

Implementation of Regular Veterinary Care for Captive Sumatran Elephants (*Elephas maximus sumatranus*)

Christopher Stremme, Anhar Lubis and Mohammad Wahyu

*Veterinary Society for Sumatran Wildlife Conservation – Elephant Health Care Program
Medan, North Sumatra, Indonesia*

Background

As a result of capturing elephants from the wild in order to reduce human elephant conflicts during the period between 1985 and 2000, today there are about 600 captive elephants throughout Sumatra (Lair 1997; PHKA 2006). These elephants are kept in about 320 government run Elephant Training Centres (ETC), zoos, recreation and safari parks, and timber companies. Due to a lack of funds, a lack of dedicated and experienced camp managers and veterinarians, and a lack of ideas about how to integrate captive elephants in a conservation strategy, in most locations this captive population lacks sufficient maintenance, health and welfare management, resulting in poor health conditions and losses (Lair 1997; Lewis 1998; IEF 2001; Suprayogi *at al.* 2001; PHKA 2006).

In order to improve management conditions for captive Sumatran elephants, in November 2006 the Sumatran NGO, Veterinary Society for Sumatran Wildlife Conservation (VSSWIC) started its Elephant Health Care Program (EHCP) for which it receives funding from the

UK based charity, Elephant Family. The EHCP is implemented by three veterinarians, who are employed full time and who have been working in the healthcare of Sumatran elephants for more than three years prior to starting EHCP. This program aims to implement regular health care for captive Sumatran elephants. Due to funding limitations at the moment the EHCP is active with regular veterinary care only in the provinces of North Sumatra, Aceh and Lampung. Presently in other areas the EHCP can only provide veterinary support by formal request of the responsible governmental departments in special cases. All activities are conducted in cooperation with the agencies for Forest Protection and Nature Conservation on the provincial and national levels (BKSDA and PHKA).

Area of activity

VSSWIC is based in Medan, the capital of the province of North Sumatra, and from there reaches out to provide regular veterinary care to seven locations in the provinces of North Sumatra, Aceh and Lampung which manage a total of 127 elephants (see Table 1).

Table 1. List of locations where elephants are being managed and details of managed elephants.

Location	Province /District	Male	Female	Distance from Medan [km]
ETC Holiday Resort	North Sumatra/Labuhan Batu	7	13	380
Forest Park Brastagi	North Sumatra/Tongkoh	0	2	65
CRU Tangkahan	North Sumatra/Langkat	1	6	105
UPG Aras Napal	North Sumatra/Langkat	2	2	125
ETC Saree	Aceh/Aceh Besar	14	14	580
ETC Teladan	Aceh/Aceh Besar	4	1	590
ETC Way Kambas	Lampung	40	21	1600
Total numbers		68	59	

Health management

The locations listed in Table 1 in North Sumatra and Aceh are visited at least once per month to conduct regular health-checks and treatments (Fig. 1). Regular visits to ETC Way Kambas are conducted at three-month intervals. The ETC Way Kambas, in contrast to all other locations, has its own veterinarian; therefore not all veterinary work has to be conducted directly by the VESSWIC veterinarians, who focus more on providing continuing material and technical support, backing up the implementation of more structured veterinary care and preventative schemes, and support for the diagnosis and treatment of special cases. More frequent visits to all of the camps are conducted if special medical cases need more intensive attention, or an emergency response is requested.

Preventative schemes

Parasites - During every visit microscopic investigations of faeces are conducted. Deworming is undertaken at 3 to 4 month intervals with different kinds of anti-parasitic drugs (see Table 2) according to the intensity of infestation and the parasite species.

Table 2 Anti parasitic drugs

Drug	Dosage [mg/kg BW]	Route of administration
Albendazol	10 – 12	oral
Triclabendazol	7.5 – 10	oral
Ivermectin	0.1	subcutaneous or oral
Ivermectin	0.2	rectal
Niclosamid	50 – 75	oral

Tetanus - Tetanus vaccinations for all elephants were initiated at the beginning of 2006 using horse toxoid vaccines, following dosage recommendations for horses. The first vaccination is repeated after 4 weeks and after this the elephants are re-vaccinated once a year. Post vaccination serum titre evaluations are planned, and a Memorandum of Understanding between the Indonesian Veterinary Research Agency (BALITVET), the agencies for Forest Protection and Nature Conservation (PHKA) and VESSWIC is underway.

