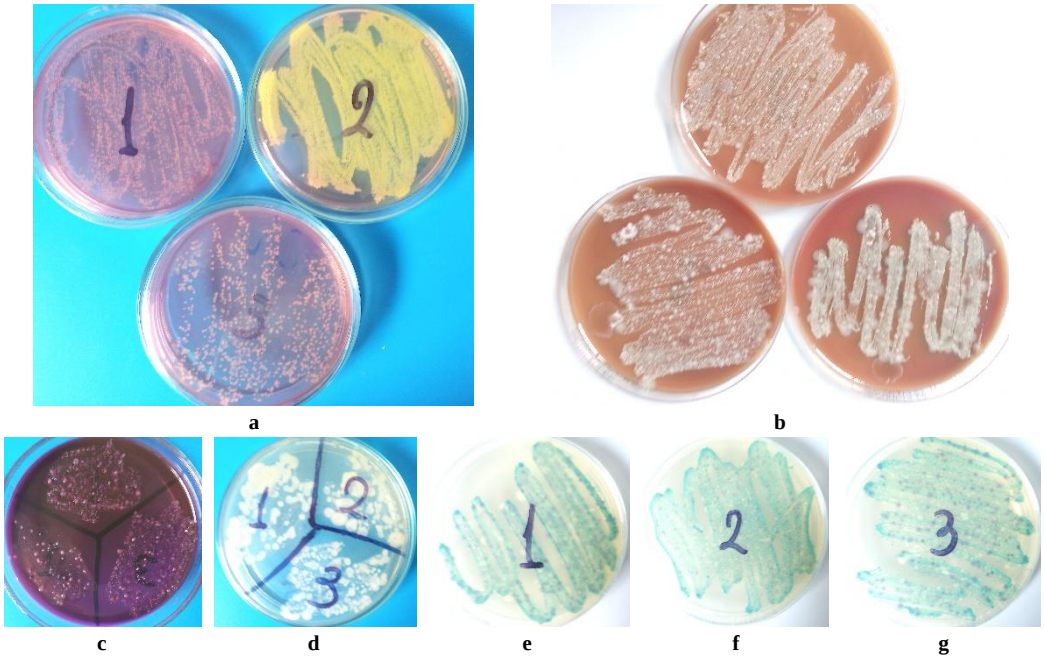

Figure 1: Results of some of the cultural studies of samples from the feet of the elephant Frostya: 1 – material under the nails; 2 – from callus on the foot; 3 - between the toes; a - on Chapman agar; b - on blood agar; c - on Eosin methylene blue agar; d - on Sabouraud agar; e – g - on Chrome agar orientation.

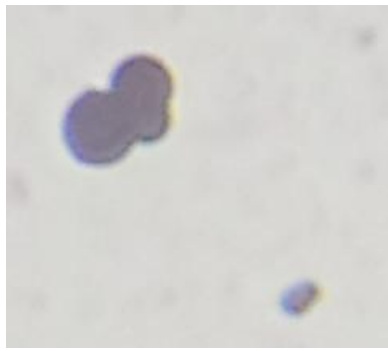

Figure 2: *Cryptococcus neoformans* cells, x 1000, Gram staining.

Figure 3: Some of the results of biochemical studies of microorganisms isolated from the elephant Frostya: top left – for Gram-negative bacteria; top right – for staphylococci; below – for oval fungi.

The results of the microbiological studies of the materials from the Myo elephant are presented in Table 2. Some of the results of the studies can also be seen in Figures 4 and 5.

Table 2: Microorganisms isolated from the tested materials from the elephant Myo

Microorganisms	Tested material		
	Under the nails	**Between the fingers**	**Foot lesion**
Gram-negative bacteria	*Citrobacter freundii, Enterobacter agglomerans* 3	*Citrobacter freundii, Enterobacter agglomerans* 3	*Citrobacter freundii, Enterobacter agglomerans* 3
Gram-positive bacteria	*Staphylococcus warneri* 1 *Staphylococcus mucilaginosus, Corynebacterium sp.*	*Staphylococcus warneri* 1 *Staphylococcus mucilaginosus, Corynebacterium sp.*	*Staphylococcus warneri* 1 *Staphylococcus mucilaginosus, Corynebacterium sp.*
Fungi	*Candida glabrata*	*Candida glabrata, Microsporium sp.*	*Candida glabrata, Microsporium sp.*

The results of the research on the materials from elephant Lesso are presented in Table 3. Some of the research results can also be seen in Figures 4 and 5.

