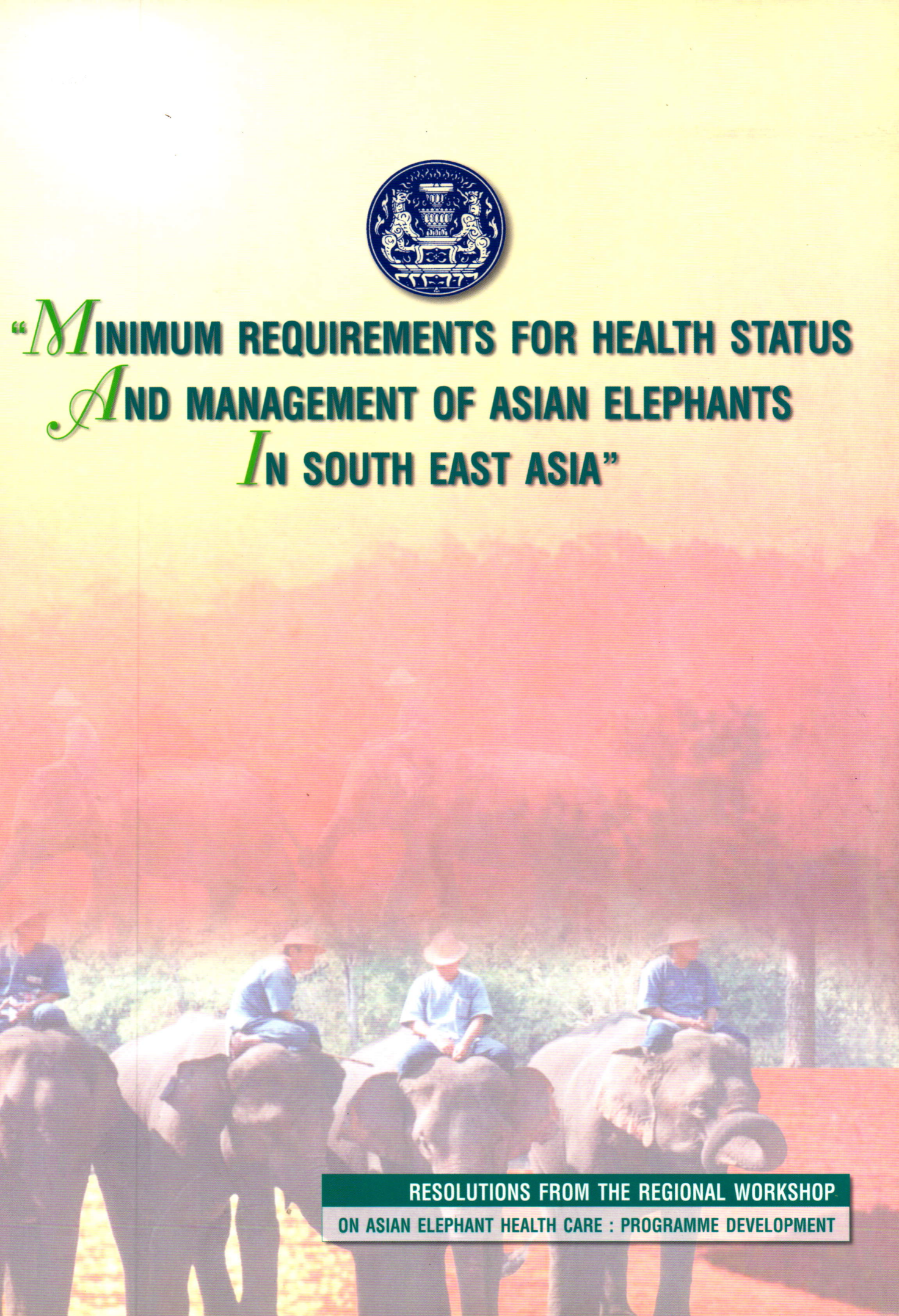
"MINIMUM REQUIREMENTS FOR HEALTH STATUS AND MANAGEMENT OF ASIAN ELEPHANTS IN SOUTH EAST ASIA"



RESOLUTIONS FROM THE REGIONAL WORKSHOP

ON ASIAN ELEPHANT HEALTH CARE : PROGRAMME DEVELOPMENT

Opening Statement by

HRH Princess Galyani Vadhana
At the First Regional Workshop on Asian Elephant Health Care : Programme Development

12 March 1999, Chiang Mai

"I am pleased to be here to inaugurate the first regional work shop on Asian Elephant Health Care: Programme Development today.

In the past, the elephant has played a very important and constructive role in Thailand and in many countries of South East Asia. In times of both war and peace, for example, elephants have served humans as vehicles to protect national sovereignty and territorial integrity; they have been employed to haul cut trees and logs out of forests for the building industry, and they have been used in the tourism industry to take tourists on treks into the forests, and to entertain young and old alike.

Elephants have also naturally performed and continue to perform very useful functions to enrich the soils of the forests and to discover and make foods and useful minerals within the natural habitat available and accessible to other smaller and weaker herbivores. Hence, they have contributed greatly to biological diversity and ecological balance of the forests.

It is, therefore, very disconcerting that these majestic and useful mammals have often been neglected and abused. Indeed, the situation of the elephants has become so critical that their number has declined drastically within a few decades as the result of human activities, such that the likelihood of their extinction is increasing everyday.

In the medium to long term, to stem the tide of rapid decline in population of elephants which require a great deal of space and

food for subsistence, it is imperative that all concerned the private and public sectors, as well as NGO's work together to provide these "pet-like" animals with adequate degraded forest land and employment. This should be done so that both the animals and their mahouts would be able to help themselves with sustainable income. Careful planning is needed so that optimum results could be obtained by all parties. For example, the tourism industry which has already benefited from the use of a few elephants could gain much more if the "elephant jungle treks" could be undertaken by tourists in all four regions of Thailand.

Of more immediate priority, however, is elephant health care in Thailand and in neighbouring countries of South East Asia. As the annual death rate far exceeds the birth rate for elephants in this region, it is very timely to embark on a regional co-operation initiative now in order to enable each country to improve its ongoing conservation work.

The regional workshop's goal to exchange information and adopt a standardized approach and method of providing health care to all elephants in this region, learning from the experiences and approaches of countries outside the region as well is highly practical and beneficial. A well prepared manual on elephant health care for countries in South East Asia would be of great value to elephant conservation work in the region.

In looking to the future, besides the systematic establishment of a network of relevant officials and experts in elephant health care among the countries of the region, the setting up of a database to be shared by all concerned would be highly useful. Furthermore, regular regional meetings of this kind to share experiences and ideas would serve to update and improve elephant health care practices in the region. The meetings would also expand the network of professionals and experts for regional collaboration in other fields for the direct benefit of the elephants, and for the maintenance of biological diversity and ecological balance of the forests in this part of the world. We should aim to maintain approximately the same number of elephants to achieve such a balance.

I would like to commend the supporters and organizers of this first regional workshop for their assistance and initiatives and look forward to reading the report of this important workshop. Finally, I wish the workshop and all participants every success.

Summary Report on the Regional Workshop on Asian Elephant Health Care : Programme Development

The regional workshop on "Asian Elephant Health Care: Programme Development" took place at Chiang Mai between 12 to 13 March 1999. The workshop was a joint initiative of the Committee on Co-ordination of Elephant Conservation in Thailand; Asian Elephant Foundation of Thailand; Forest Industry Organization (F.I.O.); the Zoological Park Organization and the Faculty of Veterinary Medicine, Chiang Mai University.

Altogether, over one hundred Thai and international officials and experts on elephant management participated in the workshop. The participants were from national and local governments, community organizations, NGOs, non-profit organizations, as well as other relevant international organizations.

The subject of the workshop was the conservation of Asian elephants with emphasis on proper care for and survival of Asian elephants.

The discussion at the workshop also involved general health care of Asian elephants through quarantine, vaccination and deworming programmes.

The major themes addressed at the workshop included tuberculosis testing; feeding; neonatal care; restraint; identification; musth management; tusk and dental care; fracture management; euthanasia; eye management and post mortem management.

Subjects such as general health care, information exchange and education services were also addressed and recommendations made at the conclusion of the workshop.

The following are the key for maintaining good health and management of elephants;

1. Elephant veterinarians in South East Asia should carry out an annual health check up and provide health care for elephants;
2. They should work closely and seek co-operation from field officers and university professors.
3. They should continue self-education programmes provided for the elephant veterinarians; and
4. They should develop and revise the protocol periodically.

In order to update their knowledge and to ensure the flow of accurate information, the workshop participants all agreed that a "Basic Data Centre" should be established in Thailand. The centre is expected to

: Disseminate and exchange information regarding Asian elephants;
: Develop credible and effective protocol;
: Organise training and seminar programmes;
: Indentify the sources of the funding both internal and external;
: Reach out to public/private partnerships and international organizations to finance innovative programmes.

The participants at the workshop expressed strong determination to co-operate in policies and programmes that address problems related to long term health status and management of elephants in South East Asia. Technical co-operation of a bilateral and multilateral nature will emanate from this regional meeting.

PREFACE

For centuries the elephant has been regarded as a national animal in Thailand. It has played an important role in Thai history and culture. Not only have they served Thailand and its people with distinction, the elephants have also played an important role in maintaining the ecosystem of the forests in the country. Despite their great value, however, these elephants have been progressively reduced in number. Indeed, in the next few decades, if the reduction is not stemmed, they could become extinct.

This international meeting which is primarily concerned with health care for elephants has been organized as part of the celebration on the auspicious occasion of His Majesty the King's Sixth Cycle Birthday Anniversary, 5 December 1999. It is hoped that the exchange of ideas and experiences among the participants and resource people and the conclusions thereof will provide valuable inputs in meeting the challenges in the new millennium for the conservation and protection of Asian elephants.

On behalf of the Committee on Coordination of Elephant Conservation, National Identity Board, Office of the Prime Minister, Royal Thai Government, I should like to express my deepest appreciation to all, who have contributed to the success of this international seminar on elephant health care in South East Asia.

First, to the members of the Faculty of Veterinary Medicine, Chiang Mai University for their generous hospitality extended to all delegates which has contributed immensely to the success of the meeting. Secondly, to the Boonrawd Brewery Co. Ltd and the Thai Airways International Public Company Ltd. for their support to all participants of this meeting. My sincere appreciation also goes to all participants and resource people to this important event.

Last but not least, I should like to express my gratitude to all those who worked so hard behind the scenes whose unfailing attention to detail and dedication to duty ensured the efficient servicing of this workshop, including prompt preparation of the draft report.

I thank you all.

Dr. Suvit Yodmani

Chairman, Committee on Coordination of Elephant Conservation in Thailand

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By Dr. Suvit Yodmani
President of the Asian Elephant Foundation of Thailand and Chairman of the National Committee to Coordinate Elephant Conservation Work

Introduction

The elephants have played very important and varied roles in the history of countries of Southeast Asia. The past centuries have witnessed warrior princes and kings doing battle on the back of the elephants. They have used them for transportation, hauling trees and logs out of the forests for marketing and export purposes. And recently, elephants have assumed another role in the tourism industry in which, they play football, and carry tourists on treks in the jungles of Thailand.

In fact, the white elephant has long been revered by Thais, and became a national symbol - symbol of wisdom and strength. Former national flags of both Lao and Thailand depict the white elephant.

Outstanding Problems

Despite the high respect accorded to elephant in this part of the world, however, this majestic animal has for several decades suffered hardship and mistreatment which has resulted in the drastic reduction in its number. Some 100 years ago as many as 100,000 elephants roamed the forests. Now, no more than 6,000 remain in Thailand.

The root causes for the decline in number of elephants in Thailand are human activities, such as the slash-and-burn method of agriculture, farmers clearing parts of forestland for agricultural activities, forest fires and logging, all of which have taken away and substantially reduced the natural habitat of elephants and other wildlife. In contrast to neighbouring Lao, which still has over 40 per cent of forest cover, Thailand, now has less than 27 per cent of forest area.

With diminished habitat, the elephant population remaining in the wild has been cut by half. Less than 3,000 elephants remain in the forests, while about the same number have left the forests and been domesticated. Wild elephants are confronted with lack of natural forest food sources and run into conflict with the intruding farmers who have cleared the forest land to cultivate vegetables and fruit crops. As the elephants eat and trample on vegetable and crops such as pineapples and corn they have been chased off, hunted, and killed by the new forest intruders.

Besides these farmers, poachers have hunted for ivory to be sold to tourists, and for calves to be sold to tourist resorts. As the result of human intrusion into forests some herds of elephants have been cut off and isolated. Inbreeding among isolated herds has resulted in much weakened offsprings in the wild.

The domesticated elephants are confronted with equally serious problems. For several decades, they worked to transport cut timber and logs. Due to the logging ban by the government and the heavy floods in the Southern part of the country, which caused a record damage to life, property and agriculture, the result is unem-

ployment for elephants and mahouts. Both have had to leave their homes and search for income in Bangkok and other large cities such as Chiang Mai and Phuket. The course of their lives have taken a turn for the worse.

Numerous accidents have occurred, as these elephants have not been able to adjust to urban traffic and noise pollution. Elephant performances of acrobatics have also resulted in accidents and injuries. Over-worked and hungry, these normally peaceful and friendly animals often became irritable and wild. Once they go into 'musth' or run wild, they cause death, injuries and damage to property. Often they have had to be stopped by bullets.

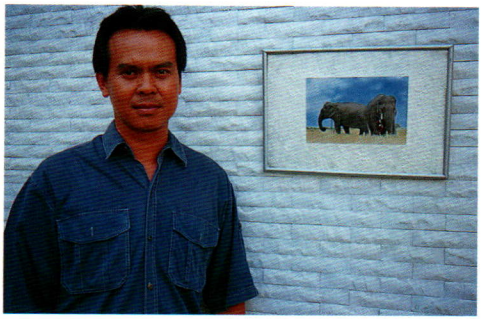
Those elephants which survive the above hardships and dangers, are constantly at risk of contagious diseases from other animals such as bulls and cattle. Frequent diseases include Foot and Mouth, Haemorragic septicemia, internal and external parasites. Moreover, many suffer from malnutrition, Amphetamine and drug addiction, incorrect or imbalance feeding (especially the calves). Some elephants have been found chained outside resorts or tourism establishments without proper care or supervision.

Such is the plight of elephants in Thailand. The general population in Thailand recognizes these problems and hardships, and feels compassion for the unfortunate animals. If no effective measures are found and used to rectify, the serious situation on this largest terrestrial mammal will face extinction in the near future.

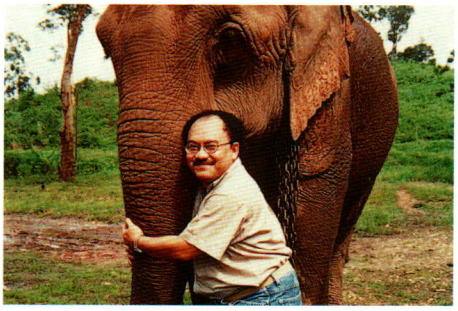
Elephant Conservation:

A Thai Example

Many elephant lovers in government and business as well as non-governmental organizations and mass media contributed to solving the problems. One registered environmental NGO, **the Asian Elephant Foundation of Thailand (AEFT)** has done pioneering work in several areas which has contributed to raising public awareness.



Formed in 1991 as an informal club of elephant lovers and led by journalist and artist **Pittaya Homkrailas** and veterinarian **Dr. Parntep Ratanakorn** as well as other businessmen, government officials and veterinarians, the so called **"Elephant Lovers' Club"** was the first NGO to deal directly with elephants. Members are now found in six other provinces, namely Buriram in the Northeast, Kanchanaburi in the



West, Phuket and Yala in the South, Sukhothai and Chiangmai in the North.

In 1995, the "Elephant Lovers' Club" was transformed into Asian Elephant Foundation of Thailand (AEFT) and has the following objectives:

- to develop policy on elephant conservation
- to promote legislation to protect elephants.
- to sustain public awareness on the importance of elephants
- to work closely with the Royal Forestry Department and other relevant agencies in order to conserve the forests for the elephants and other wildlife.
- to work closely with the Department of Liverstock Development and relevant universities and to build capacity for veterinarians, mahouts, resort owners and all those involved with elephants in the area of health care.
- to promote networking among all concerned in the country, and exchange of information and experiences with other countries and to encourage international co-operation for the benefit of Asian elephant.

In the area of policy development, the AEFT strongly recommended to the National Identity Board, Prime Minister's Office the concept of designating 13 March " Elephant Day", a day to publicize nationwide the importance of elephant and to organize the activities to recognize them.

With the support of the Royal Forestry Department and the Department of Livestock Development, Ministry of Agriculture and Cooperatives, the National Identity Board, Prime Minister's Office, the Council of Ministers approved the proposal and published the decision in the Royal Gazette on May 26, 1998.

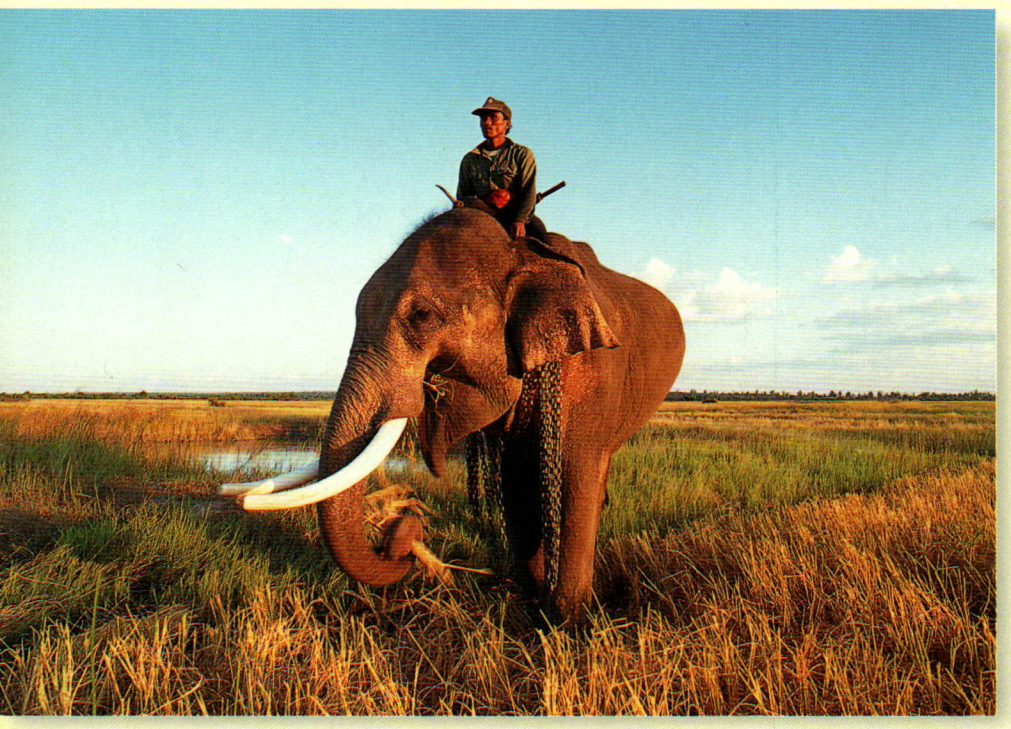
Currently, over 800 elephants are registered members of the AEFT and enjoy annually free medical check-up and treatment, and/or whenever required. Other elephants in emergency cases are also provided with free medical treatment in the event that owners lack the financial resources.

AEFT is currently aiming at an international co-operation in conservation work, particularly among countries in the region. It will start with an information sharing and networking with a view to standardize the approach to health care for elephants, and the drafting of a manual on elephant health care, which could be of use by all countries in the region.

In conclusion, to conserve the majestic elephant in Thailand and in the region requires careful study, well-planned and coordinated action from both public and private sectors. Experience has shown that no single organization can accomplish this goal. Much more needs to be done in the new millennium, we can and must act now to save this important terrestrial mammal in this part of the world.

Elephant lovers and concerned citizens devote time and efforts to positive action in Bangkok, Surin, Phuket and other provinces throughout Thailand

The AEFT co-ordinates with the Tourism Authority of Thailand to encourage proper trekking tours.



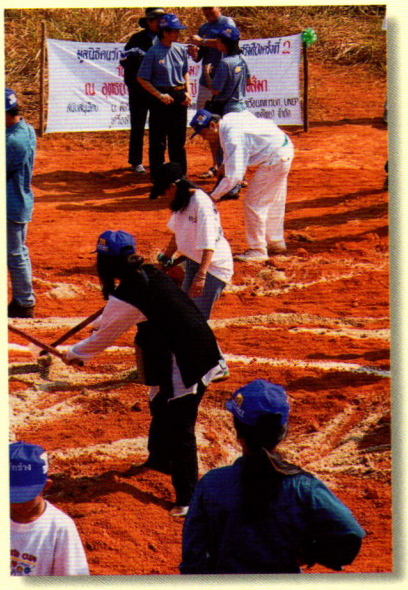
Employment of elephants in their natural habitat is the key to prevent migration of elephants into Bangkok and other urban areas.

Unemployed and problematic elephants would have to be relocated to large tracts of degraded forests, which could be their new habitat and workplace.

AEFT proposes amendments to legislation that new-born calves are officially registered within 6 months of birth with the relevant government agencies for the purpose of keeping track and facilitating proper health care.

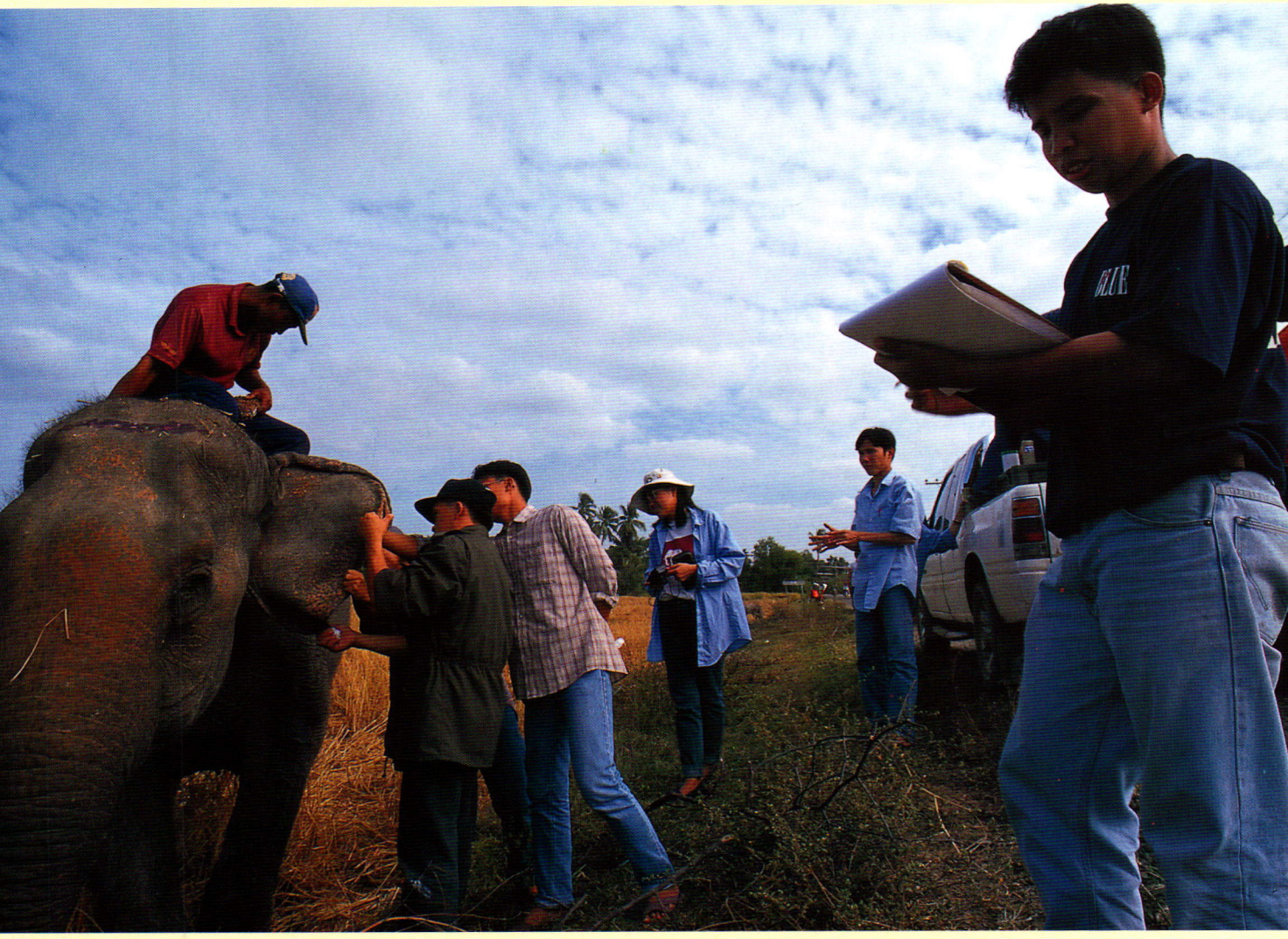
The Committee to Coordinate Elephant Conservation Work was set up under the umbrella of the National Identity Board in the Prime Minister's Office in October 1993 to co-ordinate and support activities of government, businesses, and NGOs that relate to elephants.