Nutrition - In the ETC Holiday resort the availability of natural fodder is very poor due to the encroachment of the ETC area by oil palm plantations, and the supplemented food is monotonous, therefore it seems obvious that the diet in this location is lacking energy, minerals and vitamins. To improve the nutrition in this location a special high energy supplement containing minerals and vitamins is cooked (composition listed in Table 3).

Table 3 Elephant diet supplement

Item	Amount per elephant
Rice	2 kg*
Sticky rice	1 kg*
Corn	1 kg*
Palm sugar	1 kg
Vitamin-mineral powder	60 g

*weight before boiling

This supplement is provided once a week for all elephants and three times per week for nursing mothers. In addition, during every visit in all locations about 50 bundles of bananas and 5 pineapples or papayas are provided per elephant.



Figure 1. Training for local vets and vet technicians during a field visit.

Table 4 Commonly used drugs

Drug	Dosage	Treatment intervals
Povidone-Iodine 1% and 10%	Ad libitum / local	Twice a day
Peroxide 2,5%	Ad libitum / local	Twice a day
Povidone-Iodine ointment	Ad libitum / local	Twice a day
Penicillin-Streptomycin 200.000 IU – 200 mg/ml	10.000 IU – 10 mg/kg BW / i.m.	At 24 h intervals for 7 days
Amoxicillin LA 150 mg/ml	12 mg/kg BW / i.m.	At 48 h intervals for 7 days
Oxytetracyclin LA 200 mg/ml	12 mg/kg BW / i.m.	At 72 h intervals for 7 days
Ibuprofen 400 mg/tablet	5 mg/kg BW / p.o.	Twice a day for 5-10 days
Etamidon (NSAP drug combination)	5 ml/100 kg BW / i.m.	At 24 h intervals for 3-7 days
Dichlofention (Gusanex Spray)	Ad libitum / local	Twice a day

Body-condition monitoring – Body measurements are taken twice a year and the body condition evaluated with standardised body condition formula and recorded, to document the general health and nutritional condition of all elephants.

Unfortunately regular blood samples of all elephants cannot be analysed yet due to budget limitations, therefore blood analyses are only used as a diagnostic tool in elephants showing some signs of illness.

Treatment of diseases and disorder

The most frequent disease and disorders that the VESSWIC veterinarians have documented and which needed intervention in captive Sumatran elephants during the past years were: wounds, endo- and ecto-parasites, foot diseases, keratoconjunctivitis, stereotypic behaviour and malnutrition

Wounds – Fights between elephants left unattended or chained close to wild elephant habitat, sharp foreign bodies from items such as old nails, sharp metal or glass debris thrown away in the surroundings, and improper use of management and restraint tools such as ropes, chains, elephant hooks, and unhygienic handling of darting equipment during the capture of wild elephants often cause serious wounds and abscesses needing treatment (Mikota *et al.* 2003). If treatment is administered immediately after the occurrence, usually the wounds are simple to treat and heal easily. Besides washing

the wound with clean water, it is flushed with antiseptic solutions, deeper wounds or abscesses are also stuffed with antibiotic tablets, and large superficial wounds are covered with antiseptic ointment. Whichever drugs are used for wound cleaning and disinfections, the most important issue is to continue the treatment twice a day until the wound is healed, usually about 10 days to 6 weeks. If wounds are not immediately noted or regarded as serious and reported to the veterinarian by the mahout, delayed treatment can cause complications like swellings, myiasis (maggot infestation) and generalized infections, needing more intensive and longer lasting treatment with systemic antibiotics and NSAPs (see drugs listed in Table 4). Handling and management advice to mahouts and camp managers about the above mentioned wound-causing reasons reduce their occurrence.