Table 3. Microorganisms isolated from the tested materials from the elephant Lesso

Microorganisms	Tested material		
	Under the nails	**Between the fingers**	**Foot lesion**
Gram-negative bacteria	*Citrobacter freundii*, *Enterobacter agglomerans* 3	*Citrobacter freundii*, *Enterobacter agglomerans* 3	*Citrobacter freundii*, *Enterobacter agglomerans* 3
Gram-positive bacteria	*Staphylococcus cohnii ssp. urealyticum* *Staphylococcus mucilaginosus*	*Staphylococcus cohnii ssp. urealyticum* *Staphylococcus mucilaginosus*	*Staphylococcus cohnii ssp. urealyticum* *Staphylococcus mucilaginosus*
Fungi	*Candida glabrata*	*Candida glabrata*, *Microsporium sp.*	*Candida glabrata*, *Microsporium sp.*

Figure 4: Some of the results of biochemical studies of microorganisms isolated from the elephants Myo and Lesso: on the left – for Gram-negative bacteria; on the right – for staphylococci.

Figure 5: Colonies characteristic of *Microsporium* sp. isolated from the elephant Lesso (left and middle) and from the elephant Myo (right).

The largest amount of isolated microorganisms was from the materials between the elephants' toes, and the smallest - under their nails. Bacilli were also isolated from elephants from both zoos.

As can be seen from the presented results, the species diversity of the isolated microorganisms was greater in elephants from the Athens Zoo. When examining the samples from them, it was found that the amounts of microorganisms from Myo, which is heavier, were significantly higher than those from Lesso. In them, corynebacteria and fungi with colonies characteristic of *Microsporium* sp. were found in the interdigital space and on the lesions of the foot. Such were not isolated from the materials from the elephant from the Sofia Zoo.

From the results obtained, it is seen that staphylococci of various species and oval fungi turn out to be part of the microflora of elephants. They are supplemented by Gram-negative bacteria from the family *Enterobacteriaceae*. The isolated bacteria are conditionally pathogenic (Popova, 2016).

Environmental conditions and feet care. The weather in Greece is with very warm, dry and prolonged summers and mild winters. The soil in the outside area is mostly dry and the inside are every day is cleaned from the previous day and by the time that the elephants will go inside is dry. During summer the elephants stay in their outside enclosure and the night have access to both outside and inside. In the winter, if the temperature is below 10 °C they are only inside during the night with the heaters on and outside during the day.

These environmental factors play a role to their nails which are very hard and dry and sometimes difficult for the feet care by their zookeepers but more durable. For their feet care they need to be soaked with water in order to become softer and be easier for the procedure. The tools that are used are the same as these for the hooves of horses (4-5 different hoof knives and one big rasp). For anti-bacterial action is used solution of Chlorhexidine.

The nail checkup is performed every morning before the elephants go to their outside enclosure. The procedure is before their morning nutrition and with positive reinforcement training. The foot care is applied in cases of cracks, break of nails or stones stuck on the paw or nails. Once a week every elephant will undergo a general foot care procedure for trimming and re-shaping of their nails.

The weather in Bulgaria and particularly in Sofia is known for the low temperature and prolonged winters. This is a prerequisite for higher humidity in their enclosure than in Greece. Because of this their nails are softer and makes them easier for the foot care and trimming but more prone in cracks or damages. According to our observations, no matter how hard the nail is, the crack usually remains superficial, but when the nail is soft, the crack grows inward. In general, the elephants are tolerant to low temperatures but during the night they must be kept at minimum 8°C. Because of that they spend a lot of hours in the inside enclosure with result of not walking a lot. This is negative for their nails because they are not trimmed naturally so the foot care by the zookeepers must be more often. When these two elephants arrived in Sofia their nails were very long and with a lot and deep cracks. For some months one of the authors – Andreas Antoniou, helped the zookeepers of the zoo with his guidance because of his 10 years of experience in elephants (from Attica zoological park) and today the condition of the feet is very good. The zookeepers perform good foot care with proper trimming of the nails, preventing the formation of new cracks and by fixing any of them early. The tools used are the same as in Greece and for anti-bacterial action is used Granulin.

