

Free The Wild
c/o Gina Nelthorpe-Cowne & Sagan Cowne
Unit 7c Chelsea Wharf
15 Lots Road
London, SW10 0QJ

UK

Examination Report of the Asian elephant "LUCY"

Background/Introduction

On behalf of the international charity "Free The Wild" (FTW) represented by Sagan Cowne (SC) we, Drs Frank Goeritz (FG), Head Veterinarian of IZW and Thomas Hildebrandt (TH), Head Dept. Reproduction Management of IZW examined the 47 year old female Asian elephant "Lucy" ("Skanik") at the Edmonton Valley Zoo (EVZ) in Edmonton, Alberta, Canada on 6th and 7th October as independent consultant and as part of an international team. Our main focus was to perform a medical examination to evaluate Lucy's general health condition and to provide evidence based results to finally judge her ability for travel. Also present for the examination was i.) Dr Marie-Josee Limoges (JP, Edmonton Valley Zoo's Veterinarian) who provided information about Lucy's medical history and current treatment, ii) Dr Patricia London (PL, elephant veterinarian), who circumstantially reviewed Lucy's life and medical history and her current behavior, iii.) Ingo Schmidinger (IS, Director of Operations of GSE), who focused on husbandry, training and enclosure design, and the entire Elephant Care Team of EVZ, which ensured safe access for us to Lucy.

Lucy came to EVZ as a two year old orphan. Since 2002 she was examined regularly by Dr JE Oosterhuis (Veterinary Consulting Service). In 2015 he examined her twice and since then once per year. Lucy's respiratory problem (mouth breathing) has been reported in 2009 first time. Endoscopic exploration of her trunk after standing sedation discovered a "narrowing of the nasal passage. However, the cause of the "constriction" could not be determined. Although Lucy could breathe partially through her trunk in resting state at this time, her respiratory difficulties continued progressively.



**Leibniz-Institut für Zoo-
und Wildtierforschung**

IM FORSCHUNGSVERBUND BERLIN E.V.



EVOLUTIONARY WILDLIFE RESEARCH FOR CONSERVATION

Dr Frank Goeritz, DVM, PhD, MRCVS, Dip ECZM
Head Veterinarian, IZW
Senior scientist, Dept. Reproduction
Management

TEL. +49 30 51 68-444

Mobile +49 173 9439530

GOERITZ@IZW-BERLIN.DE



HAUSANSCHRIFT/ADDRESS
ALFRED-KOWALKE-STRASSE 17
10315 BERLIN (FRIEDRICHSFELDE)
GERMANY

TELEFON
TELEFON +49 30 51 68-0
TELEFAX +49 30 51 26-104

BANKVERBINDUNG
COMMERZBANK BERLIN
IBAN: DE34 1004 0000 0520 4300 06
SWIFT/BIC: COBADEFFXXX

RECHNUNGSANSCHRIFT
FORSCHUNGSVERBUND BERLIN E.V.
RUDOWER CHAUSSEE 17
12489 BERLIN

STEUERNUMMER
27/640/51604

UST-IDNR/VAT REG NO
DE 136785011

INTERNET
WWW.LEIBNIZ-IZW.DE



Animal/Patient

Species	Asian elephant (<i>Elephas maximus</i>)
Sex	female
BSC	4.5 out of 5 (1=cachectic; 3=optimal;5=obese)
ID	„Lucy“
Age	47 Years
Date	6 th -7 th October 2022
Location	Edmonton Valley Zoo

Lucy is a calm and gentle elephant that is managed in “free contact”. She is overweight (BSC 4.5) but otherwise in good over-all body condition. All medical examinations has been applied without sedation. Standing sedation was not performed due to Lucy’s severe respiratory problems (common decision by FG, TH, JP), please see well documented medical history of Lucy provided by JP. No current/ongoing medical treatments reported by JP and staff of EVZ.

Medical examination & findings

Blood gas and blood chemistry analysis:

Elephants breathing physiologically through the nose/trunk exclusively. Lucy was breathing through her mouth solely, even in resting state without any exercise or excitement. This was different to reports in the past, where she was able to breathe partially through the trunk in resting state. Therefore, Lucy gets exhausted and hypoxic very fast. This was observed and also reported by the elephant staff very well. However, to verify hypoxia and hypercapnia and to quantify their values, venous blood has been obtained prior and after mild physical exercise (about 10 min “seek and hide training”, a special behavioral enrichment tool developed by the elephant care team of EVZ). Blood was analyzed immediately (point of care) using an i-STAT analyzer equipped with *CG4+* and *Chem8+* cartridges. The most important results (concentration of blood gases and lactate) are summarized in following table. All other blood chemistry parameters measured with the i-STAT analyzer were within the physiological range (see *Appendix 1*).

Venous blood gas values	Prior exercise	After Mild exercise	Reference values
pO ₂ %	78	22*	55-70
pO ₂ mmHg	45	19*	33-53
pCO ₂ mmHg	53.5*	68.2*	45-50

Lactate mmol/l	Prior exercise	After mild exercise	Reference value
	0.95	2.83*	0.5-2.2

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



In resting state blood oxygenation (pO₂) and lactate concentration were in the physiological range indicating that Lucy somehow “perfected” mouth breathing, which is unique in elephants and which we never observed before in any other elephant we examined. However, just minimal physical activity resulted in a rapid and very severe hypoxemia and hypercapnia. The fast increase of lactate blood value is also a consequence of hypoxemia indicating anaerobic metabolic activity, which can lead to total decompensation of the respiratory chain and metabolic steady state when Lucy’s physical activity or stress level would be extended any longer time.