Parasites - Regular microscopic investigations (Fig. 2) of faeces (flotation and sedimentation) detected that different roundworms species (*Strongyloides sp.*, *Strongylidae Ascaridae*) and Trematodes (*Fasciola sp.*, *Paramphistomidae*) are the most frequent endo-parasites, and macroscopically elephant lice (*Haematomyces elephantis*) were detected to be the most frequent ecto-parasite. Permanent burdens for most elephants are different blood sucking flies. Whether these flies transmit other diseases (bacterial and/or protozoan) has not been investigated and would need further research.



Figure 2. Microscopic investigations.

Foot diseases – The most frequent foot disease needing treatment was Podo-dermatitis, injuries of the footpad (Fig. 3), improper wear of the footpad resulting in double layers and potential infections between these layers, caused by unhygienic and permanently wet areas where the elephants are kept. Cracked toenails due to overgrown nails were rarely found and rarely required treatment. For treatment of Pododermatitis, the foot is washed with water and affected areas flushed with disinfectant solutions, overgrown toenails and footpad layers are trimmed down to the extent possible. Overgrown tissue of collagen fibre from deeper layers is trimmed to its physiological layers until blood vessels appear. All infected and necrotic material is removed. Bordering areas of overgrown collagen fibre and epidermis are trimmed to the area where the connection between epidermis and corium appears. This is repeated regularly (about every 2-3 weeks) until recovery, because the connective tissue from the corium and digital cushion grows faster than the epidermis and hinders complete healing if not trimmed. Trimmed areas are treated with antiseptic and astringent solutions, like Kaliumpermanganat 1 - 2%, Coppersulfate 3%, and Formalin 5%. Treatments are done twice a day for several weeks until completely healed. Advice about regular checks of toenails and footpad, conducting pedicures and promoting awareness amongst the camp staff about general hygienic management of the elephant stabling areas have reduced cases of Pododermatitis.

Keratoconjunctivitis – This problem is often found and is characterized by increased tears, inflammation of mucous membranes, slightly milky discolored cornea and appearance of milky, opaque spots on the cornea. Dusty, dry and hot surroundings often cause this disorder, but it seems that often bacterial infection, suspected to be transmitted by flies, can be the main reason for this disorder or at least complicate a climate induced keratoconjunctivitis. In some cases healing can happen without any treatment and the first minor signs must not necessarily be treated immediately but the condition of the surroundings should be improved. If increased signs of this illness are not treated it can lead to corneal ulcers, total blindness and total loss of the eye. For local treatment with antibiotic eye-ointment chloramphenicol ointment was found to be most effective. When using eye-ointment it is crucial to repeat the treatment several times a day (at least 3 times a day or more often) to be effective. If local treatment cannot be administered reliably (due to the unreliability of mahouts or reduced acceptance of the elephant) systemic treatment can be given. Oxytetracyclin LA 12 /kg i.m. repeated four times in 72 hour intervals was found to be effective.



Figure 3. Footpad injury.

Stereotype behaviour - In all locations visited some elephants were found that exhibited stereotype behaviour, often weaving. This can be described as permanent repetition of the same movements in the same rhythm without attaining a specific result. This is usually caused by stress and boredom due to a lack of occupation or social contacts and interaction.

Although a sufficient number of elephants of both gender and various ages are managed in all camps, the animals are managed in a way that they stay alone more than 90% of the day. During the day the elephants are brought to areas where they are chained for foraging, and in the evening (sometimes also in the morning) taken for a bath then chained with their supplemental fodder somewhere near the campsite. Although often the elephants can hear and sometimes can see each other, they cannot have direct contact with each other. Usually the elephants only have regular direct contact with each other during bathing and then the elephants still need to be under the command of their mahouts and can not freely socialise with each other. In none of the camps is time regularly given to the elephants for free roaming and socialisation. In almost all camps visited the regular workloads and occupation for the elephants are very low or nonexistent. This management structure leaves the elephants unoccupied and bored after they have eaten their food as they are unable to interact socially due to their restriction.

Unfortunately knowledge about elephant behaviour and mental wellbeing is very low amongst the camp staff; therefore stereotype behaviour is not recognized as a problem that needs to be addressed. Education about elephant behaviour and different management systems are crucial to build awareness amongst mahouts and camp managers about the mental wellbeing of elephants. Improvements happen slowly and depend on the long-term continuation of regular education and advice about this subject.