The elephants from the zoos we studied in Athens and Sofia showed no signs of pododermatitis. Even when cracks or lesions were present, there were no signs of inflammation (redness, pain, bleeding or pus, etc.). After proper and systematic care of the feet, Frostya's lesions gradually became smaller and smaller until they disappeared and the nail grew back. She had a large crack on one nail (seen in Figure 6 before and after treatment), which was so deep that while we were trimming it, we saw that it reached the nail lamellae. But even then, we did not notice signs of inflammation. Microflora studies are important to assess whether these microorganisms play any role in the development of cracks, how dangerous they can be if the lesions deepen. They were inside the cracks, but inflammatory signs did not develop. Of the elephants studied, Frostya's foot is the most affected. The black mass is necrotic tissue formed due to the untreated crack. Even in this nail we did not find signs of inflammation. The necrotic tissue reached the lamellae of the nail capsule. Andreas Antoniou treated the lesion for 2 months with the help of the keepers until healing was achieved. The second photo clearly shows the significant improvement and much less dead tissue.

As a result of regular care for the feet and nails of the elephants, now they are in very good condition, without cracks, necrosis or other lesions. Appropriate conditions in the premises and yard, as well as proper care with regular cleaning of the feet and nails, are particularly important for preventing the development of pododermatitis in zoo elephants.

Figure 6: Crack on one nail of Frostya before (left) and after treatment (right).

Due to the unique characteristics of elephant feet and their high susceptibility to disease, elephant caretakers must be well-trained in the care of these animals. They must have the proper equipment for foot care and pedicures for elephants. Good knowledge and facilities for local anesthesia are also required when painful therapeutic procedures are necessary, both for the safety of the caretaker and to prevent the elephant from being reluctant to undergo future foot care and treatment (FFCAE, 2025). In both zoos we studied, the care of elephants is fully tailored to these characteristics.

Wild elephants typically walk many miles each day in search of food. This is a prerequisite for maintaining the good condition of their feet and for them to wear down their nails and pads to a healthy length. Walking on soil, grass and a variety of vegetation is a natural prevention of foot problems, as it also favors the wear down of nails and pads. A preventive measure in captive animals is to provide conditions and sufficient space for free movement and exercise. Even in good conditions provided, however, when in captivity, elephants often do not walk enough to wear down their nails and pads, and they must be trimmed if they grow. A damp substrate is also a predisposing factor. Regular pedicures are an important part of foot health care. All foot treatments should be performed in a hygienic environment with sterile equipment. Male elephants, however, are less tolerant of foot care, which is why they are more vulnerable to diseases (Sarma *et al.*, 2012; FFCAE, 2025). Our experience confirms these findings.

Half of the elephants in captivity in India, which has perhaps the largest captive elephant population in the world, are affected by foot disease at least once in their lives, especially as they age. The hind limbs are more susceptible and the lesions are more severe. Between 2003 and 2005, Sarma *et al.* (2012) examined 312 captive elephants from Eastern India for foot disease and have

identified fourteen different types of disease. A variety of bacteria and fungi had been isolated from foot lesions, as well as mites and filarial worms (Sarma *et al*., 2012). In their study, a large number of common bacteria had been isolated from the feet of elephants affected by pododermatitis. The most common isolates are from the genera *Staphylococcus, Bacillus, Pseudomonas, Corynebacterium* and *Streptococcus*. *Dicholobacter nodusus*, which is mainly associated with foot diseases in ruminants, also had been isolated from two cases in elephants (Sarma *et al.,* 2012). This species was not found in our study. We also did not isolate *Staphylococcus aureus*, which was highlighted by Chen *et al.* (2025) as the main cause of skin diseases in Asian elephants. In addition to bacteria from these groups, Keet *et al.* (1997) reported the isolation of *S. agalactiae* and also *D. nodosus*. We believe that the absence of obligate anaerobes such as *D. nodosus* in our study is due to the regular cleaning of elephant feet in the studied zoos and the prevention of the development of deep lesions with anaerobic conditions.

