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ProGenY - Göritz • Hildebrandt GbR • Römerweg 74 • D - 10318 Berlin • Germany

The City of Edmonton
Attention: Gary Dewar
Edmonton Valley Zoof
13315 Buena Vista Road
Edmonton, AB

Canada T5R 5R1

Examination Report of the Asian elephant "LUCY"

Berlin, 2023-12-05

Background/Introduction

On behalf of the City of Edmonton we re-examined the 48 year old female Asian elephant "Lucy" ("Skanik") at the Edmonton Valley Zoo (EVZ) in Edmonton, Alberta, Canada on 5th October as independent consultants. Our main focus was to perform a complex medical examination to re-evaluate Lucy's general health condition compare to the results reported one year ago (see Examination report 06.01.2023). Also present for the examination was i.) Dr Marie-Josée Limoges (JP, Edmonton Valley Zoo's Veterinarian) and the entire Elephant Care Team of EVZ, which ensured safe access for us to Lucy.

Animal/Patient

Species	Asian elephant (<i>Elephas maximus</i>)
Sex	female
BCS	3.5 out of 5 (1=cachectic; 3=optimal;5=obese)
ID	„Lucy“
Age	48 Years
Date	5 th October 2023
Location	Edmonton Valley Zoo

Lucy is a calm and gentle elephant that is managed in "free contact". She lost enormous weight (about 300 kg) due to changed diet as recommended last year. Her BSC changed from 4.5 to 3.5! Her over-all body condition improved as well. All medical examinations has been applied without sedation as last year. Lucy was well habituated and conditioned to receive transabdominal as well as transrectal ultrasonography without any signs of stress. This was the result of a structured long term training program by the elephant care team.

Medical examination & findings

Blood gas and blood chemistry analysis:

Lucy was still breathing through her mouth. However, to measure the amount of oxygen (pO₂) and carbon dioxide (pCO₂) in the blood, venous blood has been obtained prior and after mild physical exercise like one year ago. Blood was analyzed immediately (point of care) using an I-STAT analyzer equipped with CG4+ cartridges. The most important results (concentration of blood gases and lactate) are summarized in following table.

In contrast to last year, this time all blood gas values improved slightly. In resting state blood oxygenation (pO₂), the amount of carbon dioxide (pCO₂) and lactate concentration were in the physiological range indicating that Lucy somehow "perfected" mouth breathing, which is unique in elephants. Although blood gas values were not as bad as last year after exercise (see last report), minimal physical activity still resulted in a rapid and severe hypoxemia (very low concentration of oxygen in the blood) and a mild hypercapnia (elevated concentration of carbon dioxide in the blood). However, lactate blood value did not increase as last time.

Address

ProGenY – Göritz • Hildebrandt GbR
Römerweg 74
D-10318 Berlin
Germany
Ust-IdNr. DE813161673

Telephone / e-mail

+49-30-53011578
+49-173-9439530
goeritz.frank@gmail.com

Personel

Frank Goeritz, DVM, PhD &
Thomas Hildebrandt, DVM, PhD

Bank account

Berliner Volksbank
a/c 1006615003
Sort code 100 900 00
S.W.I.F.T.-Code
BEVODEBB

Venous blood gas values	Prior exercise	After exercise	Mild	Reference values
pO2 %	86	45*		55-70
pO2 mmHg	55	26*		33-53
pCO2 mmHg	45	53*		45-50

Lactate mmol/l	Prior exercise	After mild exercise	Reference value
	2.2	1.2	0.5-2.2

**red color indicating values out of physiological range (reference values)*

Thermography:

Thermography of the whole body, with special focus to the skin, joints and feet has been performed. Two little fresh skin lesions (right elbow and head region) are observed visually and confirmed as “hot spots” using thermography (**Fig. 1-6**). Signs of chronic infection (e.g. pus formation, abscess) were missing. Foot lesion discovered last time has disappeared. Her overall foot health (nails and cuticles) improved and is currently good for a 48 year old elephant.

Oral examination:

Examination of the oral cavity did not reveal any changes. However, the size, structure and shape of fecal balls returned to normal (physiological) appearance most likely due to changes in the diet (e.g. increased feeding of branches as recommended).