AEFT organizes "salt lick" activities in various forests of Thailand for children, youth and interested public.



AEFT organizes "salt lick" activities in various forests of Thailand for children, youth and interested public.

Campaigns such as painting competition, panel discussion, debate, are aimed at creating awareness among children and youth.



The public has been encouraged to adopt elephant
by donating 5,000 Baht a year for the medical expenses.

AEFT has organized 4 training workshops for veterinarians, elephant handlers and mahouts and relevant officials from the Ministry of Agriculture and Cooperatives and the Ministry of Interior. The workshops were at Lampang, Surin, Kanchanaburi and Suratthani provinces.

Over 400 officials and people have undergone such training which is aimed at providing a nation-wide network of capable handlers.

AEFT undertakes programme for registration and examination of elephants by using transponder injection for registration and collecting individual elephant data.

Manual compiled by Dr. Parntep Ratanakorn, the AEFT's secretary-general on how to handle furious elephants or elephants in "musth" has been distributed to officials in Ministries of Agriculture, Interior and Defense.

AEFT has recommended to the Government to make this detailed registration process mandatory. With adequate support, AEFT could assist the Government to achieve this objective nation-wide.

Veterinary care for captive Asian elephants.

VETERINARY CARE
OF THE ASIAN ELEPHANT

Dr. Richard Houck, DVM
U.S.A.

"My discussion of the diseases and conditions of the Asian elephant will be in an order of the various systems of the animal. My experience is solely with captive elephants that are in isolated groups in the United States. These closed units usually are free of parasites and communicable diseases".

ALEMENTARY SYSTEM

Tongue lacerations are best allowed to heal by second intention healing due to their excellent blood supply.

Elephant herpes virus causes a systemic disease showing lesions in the mouth of swollen, cyanotic membranes that are painful. The other symptoms of fever, anorexia, malaise etc. are evident. The source of the virus which as been confirmed in the laboratory is a mystery.

Treatment consists of Famciclovar (Famvir) (23) 6mg/kg via enema because it is not usually consumed due to poor palatability. I administer many oral medications per rectum in elephants. Elephants can be trained to hold a wooden block in the mouth so medicine can be administered via does shyness.

To control secondary bacterial invaders I administer the combination of Penicillin G benzothine 150,000 units and Penicillin G procaine 150,000 units/ml (42) at 10ml/500kg IM sid.

Colleagues in Europe have seen lesions in the mouth of elephants with elephant pox. Most animals go through a stage of anorexia due to mouth pain but recover.

Many fractured tusks heal with no complication and others have disastrous consequences due to the location of the fracture and the bacteria introduced. If the pulp cavity is exposed, I have good results by flushing it with 3% Sodium hypochlorite solution (Clorox) (1) followed by Hydrogen peroxide (H_20_2) and continuing this flushing in an alternate manner until there is no purulent material evacuated. The last flush should be peroxide. The pulp cavity will fill with dentine when healed.

If the elephant packs feces or mud in the cavity I fill the cavity with Play Dough or something else that I can easily remove prior to flushing which I do at least twice a day if possible. Intractable males are flushed with water from a high pressure hose from a safe distance or sedated and treated as above. If the infection travels to the sinus, systemic antibiotics are indicated. Amoxicillin (3) 3-5

mg/kg IM sid or if anaerobic bacteria are involved, Enrofloxacin (4) 2.5 mg/kg orally or IM sid. Other antibiotics listed later can also be used. Sometimes the tusk must be removed to establish adequate drainage and prevent life threatening infection. This requires special instrumentation and general anesthesia.

Malocclusion is often seen. In most cases the animals do well. The worst cases I have seen have been those where a lower molar erupts in a vertical manner instead of in the usual horizontal plane and protrudes into the tissues over the maxilla. I have removed these protruding molars with a wire saw (5).

Here are few tips. Use only enough wire in surround the tooth and allow sawing back and forth. Then fasten long pieces of chain to the wire and cover the sharp ends of the wire with tape to avoid scarifying the tissues of the mouth. The handlers (They get tired, so it takes a few) that do the sawing stand on the opposite side.

I stand on the tooth side and keep water dribbling on the wire to dissipate heat and to monitor the sawing. I have done many standing with no sedation.

Sedation can be achieved with Xylazine (38) 100mg/100 kg IM or IV. In other cases when one cannot correct the malocclusion and the food is not masticated enough and obstipation results due to large fecal balls, I grind up the forage in a portable machine that is powered by gasoline or electricity (6)

I have frequently encountered what I assume to be cecal or large intestine impactions because they mimic the same conditions I see in horses where the diagnosis is made by rectal palpation. Often the culprit is sand. I control pain with Flunixin meglumine (7) 1-2 mg/kg IM as needed. I have found this drug useful in promoting a sense of well being and therefore improved food consumption. I try to keep the animal eating by offering a variety of favourite foods such as fruits, vegetables, and tasty browse. In rare situations I have been able to get elephants to consume tasteless mineral oil stirred in their water or to be able to administer it orally via dose syringe. Rectal enemas are helpful if only to provide hydration which is

vital. I use the siphon method from an elevated 50 gallon drum or a garden hose calculated to provide a certain volume over a specific time period so I am aware of the amount administered. Laxative feed stuffs such as wheat, bran, asylum, coffee. (2.5 kg to large elephant) and beet pulp all laced with molasses to improve palatability are indicated. Intestinal motility can be increase by D-Panthenol (8) 5mg/kg IM or IV. Hydration can be maintained by enema as mentioned and intravenous lactated ringers solution in massive amounts to assure that there is not rectal absorption of water. Large doses of the water-soluble B vitamins (9) can be added to the IV fluid or given separately. I find that this product sometimes can briefly stimulate appetite. If one is suspicious that intestinal motility has been slowed due to calcium deficiency, dilute calcium gluconate (10) should be administered intravenously.

I have seen three cases of rectal-vaginal fistula, I have never surgically repaired any and they have been healthy for many years. Occasionally, the urogenital canal fills with feces and we simply flush it out with water via a hose thorough the fistula from the rectum.

Intestinal Parasites are common. I use the oral polluted products Fenbendazole (14) at 5 mg/kg or Pyrantel tartars 1.06% (43) 30 mg/125 kg. Due to ease of administration, Ivermietin 1% (44) 10 mg/50kg can be also given orally. (NOT BY INJECTION)

I have only seen one case of liver flukes and it was treated successfully with a product used in cattle.

I have seen a case where the animal died from a pancreatic tumor. Diagnosis was made on post mortem examination. The elephant's symptoms were weakness and collapse due to hypoglycemia from the insulinoma.

RESPIRATORY SYSTEM

I've seen very few problems with this system. This is surprising because the Circus elephants travel to 90 cities all over the USA each year in all kinds of weather by railroad train. I feel that they are spared from respiratory infection because they are closed herd not exposed to contagious disease.

However, tuberculosis caused by Mycobacterium tuberculosis has been diagnosed in elephants in the United States and it is assumed that human beings are the source of the infection. Diagnosis is made by culture of saline washes of the distal trunk lumen in a laboratory familiar with the special technique. Dr. Charles Thorn at Iowa State University, Ames, Iowa has developed an ELISA test that show great promise in diagnosis. No protocol elephants. I suspect that it might be diagnostic but more research is necessary. Treatment is with Isoniazid (11), Rifampine (l2) and Pyrazinamide (l3).

CIRCULARTORY SYSTEM

Again, I have seen very little problems with this system.

Most common is ventral edema in performing elephants that miss their usual daily exercise. Usually resumption of exercise solves the problem. If not successful, I administer the diuretic, Furosemide (15), 0.5-l mg/kg orally, IM, or IV. Also I make sure to check that the serum protein and erythrocyte count is adequate because decreased amounts of either can lead to ventral odema. If inadequate, there is usually an underlying cause (parasitism. poor diet, haemorrhage) which must be corrected. I have seen 2 cases of ventral edema in male elephants where the heart rate dropped to 30 beats/minute due to separation melancholy. Furosemide (15) as above as a diuretic and Atropine (16) 0.8-1 mg/kg IM or IV to overcome vagal nerve blockage and increase heart rate are used. Paraphimosis can be a complication to male with ventral edema.

Trypanosomiasis, Piroplasmosis, and Fliariasis are not seen in the US. Also, Foot and Mouth disease has never been diagnosed in the US. Although Anthrax has been, I have never heard of the case.

SENSORY SYSTEM

Elephants eyes are amazing in their resistance to infection and irritation from their dusty environment although they are quite fragile. Treatment for such is the usual ophthalmic ointments such as Chloamphenicol 1% (17) and Gentamicin (18). Products with corticosteroids (39) can be used if one is sure there is no corneal ulcer. Older elephants can have a corneal dystrophy. Treatment is frequent instillation of artificial tears and Voltaren (19).

I have successfully removed a cataract. The cause was unknown. Surgery was elected because she was performing.

I have seen a few elephants with otitis externa. My favourite treatment is the instillation of Panalog ointment (20).

I have seen one elephant with tetanus. With Careful nursing, antibiotic (25), Tetanus Antitoxin, and time the animal recovered. The circus elephants are routinely vaccinated against tetanus with tetanus toxoid. I have noticed that those vaccinated over many years seem to have more of a reaction of painful swelling at the injection site.

INTEGUMENT

The skin of the elephant is quite hardy and adapted to their environment and long survival as a species. Most skin wounds are best allowed to heal by second intention wound healing. Frequent application (3 to 4 times daily) of freshly made 1% Povidone iodine (21) solution aids in decreasing bacterial wound contamination while not impairing the growth in all cases of wound healing. Furacin ointment delays healing as does many other harsh medications. Large laceration can be sutured to aid in healing. Understanding that dehiscence usually occurs but with less wound opening. Screw worm control is imperative.

The largest and most prevalent problem with the circus elephants concerns the toenails of the front feet. Yes, I see the problem in the hind feet but on at least a 50:1 ratio. The number one problem is abscesses that break out above the coronet. These 99.9% of the time start on the surface of the nail that strikes the ground and travel up through the nail and exit above the junction of the nail to the nail-skin. Treatment of, these must involve complete ablation of the tract created by the infection from the sole of the nail to the nail-skin junction. Many knives, curettes, and files are used. The first time are one dies this drastic curettage they wonder if it will ever heal. But it dies and much faster than very conservative treat ments. Many products can be applied to the curetted area but my favourite is the above dilute povidone iodine (21) solution. I also like to apply what call Triple dye (22). This product is also fungicidal. The second largest problem is toe cracks again mostly in the front feet. On the circus these are most often caused by the toe wall become too thin due to frequent and aggressive rasping of the nail. Nails can become thin due to poor nutrition. One should not pick out one feed ingredient to blame but strive for a balanced diet. However, biotin is extremely important and can be supplemented at 60 mg per day for and adult elephant. One must remember that the nail only grows from the cuticle or coronet and once formed does not become thicker only thinner with wear and trimming. Most trimming should occur only on the ground contact surface of the nail. If this surface is trimmed so there is less contact with the ground the nail growth will be accelerated. Sometimes the bacterial infection of the nails advances to a cellulitis and even periostitis of the third or even the second phalanx. Systemic antibioltics such as Amoxicillin (3) (above), Ampicillin (24) 3-5 mg/kg IM sid, Trimethoprim sulfadiazine (26) 15-30 mg/kg PO sid Procaine Penicillin G (25) 30,000 IU/kg IM sid, and Enrofloxacine (4) (above), Ceftiofur(301) 1~5 mg/kg IM sid must be used. If the periostitis of the second phalanx cannot be controlled by antibiotic therapy, especially if tendon sheaths are, involved, amputation is necessary.

Ticks are treated with a thorough spraying of 0. 1 25% Coumaphos (40).

SKELETON SYSTEM

Arthritis is common in the elephant probably due to the long, active life. Many elephants are positive for rheumatoid factor on serum test and many cultures positive for mycoplasma, I am not sure what this all means, but our research showed it. Degenerative joint disease is common but often not diagnosed because many or all joints are affected in some manner and the distributed pain does not cause the animal to have a limping gait as would be seen if just one joint was involved. Polysuffated aminoglycans (27) 2.5 gm IM once a week for at least 4 treatments are helpful in promoting healing of joint surfaces those are painful but subject to improvement. To control pain I use lbuprophen (28) PO 16 gm bid to an adult elephant. An excellent but expensive drug to alleviate pain in elephants is Ketoprofen (29) 0.2mg/kg IV. I use Phenylbutazone (34) 2-4gm/500kg PO and 1-2 gm/500kg IM and Flunixin meglumine (7) IM (above) for their anti-inflamatory properties. Other oral products that have been advocated to promote joint healing, but not used much by me because of poor palatability are chondroitin sulfate (31) and methylsulfonylmethane (32). Septic arthritis should be treated as in the above discussion of periostitis. A note of caution, I rarely use corticosteroids for their anti-inflamatory affect because of their side affects of suppressing the immune system making an elephant more susceptible to TB.

I have seen many bone fractures. Those of the coronoid process and anconeal process of the ulna never heal and usually lead to ankylosis. I have seen spontaneous healing of metacarpal fractures. A leather boot with a pad to elevate the healthy digits so. the digit affected is not weight bearing is helpful. I have attempted unsuccessfully to immobilize long bone fractures by slinging the animal and placing the leg in an exoandable Thomas splint made of steel. However, I would try it again. One very large male was in a sling for 8 months.

Ruptured or tearing of the ligaments of the stifle are not uncommon. One large male with rupture of the anterior cruciate ligament has been helped by the use of light therapy (33) and strengthening the biceps femurs muscle by teaching him to lift in repetition a 40 kg weighted shoe. This stronger muscle stabilizes the joint. An

equine surgeon friend, Joseph Foerner DVM, has implanted carbon fibers in the stifle of a large male in hopes of stimulating new ligament formation by a technique used in horses. The case is still in progress.

MUSCULAR SYSTEM

I have seen many case of myositis in performing elephants. They all, just as in human athletes, seem to heal with time.

I have seen 6 cases of trunk paralysis in performing Asian elephants. They can all grasp food with the tip of the trunk. They eat and drink by tossing the head quickly upward which projects the limp trunk up toward the mouth where the jaw catches it, I doubt if these animals would survive in a wild environment. The cause is unknown. Some suggest that a viral disease of cranial nerves is the etiology. I hypothesize that it is due to a deficiency in Selenium as a neonate. No treatment that I have used returns the trunk to normal function.

REPRODUCTIVE SYSTEM

Besides surgically castrating 16 elephants (45), the only case I have seen involving the reproductive tract of a male elephant was for purulent semen. I assumed that it was due to bacterial prostatitis. The results of bacterial culture led me to use Enrofloxacin (4) (above) in a successful treatment. A friend treated a large urethral calculi by breaking it into small pieces with a laser beam as done in humans.

I have used many drugs to attempt to control musth (Diethylstilbesterol, Cyproterone, Estrone). The most successful is Lupron hydrochloride (35) 35-45 mg SC to a mature male. This is a repositol type product and usually lasts 4-6 months. I repeat the injection when I see the serum testosterone start to rise. With this drug the serum testosterone will be below levels seen in castrated males.

The most common maladies I have seen in the female reproductive tract are endometriosis and leiomyoma diagnosed via ultrasound and necropsy. I have not tried to treat either. If I ever

attempted to treat bacterial endomeatritis, I would infuse the uterus with the same antibiotics used in the horse.

I have seen cases of diffuse, small warts in the posterior aspect of the urogenital canal which usually are self limiting. However, sometimes they hemorrhage and the handles become overly concerned. To hasten the immunity to the presumed virus involved, I have used an immunostimulant, Eqstim (36) 5 ml IV once a week until they start to disappear. As a side note I often use this product if I feel that the immune system needs a boost when there is infection due to virus or bacteria.

We have had many calves born at the Center for Elephant Conservation. Most are uneventful births but we are always there to assist. Dystocias are disastrous events due to size and strength of the female and the inaccessibility of the fetus. I have been involved in a number of caesarean sections and none were successful. A veterinary colleague in a zoo allowed premature, twins to macerate successfully by keeping the dam on systemic antibiotics and instilling antibacterial agents into the uterus and removing pieces of the fetuses when possible. If there is uterine inertia, it may be due to hypocalcemia and Calcium gluconate (10) IV in large quantities of saline or lactated ringers solution are helpful. If this is not successful, Oxytocin (37) 20 IU IV will cause the uterus to expel a calf in 230 minutes. This is not successful one can put traction on the placeta until it is removed. Dr. Mitch Bush cleverly used an inflated human blood pressure cuff to grasp the placenta. Of coarse the usual antibacterial agents need to be placed in the uterus until infection is under control.

I have collected semen via artificial vagina, electroejaculation, and per rectal palpation and stimulation of the accessory sex glands. Artificial insemination has also been done by various methods. Most promising is the technique used by Dr. Thomas Hildebrandt of German using the ultrasound to guide the pipette.

Estrus prediction and pregnancy diagnosis is made by interpreting the serum progesterone values determined by the radioimmunoassay technique.

NUTRITION

Proper Nutrition is essential for good health. Diets vary of coarse due to the availability of feedstuffs. However, Dr. Dwayne Ullrey at Michigan State University has established the dietary parameters that meet the needs of elephants. This is the supplement (41) that we use to augment the basic diet of good quality grass hay. We also feed apples carrots and lettuce but quite frankly it is used more as a treat.

Products and techniques mentioned;

1. Clorox ®; Sodium hypochlorite
2. -
3. Amoxi-Inject ®; Amoxicillin 25 gram/vial, Pfizer
4. Baytril ®; Enrofloxacin, Bayer
5. OB Saw wire, Jorgensen Laboratory
6. -
7. Banamine ®; Flunixin meglumine 50 mg/ml, Schering-Plough
8. D-Panthenol injection, Phoenix
9. Vitamin B Complex 150 injection, Vedco
10. Calcium Gluconate 23%, Wendt
11. Isoniazid, INH
12. Rifampin
13. Pyrazinamide
14. SAFE-GUARD ® TOP DRESS PELLETS; Fenbendazole 0.5%, Hoechst-Roussel
15. Lasix ®; Furosemide, Hoechst-Roussel
16. Atropine L.A.; Atropine Sulfate 15mg/ml, Butler
17. Chloramphenicol 1% Vet ophthalmic ointment, Pharmaderm
18. Gentocin ®; Gentamycin sulfate ophthalmic solution, Schering-Plough
19. Voltaren ophthalmic ®; Diclofenac sodium 0.1%, Schering-Plough
20. Panalog ® ointment; Nystatin-Neomycin sulfate-Thiostrepton-Triamcinolone Acetonide, Solvay
21. Povidone solution; Povidone-iodine (Tritratable iodine 1%) Butler
22. Triple Dye ®; Gentian violet 0.22%, Brilliant green 0.22% Proflavin Sulfate 0.11%, Lloyd
23. -
24. Amp-Equine ®; Ampicillin sodium for horse, Pfizer
25. Penicillin G Procaine Aqueous suspension; 300,000 units/ml, G.C. Hanford

26. Tribissen ® Tablets; Trimethoprim and Sufadiazine, Mallinckrodt
27. Adequan ® I.M.; Polysulfated Glycosaminoglycan (PSGAG) 500 mg/5ml, Luitpold
28. Advil ®; Ibuprofen Caplets, Whitehall-Robins
29. Ketofen ®; Ketoprofen solution 100 mg/ml, Fort Dodge
30. -
31. Flex Free Original ®; Chondroitin sulfate, Vita-Flex
32. Vita-Flex MSM ®; Methylsulfonylmethane, Vita-Flex
33. Photo Therapy : AKA Therapeutic Laser
34. Phen-Buta-Vet inj. and tab. (Horse); Phenylbutazone 200 mg/ml and 1 Gram/tab, Anthony
35. Leuprolide acetate; Lupron ®, Takeda
36. EQSTIM ®; Propionibacterium acnes immunostimulant, Vetoquinol
37. Oxytocin inj.; 20 U.S.P. Units per ml, Rhone Merieux
38. -
39. Gentocin Durafilm ®, Gentamycin sulface and Betamethasone Ophthalmic solution, Schering-Plough
40. CO-RAL ®; Coumaphos 25% wettable insecticide powder, Bayer
41. Mazuri Elephant Supplement
42. Ambi-Pen; Penicillin G benzathine and procaine, Butler
43. Strongid C; Pyrantel tartrate, Pfizer
44. Ivomec ®; Ivomectin inj. For cattle and swine 1% solution, Merial
45. Foerner, J. et al; Surgical castration of the elephant *(Elephas maximus* and *Loxodonta africana).*

PONDERING PACHYDERMS

Facts About the Asian Elephant *(Elephas maximus)*

Why are elephants sometimes called "pachyderms"?

The word pachyderm is derived from a Greek word, *pachydermose,* meaning "thick-skinned." On top of its head and on its back, an elephant's skin is one to two inches thick; elsewhere on its body it is thinner. The skin, sparsely covered with wire-like bristles, protects the animal from the sun and shields against moisture loss.

What is the difference between Asian elephants and African elephants?

They are two entirely different species of animals, not different breeds of the same species: the Asian elephant is *Elephas maximus* and the African elephant is *Loxodonta africana.* The two types of elephants differ in many ways, most noticeably in ear size. The African elephant's ears can reach a width of up to four feet while the Asian elephant's ears are much smaller. The two species are also shaped differently overall: The African elephant has a concave back, while the Asian elephant's back is convex or level. The head of an African elephant is sloped and has no depressions or bulges; the Asian elephant's head is more rounded and has bulges. Both males and females of the African species have tusks, while only Asian males have well-defined tusks. The African elephant has two finger-like projections on the tip of its trunk while the Asian only has one. Other differences can be found in the skin, the number of ribs and the nails of the elephants' feet.

How long have elephants been around?