Figure 4. Baby elephant getting food supplements.

Malnutrition – Beside the visual appearance of unnatural bony and skinny body condition, values of total blood protein is used to determine malnutrition. Adult animals with a total blood protein below 7.0 g/dl (mean standard for blood protein: 7.9 – 8.4 g/dl and standard deviations are: 0.6 – 0.8 g) are regarded as suffering from malnutrition (ISIS 2002).

In all locations with more than ten individuals, some elephants were found to be suffering from malnutrition. Besides a general lack of food availability, this problem is often related to management and handling insufficiencies such as the following:

- Available resources for supplementary fodder are not used sufficiently, e.g. lacking in quality and variability, or amounts not equally distributed.
- Natural food resources in and around the camp are not sufficiently utilized.
- Elephants are not moved often enough from the places where they are tethered.
- In the past no regular de-wormings (if at all) were conducted, therefore a very high infestation with endo-parasites exists.

For treating malnutrition it is crucial to somehow influence the above mentioned management weaknesses, to raise awareness about this amongst the camp staff and to

improve utilisation of existing resources. Regular anti-parasitic treatments have been implemented (see above) since the EHCP started and contribute to the reduction of malnutrition. It appears that animals suffering from chronic malnutrition exhibit physical weakness and sometimes show signs of mental depression leading to a lack of interest in intensively and actively searching for food, as well as reduced appetite to consume available food, which might be less tasty. Providing Vitamin injections, high-energy food supplements and sweet fruits usually help overcome this condition (Fig. 4).

Other less frequent diseases

The above described diseases represent not all but only the most frequent diseases and disorders needing medical intervention in Sumatra. Beside these there are also single cases of gastrointestinal diseases (colic, constipation, diarrhea), tetanus infections, sunburns, navel

infections, tail bites followed by amputation, hyperkeratosis, dermatitis, *E. coli* infection, etc. needing treatment during the past years (Fig. 5).

EEHV and TB – Infections with the Elephant Endotheliotropic Herpes Virus and Tuberculosis (TB) caused by *Mycobacterium tuberculosis* have been reported during the past years by colleagues working with captive elephant populations in other countries (Binkley 1997, Dunker & Rudovsky 1998, Richman *et al.* 2000, Fickel *et al.* 2001, Fowler 2006, Mikota 2006, Montali *et al.* 2001). These diseases, which are considered to be able to badly affect captive populations, have so far not been reported in Sumatran elephants. But this absence of evidence is just the result of a lack of any investigations or research about these two important diseases in Sumatran elephants and should not be misunderstood as evidence of the lack of these diseases in the Sumatran elephant population.



Figure 5. Tetanus infected elephant receives I.V and rectal fluid therapy.

Unfortunately, it is not unlikely that Sumatran elephants are also affected by TB and/or EEHV. Indonesia ranks third in the list of 22 high burden tuberculosis countries, having more than 530,000 new human infections and more than 91,000 people dying from tuberculosis in 2005 (WHO 2007). Therefore it is not impossible that TB might occur amongst mahouts and due to daily close contact between mahouts and their elephants it might be transmitted to elephants.

During the past years the VESSWIC-EHCP veterinarians have found three young elephants (age below 6 years) with wart like skin lesions, two adult elephants with small round lesions in the mouth mucosa, and post-mortem findings in one two-year-old pre-mortem healthy looking elephant calf that suddenly died, that looked very similar to findings described from other authors in elephants that were confirmed positive for EEHV. Of course these findings do not confirm existence of EEHV in Sumatran elephants and could also be caused by other diseases, but it seems sensible during the next years to establish sufficient cooperation between responsible governmental agencies and international and national institutions, organizations and specialist groups to conduct research regarding these two diseases amongst Sumatran elephant populations.

Staff training

To successfully conduct veterinary work good cooperation between camp staff (mahouts, veterinary technicians and camp managers) and the VESSWIC-EHCP veterinarians is crucial. Therefore amongst the camp staff a good understanding about elephant biology, behaviour, welfare needs, and how proper healthcare management contributes to this is important. The camp staff's willingness to cooperate with the VESSWIC-EHCP veterinarians depends very much on trust and belief in the veterinarians' work and recommendations for improvements and modifications of established management structures and/or handling procedures. This trust did not automatically exist at the beginning of the VESSWIC-EHCP work, but was built due to reliable and regular visits. It was also possible

because the VESSWIC-EHCP team not only provides pure veterinary care but during every visit also conducts some training and/or information sessions for the camp staff.