Ultrasonography:

Heart, pericardium (heart sac), imaged by transcutaneous ultrasonography appeared normal with physiological heart frequency of 35 beats/min. The liver could not be visualized this time which might be indicative of the disappearance of accumulated fat tissue observed last time. Transabdominal visualization of parts of the uterus and incorporated leiomyomata like last time was not possible from both body sites. This indicates regression in size and activity of the uterine tumor formations. Transrectal Adapter Sonography (TAS) revealed a much smaller appearance of all reproductive organs (vestibulum, vagina, cervix, uterine body and uterine horns). However, multiple small leiomyomata are detected in the caudal reproductive tract. In contrast to last time visualization of both ovaries was possible by TAS. Left ovary showed the expected dormant status caused by application of GnRH vaccine. Right ovary was enlarged and showed significant pathology (one solid mass with multiple echogenic spots and with a central cavity of 9 mm in diameter). In the periphery of this structure a 12 mm follicle-like, fluid-filled structure was detected. Close to the oviduct an irregularly-appearing fluid-filled structure with the dimension of 36.5 mm by 45.4 mm was imaged. These pathological structures are most likely not sensitive for GnRH treatment and might be responsible for rare episodes of abdominal pain behavior reported by the elephant care team (**Fig. 7-10**).

How were the Conclusions and Recommendations given last year addressed and what are the consequences?:

“I.) In summary of all medical finding we conclude that Lucy is not fit for travel, neither for long nor for short distances. Chief case for that is her severe respiratory problem which leads to rapid hypoxemia, hypercapnia and increase of lactate values. Stress and even very mild physical activity brings Lucy in an anaerobic metabolic status, which can lead to total decompensation of her respiration and hence general metabolism.”

Lucy is still not fit for travel, although her blood gas values before and after exercise improved a bit!

“II.) Therefore Lucy should remain at EVZ. Aside from her ineligibility to travel she is a geriatric patient and would not be able to cope with her new environment (unfamiliar habitat, new caretaker staff, and other elephants). Lucy is receiving a high level of affection and attention from her keepers and veterinarians, which resulted in a specific management and enrichment program adapted to Lucy’s age and health status. She

would not survive independently from humans. Ultimate goal is to keep Lucy stimulated and engaged and to provide her with good care for the rest of her live (potentially 4-8 years?)."

Still 100% valid!

"III.) Lucy's sexual cycle should be down regulated to reduce or even stop growth rate of the uterine tumors (leiomyomas) by vaccination with a GnRH vaccine (e.g. Improvac™, gonadotropin releasing factor analogue-protein conjugate). Vaccination pattern: 3.0 ml of the vaccine deep IM (100 mm needle) on day 0, day 28, day 42, day 182, day 365. After that repeat twice a year. If blood progesterone (P4) is increasing over base line (monitor P4 once per month) you should booster immediately. It is proven that this treatment reduces the incidence of colic symptoms, abdominal pain and has positive effect on foot health."

Lucy was vaccinated by Dr Marie-Josée Limoges as recommended. This treatment contributed to the improvement of Lucy's general health condition and in the reduction of the dimension of multiple uterine tumors (leiomyomata). Hormonal monitoring and treatment should be continued.

In general removal of the pathological structures on the right ovary by transrectal needle aspiration is technically possible in elephants. However, it would require a mild short term sedation of about 20 min. Due to the risk of even the mildest form of sedation, it is only indicated and recommended if recurrent episodes of abdominal pain or colic symptoms increase in frequency and severity, from which Lucy would really suffer from.

"IV.) Evaluate adapt the current diet and feeding protocols to reduce her body weight. For detailed examination of the body condition see Appendix 6. Due to limitations to increase exercise intensity and due to her metabolism slowing down with age this is very challenging. However, provide mainly high volume, low caloric diet (e.g. fresh branches, straw, hay) and try to reduce feeding additional treats. Replace treats (food) by improving clicker training (or whistle as acoustic signals) for positive reinforcement."

Diet protocol was successfully applied and should be continued.

"V.) Geriatric care: Lucy will continue to develop geriatric problems. To improve peripheral blood circulation hence the oxygenation of brain, skin, legs and feet oral application of propentofyllin (Karsivan™) 1-3 mg/kg BID or pentoxifyllin 5-10 mg/kg BID (alternative drug used in human medicine) supports general condition."