Elephant-like animals have roamed the earth for the past 55 million years. In today's world, only two members of the order Proboscides (so named for their long trunks) remain the Asian elephant and the African elephant. The mammoth and the American mastodon, the elephants' last living relatives, are believed to have become extinct during the Ice Ages.

How much do elephants weigh?

At birth, Asian elephants weigh from 150 to 250 pounds (males are heavier than females). Fully grown, males weigh in at 10,000 to 12,000 pounds, and females at 8,000 to 10,000 pounds. Standing up to 10 feet in height, they are, together with the African elephant, the largest living land animals. Despite their size, elephants are agile and graceful in their movements.

What do elephants eat?

Elephants are herbivorous (i.e., vegetarians). Their staple diet is 150 - 250 pounds of hay per day with some additional grains, fruits and vegetables. In season, elephants have been known to enjoy pumpkins and watermelons. It is untrue that elephants love to eat peanuts. And they drink large quantities of water, some 30 to 50 gallons a day.

How do elephants use their trunks?

With more than 40,000 muscles, the elephant's trunk is very versatile. With it an elephant smells, picks up food and other objects, and sucks up water to blow into its mouth. Elephants also use their trunks to spray liquids or sawdust onto their backs for cooling or protection from flies, to greet each other, and to vocalize. A "finger" at the end of the trunk allow elephants to grasp objects much as humans do with their fingers. While an elephant's trunk is extremely powerful, it also agile. A pachyderm can pick up a bird's nest without breaking the eggs.

Why is breeding elephants so difficult?

At Ringling Bros. and Barnum & Bailey, most of the Asian elephants in the herd are females. As in the wild, the females and young offspring stay together in a group, along with a dominant male for breeding. In the care of humans, the female and male must be physically brought together in a large enough area. The window of opportunity for elephant breeding is brief. Female Asian elephants come into season only four times a year, as compared with every three weeks for horses and cows.

The gestation period of an elephant averages 22 months, the longest in the animal kingdom. Due to its large bulk, outward physical signs of pregnancy are not always apparent. At the Ringling Bros. and Barnum & Bailey Center for Elephant Conservation, the blood serum of the female elephants is tested weekly to determine their receptivity for breeding or their pregnancy status.

How are elephants born?

During birthing, elephant calves are presented hind legs first and walk within hours after their arrival. Most elephant births are singular. Calves nurse for one to two years after birth, using their mouths, not the tip of the trunk. The mother's breasts are located between her front legs.

How do elephants communicate with each other?

Elephants' vocalizations incorporate a wide range of frequencies, ranging from high-pitched squeaks to low rumbles. The human ear can hear most of these vocalizations; however, some are of such low frequency that they are audible only to the animals. Their low-pitched sounds can travel over long distances. When greeting each other, elephants will often intertwine trunks. An experienced elephant trainer can recognize each individual voice of his or her elephants.

How long do elephants live?

With good care, elephants may live for 60 to 70 years, a lifespan equivalent to humans. They reach adolescence at about 12 years of age, attain sexual maturity at 16 to 18 years of age and are fully grown by their early 20s.

Is it true that an elephant never forgets?

Yes. Elephants learn by emulation, a sign of high mental capacity. They will respond to some 60 verbal commands, as well as recognize human and animal friends after years of separation.

Have elephants and humans always had a close relationship?

Ancient religions in India, Sri Lanka, South China and Java have worshipped gods with elephant heads. According to legend, the future Buddha entered his mother's lap in the form of a white elephant. An early Buddhist and Hindu scholar wrote, "A king who cares for the elephants like his sons is always victorious and will enjoy the friendship of the celestial world after death." Domesticated for thousands of years, elephants first were used as workers in logging, agriculture and military activities.

What are the roles of domesticated elephants today?

As in centuries past, elephants today work mostly in logging and agriculture (rice paddies and coconut plantations, for example) in their native Southeast Asia. They add dignity and stature to ceremonies and religious processions and are often revered by local peoples.

Elephants also entertain through their interactions with human performers and play an increasingly important role as photographic subjects for ecotourism.

What is the greatest threat to elephants in the wild today?

Humans are the major cause of death among both African and Asian elephants. Man's need for wood products, human settlement, livestock grazing and agriculture all encroach upon elephant habitats and contribute to their mortality. Elephants' majestic size and valuable ivory tusks have also made them a target for hunters and

poachers. The U.S. Department of the Interior placed the Asian elephant on the endangered species list in 1976.

Outside their native habitat, where is the largest number of Asian elephants to be found?

Between the elephants at the Ringling Bros. and Barnum & Bailey Center for Elephant Conservation and those performing with The Greatest Show On Earth, Ringling has the largest gene pool of Asian elephants outside of Southeast Asia.

Have elephants always been a main attraction of the American circus?

Yes, ever since the first elephant arrived in the United States in 1796. Jumbo, the largest elephant in captivity, created such an impact when P.T. Barnum took him on tour in the early 1880's that his legacy lives on in the English-language word jumbo.

What rules and standards govern elephants' well-being?

At Ringling Bros. & Barnum and Bailey, all animals are cared for in strict accordance with the Animal Welfare Act of 1985, and facilities are regularly inspected by U.S. Department of Agriculture veterinary inspectors. Facilities are staffed by skilled professionals trained and experienced in animal care and husbandry.

How many baby elephants have been born in the circus?

To date, there have been only 11 documented elephants births in American circuses, including Ringling Bros. & Barnum and Bailey's own Romeo end Juliette (the 11th and 10th, respectively). The first baby elephant born in captivity was Columbia, born in Philadelphia at the winter quarters of the Great London Circus of James A. Bailey and James E. Cooper on March 10, 1880. Columbia is cited as one of the forces that brought about the partnership between P.T. Barnum and James Bailey in 1881.

VETERINARY CARE

OF ASIAN ELEPHANTS IN EUROPE

Dr. Wolfram Rietschel
Zoological - Botanical Garden
Wilhelma, Stuttgart, Germany

"Elephants can be tamed and educated but they have never been really domesticated".

1 Introduction:

The elephant is the biggest terrestrial mammal. Elephants are very sensible and intelligent. Elephants can be tamed and educated but they have never been really domesticated. In the wild, elephants are active most of the day and during night due to the fact that their

big organism needs permanent food supply. Due to poaching and a significant loss of their habitat Asian elephants are an endangered species. Due to hunting and a change of climate wild elephants in Europe are extinct since more than 30,000 years. In Thailand there seem to be less than 2000 elephants left in the wild, most of them in national parks, while another 2500 - 3000 are kept as working elephants most of them in the logging and tourist industry. Today in Europe about 500 Asian and 350 African elephants are kept in zoological parks and circus companies. Most of the Asian elephants have been imported from India, Sri Lanka and Thailand. Since more than 2000 years elephants are used for military purposes and as working animals. The first Asian elephant in Europe was given as a political present by the Arab Kalif Harun al Radschid to the emperor Charles the Great in the ninth century. There has also been breeding in captivity most of the animals used by man have been captured in the wild. Two of the most successful breeding bulls in Europe, the famous Siam at Paris Zoo and Chiangmai at Copenhagen Zoo are of Thai origin.

1.1 Management:

Since 1902 there have been more than 100 births of Asian elephants in Europe but more than 50% of the newborn did not survive the first five years. In Germany there are 84 Asian elephants (6 bulls, 78 cows) in zoological parks and 66 (1 bull, 65 cows) in circus companies. In general the number of births is increasing (recently there have been newborn elephants in Hamburg, Munster, Berlin and Hanover), but only 10% of the zoo-stock is able to reproduce and there has been almost no reproduction in circus-holdings in the last decade. There have been significant losses of adult and newborn animals due to Pox virus and a new Herpes virus originating from Africa and transmitted to Asian elephants in zoo-holdings. Probably this virus has been already imported to Thailand with African elephants and immediate action from the Thai veterinarians seems to be necessary. One of the main problems in Europe is musth management in male animals. During this century there have been more than 300 accidents and casualties caused by elephants and this is one of the reasons most zoological

parks and circus companies keep only female animals. In Europe and the USA there have been more accidents with female than with male elephants. A veterinarian should always consider any elephant to be a potential dangerous animal and never approach an elephant even if chained without the mahout or keeper.

The health condition and the management of animals in zoological gardens and circus companies is closely watched by the public and various non-government organizations.

Complaints are reported to the official veterinarians who are responsible for their supervision and have to do regular checkups. Guidelines for the management and health care of elephants have been issued by specialist groups and are renewed regularly. In case of serious complaints in a circus the official veterinarian will co-operate with a specialist from the nearest zoo. Additionally there are workshops to train government officials in wild animal care and supervision of circus holdings. If animals are not kept according to their species specific requirements and if a diseased animal gets no veterinary care the owner or holder of the animals can be prosecuted and the animals confiscated.

Elephant keepers in European zoological gardens are qualified and well-trained staff members with a high responsibility and appropriate salary. There is no doubt that the quality of the keeper and the holding conditions of the zoo or circus are the most important factors for the health of the elephant.

1.3 Veterinary care:

There is a limited offer of lectures, workshops and training courses about zoo and wildlife medicine at the six veterinary faculties in Germany. To acquire the degree of a Specialist in Zoo and Wild Animal Veterinary Medicine one needs a four year post graduate specialization at one of the few big zoological gardens, which are administered by the veterinary chamber. In 1999 there are about 40 specialized veterinarians for zoo animals and wildlife in Germany. Most of them work in zoos, a few of them are private practitioners, while others work at clinics of the veterinary faculties and

institutes. There is an annual European meeting of German speaking zoo veterinarians. The members of the European Association of Zoo and Wildlife Medicine meet every two years alternating with an International Symposium of Diseases of Zoo Animals and Wildlife. The proceedings of these meetings contain valuable information about veterinary care of all kind of wildlife, including elephants. The Institute of Zoo Biology and Wildlife Research (IZW) in Berlin offers worldwide cooperation in various fields like reproduction, pathology, parasitology, virology and nutrition physiology in zoo animals. Specialists of the IZW support zoo veterinarians in disease problems and can be called in for post mortems in elephants. Additional samples of diagnostic interest can be sent to the laboratories of the IZW for further investigation.

1.4 Nutrition and feeding:

In zoological gardens, feeding of elephants seem not to be a problem, but there might be problems of malnutrition in small circus companies due to budget problems. An adult elephant will eat about 40 - 60 kg of hay and straw in summer, mixed with green forage, 10 kg of fruits and vegetables, 5-10 kg of concentrates (zoo-pellets with minerals and vitamins, grain, brewery products, bread) and branches of trees with leaves, if available.

1.5 Treatment and clinical examination:

1.5.1 Restraint:

Elephants are usually trained by their keeper, that most of the veterinary examinations and treatments including pedicure can be performed without any chemical restraint. If necessary elephants are chained or moved to a crush for physical restraint.

1.5.2 Sedation:

100-700 mg Xylazine (Rompun®) is used for sedation of adult elephants. In dangerous or stressed animals the injection can be given by blowpipe. The recommended antidote is Yohimbine 100-150mg/1000 kg body weight, or Atipamezol (Antisedan®) 1 mg/10 mg Xylazine. Acepromazine can be used orally, but at

least in one case a prolapse of the penis was observed in an elephant bull after an overdosing of Acepromazine.

1.5.3 Immobilization:

Usually Etorphine (Immobilon® or M99, not available in Thailand) is used for elephant immobilization.

Houck (personal communication) describes a method of immobilizing an elephant sedated by Xylazine with an intravenous injection of ketamine.

1.5.4 Euthanasia:

Usually by intravenous injection of T61 (Hoechst) or any anaesthetic drug, in emergency by gunshot (Parntep Ratanakorn has published a booklet on immobilization and euthanasia in 1996).

1.5.5 Application of drugs:

All injections and other applications of drugs should be performed or supervised by a veterinarian to avoid abscesses, overdosing and other side effects.

1.5.6 Collection of blood:

Collection of blood samples, intravenous injections or intravenous fluid therapy is possible by use of an ear vein or the V. cephalica antebrachii.

1.5.7 Special examinations:

1.5.7.1 Electrocardiography:

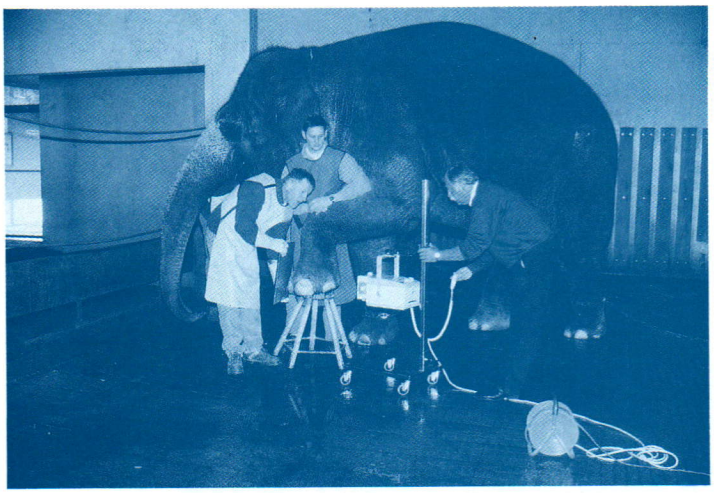
An ECG might give information about cardiovascular disorders but the evaluation requires a lot of experience. An ECG equipment for horses can be used.

1.5.7.2 Radiography:

An X-ray of feet and joints requires a portable equipment on a movable stand. The system used for adult elephants at Stuttgart zoo has a maximum output of 10O kVp and 40 mA with a maximum time setting of two seconds.

1.5.7.3 Endoscopy:

Endoscopes for horses can be used for examination of the female genital tract in elephants. This technique is necessary for the diagnosis of diseases and artificial insemination.



X-ray of an elephant foot with mobile equipment

X-ray of the left front foot of an adult Asian elephant with a digital fistula.

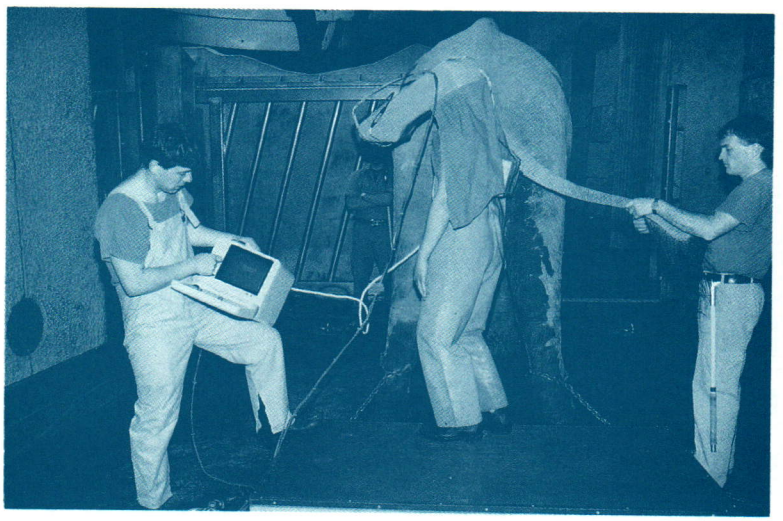
Bronchoscopy, oesophagoscopy and gastroscopy are possible only under anaesthesia.

1.5.7.4 Ultrasonography.

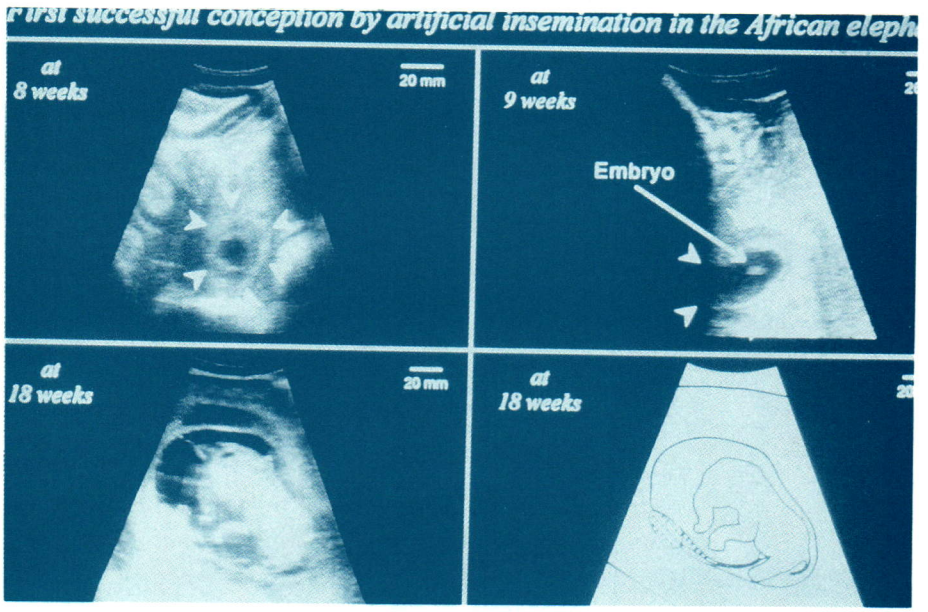
The ultrasonographic examination of the urinary and genital tract in elephants requires the use of a special ultrasound probe which is placed deep in the rectum. The equipment and technique was developed by the IZW in Berlin and used for the first successful artificial insemination in Asian and African elephants.

1.5.7.5 Computer tomography:

CT is mainly of scientific interest and not of practical diagnostic importance. This diagnostic technique is only possible in calves and can give us valuable information about anatomical details.



Ultrosonographic examination of a female elephant at Vienna zoo.



The first successful artificial insemination in an African elephant (ultrasonographic picture by Hildebrandt).

1.6 Diagnosis and treatment of parasites:

1.6.1 Endoparasites:

Endoparasites can be diagnosed by a saline floatation and a sedimentation technique. Additionally a larvae migration technique (Baermann-Wetzel) is recommended. The most important endoparasites in elephants in Europe are nematodes which can be treated by use of ivermectin, mebendazol, fenbendazol and other antiparasitaria. There are a few reports about various trematodes, usually in fresh imported animals, and only one about a tape worm infection.

1.6.2 Ectoparasites:

With the exception of lice, ectoparasites are very rare in Asian elephants in Europe. Elephant lice *(Haematomycis elephantis)* are visible without equipment and can be treated by washing with insecticides or by oral or subcutaneous application of Ivermectin. Ivermectin has been used successful in elephants in Northern Thailand infected with *Elephantoloemus indicus.*

The elephant louse (Haematomycis elephantis) is the only ectoparasite living on the skin of Asian elephants in Europe.

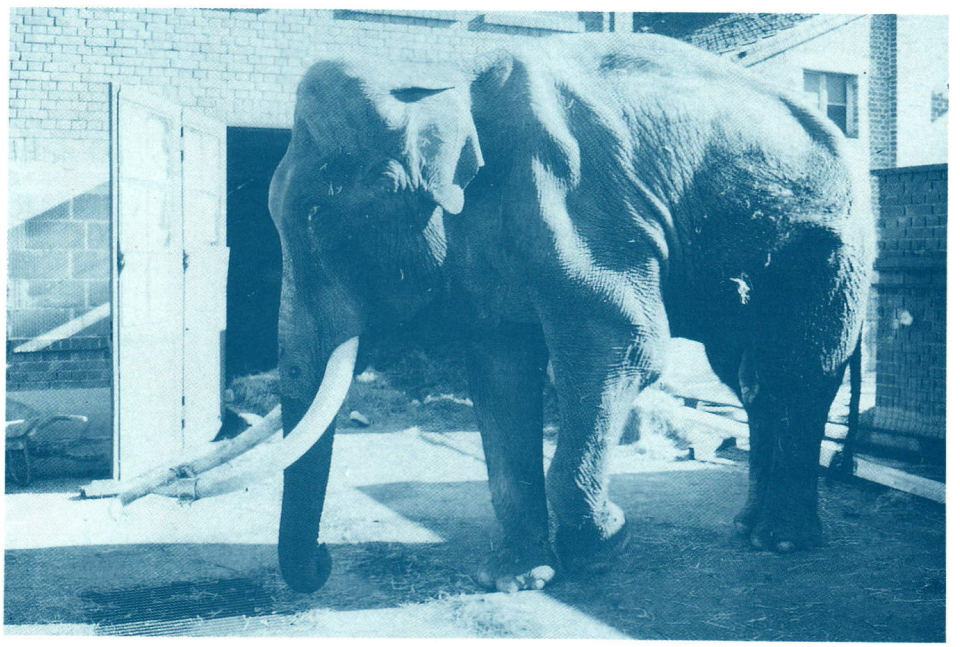
1.7 Diagnosis, treatment and prophylaxis of relevant infectious diseases:

1.7.1 Bacterial diseases

1.7.1.1 Tuberculosis

Tuberculosis has been diagnosed in zoo and circus elephants in Europe. The disease is caused by *Mycobacterium tuberculosis,* type humanum and bovinum. Clinical symptoms are a chronic loss of weight, respiratory disorders with coughing and nasal discharge, rheumatic symptoms and sudden death. Often tu-

berculosis is found only post mortem in apparently clinically healthy elephants. The intradermal test is not always reliable, neither the serum-ELISA test. Only the isolation of mycobacteria in nasal or vaginal discharge or other material can confirm the diagnosis. Tracheal washes can be collected only by anaesthesia. Recently a method of collection of trunk wash samples from unsedated elephants has been described in the USA. The treatment of TB in elephants is possible, but due to European disease control legislation, in most



Chronic loss of weight might be a symptom of Tuberculosis.

cases, infected animals have to be culled. The disease is a dangerous zoonosis and in case of TB in an elephant all other animals of the holding and all staff have to be checked. Prophylactic measures include strict quarantine of new arrivals, no direct contact of elephants and non-elephant staff, regular health check of elephant staff including TB tests.

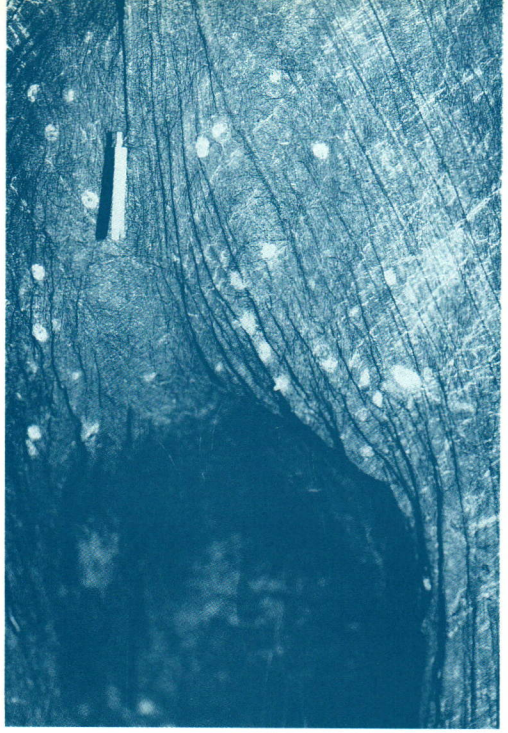
1.7.1.2 Salmonellosis: Due to the close contact of captive elephants and man, Salmonellosis is a widespread disease. Usually only few animals show symptoms, but all other animals might be carriers. There have been frequent losses due to Salmonella, usually in young, injured, feeble and very old elephants. Symptoms are anorexia, weakness, loss of weight, colic, heavy diarrhoea with

mucous and blood. The diagnosis can be confirmed by bacteriological examination of the faeces. Therapy requires antibiotics and fluid with electrolytes either by infusion or oral and rectal administration. Prophylactic measures include strict quarantine of new arrivals, regular bacteriological faecal examination of elephants and staff.