Thermography:

Thermography of the whole body, with special focus to the skin, joints and feet has been performed. Three little skin lesions and abscess on the right front foot has been observed visually and confirmed as “hot spots” using thermography (see **Appendix 2**).

Both, skin and foot lesion, has been observed in captive elephants frequently, with higher incidence in older elephants. Main contributing factors are inadequate husbandry and management (e.g. hard flooring, lack of physical exercise, lack of regular foot care), obesity and general diseases (e.g. infections, tumors). The latter may contributed to her actual foot problems, since Lucy’s feet has had attentive care (clean nails and nice cuticles) and received also good general husbandry. Old nulliparous females very often suffer from uterine tumors, which producing and releasing paracrine factors (e.g. Tumor Necrosis Factor- alpha) and toxins, which (tumor diagnostic see *Ultrasonography*).

Oral examination:

Oral exam confirmed deformity of her molars which was reported earlier. The left upper molar was twisted 90 degree (see **Appendix 3**). Dental abrasion and malformation is causing mild problems with mastication. Although fecal boluses show normal size, they contain a high proportion of long undigested fibers (incomplete grinded straw, hay and grass). Dental extraction/correction is not recommended because of high risk of anesthesia/sedation due to her respiratory problems and because she is using assumable her final set of molars.

Ultrasonography:

Heart, pericardium (heart sac), cranial part of uterus was imaged by transabdominal and vestibulum, vagina, urinary bladder, cervix, uterine body and caudal parts of uterine horns by transrectal ultrasonography (sonograms see **Appendix 4**). Heart action was normal and pericardial effusion could not be detected. Heart failure could therefore excluded as main cause of Lucy’s short breath and weakness after mild physical exercise or stress. The liver showed several focal spots of accumulated fat tissue, which is related to age, diet and obesity. However this is temporarily not causing clinical problems, it should be followed up because progressive development can impaired metabolic liver activity.



Leibniz-Institut für Zoo-
und Wildtierforschung

IM FORSCHUNGSVERBUND BERLIN E.V.

Leibniz
Gemeinschaft

EVOLUTIONARY WILDLIFE RESEARCH FOR CONSERVATION

Sonograms of the urogenital tract indicated that Lucy is still cycling. Lucy was in her luteal phase shown by a vaginal mucus plaque. Multiple small leiomyomas have been detected in the caudal reproductive tract by transrectal ultrasound. The cranial part of the uterus could not be visualized transrectally, as you could in a healthy non-pregnant uterus, because it was “diving” straight down in front of the pelvic rim towards ventral abdominal wall. However, transabdominal ultrasound revealed a much enlarged uterus horn on the right side of the bottom of the abdominal cavity.

Location and sonographical appearance approved clear diagnosis of an advanced leiomyoma (estimated weight ca. 30 kg) which was displacing surrounding organs. That explains the recurrent episodes of colic symptoms and abdominal pain reported before.

Leiomyomas are very frequent in older nulliparous elephants with active sexual hormonal cycle. At an early stage they can be diagnosed *intra vitam* by Transrectal Adapter Sonography (TAS) only. This was performed in Lucy for the first time.

Leiomyomas are benign tumors which are subclinical at the early stage and contributing to female infertility. However, they grow constantly, mainly triggered by estrogens produced in the ovaries during follicular phase and may cause some clinical signs (e.g. abdominal pain, colic, impaired wound healing at skin and feet). Large leiomyomas (advanced stage) can cause uterine torsion, which is an acute life-threatening emergency and can lead to death of the animal.

Trunk endoscopy:

Endoscopy using a long flexible bidirectional endoscope to image the complete respiratory airway from the tip of the trunk down to the trachea and bronchi has been published recently and performed in elephants. This technique called broncho-alveolar-lavage (BAL) is mainly used for tuberculosis diagnostic (see *Appendix 5*).

However, trunk endoscopy to find the cause of Lucy’s respiratory problem has not been performed because of necessity of deep standing sedation in addition to local anesthesia. But, it was performed earlier (when sedation was not yet life-threatening) by specialized horse practitioners. Reviewing the video material provided by JP, we concluded that this examination was incomplete. It ended at the trunk base (cartilage plate = physiological structure to close the airway voluntarily, see *Appendix 5*). Neither nasal nor oral cavity was visible. Hence the actual cause (e.g. constriction of or tumor in the airway) of Lucy’s respiratory problem is still unknown. On one hand this is disappointing, on the other hand evidence-based surgical intervention is not anymore an option to solve Lucy’s respiratory problem.



Conclusions and Recommendations:

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.

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?).

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.

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.

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.



Leibniz-Institut für Zoo-
und Wildtierforschung

IM FORSCHUNGSVERBUND BERLIN E.V.

Please, don't hesitate to contact me for further questions.

Berlin, 06.01.2023

Leibniz
Leibniz
Gemeinschaft

EVOLUTIONARY WILDLIFE RESEARCH FOR CONSERVATION

Attachments:

Appendix 1: Results of blood gas analysis

Appendix 2: Results of Thermography

Appendix 3: Dental check

Appendix 4: Ultrasonography

Appendix 5: Endoscopy of entire airway via trunk (example; NOT in Lucy!)

Appendix 6: Assessment of body condition (Wemmer et al., 2006)