The treatment was already been started by Dr Marie-Josée Limoges 15th of August. However, it might be too early to notice additional positive effects of physical performance of Lucy. Feedback of observed effects of the long term treatment with propentofyllin to the consultants are highly appreciated. Continuation of annual clinical examinations by veterinary elephant experts should be obligatory due to the improvement of the welfare of Lucy.

Thank you very much for the excellent collaboration.

Sincerely,

ProGenY
gez. Drs. Frank Goeritz & Thomas Hildebrandt

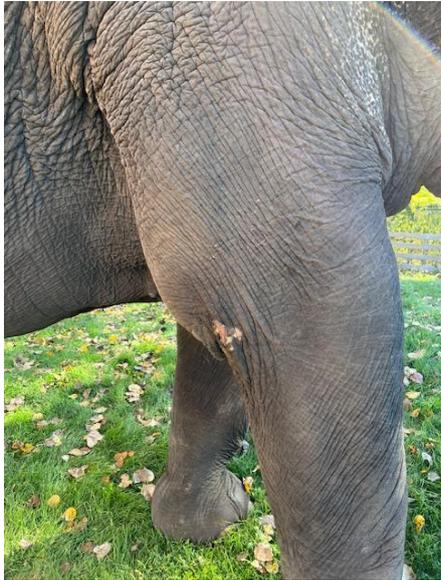


Fig 1 & 2. Skin lesion of the right elbow region (native left; thermographic right)



Fig 3 & 4. Skin lesion at right hip region (native left; thermographic right)



Fig 5 & 6. Healthy foot without any signs of inflammation (native left, thermographic right)



Fig 7. Inactive left ovary (red circle)



Fig 8. Right ovary, solid mass (red circle) with central cavity



Fig 9. Right ovary, follicular like structure in the periphery (12 mm in diameter; red circle)

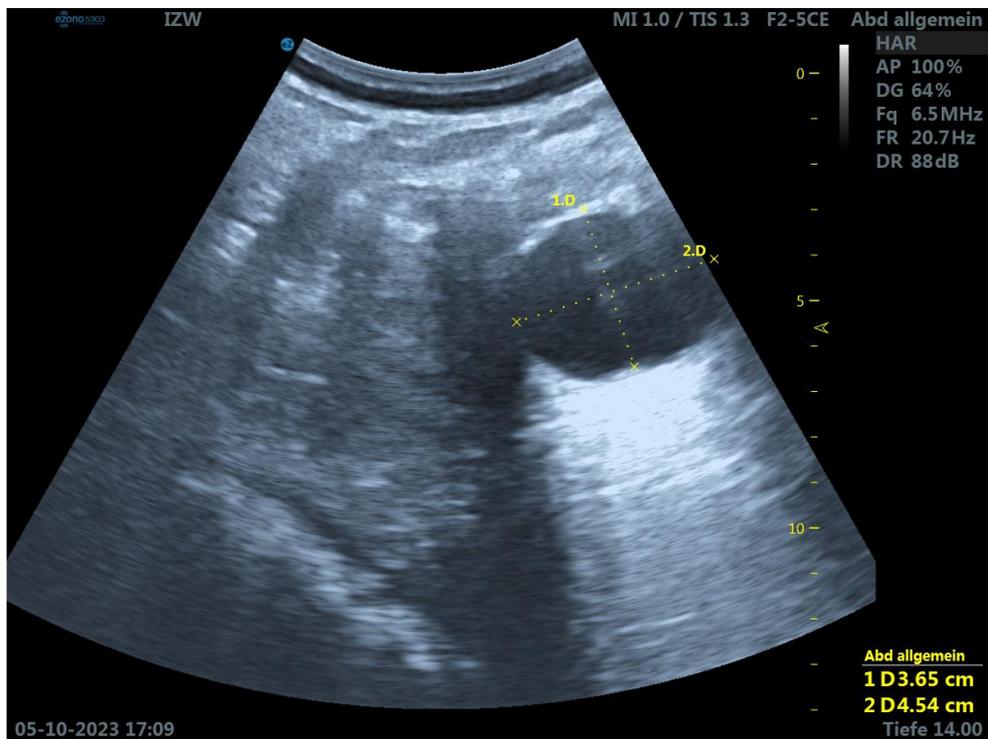


Fig 10. Right ovary, irregularly-appearing fluid-filled structure with the dimension of 36.5 mm by 45.4 mm