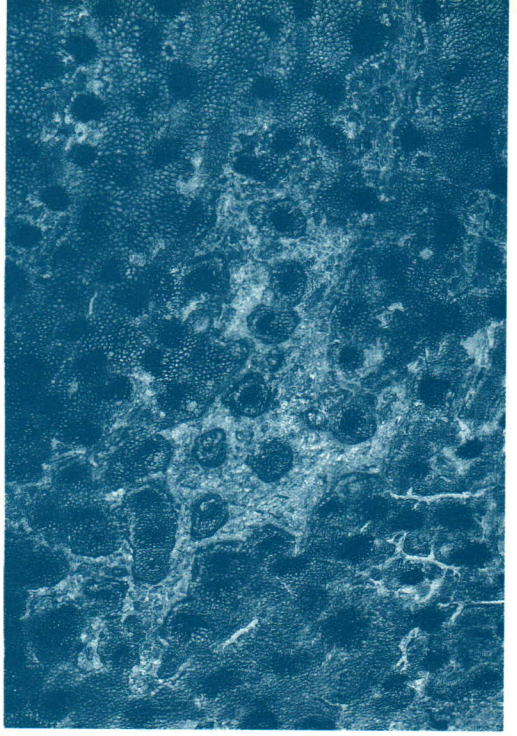
1.7.1.3 Anthrax: There have been only sporadic cases of Anthrax in zoo and circus elephants. The source of *B. anthracis* is usually contaminated food or water. Symptoms might be high fever, colic, haemorrhagic mucous membranes, lameness, tremor, subcutaneous swellings, bloody diarrhoea. Diagnosis is done through bacteriological examination of blood or discharge. If Anthrax is suspected, high dosage of Penicillin is indicated. A vaccination is necessary in endemic areas.

1.7.1.4 Tetanus: This disease is quite common in elephants, *Clostridium tetani* is found in unhygienic conditions. The disease is diagnosed in elephants with neglected pedicure, with wounds caused by use of a sharp elephant hook or in animals with broken tusks and exposed root canal. The symptoms are muscular spasms, specially in the jaw. Therapy includes repeatedly injections of high dosage of antitoxin (250,000 - 500,000 I.U.), Chloral hydrate (rectal), Salicylic acid, Penicillin and force-feeding. It is recommended to vaccinate elephants with a commercial horse vaccine.

Elephant pox in an African bull.



Pox lesions in an African Elephant.

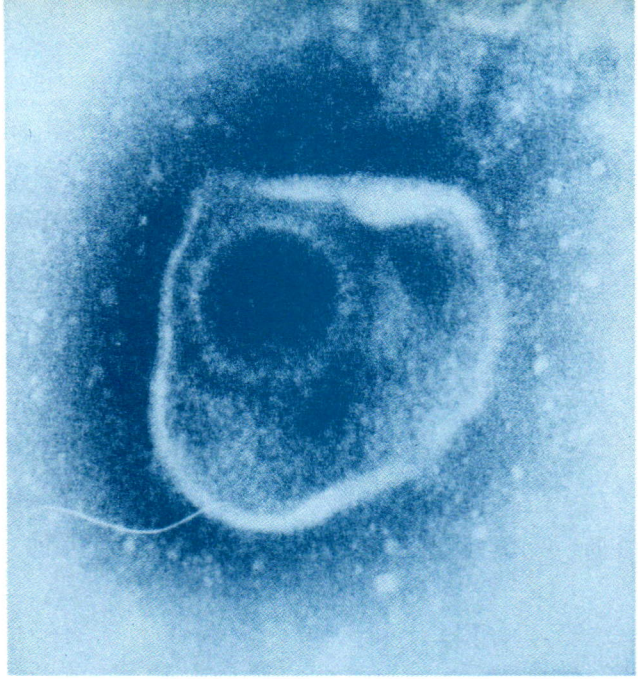


Skin lesions in an elephant with cutaneous Herpes.

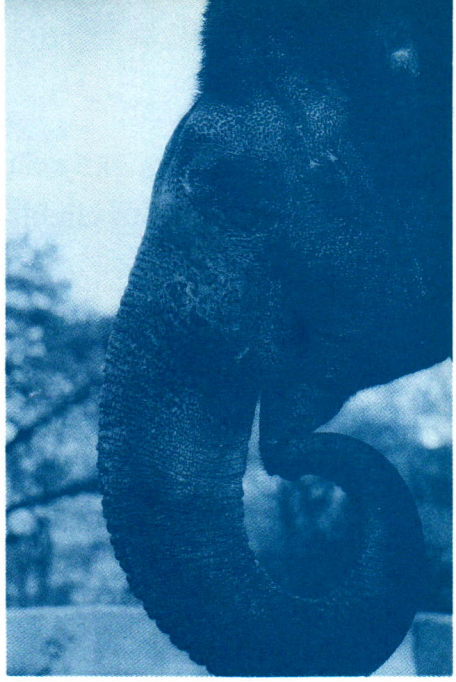
1.7.2 Viral diseases

1.7.2.1 Elephant Pox: Infections with Pox-virus have been diagnosed quite often in European zoo and circus elephants. Early clinical signs may include loss of appetite, dysphagia and lameness. Vesicular lesions which may become filled with clear, blood tinged or purulent fluid develop on tongue, lips, trunk tip, and skin. The corium of the nails might be involved too, sepsis and death is quite common. Diagnosis can be confirmed by electron-microscope of the content of the vesicular lesions or crusts. The virus is very contagious and may infect man too. Treatment is supportive and may include fluids, antibiotics, vitamins and if the feet are involved, a lot of bandages and special shoes. In Germany most of the elephants are now protected by a special vaccine.

1.7.2.2 Elephant-Herpes: There have been several fatal cases of infections with a new endotheliotropic Herpes virus in Europe and the USA. Recently the virus has been identified by polymerase chain reaction (PCR). The disease has a sudden onset and is characterized by oedema of the head and proboscis, and variably cyanosis of the tongue, leucopenia, thrombocytopenia, and internal haemorrhages.



An electron micrograph of Elephant Herpes virus.



Cutaneous Herpes in an Asian elephant.

There is a theory that the virus is indigenous to and non-lethal in African elephants and causes a lethal disease if transmitted to young Asian elephants. The virus has been found in wild African elephants but up to now there has been no research in wild or captive Asian elephants. It is suspected that Herpes viruses have contributed to a significant proportion of captive born elephant mor tality. In three cases a treatment with an anti-viral drug (famciclovir) has been effective. To avoid infections Asian elephants should never have direct contact with the African species.

1.8 Diagnosis and treatment of non infectious diseases:

The paralysis of the trunk might be caused by infections, trauma, degeneration of blood vessels or nerves. Tracheitis, bronchitis and pneumonia can be treated like diseases of the respiratory system in horses.

Diseases of the digestive system include teeth problems, stomatitis (Pox and Herpes virus). Oesophageal obstruction by a foreign body might require an anaesthesia and the use of a gastroscope. Constipation of the intestine might be caused by unbalanced food, stones, turnips and sand. Enteritis caused by pathogenic bacteria or malnutrition can be treated according to the procedure in horse veterinary medicine.

Oedema might indicate diseases of the heart and circulatory system. Most of circulatory diseases are diagnosed only post mortem.

Infections of the urinary tract can be treated with antibiotics. The diagnosis of diseases of the reproductive organs might require the use of an endoscope or ultrasonographic equipment.

Diseases of the muscular and skeletal system include fractures (usually a treatment is not rewarding) and distortions. Chronic arthritis is often caused by poor management or infections.

Skin, feet and tail seem to be the indicator for good care of an elephant and the quality of the mahout or keeper. Animals which are not washed regular and don't have the opportunity of a daily bath will develop serious skin problems. If there is no regular pedicure, cracks in the nails or cuticle, abscesses and infections of subcutis and joints might develop. If wounds in the tail area are not treated immediately ascending inflammations might cause the loss of the whole organ.

1.9 Intoxications:

Aflatoxin intoxication was observed after feeding rotten bread. In Munich Zoo three Asian elephants developed heavy symptoms after an Aracea-plant intoxication, other cases of plant intoxication are reported from various zoo logical gardens.

1.10 Feeding problems and malnutrition:

There are sporadic reports about iron deficiency, mineral deficiency, vitamin deficiency, colic caused by unbalanced food, ingested stones, usually from small circus holdings.

1.11 Gynaecology:

The Institute of Zoo and Wild animal research (IZW) has developed a method of ultrasound examination of the female genital tract of elephants. By additional use an endoscope the first artificial insemination have been performed in the USA and Europe. At the present time there are three (April 99) confirmed pregnancies in Asian and African elephants in the USA. Caesarean sections have

been tried, but have never been successful, neither for the mother nor for the calf. Oxytocin (200-300 I.U.) is used for birth assistance. Episiotomy has been used successful in case of dystocia.

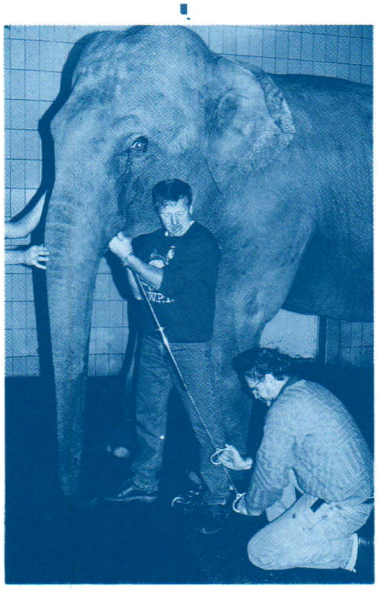
1.12 Andrology:

There have been successful attempts at semen collection by manual rectal masturbation and by electroejaculation. Up to now cryopreservation of elephant semen has not been successful. Clinical examination of the internal genital glands of male elephants can be performed by ultrasonography.

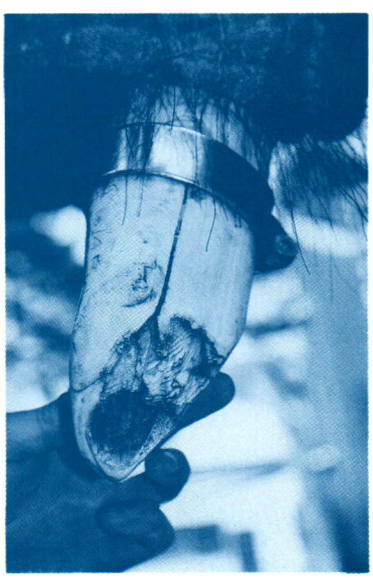
1.13 Surgery:

There is a limited number of operations described in elephants like: Dental operations; removal or repair of fractured tusks; removal of molars. Amputation of a prolapse of a female preputium.

Replacement and fixation of a prolapsed penis into the preputium of an adult bull. The first successful castration of a male elephant has been performed in 1985 near Stuttgart. Several eye operations are described. Surgical removal of the infected temporal gland has been successful. Many injured or infected tails have been amputated although the author prefers a conservative treatment.



Cutting of a tusk in a female Asian elephant. The animal is sedated with 300 mg of Xylazine.



Fixing of a longitudinal fracture of the tusk of a female African elephant.

Prolaps of the penis in an Asian elephant bull after overdosing Acepromazine.

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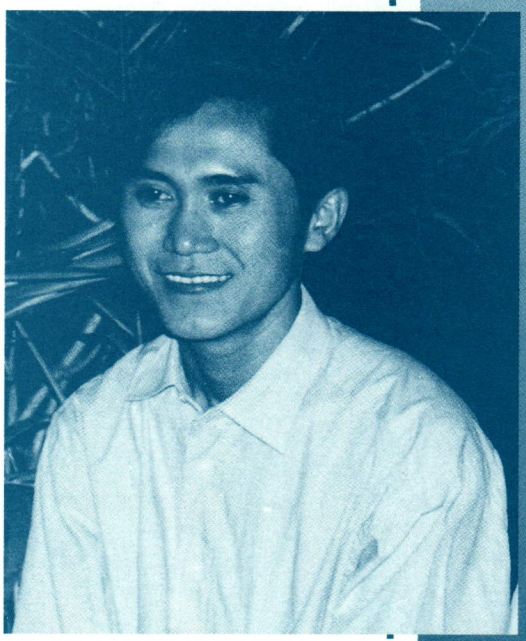
Country Reports

MAIN PROBLEMS OF ELEPHANT HEALTH CARE IN CAMBODIA

Dr. Berlina UK
Animal Health Office. Department of animal Health and Production, Kingdom of Cambodia



Dr. Sokhdom Say
Animal Health Office. Department of animal Health and Production, Kingdom of Cambodia

Introduction

According to documents before 1970, forest land in Cambodia was estimated to be about 13,227,100 hectares. At present, by the assessment of the deparment of forestry, it remains only 40%, but in the conclusion of FAO, it remains only 7,500,000 hectares in comparision with the period before the civil war in 1970.

The department of forestry has reported that this caused by the following reasons:

1. People clear forest land to become a field for crops.
2. People clear forest land to build a village.
3. A part of forest has been cleared to make secure along the roads.
4. Anarchy in forest exploitation.
5. Forest has been destroyed by war.

War and the extinction of forest cause to the extinction of wildlife habitats.

Elephant existing areas

The elephants of Cambodia live in herds of ten to thirteen in the forest habitats adjoining. In Cambodia, elephants have been captured, trained and utilized as a means of transport to carry the forest products such as woodoil, fruits of cardamoms, rattan and trophies from remote upland regions to river side districts of Tonle Sap or Mekong River or other villages in the forest or agricultural plains from where they carry foodstuff and necessary medicine back to the mountains and some have been captured, trained and utilised in timberyard for forest exploitation. These areas are far from the people gathering places and it is difficult to find ways reach in there.

Elephant health care

There is no veterinarian in the remote areas and there are few ones in the districts. They have little knowledge on animal health care. They are lacking of medicine, veterinary equipments and fund for veterinary service sustainability even at provincial and central levels.Most of veterinarians have no skill and experience on elephant health care. There is no information about elephant illness to the department of animal health and production. First, the place where the elephant get sick is far. There is no vehicle, fuel and perdiem for veterinary agents go to field to get survey. Secondly, the owners of sick elephants disbelieve Western

treatment. They use traditional herbal medicine for treatment. Thirdly, there is no communication systems.

From hearsay, infectious disease occurs in elephants. Many elephants died without knowing causes and there is no sample sent to veterinary diagnostic laboratory at the central department.

The department has no fund to solve the problems even the problems of cattle, buffalo, pig and poultry.

The department of animal health and production has requested to UNEP and other international organization to help and solved the serious problems. If the above issues can not be solved, the elephants of Cambodia will be extinct. I think, elephant is the largest amimal of our human heritage, it has to be conserved.

Number of domesticated elephants before 1975

Table 1

Year	No. in heads
1955	510
1960	730
1965	600
1966	550
1975	582

Number of domesticated elephant in some provinces of Cambodia in 1975.

Table 2.

Provinces	No. in heads
Battambang	34
Kampot	45
Koh Kong	44
Kampong Cham	5
Pursat	59
Kratie	62
Mundulkiry	110
Kampong Speu	115
Takeo	2
Seam Riap	2
Preah Vihear	2
Total	582

ELEPHANTS HEALTH CARE IN RAGUNAN ZOO

"Indonesian elephants genuinely from Sumatran Island ...".

Dr. Ismianto, DVM
Director, Ragunan Zoological Parks,
Jakarta, Indonesia

INTRODUCTION

Elephants are the scarcity animals that enrich Indonesian natural resources have typical shape of its body and protected by the Law in 1931. Indonesian elephants genuinely come from Sumatran Island and it is categorised as *Elephas maximus sumatranus* species. Sumatran elephants are spread in four provinces namely; at South Sumatran Bengkulu, Lampung and Jambi, its population approximately 3,000 to 4,000 elephants. Elephant habitats from time to time less due to the space of its habitat taken by the growing population of people.

To conserve its habitat it is therefore appropriate conservation efforts in parallel with protection and preservation aspects: one of conservation efforts is to place special region for elephants to tame to accommodate them.

To conserve and to protect elephants, the Government established Environment Law No. 5 Year 1990 that regulate elephants special region and its accommodation in Way Kambad Lampung. The tamed elephants are protected and place at Way Kambas accommodation trained and cared their healthiness. The tamed and healthy elephants are sent to the requiring zoo.

All the, elephants an the zoo are treated by good food, healthy and its breeding also benefited as the riding elephants.

In Ragunan Zoo, it has 13 elephants consisting of 3 male elephants and 10 female elephants. The elephants never get infectious diseases but very often get non-infectious diseases. The non-infectious diseases are like worms and abscess twig of tree.

Generally speaking the non-infectious disease on Ragunan elephants it found as follows:

ETHIOLOGY

Some endoparasitic diseases are found at Sumatran elephant of Ragunan Zoo are

No-	Date	Sex	Name	Kind of Endoparasite	Stadium
1.	19-12-94	Female	Ola	+++ *Strongylus sp*	Larva and egg cc
2.	19-12-94	Female	Naralia	++ *Strongylus sp*	Larva and egg cc
3.	18-10-95	Female	Ola	++ *Strongylus sp*	Larva and egg sp
4.	29-12-95	Female	Pteno	+++*Balantidium sp*	Active
				sp	
				+++*Strongylus sp*	Larva and egg sp
5.	15-12-98	Female	Putri	+++*Balantidium sp*	Active
				sp	
6.	08-02-94	Female	Ratih	*Abscess*	

PATHOGENESIS:

In general *Strogylus* sp. can cause caecum and colon restraints which in turn may happen haemorrhagic and metastatic infarc. Haemorrhagic infarc at colon and caecum restraints show at serosa area in the colour of red - grey area and bordered obviously.

This infarc could happen very strong and quickly. Beside that it makes worm lump in sub mucosa that sometime it relates with intestines. Some literatures state that a large of worms can cause cataralic, perechie until bleeding in duodenum and jejunum intestines.

In the meantime its larva can cause the shape of local thickening and arise its peritonium web. It can also cause subperitoneal bleedings.In principle, *Balantidium* sp. cause intestinal surface irritation, in which it is therefore at bad condition in turn make serious irritation.

CLINICAL SIGN:

The arising clinic phenomenon is diarrhoea. It is sometime found bleeding and less appetite. And this causes a lot of lost weight. The elephants look restless and no energy.

EPIDEMIOLOGY:

Strongylus sp. and *Balantidium* sp. are much found at every place especially for badly sanitation. Both are extremely difficult to remedy.

TREATMENT

Rintal® worm drug is very potential to remedy on kind of *Strongy lus* sp. worm by doses 6 gr. per 100 kg bodyweight.

Flagyl® drug given to cope with Balantidiasis to Sumatran elephants by doses; 500mg per 100 kg bodyweight.

DIFFERENTIAL DIAGNOSE:

Differential diagnose has in common with some diseases that are caused by:

a. Food allergy
b. *Trichuris* sp worm
c. Diarrhoea caused by working tired.

DISEASES DATA

Several endoparasitic diseases that found on Sumatran elephants in Ragunan as follow:

No.	Date	Sex	Name	Kind of Endoparasite	Stadium	Treatment
1.	19-12-94	Female	Ola	... Strongylus sp	Larva and egg cc	Rintal 60 gr 5 days
2.	19-12-94	Female	Natalia	++ Strongylus sp	Larva and egg cc	Rintal 60 gr 5 days
3.	18-10-95	Female	Ola	++ Strongylus sp	Larva and egg sp	Rintal 60 gr 5 days
4.	29-12-95	Female	Pleno	+++Balantidium sp	Active	Flagyl 10 gr 5 days
5.	29-12-95	Female	Ola	+++ Strongylus sp	Larva and egg sp	Rintal 18 bolus 5 days
6.	15-12-98	Female	Putri	++ Balantidium sp	Active	Flagyl 12,. 5 gr 5 days

February 19, 1999
Ragunan Zoology Parks

PROGNOSA

Based on observation of larva, worm eggs and active - non active *Balantidium* can be remedied by correct doses regularly during 5 days and the result is quick and good.