Mahouts – No structured education and training scheme exists for the mahouts in Sumatra. Once people are recruited for the job of mahout they have to try to learn somehow from the more senior mahouts in the camps how to handle and train elephants. Although after some time many mahouts develop reasonable to good skills of handling the individual elephant they are in charge of, knowledge about elephant biology, behaviour, different management and handling systems, basic knowledge about health care and medical procedures and treatments is very limited. The VESSWIC-EHCP team tries to address this issue by training sessions using slide shows, video films and practical demonstrations about the following subjects:

- Elephant biology and behaviour
- Basic elephant anatomy and physiology
- Prevention and treatment of basic medical problems
- Different elephant handling, training and restraint techniques
- Training elephants for medical procedures (e.g. foot care, mouth inspection, blood sampling, rectal intervention, treatments)

Veterinary technicians – the local “paramedics” have undergone basic education in a government or government licensed school about the basics of veterinary management, disease and treatments. But this education focuses on livestock and does not include any special elephant related training. Often this occurred a long time ago and, as there is no continuing education and often only few if any medical supplies exist in the camps, much of the previously gained knowledge has been forgotten. The VESSWIC team tries to address this issue by training sessions using slide shows, video films and practical demonstrations about the following subjects:

- Elephant anatomy and physiology
- Elephant diseases
- Obtaining samples and analyses

- Treatment schemes and drug dosages
- Record keeping
- Elephant handling and management
- Waste management/camp hygiene

Local veterinarians – Only a few of the government departments in charge of elephants have their own veterinarians. However, even when they do, none of them stay in the camp permanently and for the most part they have more administrative than veterinary duties. Nevertheless the VESSWIC-EHCP veterinarians try to involve these colleagues, as well as interested local colleagues, as much as possible in the veterinary work. Veterinarians from other areas in Sumatra have been invited and have volunteered with the VESSWIC-EHCP team in the past. Beside this, the VESSWIC-EHCP team has presented its work for elephants in national veterinary meetings and workshops to raise awareness amongst local colleagues about the veterinary needs and problems of elephants in Indonesia.

Veterinary student education – VESSWIC-EHCP veterinarians have been invited as guest lecturers by the veterinary faculties of the universities in Banda Aceh and Bogor to lecture about elephant diseases and health management. Currently VESSWIC-EHCP has started to involve veterinary students from the veterinary faculty in Bogor as volunteers in the fieldwork to gain hands on experience in elephant health management. As VESSWIC has received a request from the Veterinary faculty in Bogor to conduct more regular lectures and courses about elephant health care, VESSWIC is now seeking the necessary resources to design and implement a structured student training course about veterinary management of elephants, more intensively involving students in field work.

Mahout welfare

Salaries of the mahouts are very low, and living conditions in the camps are mostly very basic and monotonous, not providing many possibilities for recreation and information exchange. The possibility for the VESSWIC-EHCP to assist with these conditions is very limited due to budget considerations, but with

some basic support tries to attain improvements for the camp staff with the following activities.

Mahout uniforms – Every year a basic uniform set consisting of trousers, shirt, etc. for each mahout in the 7 locations is provided.

Social networking and information meetings – During these meetings newspapers are distributed, information about situations/problems in other elephant camps (elephant and non elephant issues) and other actual news from Sumatra is exchanged and discussed. Snacks, drinks and cigarettes are provided during these informal meetings, which are attended not only by the mahouts but by their whole families.

Incentives – Small stipends are paid as a type of reward to mahouts who have performed extraordinary care for their elephants requiring increased work loads for the mahout, such as reliably and successfully continuing treatments advised by the veterinarians, providing intensive care for mothers and new born calves during the first weeks after birth, successfully training the elephant for special medical procedures, etc.