West (2001) has isolated *Proteus mirabilis*, *Enterobacter* sp. and *Bacteriodes* sp. from lesions on elephant feet. In our studies of elephants from the Athens Zoo, we also isolated *Enterobacter agglomerans* 3, but not anaerobes such as *Bacteriodes* sp. Chakraborty *et al.* (1991) reported *Staphylococcus aureus* and *Streptococci pyogenes* in material from the feet of elephants from Assam, which were of higher pathogenic potential than the staphylococci we identified in animals from both zoos. Elephants raised in Western countries usually develop bacterial foot infections in winter, as they are usually kept in stables during the winter season. Urine keeps the area moist, allowing bacteria to colonize the skin, which can initiate the development of foot rot. The bacteria are usually of soil origin. In our studies, most of the bacteria isolated from all animals studied were of this origin. Skin injury in the foot area leads to the creation of an entry point and the penetration of bacteria with the possibility of invasion into deeper tissues (Sarma *et al.,* 2012). Sreehari *et al.* (2025) reported that *Stenotrophomonas maltophilia*, *Lactococcus lactis* and *Staphylococcus arlettae* are the main bacterial species identified by PCR in fecal samples of captive elephants, of which *Stenotrophomonas maltophilia* is an opportunistic pathogen that dominated all age groups. Wang *et al.* (2024) point out that habitat and husbandry practices significantly influence the gut microbiota of captive Asian elephants. *Bacteroidetes* and *Firmicutes*, which are key cellulose-degrading bacteria, are the dominant phyla. The identification of bacterial species such as *Lactobacillus fermentum, Clostridium neonatale, Enterococcus mundtii, Klebsiella huaxiensis*, *Corynebacterium nasicanis*, and *Streptococcus equinus* highlights the potential role of specific microbes in elephant health. Encouraging microbial diversity through improved captive conditions could improve the health of these endangered animals.

In addition to bacteria, various types of fungi have been isolated from chronic foot lesions. The most common fungi are from the genera *Aspergillus, Trichophyton, Candida, Phycomycetes* and *Blastomycetes*. In some cases, yeasts have also been found. Chakraborty *et al.* (1991) identified fungi from the feet of elephants affected by chronic infection, such as *Trichophyton terrestre* and *Aspergillus niger*. We also isolated oval fungi of the species *Cryptococcus neoformans* (from the Sofia Zoo) and *Candida glabrata* (from elephants in the Attica Zoo), where we also found *Microsporium* sp. We did not find filamentous fungi in the examined materials from the Sofia Zoo. These differences are, in our opinion, related to the differences in the growing conditions and climate in Athens and Sofia.

Pododermatitis is a very painful chronic disease characterized by proliferative or degenerative lesions in and around the feet of elephants, and is widespread among captive elephants. It is usually

complicated by pyogenic and fungal infections. These diseases are either extremely difficult to treat with conventional means or are not curable, which is why prevention is of paramount importance. Chronic foot problems can lead to serious disability or even death in elephants. Therefore, it is extremely important to detect these diseases at an early stage and seek appropriate treatment in a timely manner. However, the most effective way to deal with this widespread problem is prevention. Periodic pedicures of captive elephants should be an integral part of modern captive elephant care (Sarma *et al.*, 2012). Our experience shows that with regular and proper care of elephants' feet and claws, the development of lesions is successfully prevented.

Conclusion

Microbiological studies were performed on samples of the contents under the nails and from lesions in the interdigital space and on the foot of captive elephants from zoos iv Atina and Sofia. Combinations of microorganisms were found, including Gram-negative bacteria from the family *Enterobacteriaceae*, staphylococci and oval fungi. From the materials from the elephant Frostya from the Sofia Zoo, the Gram-negative species *Serratia marcescens* and *Hafnia alvei* 2, also *Staphylococcus warneri* and *Staphylococcus simulans*, as well as the oval fungus *Cryptococcus neoformans* were isolated. From the elephants Myo and Lesso from the Athens Zoo, the Gram-negative species *Citrobacter freundii* and *Enterobacter agglomerans* 3, three types of staphylococci - *Staphylococcus warneri* 1, *Staphylococcus mucilaginosus* and *Staphylococcus cohnii* ssp. *urealyticum*, *Corynebacterium* sp., as well as the oval fungus *Candida glabrata* were isolated. In addition, fungi with colonies characteristic of *Microsporium* sp. were isolated from them. The microflora found in elephants from the Athens Zoo has a greater species diversity.

Acknowledgements

We express our gratitude to: Dobromir Borislavov - Sofia zoological park director, Jean-Jacques Lesueur - Attica zoological park director, Antonis Ballas - Mammals and reptiles curator (Attica zoological park), Vangelis Potes : Elephant headkeer (Attica zoological park), as well as to the rest of elephant zookeepers of both zoos for their help.

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