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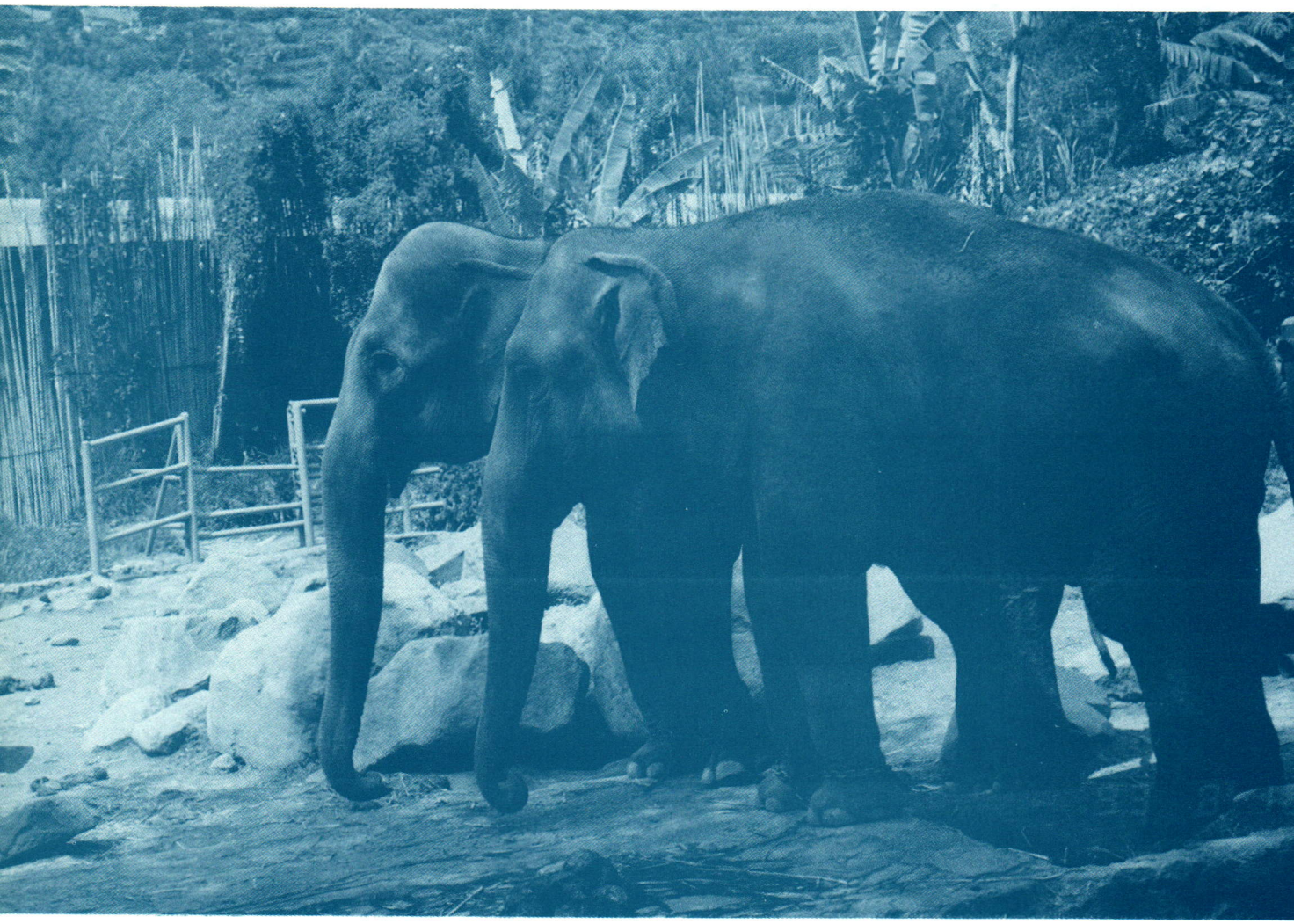
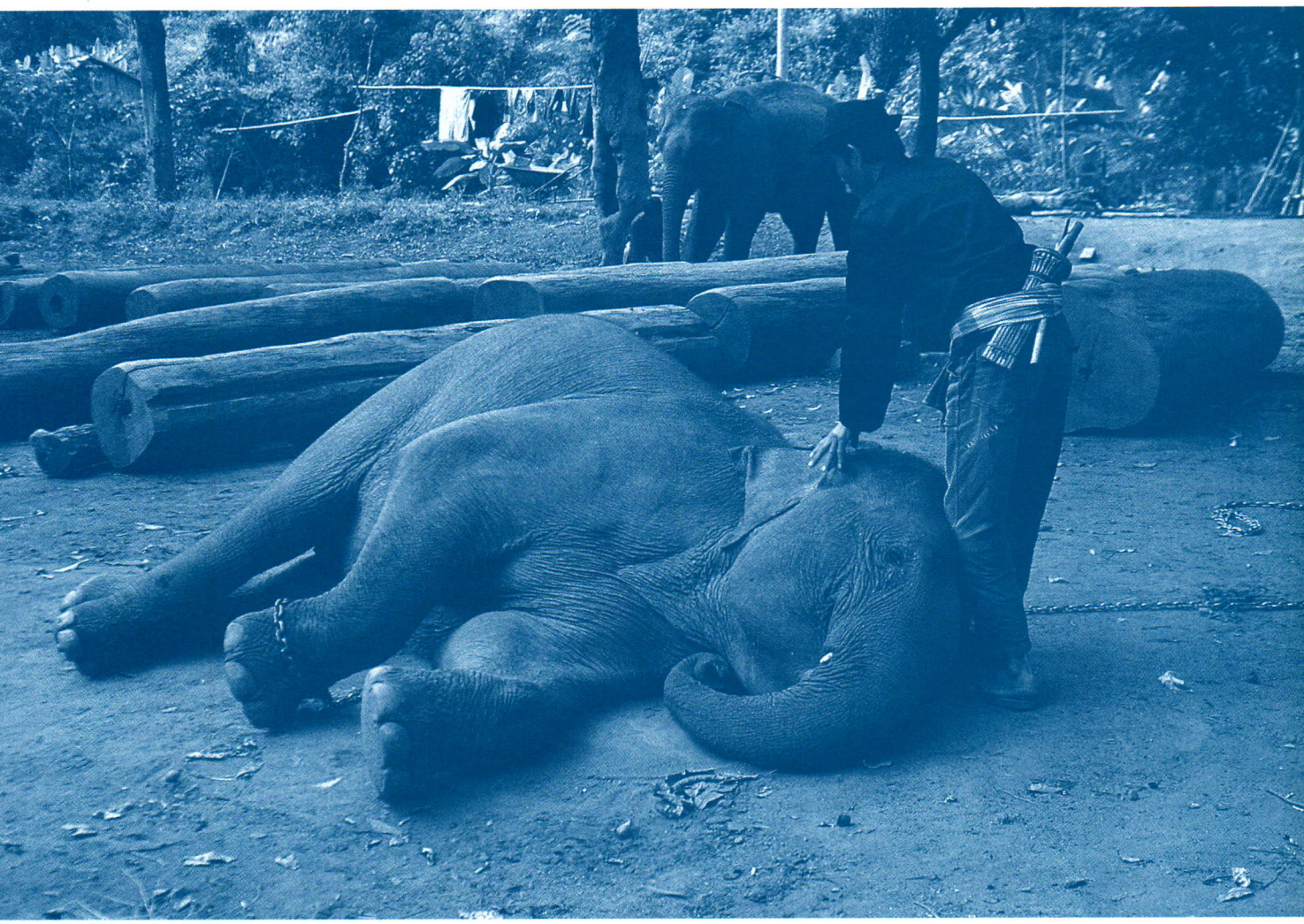


Captive elephants in Taman Safari, Bogor, Indonesia
Photo by Dr. Parntep Ratanakorn



THE HEALTH CARE OF ELEPHANTS AT GEMBIRALOKA ZOO YOGYAKARTA, INDONESIA

Dr. Machmud Asvan
Senior Veterinarian, Gembiraloka
Zoological Park, Yogyakarta, Indonesia

Health status: Infectious diseases

1. Acute Catarrhal Pneumonia

Etiology: not understood yet.

Pathogenesis: not understood yet

Clinical signs: There were 7 animals in one location and they were separately put on an individual cage based on their ages. A special different keeper was taking care of each of them. The animal had clinical signs, which were mostly serous fluid discharges from the trunk. Besides that, we also observed that the serous fluid was very often discharged after the animal had cough. Other clinical signs observed were only mild. Those are as follows: hyperemia of the mucous membrane of trunk, anorexia and deep breathing.

Epidemiology: It seems to us that the infection was transmitted by the keeper since the animal was still in a good condition before being taken care of by the keeper who had a severe cold during caring for the animal.

Treatment: The animal was treated with Penicillin-Streptomycin (Duphapen®) 20,000 iu/kg b.w. i.m. for 4 days. B-complex vitamin i.m. was also given once. The animal was recovery by 3 days after being treated.

Differential Diagnosis: Tracheitis, bronchitis or tuberculosis. In the present case, the keeper was checked for Tuberculosis infection and his Tuberculosis test was negative. Therefore, human

Mycobacterium, which was suspected of being the most likely, can be eliminated

Prognosis: Fausta

2. **Enteritis**

Etiology: not understood yet.

Pathogenesis: not understood yet.

Clinical signs: Enteritis was found in the elephant at the age of 8 years. The most significant clinical sign was an acute, intermittent profuse and watery diarrhea. Other clinical signs were anorexia, fever and weakness.

Epidemiology: not understood yet.

Treatment: The animal was treated with Penicillin 20,000 iu/kg b.w. i.m. and simultaneously given B-complex vitamin. The animal was recovery 2 days after treatment.

Differential Diagnosis: Salmonellosis. The Salmonellosis was sus pected of causing the diarrhea since the clinical signs observed were similar to it.

Prognosis: Fausta

3. **Parasitic diseases of the intestinal tract**

Etiology: Ascariasis and Strongylosis.

Pathogenesis: not understood yet.

Clinical signs: In any severe cases of helminthiasis. The elephant had abnormal extremities movement. This clinical sign was confirmed with the routine fecal examination. It was suggested that such clinical sign is pathognomonic for Ascariasis and Strongylosis infection in the elephant at Gcmbiraloka Zoo.

Epidemiology: Sanitation should had been good in order to prevent the outbreak of parasitic infection.

Treatment: Rintal® granule was given 7.5mg/kg b.w. per oral. Fasting of the animal was as a must.

Differential Diagnosis: Other types of intestinal parasitic infection should be considered.

Prognosis: Fausta

Health Status: Non-infectious Disease

1. Choke

This occurred accidentally due to consumption of the banana roots when the elephant was raised in the field. The clinical sign observed was vomiting just after the animal either was fed or given drinking water. The fluid therapy was applied every other day after the animal had a consistent vomiting and did not have a capability to consume the diet. The constipation was released by giving the enema. The animal was also given a supportive treatment, such vitamins (Hematopan® and B 12 vitamin and Biosolamine®). The choke was overcome by pushing its cause using the stomach tube from esophageal canal into the stomach. This was done at least 3 times before the choke could be released from the animal. It was not an easy job actually to do it after this point. Antibiotics were given due to the blood profile analysis indicated that the animal had leucocytosis. We could say that after being cured the animal is given the soft diet, such as fruits or young leafs in order to maintain of its normal condition. However the cured animal sometimes had still a vomiting but this would stop right away.

2. Common Health Problems and Management

Musth Management

Duration - Several days to several months.

Season - varied individually

Control Method - by observing the behavior of animals, such as aggressiveness, restlessness, dribbling of the urine from the prepuce and the secretion of oily substance at temporal gland.

Identification and Registration

Legally: Based on the Article for Indonesia X 5, 1990.

Method: Any kinds of institutions can raise the elephants as long as it is suitable to their functional purposes. This is done by applying the proposal to Indonesian Government. If it is agreed with them, the letter of a permission to carry the animals from the host region to the interested area will be issued. The next step, we have to make a trimester report of the animals condition we have.

Tusk and Dental Care

Cut: Cut of the tusk was performed when it disturbed the animal itself. The method applied was as suggested by Schmidt, 1986.

Integumentum Management

Abscess: First take out the pus material inside, the treatment depended on the size of abscess. If it was small, give a topical antibiotics treatment, if it was big, give an antibiotics injection.

Papillomas

Papillomas were treated by autovaccine. Vaccination was given twice one week another. By this method, the spread of this tumor could be prevented. The papillomas were cut surgically and were cauterized in order to prevent the hemorrhages.

External parasite

We sometime observed ticks infestation and did nothing if the infection was only mild. The ticks were used as an old home remedy for human hepatitis in Central Java.

Toxicity Management

To avoid being toxicated, rinse the animal diet with water.

Urogenital Management

Placental retention was the part of being observed during parturition.

Restraint: Physical & Chemical/Transportation

Indication: To domesticate the elephants and to prepare the animals for treatment and mild surgery.

Method: The animals were tied with the rope on the appropriate restraint facility. Sedative anesthesia was applied.

Anesthetic Technique

Indication: Surgery

Method: i.v. (ears and thigh) and i.m. (caudal extremity).

Euthanasia

Never been done.

Vaccination Program

Age	Vaccine against disease	Type of vaccine
7-8 years old	Tetanus/Clostridium	Toxoid

Deworming Program

Age	Drug and Dosage
2-3 years old	Rintal® 7.5/kg b.w. Panacur® 5-25 mg/kg b.w. Kalbazen®

Feeding Program

Age	Kind of food	Amount and Frequency
Mature	King-grass	50kg/3x/day
	Banana	5-10 loafs
	Papaya	2-3 pieces
	Coconut	4 pieces
	Tamarin + Salt	1 handfull/1x/week
	Mineral + Vitamin	250 mg/day

Captive elephants in Taman Safari, Bogor, Indonesia
Photo by Dr. Parntep Ratanakorn

ELEPHANT HEALTH CARE IN LAO PDR

"....Basic knowledge on infectious and non - infectious diseases of the elephant in Lao PDR is currently very limited.This conference gives us a valuable opportunity to meet and learn more....."

Dr. Chonechith Douangphachanh
Deputy Head of Animal Health Division, Department of Liverstock and Fisheries, (DLF) Ministry of Agriculture and Forest, Lao PDR.

Background

The government of Lao PDR recognizes the important role of livestock in rural development programs. An important constraint in achieving the objectives of these programs has been high incidence of diseases causing heavy mortality and morbidity. Serious livestock diseases such as: Haemorrhagic Septicaemia, Foot and Mouth disease and Anthrax are still endemic, in Lao PDR. Livestock provide a very significant portion of the rural population's cash income. Diseases lower the production, decrease income security and severely limit the access to export markets.

The government support for animal health and production services still focuses on the control of the major epidemic diseases. The disease control program involves participation in an animal health care program that is already established and widely distributed throughout the countryside down to the district level. A multitude of village veterinary workers have been trained in animal health care but their contribution is only partly effective due to management constraints and limited vaccine cold chains and veterinary equipment.

The key role of DLF has been to reorganize in order to focus on rural development and to provide support services to the livestock industry. Small holders and other private sector farmers retain 95% of national livestock populations and DLF advises and monitors development at all levels. Special consideration is given to strengthening technical support services for small holders, particularly in remote areas. This aims to assist employment opportunities and income levels of small farmers to ensure improved living standards.

Numbers of domesticated elephant

The Lao PDR, called Laos in earlier days, was once known as Muang Lanxang meaning "The Land of a Million Elephants". Forest is currently estimated to cover 47% of the country and this is equivalent to about 11,000,000 hectares.

The government estimates that the combined contribution of agriculture and forestry to provide about 60% of gross domestic product. Economic pressures and the resultant deforestation in the Lao PDR are causing great damage not only to wild elephants but also to domesticated elephant populations. The animals have a perennial need for forests to provide both foods for themselves and paying work for their owners.

A very strong concentration of domesticated elephants is found in Sayaboury on the Northern Lao border with Thailand. The only other large concentration is found in the adjoining provinces of Champassack around the town of Pathumphone district near the border with Attapu province. All previous figures in the literature would seem to be reasonably correct, although. There are some minor contradictions. McNeely (1975) stated that there were 902 domesticated elephants in Lao. Data courtesy of the animal health division in Lao PDR on 1996-97-98 shows the following:

DOMESTICATED ELEPHANTS IN LAO PDR, 96-97-98.

YEAR	ELEPHANT POPULATION
1995-96	922
1996-97	929
1997-98	920

Veterinary Care and Health

Animal disease control measures are still inadequate, due to the limited capability of livestock veterinary extension services. The epidemiology, diagnostic and physical infrastructure capabilities in the Animal Disease Diagnostic Center need to be strengthened. As yet there is no formal national veterinary legislation though the Prime Minister's decree on livestock management is effectively applied.

Conclusion

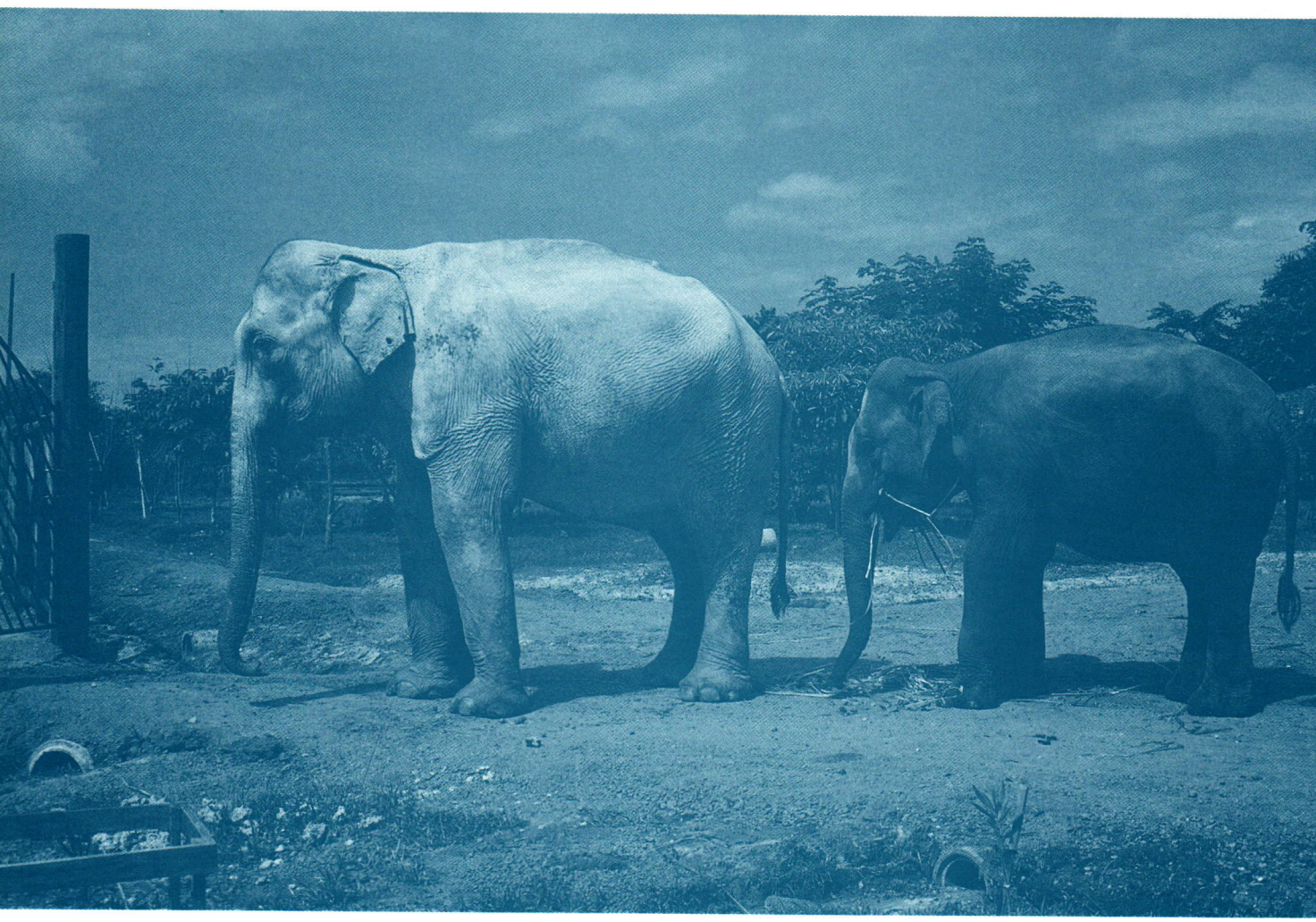
Basic knowledge on infectious and non-infectious diseases of the elephant in Lao PDR is currently very limited. This conference gives us a valuable opportunity to meet and learn more from the experience of colleagues in other South East Asian countries that have larger elephant populations.

Similarly our experience on common health problems and management with elephant is constrained though problems such as external parasites and general animal care apply also to other species.

In 1998 the Lao P.D.R. had about 920 domesticated elephants.

Domesticated elephants in the Lao PDR, 1998

No.	Province	District	Elephant Population
1	SAYABOURY	Sayaboury	23
		Peuang	82
		Parklay	158
		Kenthao	17
		Botene	37
		Hongsa	99
		Sienghone	27
		Thongmixay	130
		Muangngun	123
		Muangkhop	2
		Total:	**698**
2	CHAMPASSACK	Pathumphone	129
		Parksong	14
		Total:	**143**
3	VIENTIANE	Thoulakhom	3
		Sanakham	12
		Mek	1
		Hinhheup	6
		Total:	**22**
4	VIENTIANE MUN	Park Ngeum	2
		Total:	**2**
5	BORIKHAMXAY	Borikhan	1
		Thaphabat	2
		Total:	**3**
6	KHAMMUANE	Mashasay	1
		Bualapha	1
		Total:	**2**
7	SARAVANE	Laogam	1
		Samoy	1
		Total:	**2**
8	ATTAPEU	Samanesay	15
		Total:	**15**
9	BOKEO	Huaysay	20
		Tonphcung	1
		Total:	**21**
10	LUANG PRABANG	Luangprabang	6
		Park ou	1
		Chomphet	5
		Total:	**12**
		Grand Total:	**920**



White coloured elephant (on the right) in Vientiane Zoological Gardens compares to a normal colour one (on the left).

Photo by Dr. Parntep Ratanakorn

THE WHITE ELEPHANT
IN VIENTIANE
ZOOLOGICAL GARDENS

Dr. Chonechith Douangphachanh
Deputy head of Animal Health Division,
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"...As mentioned, we are operating a new zoo with initial knowledge and experience in caring for elephants and would greatly appreciate any additional recommendation from you in such matters...".

Vientiane Zoological Gardens

The construction started in 1992, the Ministry of Defense officially inaugurated it on January 14, 1994. With the financial support from the private sector for its construction and operation, this was the first zoo in the Lao PDR.

There are 3 elephants under the care of our zoo.

- A male albinos elephant of 32 years of age, originating from the Northern part of Laos.
- A black female elephant of 20 years of age, originating from the Central part of the country.

- A black male elephant of 17 years of age, originating from the Eastern part of Laos near the Vietnamese border. This elephant has only one tusk since birth its body is rather small (it might belong the pygmy elephant species) when compared to other elephants of the same age.

The two black elephants, upon their arrival (approximately in 1993), were still young and had no problems in adjusting to their new environment. The zoo has arranged a premise within the zoo in the form of roofed structure for providing a good ventilation. Elephants are shown to public from 9.00 to 17.00 every day. Within this premise, the clean drinking water is provided to ensure that elephants have their bath. However, these elephants are not chained or tied, they are left to move about within their premise, which is surrounded by a double fence to avoid any threat to visitors. The floor is made of cement so that the wastes such as feces and urine are regularly removed and the floor then washed. The wastewater is recycled in an underground pit to avoid any foul smell.

Since the zoo covers an area of 400 rays of natural forest, electrified fences have been installed, the elephants are then left stray in the forest and are brought back in the following morning to their premises. Although they are left stray in the forest, they still remain under close control and monitoring. They may select their food in the natural forest, but complementary food and water are provided in different spots.

In conclusion, the method we apply for caring the elephants is a semi-natural method. In terms of their health, they do suffer from minor diseases from their food or digestive system.

The problems we encountered have rather been with the albino's elephant, which is now 32 years old. It arrived to the zoo in 1997. It was a wild elephant originating from the forests in Sayaboury Province (next to Nan Province in Thailand). Villagers caught it when it was 8 years and was trained to work with other elephants. When it was caught, this elephant was in normal color but already differed from other totally black elephants and had a different shine. Experienced persons noticed the differences and called it the "dark albinos" from its color.

As the dark albinos reached the age of 15, it was used to pull timber in the forest. and work hard in the forests until the age of 25. It was then that abnormal changes started. It started to slowly loose the skin over its backbone, which was replaced by a pinkish white skin. Such changes continued over a period of 3 years until it reached the age of 28 when it totally became of a pinkish white color until now. The fur on its tail and body also became white. We tried to gather information from the elephant's owner and received no confirmation whether such change of color had occurred before or not.

During the two years where the elephant stayed with us the abnormalities may be summarized as follows:

- Clear mucus continuously flows from this elephant's tusk in rather large quantity. It was concluded that the diseases was due to the fact that the elephant is stressed and suffers from allergies as it was used to pull timber in the forest and is now no longer working. It was therefore led to perform physical exercise for 2 hours each day by walking around the premise and pulling small timber over a distance of 100-200 m. back and forth. Medication is given from time to time which generally include indigenous medicinal plants, such as 2 kg of bolabeth.
- Musth appears during the cold season in November and December 1998 for approximately 1 month, which is solved by tying the elephant under a large tree, reduced food and increased water intake.
- The abnormal changes in its skin during the cold season, which usually hardens and breaks and falls from its back in the area of the tusk and end of its tail. Moreover, the skin on its feet would break but without any blood.

  Treatment: layers of Asuntol® (chloro methyl coumarinyl + phosphorothioate) are placed on injuries.
  Skin cream is used.
- Swollen lower part of the neck

  Treatment: Oxytetracycline (inj.) 70-80 ml x 7 days
  or Amoxycillin (inj.) 70-80 ml x 7 days

These symptoms alternately occur and disappear.

As mentioned, we are operating a new zoo with initial knowledge and experience in caring for elephants, and would greatly appreciate any additional recommendation from you in such matters.

Twin Female Asian elephant calves, Khao Kew Open Zoo, Thailand.

ELEPHANT HEALTH CARE AND STATUS IN MALAYSIA

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" ...This paper outlines the health care management and husbandry practices used to look after captive elephants in Malaysia... ".

Malaysia consists of thirteen states, eleven in penisular Malaysia and two in East Malaysia. Elephants once roamed freely through out but because of large scale destruction of the jungle for various purposes their number are now restricted to only six states.

The elephant population in the wild is estimated at 671 (Khan et al., 1982). This figure is getting lower, due to the rapid development of peninsular Malaysia. In penisular Malaysia, the Department of Wildlife and National Parks manages and monitors all activities pertaining to elephants in the wild. In East Malaysia, there are no elephants in Sarawak, while in Sabah, the Department of Wildlife and National Parks, Sabah is responsible for the elephants there.