Conclusion

The captive population of the Sumatran elephant (*E. m. sumatranus*) today represents approximately 20% of the overall population of this subspecies. If carefully managed this genetically valuable population can play an important role for the conservation of this unique subspecies by focusing on conservation and self-sustainability. The experience of the VESSWIC-EHCP activities show that there is a chance to implement sufficient veterinary care, and that changes in handling and management can be accomplished for these captive elephants if support is long term, focused and conducted in close cooperation with camp staff and government agencies in charge.

For the future the VESSWIC-EHCP team hopes to be able to intensify its activities in the current areas of the project and enlarge such support to camps in other areas in Sumatra. The VESSWIC-EHCP team also hopes to accomplish a more intense knowledge exchange with other

colleagues in Indonesia about elephant veterinary care, and conduct courses for students on this subject in order to increase the number of colleagues able and willing to provide veterinary care for Sumatran elephants.

References

Binkley, M. (1997) Tuberculosis in captive elephants. *Proc. Amer. Assoc. Zoo Vet.* Huston, Texas. pp. 116-119.

Dunker, F. & Rudovsky, M. (1998) Management and treatment of a Myco-bacterium Tuberculosis positive elephant at the San Francisco Zoo. *Proc. Amer. Assoc. Zoo Vet.* pp. 122-123.

Fickel, J., Richman, L.K., Montali, R., Schaftenaar, W., Göritz, F., Hildebrandt, T.B. & Pitra, C. (2001) A variant of the endotheliotropic herpesvirus in Asian (*Elephas maximus*) in European zoos. *Veterinary Microbiology* **82**: 103-109.

Fowler, M. (2006) Important viral diseases. In: *Biology, Medicine and Surgery of Elephants*. Fowler, M. & Mikota, S. (eds.) Blackell Publishing, Ames, Iowa. pp 132-133.

IEF (2001) *Support for the Improved Health and Health Care Management of Captive Populations of Sumatran Asian Elephants*. Final Report.

ISIS (2002) www.isis.org. Apple Valley, USA.

Lair, R. (1997) *Gone Astray, the Care and Management of the Asian Elephant in Domesticity*. FAO/ROP, Bangkok.

Lewis, J. (1998) *A Veterinary Assessment of Sumatran Elephant Training Centres*. Fauna and Flora International, Cambridge.

Mikota, S. (2006) Important bacterial diseases. In: *Biology, Medicine and Surgery of Elephants*. Fowler, M. & Mikota, S. (eds.) Blackwell Publishing, Ames, Iowa. pp 138-140.

Mikota, S., Hammat, H., Finnegan, M. (2003) Occurrence and prevention of capture wounds

in Sumatran elephants. *Proc. Amer. Assoc. Zoo Vet.* pp 291-293.

Montali, R., Richman, L., Mikota, S., Schmitt, D., Larsen, R., Hildebrandt, T., Isaza, R. & Lindsay, W. (2001) Management aspects of Herpesvirus infections and Tuberculosis in elephants. In: *A Research Update on Elephants and Rhinos*. Proceedings of the International Elephant and Rhino Research Symposium, Vienna, 7-11 June 2001. pp 83-95.

PHKA (2006) *Asian Elephant Conservation in Indonesia*. Country Report Progress 2004-2006 for Asian Range State Meeting in Kuala Lumpur, 24-26 January 2006.

Richman, L.K., Montali, R.J., Cambre, R.C., Schmitt, D., Hardy, D., Hildebrandt, T., Bengis, R.G., Hamzeh, F.M., Shahkolahi, A. & Hayward, G.S. (2000) Clinical and pathological findings of a newly recognized disease of elephants caused by endotheliotropic herpesvirus. *Journal of Wildlife Diseases* **36**: 1-12.

Suprayogi, B., Sugardjito, J. & Lilley, R. (2001) Management of the Sumatran elephants in Indonesia: Problems and challenges. In: *Proceedings of the International Workshop on the Domesticated Asian Elephant*. Bangkok. pp 183-193.

WHO (2007) *Country profile Indonesia 2005*. http://www.who.int/GlobalAtlas/predefinedReports/TB/PDF_Files/idn.pdf.

Corresponding author's e-mail:
stremme@gmx.net