In captivity, elephants are maintained in zoos and resorts. The four Malaysian zoos are namely: Taiping Zoo, Zoo Negara, Melaka Zoo and Johore Zoo. The resorts includes Mines Wonderland and Desaru Resort. Among the royalities, elephants are kept at the Istana Pekan, Kuantan and Istana Johore, Johore Baru, Malaysia.

This paper outlines the health care management and husbandry practices used to look after captive elephants in Malaysia.

INFECTIOUS DISEASES

1.1 Tuberculosis

1.1.1 Etiology

The causative organism is *Mycobacterium bovis and M.tuberculosis.* (both bovine and human tuberculosis).

1.1.2 Pathogenesis

Among the Asian elephants, high incidence of TB are found among Indian elephants. Lesions of the lung may be granulomas as large as 20 cm in diameter and extensive consolidation of lung parenchyma (Saunders, 1983 and, Gutter, 1981). Smaller nodules may be noted in other tissues.

1.1.3 Clinical sign

Signs of TB include chronic weigh loss despite good nutrition and a chronic nasal discharge. Occasionally increase in body temperature with cervical edema with laborious movements, dry cough and dyspnea.

1.1.4 Epidemiology

The animals are exposed in their country of origin or close contact with the infected workers in circuses or zoos (Schmidt, 1986). It may also be due to public feedings.

1.1.5 Treatment

Confirmed case of TB has been treated by injection of Isoniazid (Schmidt. 1986). Devine et al., (1983) has recommended a dose of 5 mg/kg/day of Isoniazid as a prophylactic measure. Tuberculosis is an infectious disease, hence the author is of the opinion of recommending euthanasia. If treatment is deemed necessary because of the rarity of the animal, Isoniazid should be considered.

1.1.6 Differential Diagnosis.

- ♦ Pneumonia.
- ♦ Pulmonary edema.
- ♦ Parasitism.

1.1.7 Prognosis

Guarded. There is no reported case of TB in Malaysia.

1.1.8 Tuberculin Testing

Culturing the bacteria using the tracheal washing is essential.

1.1.9 Recommendations

- ♦ The administration of 0.1 ml bovine purified protein derivative Tuberculosis (Coopers, Kansas) containing 5000 IU in the caudal fold is recommended as a screening procedure.
- ♦ Annual Tuberculosis testing of staff working in close proximity to elephant.
- ♦ The variability in response to Tuberculosis testing, however, complicates the evaluation of health status and impact of decisions concerning animal movement between facilities. The epidemiology and diagnosis of Tuberculosis in elephant warrants further research.

1.2 Anthrax

1.2.1 Etiology

The etiologic agent is *Bacillus anthracis,* a capsulated gram positive rod-shaped bacteria. Anthrax is transmitted by predators, scavengers and airbone dust. Affects tame and wild elephants in Asia.

1.2.2 Pathogenesis

The skin form of Anthrax is common in the wild, while the intestinal form occurs in zoos and circuses due to contaminated food and water. It is usually acute and can be fatal within hours or days. In the chronic form of the skin type it is self-limiting. The bacilli ingested

reach the tonsils where they proliferate, reaching the lymphatic glands via lymphatic. The bacilli that are in the stomach are killed by the gastric juice. The spores, unharmed by the gastric juice, develop into bacilli in the intestines. They may penetrate the intestines, glands and lymphoid follicles reaching the musocal and submucosal lymph space where they multiply. Bacilli or spores entering the skin through wounds proliferate in the connective tissues. Death occurs in 12 to 16 hours after onset of symptoms.

1.2.3 Clinical sign

Characteristic symptoms are sudden onset with high fever and the elephants that are severely affected will show signs of tremor, paralysis, lethargy, convulsions pain hemorrhagic on various mucous membranes, colic severe diarrhoea often with blood, specks pustules initially firm hot and painful swellings which later become cold and painless containing yellow gelatinous exudate.

1.2.4 Epidemiology

Route of infection

- Ingestion of contaminated food and water.
- Wound infection. This is the route in man causing malignant carbuncle or pustule.
- Biting flies, *Stomoxys calcitrans* and *Tabanus sp.* may physically transmit the vegetative organisms.
- Inhalation, in man "wool sorters disease".
- Vaccination, the spores may vegetate and cause the disease if the vaccine is not sufficiently attenuated.

The incubation period is 1 to 14 days. When transmitted by biting flies, it may be 24 to 48 hours. Spores can remain viable for as long as 15 years in the soil (Sastry, 1971). Drought and alkalinity of soil favours outbreaks.

1.2.5. Treatment

Repeated dose of Penicillin at 5,000 to 20,000 IU/Kg body weight.

1.2.6 Differential Diagnosis

- ♦ Lightning stroke
- ♦ Pasteurollosis.
- ♦ Hemorrhagic septicemia.
- ♦ Babesiosis.
- ♦ Leptospirosis.
- ♦ Acute lead poisoning.
- ♦ Acute bloat
- ♦ Snake bite.

1.2.7 Prognosis

Guarded. No recorded fatal cases of Anthrax in Malaysia, but the author has seen numerous cases among cattle in India.

1.2.8 Vaccination

- ♦ Avirulent spore vaccines (South Africa)
- ♦ Attenuated Anthrax vaccines (Asia)

Carcasses should not be opened. When opened, the spores will form.

1.3 Salmonellosis

1.3.1 Etiology

The serotypes of Salmonella isolated in elephant are *S. javiana, S. butantan, S. weltevreden, S. oslo, S. paratyphi B, S. anatum, S dublin, S. stanle, S. enteritidis Breslau, S. typhimurium* and *S. chicago.*

1.3.2 Pathogenesis

The pathogenesis of Salmonella involves the gastro-intestinal tract. The bacteria causes both acute and chronic damage on the mucous layer of the gastro-intestinal wall.

1.3.3 Clinical sign

Includes gastroenteritis, loss of body weight, anorexia, and dehydration. The diarrhoea is profuse and watery and sometimes contains blood and mucus.

1.3.4 Epidemiology

Oral infection through contaminated food and water. Elephant workers are also potential transmitters.

1.3.5 Treatment

Perform a faecal culture and sensitivity test. Based on the sensitivity test select the antibiotics. Suggested to combine the antibiotics. Dosage as for equines. Supportive treatment is essential.

1.3.6 Differentiatl Diagnosis

Diarrhoea

1.3.7 Prognosis

Acute form is fatal. If diagnosed earlier, can be treated.

1.3.8 Comment

The author has successful treated Salmonellosis in 2 captive elephants. *Salmonella blockley,* was isolated in Malaysian elephants (Chooi and Zahari, 1988).

1.4 Tetanus

1.4.1 Etiology

Caused by exotoxin of *Clostridium tetani,* a gram positive, sporulating anaerobe.

1.4.2 Pathogenesis

The spores that enter a foot, tusk or hook wound require favourable conditions to vegetate and liberate the toxin. Toxin-free spores are not pathogenic. They are engulfed by the leucocytes. When necrosis or hemorrhage or other aerobic and pyogenic bacteria are present, producing anaerobiasis, the spores vegetate. The spores may be in the tissues for a long time till favourable conditions prevail. The organisms liberate the toxin locally. The toxin is absorbed by the axons of the peripheral nerves and causes the tetanic spasms.

1.4.3 Clinical sign

The characteristic clinical sign are nervous system and musculoskeletal abnormalities. A stiff gait, muscle rigidity, difficulty in prehension and swallowing and increased sensitivity to loud or physical stimuli. Reluctant to open the mouth, pressing of the head against a wall is noticed.

1.4.4 Epidemiology

The route of infection in by way of wound infection. Deep punctured wounds are more conducive for the growth of the organism. Period of incubation is one to three weeks.

1.4.5 Treatment

Use of 30 million units of Procaine Penicillin and mas sive repeated doses of Tetanus antitoxin (200,000 to 250,000 units) every six hours plus supportive care may enable the elephant to survive the infection. Chloral hydrate has been used to control the muscle tetany.

1.4.6 Differential Diagnosis

- Grass tetany
- Rabies
- Milk fever
- Muscular rheumatism

1.4.7 Prognosis

Poor recovery

1.4.8 Comment

The author has seen cases of Tetanus in horses, cattles and dogs and not in elephants.

1.5 Pasteurellosis *(Hemorrhagic septicemia)*

1.5.1 Etiology

The causative organism, *Pasteurella multocida* is a short gram negative, non-motile organism which with Leishman's stain takes a characteristic bipolar staining

1.5.2 Pathogenesis

Depending on the virulence of the organisms the nature of the disease caused varies. If the organism is very virulent and the animal's resistance low, then peracute type of the disease results. The organisms entering the blood rapidly proliferate and spread throughout the body. Death occurs in 10 to 24 hours. There will be petechial on serous membrane and other organs. Subcutaneous edema seen in the throat and brisket region. When the virulence of the organism is lowered, the acute form of the disease is manifested. In this form, besides haemaorrhage, fibrinous pneumonia of the mucosa of gastro-intestinal tract are seen. With organisms of low virulence, a more chronic type of the disease is seen. The organism localised in the liver will caused necrotic foci.

1.5.3 Clinical sign

The clinical signs include hemorrhagic septicemia, pleu ropneumonia, dyspnea, gastroenteritis and depression.

1.5.4 Epidemiology

Infection is mainly by ingestion of contaminated fodder and water. Carrier animals and ***clinical case*** are sources of infection. The organism is found in the saliva of affected animals. Passage through an animal increase the virulence of the organisms. Incubation period is 2 to 5 days.

1.5.5 Treatment

Tetracyclines and Sulfonamides.

1.5.6 Differential Diagnosis

- ♦ Anthrax
- ♦ Viral disease
- ♦ Pleuropneumonia
- ♦ Bronchopneumonia

1.5.7 Prognosis

If diagnosed earlier treatment is effective. Acute form can often be fatal.

1.5.8 Vaccines

The use of Pasteurelia vaccine in elephant is questionable. Need more research data.

1.5.9 Miscellaneous Bacterial Diseases

Elephants are susceptible to the majority of bacterial pathogens that cause diseases in cattle and horses. Treatment of such diseases should be guided by culture and sensitivity testing. The type of antibiotics used depends on the method of administration of the drug and the cost of drug.

VIRAL DISEASES

1.6 Foot and Mouth Disease

1.6.1 Etiology

Foot and Mouth disease (FMD) is a very contagious disease caused by epitheliotropic Enterovirus of the Picorna virus group. Seven strains of the virus are known; 0,A,C, SAT-1, SAT-2, SAT-3 and ASIAN 1.

1.6.2 Pathogenesis

At the place of entry (gastric or intestinal mucosa) the virus invades the epithelial cells and multiplies, producing focal area of degeneration and inflammation. The virus invades the lymph and blood and reaches the epithelium of the other mucous membranes and skin producing vesicles.

1.6.3 Clinical sign

Includes elevated rectal temperature, depression, anorexia, acute painful stomatitis, excessive salivation, ulcerations and vesicle formation on the buccal mucosa hardpalate and tongue. The vesicles rupture 24 hours after they appear on the feet in the area of the coronary band.

1.6.4 Epidemiology

The route of infection is through ingestion of contaminated fodder. The virus can be transmitted physically by man and other cloven hoofed animals. The virus is present in the saliva even before vesicles form and in the secretions and excretion and before the elephant is clinically ill. The incubation period is a few hours to a few days.

1.6.5 Treatment

No specific treatment except for supportive therapy.

1.6.6 Differential Diagnosis

- ♦ Vesicular stomatitis
- ♦ Rinderpest
- ♦ Vesicular exanthema
- ♦ Mucosal disease

1.6.7 Prognosis

It is a reportable disease to the government. Guarded prognosis.

1.6.8 General

FMD has been isolated commonly in India. (Pyakuryal et al., 1976. Rahman et al., 1998). Due to the widespread of FMD in cattle, it is one of the important disease to be discussed at this workshop.

1.7 Rinderpest

1.7.1 Etiology

Caused by Myxovirus related human Measles and Canine Distemper. (Sastry, 1971; Wallach, and Boever, 1983). Like FMD, Rinderpest in a disease of cloven-hoofed species.

1.7.2 Pathogenesis

The virus has great affinitiy for lymphoid cells and epithelial cells of digestive system. It causes pyknosis and fragmentation of the nuclei in lymphocytes, their necrosis and subsequent disappearance. The germinal centres of lymph nodes are bare and do not contain lymphocytes. Only the recticulum meshwork remains.

The virus produces lessons in the oral mucosa after remaining in the cells following viremic state.

1.7.3 Clinical sign

A sudden onset of elevated rectal temperature that lasts for 2 to 3 days. Behaviour alters from shyness to aggressiveness, and a profuse occular discharge. Three to four days later, shallow erosions and ulcers appear on the mucosa of the vagina and oral cavity, and there is profuse salivation.

1.7.4 Epidemiology

Transmission occurs through airborne contamination of feed or direct contact with infected animals. Clinically normal animals shed virus in the early stages of Rinderpest. The incubation period can be from 3 to 15 days. Outside the body, the virus cannot thrive for more than 24 hours. It is rapidly destroyed by sunlight and ordinary disinfectant.

1.7.5 Treatment

Usually not attempted. Survivors have lifelong immunity.

1.7.6 Differential Diagnosis

- ♦ Coccidiosis
- ♦ FMD
- ♦ Mucosal disease

1.7.7 Comment

It is a reportable disease. Not reported in Malaysia. Common in India associated with the cattles. The use of attenuated virus vaccine should be discussed at the workshop.

1.8 Elephant Pox

1.8.1 Etiology

Caused by dermatotropic virus.

1.8.2 Pathogenesis

As in Cow pox, consists of 5 stages namely, the roseola stage, the papular stage, the vesicular stage, the pustular stage and the desquamative stage.

1.8.3 Clinical sign

Signs of Pox lesions on head and trunk and the body. The other signs include erosion and ulceration of mucus membrane, difficulty in swallowing, fever and lameness.

1.8.4 Epidemiology

Very little is known in the case of the elephant.

1.8.5 Treatment

Isolation and good supportive care and administration of antibiotics to prevent secondary bacterial infection.

1.8.6 Differential Diagnosis

Diagnosis of Pox is easy from the symptoms and lesion.

1.8.7 Prognosis

Develops good immunity

1.8.8 Comment

It is zoonosis, so workers should be careful to avoid infecting themselves through contact with affected elephants. The author has seen a Pox lesion and treated it successfully.

II. NON-INFECTIOUS DISEASES

2.1 Fungal Infection

2.1.1 Etiology

Trichopyton sp. and Microsporum sp.

2.1.2 Pathogenesis

The fungus grows on the hair follicles and keratinized tissue. The organism excrete an exotoxin which on penetration causes inflammation and itch.

2.1.3 Clinical sign

Chronic itch of the affected area.

2.1.4 Epidemiology

As in any dermatomycoses.

2.1.5 Treatment

- ♦ 0.5 to 1% Potassium permanganate
- ♦ Clinafarm® solution
- ♦ Anti-fungal powders

2.1.6 Differentiated Diagnosis

Well diagnosed

2.1.7 Prognosis

Good improvement.

III. OTHER NON-INFECTIOUS DISEASES

3.1 Skin Diseases

3.1.1 Dermatitis

This is due to inadequate daily skin care. Needs daily bathing and scrubbing with stiff brush. If not bathed, the skin becomes dry, scurfy and warty looking and will show signs of pruritus. It is best to rub with any mineral oil or vegetable oil to the skin.

3.1.2 Abscesses

3.1.2.1 Etiology

Pus forming bacteria like *Streptococcus sp., Staphylococcus sp., Corynebacterium sp., Pseudumonas sp.*

3.1.2.2 Pathogenesis

Abscess can form under the skin due to contusions, chafing wounds, parasitic invasions and general debility.

3.1.2.3 Clinical sign

Swellings, which are painful.

3.1.2.4 Epidemiology

Due to the thickness of the skin, the abscess goes undetected and spreads and then ruptures externally. Work elephants develop abscesses

on the dorsal spinal part. Hard swelling and later fluctuant swelling underneath the skin.

3.1.2.5 Treatment

- ♦ Drainage and pack up with gauze soaked in Eusol or any antiseptic lotion.
- ♦ Frequent surgical drainage and flushing.
- ♦ Parenteral antibiotics.

3.1.2.7 Prognosis

Can be treated effectively.

3.1.2.8 Comment

A common problem with elephants. One should attempt to culture the organism and treat accordingly. The other non infectious problems of the skin are trauma, ulceration, neoplasia and subcutaneous edema.

3.2 Medical Disorder of the Feet

3.2.1 Overworn Sole

Due to constant moist condition elephants are reluctant to move, feel lame and have a tender sole on palpation. Can be corrected, by keeping the feet dry.

3.2.2 Cracked Sole

Due to wet condition and poor sanitation, can result in infection. The signs include lameness, pain, exudate, erosion and ulcerative of the edge of the crack, granulation and development of a hole at the bottom of the foot. Treatment is done with antiseptic washing and application of topical antibiotics. Parenteral antibiotics based on culture and sensitivity test are useful.

3.2.3 Cracked Heel

As above

3.2.4 Overgrown Sole

Needs regular trimming.

3.2.5 Overgrown Nails

As above

3.2.6 Split Nails

Caused by inadequate wear or trimming combined with moist conditions. Trimming is done.

3.2.7 Ingrown Nails

In regularly trimmed, elephants ingrown nails are occasionally seen. Corrected by trimming back the ingrown nail and removing the granulation.

3.2.8 Overgrowth of Cuticle

Apply daily vegetable or mineral oil. This will soften the cuticle and the elephant will rub off the excess themselves.

3.2.9 Trauma associated with leg chains

Use plastic sealed chains. Application of non-antibiotic topical preparation.

IV. COMMON HEALTH PROBLEMS AND MANAGEMENT

4.1 *"Musth"* Management

4.1.1 Duration

Chandrasekharan et al., (1992) reported the entire duration of *"musth"* comprising of previolent and post "*musth*" stage was found to vary from one to three months and in one case it lasted for five months. In Chandrasekharan, et al., (1992) studies for a period of 10 years with 140 captive elephant in *"musth"*, he concluded that "*musth*" ranged from 30 to 45 day in 15 elephants, 45 to 60 days in 20 elephants and 60 to 90 day in 92 elephants. The author's view is that the duration of *"musth"* differs from one country to another in Asia.

4.1.2 Season

The incidence and the behavioural manifestations of *"musth"* in Asian elephants have been studied in details by Evans, (1910), Hepburn (1918), Jainuddin et al., (1972) and Utoke (1974). There seems to be a

general agreement on the annual periodicity of *"musth"* in captive elephants, there are some views on the season when peaks are observed. Chandrasekharan et al,, (1992), Evans, (1910) and Utoke (1974) observed high incidence of *"musth"* during cold or winter season, whereas Hepburn (1918) and Jainudeen et al., (1972) reported high incidence of *"musth"* during hot and rainy seasons. This should be debated and discussed at this workshop.

4.1.3 Control Methods

It is a usual practice in Asia, to tie the elephants in *"musth"* to a tree or pillars under shade with specially made strong chains on one of the hind limbs and fore limbs, separately. In violent elephants, the restraining is reinforced by additional hobbles between the hind limbs. The elephant is fed with sufficient fibre and water.

In South India, some elephant owners have the practice of giving a daily dose of 250 gm of an Ayurvedic preparation containing equal quantity of *Withonia somnifera, Sesamum indicum, Pepper longum, Mukana pruvilia and Asteracantha longifolia* mixed with honey or milk extracted from the coconut kernel for 10 to 15 days during the preliminiary stage of violent *"musth"* (Chandrasekharan et al., 1992). The feeding during the period consist of cucumber and plantains (bananas). It is supposed to cool the over heated body of the elephants during "*musth*".

In Malaysia, a male elephant in Taiping Zoo comes to silent preliminiary violent '*musth*' annually. Two male Indian elephants were euthanised during violent *"musth"* in Zoo Negara Malaysia (Vellayan, 1992). The Elephant Management Unit at Kuala Gandah, Pahang, DWNP, Malaysia recorded violent *"musth"* in 3 elephants and were shot to death (DWNP, 1993). Sedation is done during violent *"musth"*.

4.2 Identification and Registration

The author feel that microchip implantation is the best method. However due to the low population of Malaysia elephants, identification and registration is not a problem in Malaysia. This is essential for Thailand where the population is big and different provinces are involved. This issue can be addressed at the workshop by other participants.

4.3 Tusk and Dental Care

4.3.1 Tusk Cut

This is done when the tusks became too long or break off with a jagged edge. This is easily done by stain less steel wire. Avoid cutting the tusk back too short because it exposes the pulp (nerve). This has resulted in complete loss of the entire tusk due to bacterial infections. The rule of thumb generally used for estimating the length of the nerve is that the distance between the elephant's eye and the distal portion of the sulcus is equal to the distance from sulcus to the end of nerve extending distally in the tusk (Schmidt 1986). One should consider concurrent use of a metal ring to prevent splitting. Tusk pulp infection should not be ignored as it results to loss of tusk sinusitis endotoxic shock endocarditis or even tetanus.

4.3.2 Infected Root Canal

Once the pulp canal is exposed, bacterial infection begins. *Streptococcus sp., Staphylococcus sp., Pseudomonas sp.,* and *Corynebacterium sp.* are commonly isolated, (Susan et al., 1994). Pulp infections may persist for months or years. The treatment includes flushing and protection from environmental contamination. Cauterization with Silver nitrate is very successful. Pulpotomies have been successful even in case of chronic infection. Complete extirpation of the canal is not possible in elephant. It is recommended to administer Tetanus antitoxin (TAT).

4.4 Fracture Management

4.4.1 Incomplete and Complete Fracture

The prognosis for fractures in elephant is poor. Elephant cannot get around well on three limbs, so any limb fracture will force the animal to lie down or stand in one place. Modern large animal bone plating techniques may be attempted in young calves. The author has no experience of this aspect. Jarofke, (1981) repaired a humeral fracture in a five year old Asian elephant using intramedullary pinning. Fracture of the limbs of older elephants have healed with the leg held in a fixed rested position for months. Facilities such as crush cages and added facilities are needed. Compound fracture requires the use of systemic antibiotics with topical antibiotic solutions or ointment to prevent osteomyelitis.

4.4.2 Deformities

Deformities in calves are difficult to manage. The etiology for the leg deformities are due to high protein level. Hence the therapy includes diet changes.

4.5 Integument Management

4.5.1 Wound

The etiology for trauma to the integument in captivity includes exhibitmate hook self inflicted enclosures features treatment related accidental fall foreign body and other sources. The wound, both acute and chronic forms, can be treated. The author recommends native theraphy or Ayurvedic preparations. The author uses neem oil (margosa oil) champor turmeric powder in combination with topical antibiotic powder or cream. The treatment will vary from one country to another in South East Asia based on financial support. It should be complimented with parental antibiotics. It is always best to perform a bacterial culture and sensitivity test.

4.5.2 Abscess

Abscesses in elephants are seen in the foot, facial region, the thoracic region and the lower abdomen. The etiology are as in wound. It may be an acute type or a chronic type. Management of abscess is as in wound management.

4.5.3 Dermatitis

This clinical condition has been dealt under the non-infectious disorders. Some clinicians use the following terms such as pustules, ulcers, alopecia, pruritis and sores. The etiological causes are environmental, trauma, infectious agents, poor skin care and others.

4.5.4 Papillomas

Papillomavirus or Herpes virus may be associated with Papillomas. This is a common problem of the integument. *Multiple episode do occurs* (Susan et al., 1994). The majority of lesions occurs on the head or trunk. This can be treated succesfully with topical treatment with Furacin or Povidone. The author's choice of treatment is Turmeric and Eusol paste. This paste is applied liberally on the lesion after a good bath with Potassium permanganate solution. Usually followed up by administration of parenteral antibiotics and supportive treatment.

4.5.5 External Parasites

Infection with external parasites is common both in the wild and captivity. The degree is high in the wild population. The common ectoparasites are Lice *(Haematomyzus elephantis),* Ticks, Mites, and Flies. A variety of topical insecticides can be used. Permethrin is most frequently used topical insecticide. Presently the best choice of drug is Ivermectin.

4.6 Toxicity Management

The ingestion of some of the toxic foliage results in colic and impacted stomach caecum and intestinal tract. Various other authors have reported toxicity due to

captive elephants. Chaining can facilitate foot work, feedings, copulation, veterinary procedure, animal introduction and parturition. In the night, elephants should be chained. They should be chained by one front leg and one rear leg or by one front leg only. The chain should be alternated every other night to prevent injury to the leg.

The chain must be long enough to allow the animal to lie down and get to its feet daily. It should not be so long that the animal can become entangled in the chains. It is advisable to console with a rubber or plastic hose.

Training elephants with commands is the best procedure for medical examination and for other purposes. In Asia, the elephant mahouts are good in training the captive elephants as they are intelligent animals. Elephant hooks are very commonly used in Asia. In case of emergency, sharp pointed objects such as a can opener, sharp key and penknife can be used. Elephant can tolerate quite painful procedures with physical restraint. The use of electric shocks is limited to extreme cases only.

4.8.2 Chemical Restraint and Its Indications

Chemical restraint on elephants is risky. It should be done only after careful consideration. The choice of the drug depends on the individual elephant, the type of indication and the area. Complication of elephant sedation includes inadequate dose, excitement of the elephant, traumatic injury, from efficacious respiratory failure, from abnormal posture, cardiac arrest, abnormal position that prevents a surgeon from performing the surgery, injury during recovery torsion or volvulus of the gastro intestinal tract from rolling the elephant after malposition and finally injury to the staff. Schmidt (1986) has classified 3 classes of drugs for most efficacious and safe sedation in elephant. They are

Phenodirazine tranquilizers narcotics (Etorphine Diprenorphrine Morphine and Meperidnie) and Xylazine hydochloride.

The workshop should discuss the type of anaesthetic drugs available in South East Asia and the difficulties in obtaining them.

4.8.3 Transportation

Elephants can be transported by rail and long lorries. The lorries are well designed on the floor with hooks for chaining the elephants. The rear portion moves in first and the trunk at the back. Young calves can be transported by air. Thirty four elephants were succesfully transported by rail (Cheeran et al., 1992) and they travelled 3,011 kilometres and took 7 and 8 days for the up and down journeys respectively.

4.8.4 Anaesthetic Technique

The following techniques can be used for chained or trained elephants hand held syringe and blow darts. In case of wild elephants, the Palmer® projectors (rifles) or the short range projector (pistol) can be used. The pistol and rifle have a modified pellet gun with powdered compressed carbon dioxide.

4.8.5 Operations

In elephants simply operations involving the skin, trunk, eye, feet, castration, tusk, ear and the tail can be performed by a single or two veterinarians. In complicated surgeries such as caesarean it requires a team of qualified elephant veterinarians.

4.8.6 Euthanasia

The humane method of euthanasia consists of administration of a recumbency inducing dose of Xylazine. This is then followed by the administration of 1 to 3 kg of Potassium chloride by intravenous (Schmidt, 1986). There are two euthanasia solutions available,

one is Valabarb®, Jurox, Australia and the other is Dolethal® Vetoquinol, France. The latter contains Pentobarbital 18, 22g comes in packing of 500 ml bottle. Valabarb contains Pentobarbitone solution 273 mg/ml. The doses depend on the condition of the elephants. Two male elephants of aged 30 years and 28 years were shot to death due to violent *"musth"* (Vellayan, 1992) using a rifle at Zoo Negara, Malaysia.

V. POST MORTEM EXAMINATIONS

5.1 Experienced Method

The following procedures can be followed.

- It is best to place the carcass on the left side, relieve the rumen pressure. In heavy elephants where the carcass is on the right side, try to relieve the rumen pressure. It all depends on manpower availability and the field situation.
- Reflect the right fore limb.
- Disarticulate the right hind limb.
- Cut between mandible.
- Remove pharynx trachea and esophagus.
- Open trachea and esophagus.
- Open rib cage and remove heart and lungs.
- Examine lungs.
- Open abdominal cavity.
- Remove stomach and caecum and inspect all organs.

VI. HEALTH CARE PROTOCOLS

6.1 Vaccination Programme

6.1.1 Vaccination Programme

There is no standard vaccination programme established for Asian elephants. In the Western zoos and

for captive elephants, some of them practice the general vaccination programmes used in equines for elephants. In India, and Africa, some researchers vaccinate the captive elephants against Rinderpest, FMD, Tetanus, and Anthrax. In Malaysia, no vaccination programme is done. Perhaps, in this workshop we can discuss with other workers.

6.2 Deworming Programme

The author would like to recommend both routine and specific deworming. Routine deworming is recommended once in three months for wild elephants or elephants in sanctuaries and work places. A mild dewormer is used. In case of specific deworming, the faecal examination is done and the appropriate drug is selected. The selection of the drug is all based on the respective country the cost and availability.

The common anthelmintics used by the author for nematodes are,

- ♦ Rintal® granules 10% (Bayer) contains Febatel; at a dose rate of 7-10 gm/100 kg body weight.
- ♦ Telmin® oral wormer (Janssen) contains Mebandazole 2 gm per sacket; at a dose rate of 10 mg/kg body weight.
- ♦ Telmin paste® contains mebendazole 4 gm per syringe, 4 gm per adult elephant.
- ♦ Flubenol 5%® contains 50 mg Flubendazole per gram of powder, at a dose rate of 30 g Flubendazole per 50 kg bodyweight for 5 consecutive days.
- ♦ Levamisole at 10-20 mg/kg of body weight.

For cestodes, the choice of drug is Diphenthane-70 (Taniatol®) orally at the rate of 40 mg per kg. For trematodes, Nithoxymil 10 mg per kg administer subcutaneously. Ivermectin, a broadly dewormer at a dose rate of 1ml per 50 kg is the best choice of drugs for nematodes, filariasis, myasis and major parasitic and external skin disorders administered subcutaneously.

6.3 Feeding Programme

This is shown in Table 1.

Table 1: Diet for 1.3 Adult Malaysian Elephant at Zoo Negara

NO	ITEMS/KIND OF FOOD	QUANTITY (kg)	FREQUENCY
1.	Whole Bananas	40	Daily
2.	Papaya	20	"
3.	Bread	20	"
4.	Tapioca	20	"
5.	Sweet Potato	5	"
6.	Cooked rice + cattle pellet + molasses	10	"
7.	Cod liver oil	1	"
8.	Calcium Carbonate	0.5	Daily
9.	Pre mix AD	0.25	Daily
10.	Common salt	4	Daily
11.	Oaten Hay	20	Daily
12.	Sugar Cane	10 stairs	Weekly
13.	Banana stem	4 stem	Weekly
14.	Green foliage + Grass	Q.S.	Weekly

Diets should be reviewed annually and as part of the diagnostic work up for medical problems.

VII. NEONATAL CARE

There has been no captive births of the elephants in Malaysia. Hence the author do not have his own experiences. The author will discuss the neonatal care at the workshop based on his observation in South India.

VIII. GENERAL CARE

8.1 Skin

This has been dealt under the dermatitis. A normal elephant skin is supple pliable and free from scurf and warty growths of the outer layers. Elephant needs daily

bath and brushing. Elephant loves scrubbing. Rubbing poles should be provided for them to rub off their dead skin themselves. Subsequently, any mineral oil or vegetable oil should be applied. In South East Asia it is best to use red palm oil as it rich in vitamin A and E.

8.2 Foot

Overgrown sole, cracked sole, cracked heel, overgrown sole, overgrowth of cuticles and fungal infection are common problem in captive elephants. Individual elephant differ in the degree of foot care. Therefore elephant keepers and veterinarians must be able to examine and handle all four feet of every elephant. It is be done by training the elephant. The feet should be examined regulary and excessive nail and sole material should be removed with hoof knives and rasps. Periodically it is best to dip the feet in lukewarm 10% Potassium permanganate solution.

8.3 Nails

Routinely check for overgrown nails, split nails and ingrown nails. These are all caused by bad management and husbandary. The elephant should not be kept in moist conditions. Regular nail trimming should be done.

8.4 Eye

The occular diseases of elephant are traumatic injury, cataracts, keratitis, conjunctivitis, retinal atrophy and excessive lacrimation. The later is due to excessive feeding of pineapple (pyurvic acid). Routinely the eyes should be washed or cleaned with normal saline.

8.5 Geriatic Care

This includes the followings:

- ♦ Diet review, soft diets.
- ♦ Avoid rheumatoid arthritis.
- ♦ As age advance, they should be housed separately and daily individual attention should be provided.

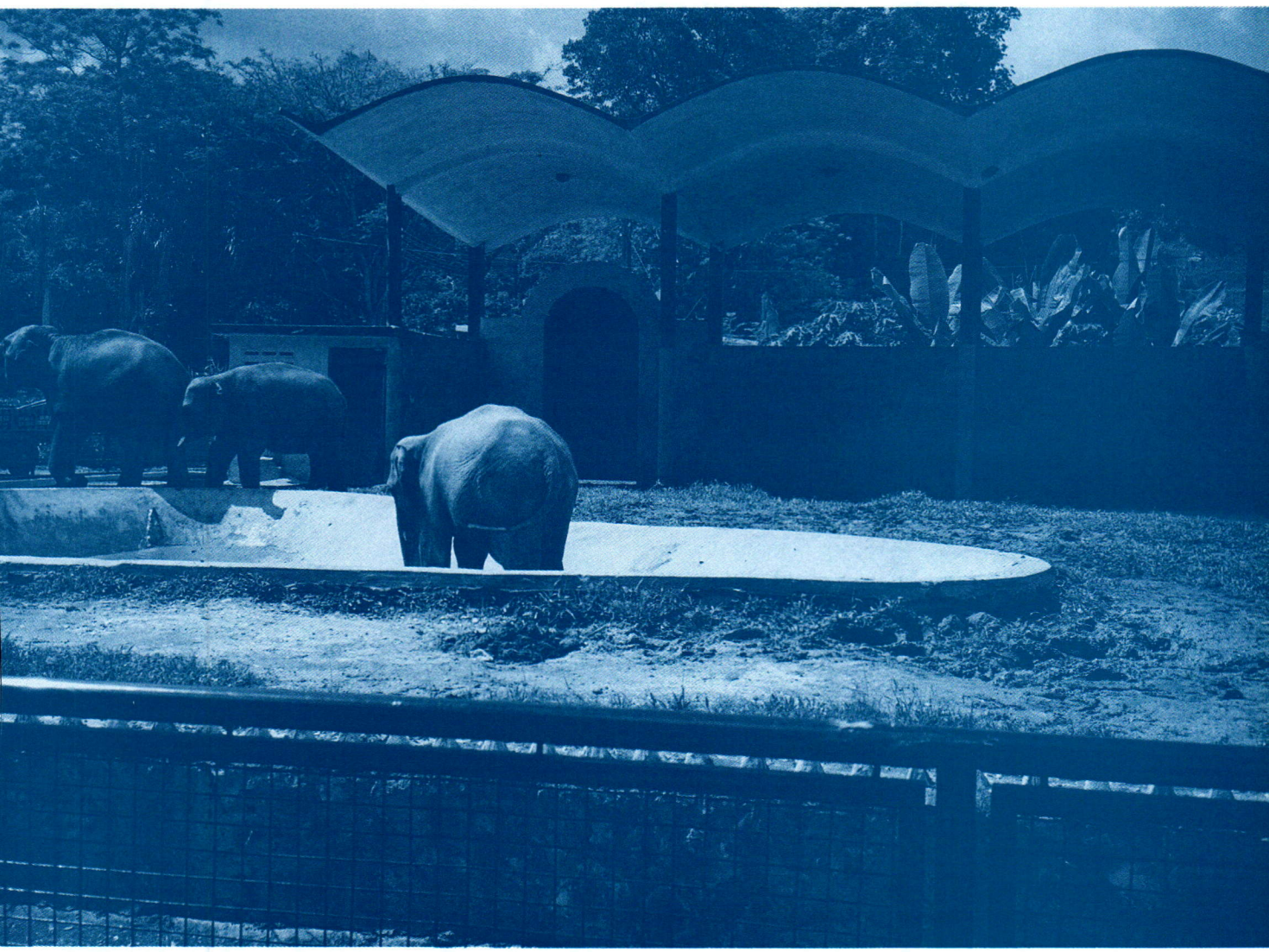
8.6 Housing

8.6.1 Environment

The female and younger male should not housed alone. Elephants need contact with other elephant in order to develop correct elephant social behaviour. To provide for the social needs of female elephants in captivity, minimum space requirements should be based on no less than 2 animals and should allow proper social interaction in safe manner. Sexually matured male are housed alone although total isolation from others elephants should he avoided. There must be facilities for housing the bull separately during musth. In South East Asia, a simple and strong housing facility is essential.

8.6.2 Location

The elephant enclosure should face the East, so that the rising sun as a good disinfectant to dry up the washed area. There should be sufficient ventilation for the indoor holdings.



Negara zoo elephant house
Photo by Dr. Parntep Ratanakorn

Negara zoo elephant house
Photo by Dr. Parntep Ratanakorn

Acknowledgements

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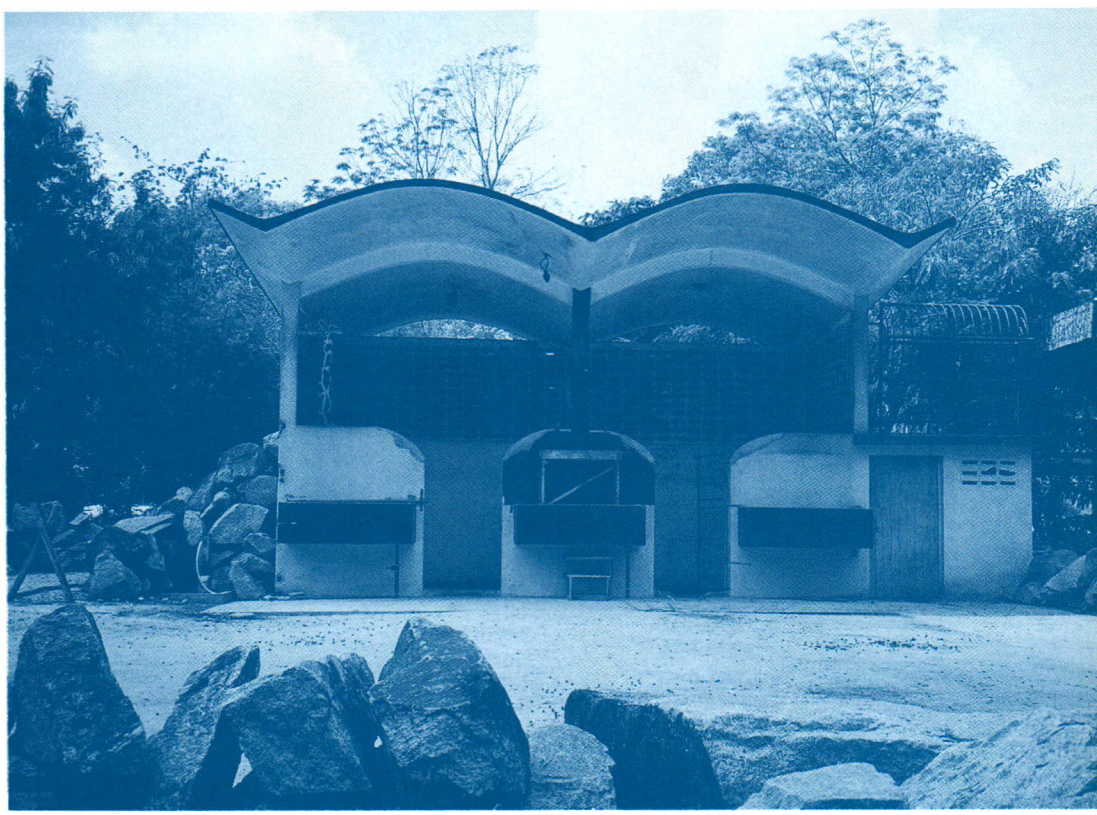


Negara zoo elephant house
Photo by Dr. Parntep Ratanakorn

ELEPHANT HEALTH CARE IN FOREST DEPARTMENT

"...Elephants play a major role in Myanmar because the elephant is very precious and endangered animal. So, I hope we need to be trained, learn and take the field research about elephant health care to share and collaborate with other countries...".

Dr. U Thaung Shan, Veterinary surgeon,
Nature and Wildlife Conservation Division,
Forest Department, West Gyogone, Insein, Bayintnaung Rd.,
Yangon, Myanmar

Myanmar is situated in the tropical and temperate region and has the effects of the monsoon. It has many natural resources. There are about 7,000 species of flora, 300 species of mammals, 1,000 species of birds and 360 species of reptiles.

To safeguard the generations of wildlife species and the habitats, the wildlife sanctuaries, the wildlife parks, the national parks botanical garden and zoological gardens were established under the forest department.

Alaungdaw Kathapa National Park is 951 miles from Yangon, 148 miles west of Mandalay and 57 miles from Monywa. It has 620 square miles (1605.79 km^2) very rugged mountainous and outstanding beauty with religious and scientific interest. There are many endangered species such as elephant, tiger, leopard, gaur, serow, Asiatic black bear, wild dog, hornbill and peacock.

According to the Forest Department, elephants are classified into three groups according to the age.

They are:

(1) Calf at Heel (CAH) - from birth to 4 years.

(2) Trained Calves (TC) - 5 to 17 years.

(3) Full Grown (FG) - 18 to 55 years.

At the age of 55 years, they are retired from the work.

For the veterinary care of elephants, there are 10 veterinarians. The veterinarians are all B.V.S (9 veterinarians in the other parks and zoological gardens and one veterinarian in Alaungdaw Kathapa National Park).

For the elephant health care at the Forest Department, the major problems are parasitic infestation and nutritional disorders. The elephants in Forest Department died with various diseases.

Routine examination of stool, skin and blood sample are carried out for the prevention and treatment of parasitic infestation. Suitable medications have to be given according to the results. Medications include Thiabendazole and frequent injection of Ivomectin (Ivomec®).

Prevention of infectious diseases includes the vaccination against Anthrax and Haemorrhagic septicemia. For prevention of Anthrax, Anthrax S.A., Spore Vaccine which is produced locally is given annually. [S.A. = Stern's Avirulent Vaccine]. For prevention of Haemorrhagic septicemia (H.S.), H.S. Alum precipitated Vaccine is given six month interval.

Another infectious disease is enterotoxaemia, which is associated with feeding practice. Feeding of elephants in other parks and zoological gardens have to be carefully inspected by the veterinarian.

In Alaungdaw Kathapa National Park, some common cases, such as bruise (on the back and flank), arthritis and abscess can be seen.

In hot season (esp: March, April), the elephants get some cases such as heat stroke, anemia and weakness because the loss of permanent grazing area and reduced water consumption. Availability of clean water is reduced during the hot season and the water contains of rotten leaves and twigs, etc. As the elephants of Forest

Department, have to work the whole year, they are divided into groups and given alternate resting days in the deep forest. The working group is given rest between 10.00 A.M. to 16.30 P.M.

H.S. disease is rare in Myanmar, the main clinical signs are edematous swelling of neck, diagnosis is made by the culture of organism and identified the onset of H.S. disease, the infected elephant dies within 12 hours if untreated.

The Postmortem Findings are:

1. **Respiratory system.**

Larynx	:	Mucous discharges present.
Lungs	:	Normal size,
	:	Dark brown color.
	:	Black spotted layer between the lungs and diaphragm.
Trunk	:	Normal to slight congestion.

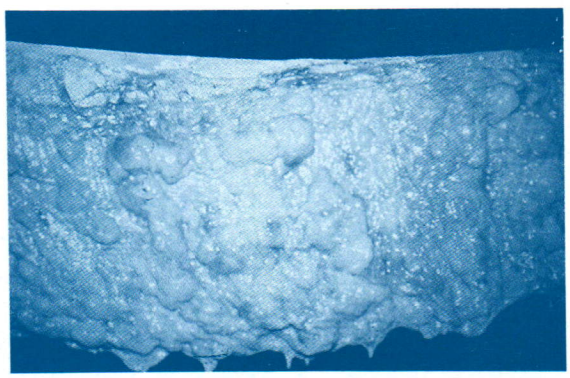
2. **Circulatory system:**

Heart	:	Enlarged,
Auricles and ventricles	:	Congested with dark brown blood and blood clots.

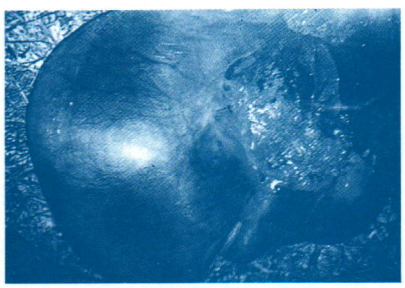
Heart

3. Digestive system:

Tongue and mouth cavity	: Slightly cyanotic
Stomach	: Slight infection of strongylus, bot and paraphistome.
Large intestine	: Accumulation of fluid.
	: Normal faces color present.
	: Echymosis hemorrhages at the wall.
Spleen	: Enlarged, with rounded edges.
Pancreas	: Normal
Liver	: Normal size
	: Brownish color.
Anus	: Normal



Small intestine

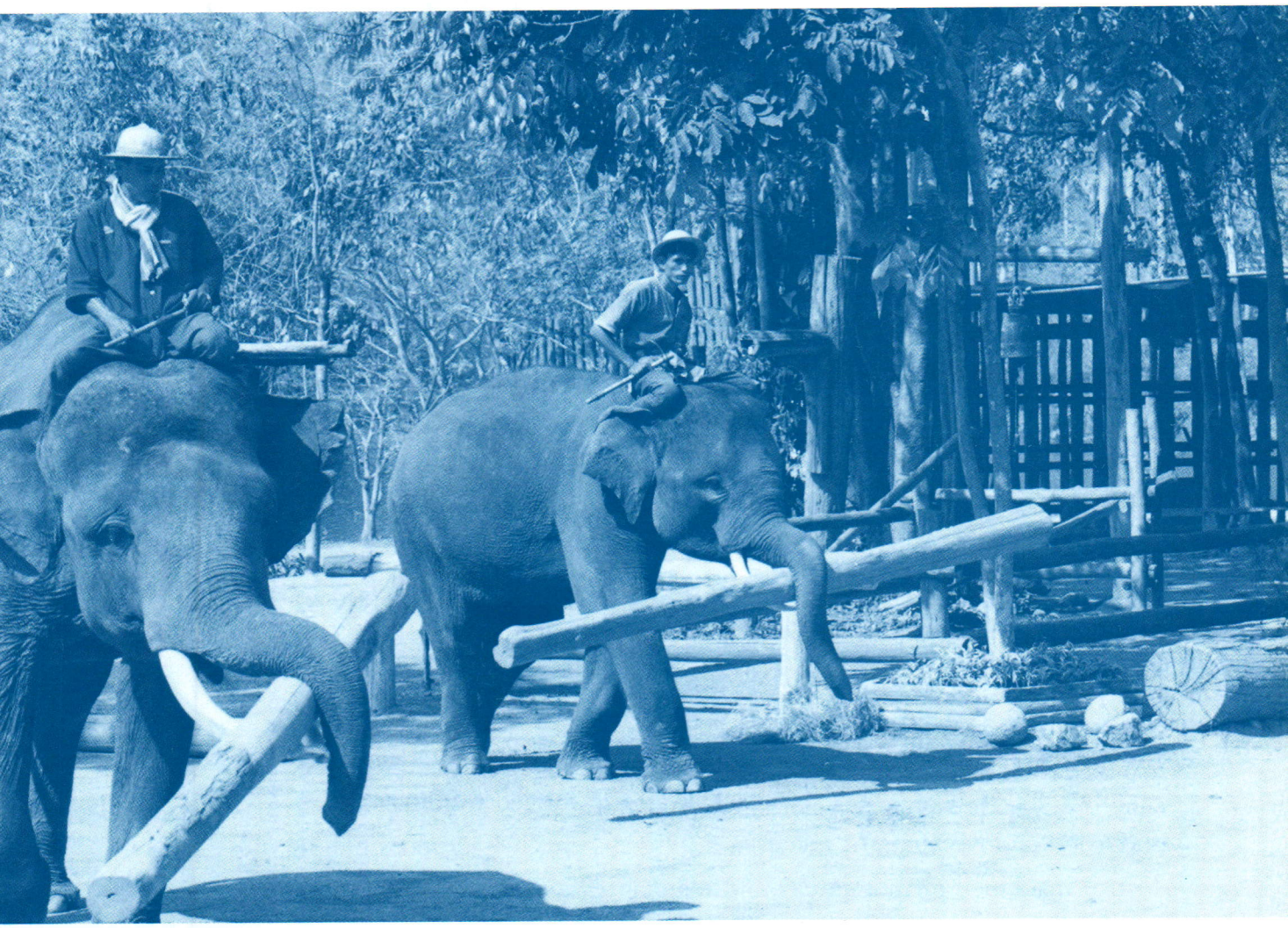


Liver

Liver Fluke

Sudden death within 12 hours, edematous swelling of the neck and identification of the organism by blood test and blood culture are sufficient for the veterinarian to determine H.S. disease.

Elephants play a major role in Myanmar because the elephant is very precious and endangered animal. I hope to be trained learn and take the field research about elephant health care, share and collaborate with other countries.



TIMBER ELEPHANT AND HEALTH CARE

"...To conserve the elephant population and to promote the health status of timber elephants, we need to collaborate with the other countries...".

Dr. U Thoung Nyunt
Assistant Manager (Vet. Surgeon)
Myanmar Timber Enterprise, Extraction Department
Ahlone, Yangon, Union of Myanmar

The Union of Myanmar is the largest country on the main land of South East Asia with a total land area of 676,553 Km^2 (32.4 Million hectares). Different type of forest cover is about 50.87% of its land surface area. Myanmar has a well established tradition of harvesting its natural resources conservatively. To ensure the sustainable production of timber resources in Myanmar, we applied a selective felling system. Topographically, the country is very rugged and mountainous, most of the timbers harvesting sites are situated in these ranges.

Myanmar has three difference types of seasons: rainy season, summer and winter (cold) season. Due to the rugged terrain, long monsoon and Myanmar's selective felling system, it is impossible to use machines in most areas and elephants have been playing a vital role in this context since the prewar period. It is universally accepted that animal skidding is the most environmentally friendly method and Myanmar is the only country in the world that extensively utilizes elephant power in logging operations.

In Myanmar there are about 100,000 tons of teak and 400,000 tons of hard wood extracted annually for domestic use and for export earning. Approximately 6,000 elephants are kept as captive animals of which 3,000 elephants are under the Myanmar Timber

Enterprise (MTE) and 3,000 elephants are in the hands of private operators. (The number of MTE elephants for 5 years (1993-94 to 1997-98) Appendix A).

The MTE elephants are divided into three groups, based on their age, such as Full Grown (FG), Trained Calves (TC) and Calf at Heel (CAH). From birth to the age of 4 years the elephants are grouped as CAH, 5 to 17 years are grouped as TC, and between the ages 18 to 55 years, they are put into the class of FG for logging operations. Above 55 years of age they are retired from logging.

Concerning the health problem of MTE elephants, the major problems are parasitic infestation and nutritional disorders. (The number of MTE elephants which have died with various disease for 5 years, (1993-94 to 1997-98) Appendix B). Concerning veterinary care for the MTE elephants, there are 168 veterinarians. (16 B.V.S. and 52-Dip Vet) (Appendix C)

For contagious disease such as Anthrax and H.S, we use Anthrax Spore Vaccine and H.S Alum Vaccines. Logging elephants get some injuries such as harness sore, limb injuries and dislocation of joints. In some deeper forest areas, snake bite cases are found in small elephants.

For parasitic infestations, the MTE elephants undergo stool and blood checks quarterly and given proper treatment. In the hot (dry) season, some cases of constipation and heat stroke are seen due to high fibre content in food and less water. The working elephants work in the rainy and winter seasons and rest in the hot (summer) season. In the resting period the elephants are sent to the deeper forest, given plenty of water and fodder and allowed to rest and prepare for the next logging programme.

For the health care of the MTE elephants and privately owned or hired elephants, MTE vets are fully responsible and go from camp to camp and elephant to elephant administering modern drugs and traditional medicine.

To conserve the elephant population and to promote the health of timber elephants we need to collaborate with other countries.

Appendix - A

Number of Timber elephants

Sr. No.	Financial Year	FG		TC		CAH		TOTAL		
		M	F	M	F	M	F	M	F	TOTAL
1.	1993-94	608	997	428	486	136	164	1226	1647	2873
2.	1994-95	619	1003	470	484	123	146	1221	1633	2854
3.	1995-96	617	1025	470	457	114	121	1201	1603	2804
4.	1996-97	636	1036	452	452	103	111	1191	1599	2790
5.	1997-98	645	1022	431	451	103	100	1179	1573	2752

Appendix - B

Number of dead elephants due to various diseases

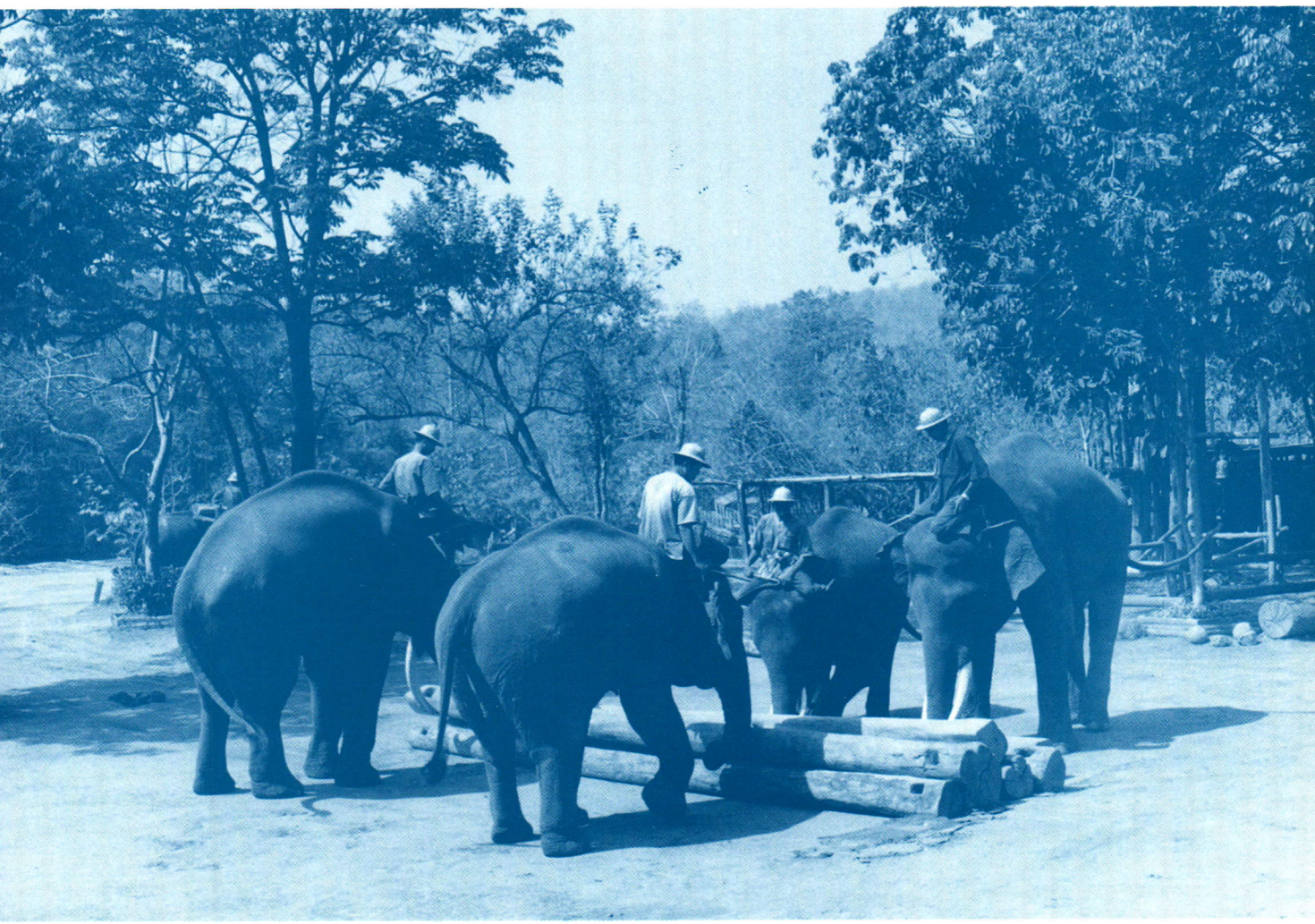
Sr. No.	Financial Year	Parasitic Infestation	Nutritional Disorder	Contagious Disease	Snake bite	Constipation
1.	1993-94	11	12	9	9	4
2.	1994-95	13	4	8	4	2
3.	1995-96	9	11	8	9	8
4.	1996-97	9	13	8	9	5
5.	1997-98	10	7	12	8	7

Appendix - C

No. of Veterinarians in M.T.E

Sr. No.	Total Vets. (in no.)	B.V.S* (in no.)	**Dip. in vet. Science (in no.)
1	68	16	52

*Bachelor of Veterinary Science - 6 year course
**Diploma in Veterinary Science - 3 year course



HEALTH STATUS AND MANAGEMENT OF ASIAN ELEPHANT IN THAILAND

"...Due to the lack of experience, information, references and supports result few numbers of veterinarians involving and providing enough health care to elephants...".

Dr. Parntep Ratanakorn [1,2,3]

1. Dean, Faculty of Veterinary Science, Mahidol university, Salaya, Nakornpathom, 73170 Thailand

2. Secretary - General, Asian Elephant Foundation of Thailand.

3. Member, Committee on Coordination of Elephant Conservation in Thailand, National Identity Board, for the Benefit of Elephant Health and Welfare, Government House

Status of Elephant Health

Health problems of elephants have been a concern for elephant veterinarians in the South East Asia region for a long time. Due to the lack of experience, information, references and support however few veterinarians are involved in providing enough health care to elephants. Standardization of the protocol for treatment, preventive medicine and husbandry is currently limited and needs to be done as soon as possible.

The health problems facing both captive and wild elephants can be divided into two categories, infectious and non-infectious diseases. They are as follows:

- **Infectious diseases** of elephants in Thailand which are of major concern are Haemorrhagic septicemia, Foot and Month disease, Tetanus, intestinal fluke infestation, bacterial diarrhoea in calves (e.g. Salmonellosis), lice infestation, etc. Common minor infections are noted such as abscesses, dermatitis, conjunctivitis and infected wounds.

- **Non-infectious diseases** are mostly due to trauma caused by car accidents, fighting among animals and bullets shot by human beings. Nutritional diseases are also observed, for example, "rickets" in calves, anaemia, colic, etc. These are caused by the improper feeding in terms of both quality and quantity of food.

Management of Elephant Health

The health management conducted for captive elephants is currently estimated to serve around 3,000 elephants. It can be summarized as follows:

Vaccination

No exact or formal vaccination program for captive elephants has ever been conducted in Thailand but some veterinarians have followed methods such as the use of "Haemorrhagic septicemia vaccine" to administer on elephants in every six months at a double dosage given to cattle. "Anthrax vaccine" is also administered on elephants in areas where Anthrax is endemic for cattle.

Deworming

Many authorities use Ivermectin for deworming the elephants twice a year at the dosage of 1 ml/500 kg body weight (Subcutaneous injection). Mebendazole, Neguvon, Thiabondazole, Fenbendazole and Levamisole are also applied.

Feeding

Fresh food is provided to each elephant twice a day (i.e. morning at 8-10am, afternoon at 2-4pm).

Example for feeding an adult elephant per day is follows:

100 kg	fresh grass
50 kg	dried grass straw
50 kg	fruits
20 kg	vegetables
0.25 kg	salt lick

Fresh leaves and branches are also provided.

Water for drinking and bathing is provided at 200 litres to an elephant per day. Although the food in the form of pellets has been tried and carried out, there are still problems related to the moisture and the cost production of pellets on a large scale.

Neonatal care

Most calves are raised by their mothers until weaning which occurs when the calves are around 3-4 years old. Some calves, which are weaned before this period or prematurely (e.g. 1-2 months old or 1 year), might have a problem of rickets.

The following milk replacement formula is used to raise orphaned calves:

1. Dried whole milk 0.5 kg
   Sugar 0.2 kg
   Boiled rice 0.5 kg
   Water 0.5 L
   or
2. Powdered milk 6.0 cups
   Boiled rice 5.0 L
   Calcium lactate 100-140 mg/kg/day.

   Infant multivitamin is also added. Feed 6-8 times per day.

Restraint

Manual restraint is performed by a mahout using chains hook pole and voice commands. It is easy to deal with the well-trained elephant. Chemical restraint is used to control animals for some minor surgeries or in *'musth'* by using Xylazine HCl, which is the most popular and available in Thailand.

Musth management

Many protocols are applied to bull elephants in *'musth'* such as solitary confinement, chaining and deprivation of food. In a severe case, chemical restraint is applied as follows:

Chlorpromazine	0.5-1	mg/kg (orally)	or
Acepromazine	0.01-0.07	mg/kg (I/M)	or
Xylazine	0,04-0.08	mg/kg (I/M)	or
Xylazine	0.02	mg/kg	plus
Ketamine	0.25	mg/kg	plus
Acepormazine	0.06	mg/kg (I/M)	

Identification

There is no official marking for identification of captive elephants in Thailand. Its identification is currently made through reference to individual natural marks and cuts, the shape of backbone, scars on the body surface, etc. The procedure is difficult to describe and identify the elephant.

Transponder injections are applied and provided for permanent elephant identification. The injection is administered intramuscularly at the base of the left ear.

Blood and hair are also collected from each captive elephant, which is registered and injected with transponder. The two specimens are banked for further DNA analysis using the fingerprinting method for their identity and parentage check.

Tusk management

Illegal and improper removal of tusks causes severe and chronic root canal infection. Some elephants suffering from *Clostridium tetanus* infection may even die. No molar check or fillings are done regularly.

Fracture management

Fracture in elephants usually occurs in long bones (i.e. femur and humerus) and are often caused by car accidents. These fractures cause serious health problems and affected elephants mostly die. It is very difficult to treat and solve this problem.

Using of fiberglass casting has been possible to save only one case of metatarsal bone fracture in a 6 1/2 year old elephant. The procedure cost is around 100,000 bath.

Eye problems and management

Conjunctivitis, keratitis, corneal ulcer and cataract have been reported. Basic treatment involves administering antibiotic topical ointment and solution, steroid injections as well as other systemic treatments.

Wound management

Debridement and curette of chronic or necrotic wounds are flushed with normal saline solution. One percent Povidone iodine or 0.05% Chlorohexidine are used for wound cleaning. In case of deep wound, *setonizing is selected.* Topical antibiotic and systemic treatment can be applied as well.

General care

Health exam is performed at least once a year. Daily bathing and cleaning of skin nail and feet is done regularly. As part of their overall responsibilities, the keepers or mahouts who take care of elephants will inform veterinarians when animal health problems are occurred.

Euthanasia

Using Potassium chloride (KCl injection intravenously after immobilization performs euthanasia of a severely injured elephant or one suffering from incurable disease. Shooting with rifle bullets through the frontal sinus or temporal part of the brain is also performed.

This information is from veterinarians of the Zoological Park Organization, Elephant Conservation Center, Faculty of Veterinary Medicine of Kasetsart University and Mahidol University and the Asian Elephant Foundation of Thailand.

A 30 years old female Asian elephant suffered from infected wound caused by land mine explosion on the border between Thailand and Mynmar during logging. Veterinarians from Asian Elephant foundation of Thailand and Faculty of Veterinary Medicine, Kasetsart University are treating the elephant by curetting and debriding of necrotic tissue on lateral and sole of left hind foot.

Photo by Thorntep Ratanakorn

Domestic Elephant : Status and Management in Thailand

Dr. Sittidet Mahasawangkul
Head of Veterinary Section, Northern Timber
Working Department, Forest Industry Organization

Abstract

There are about 3,800-4,000 domestic elephants in Thailand. In the past elephants played an important role in logging and transportation. In the early of twentieth century, there were about 100,000 domestic elephants. In 1884, the North of Thailand alone had more than 20,000 domestic elephants. In 1965 The Department of Livestock Development reported that there were only 11, 192 domestic elephants. Later in 1985, the number decreased to only 3,381. This data confirms that the population of domestic elephants has decline 3.5% per year in the past 20 years.

The status of domestic elephant in Thailand turned into crisis when the government banned the logging in 1989. Elephants all over the country have suddenly become unemployed. Only a few elephant are used for trekking in tourism business. Most of domestic elephants in Thailand are involved illegal logging. They are given Amphetamines in order to speed up work in limited time and avoid detection by government officers. Some elephants are in poor condition, some are sick and die. Some unworkable elephants are slaugh tered and their meat are sold. Now these problems are developing into more and more crisis. It is suggested that the government should solve the problems by control domestic elephants all over the country and managing them to provide more suitable living condition and working environments.

Introduction

Elephants had a relationship with Thai Society for a long time in terms of history, religion, culture and economy. In the past, elephants have play important roles in transportation and logging . Elephants were originally found throughout the country, (Oliver, 1978) especially in the North of Thailand where there were abundant teak forests. In 1884, that in the North of Thailand alone there were more than 20,000 domestic elephants (Humphrey and Bain, 1990) in the same year that England began the teak logging business in Thailand and founded the Forest Industry Organization or F.I.O. in 1947, This organization was an organization which took care of most domestic elephants. In 1955 F.I.O. took care of 23 domestic elephant, 135 elephants in 1965, (Sorrachart, 1997) and now 84 elephants. Comparing Thailand's elephants population with neighboring countries, Burma has 5,591 domestic elephants (Lair, 1997) which is the largest number. Thailand has 3,588 (Mahasawangkul, 1998), And there are 3,050 in India (Lair, 1997), 1,200 in Lao and 570 in Indonesia respectively, (Santtiapilai, 1997) For Indonesia, 100% of domestic elephants belong to the government, while 50% in Burma belong to the government. In Thailand 108 domestic elephant belong to the government, of which 84 belong to F.I.O. (Mahasawangkul, 1998), 13 belong to The Zoological Park Organization (Utala, 1998), and 11 belong to the Royal Elephant Stable at Royal Palace (Diskul, 1998).

Table 1 Comparing the number of domestic elephants between Thailand and neighboring countries.

Country	Burma	Thailand	India	Lao	Indonesia
Number	5,591	3,588	3,050	1,200	570
Government	2,873	108	200	-	-
Private	2,718	3,480	2,850	1,200	-

The use of domestic elephant in Thailand

There have been written records about the use of elephants in Thailand for more than 700 years ago. In the region of King Ramkamhaeng the great in Sukhothai era, elephants were used as vehicle in wars. Wild elephant were cought for training and then were sold to use as vehicle and transportation (Sungkhakul, 1992). Before the second world war, Thailand was fertile with forests, especially in the North where teak forests are abundant. Elephants played an important role in dragging wood from the mountainous forest. An elephant 's capability is to drag 2 ton of wood and lift 700 kilogram by its tusks (Corvanich, 1980). Nevertheless its capacity to carry weight was fixed by the military at only 100 kilogram.

Usually in the forest concession, elephant will be allowed to work 3 days and rest 2 days, or work 4 days with 2 days rest, depending mahousts' discretion. More over, they will be allowed to stop working on full moon day. During February - May when summer is coming, elephants are free from work. They find food to eat naturally. This period also provided an opportunity for them to breed naturally (Corvanich, 1962).

Table 2 F.I.O. elephant logging ability (Corvanich, 1983)

Logging by elephant	Number of elephant	Forest management capability			Remark Logging 8 month/y
		difficult	medium	easy	
Average (Cubic Metre/K, M./year)	1	300	500	700	And 25 day/month
Average (Cubic Metre/K.M./year)	28	8,400	14,000	19,600	Total 200 day

Number of domestic elephant in Thailand

Richard C. Lair (1997) reported that there are about 3,800-4,000 domestic elephants in Thailand. There are only 2 government departments to work about data of domestic elephant numbers.

1. The Department of Livestock Development, Ministry of Agriculture and Cooperatives.
2. Registration Division, Ministry of Interior.

According to the Bill on Vehicle Animal, domestic elephant which are 8 years old and above are to be registered and given a document called the "Tua Pim Luppapan". The Ministry of Interior is incharge of gathering the registration information. However it is often found that the elephants registered are infact wild elephants. Moreover, when registered elephants die, the owners do not inform the Registration Devision. They sometime use the "Tua Pim Luppapan" for other domestic elephants.

The Provincial Livestock office is responsible for collecting data and reporting to the Department of Livestock Development, The Ministry of Agriculture and Cooperative.

Table 3 Statistics of registered domestic elephant by Ministry of Interior

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Male	1559	1433	1418	1513	857	1570	1481	1388	1207	1145	1092	879
Female	1892	1627	1641	1743	806	1815	1749	1666	1505	1336	1407	1122
Total	3451	3060	3059	3256	1663	3385	3230	3050	2712	2481	2499	2001

The problems of domestic elephant in Thailand

When the government banned logging concession in 1989. Most domestic elephant in Thailand became jobless. They had to find new way to earn their living. Domestic elephants are categorized as follows:

1. Illegal logging group

Most of the elephant in around 2,000-2,500 are in this group (Phongkum, 1997). Elephant can earn income about 50,000-100,000 baht/month (1,250-2,500 US dollar). They are given overwork because it is illegal logging. Therefore the work should be done in a short time as possible. Sometimes, they have to work all day and all night as they are given Amphetamine. Some are controlled by fire, knives or sharp objects while working. When the owners and

the elephant are arrested, They are sent to Forest Industry Organization (F.I.O.) while waiting for judgment from the court. Some elephants are returned to their owners. Some are confiscated by the state. Most of them are found in poor condition, such as being lame, broken back, broken leg, blind or wounded. There are under care of F.I.O.

Most of the judgments are to return the elephants to their owners because of the weak points of the law. When the elephants and owners are arrested, another person will appear to claim that he is the real owner, and that his elephant was taken from him and brought to work illegally without his consent. Some confiscated elephants die while waiting for the judgment because of their poor health when arrested.

This illegal logging group of elephants will move all the time to fertile forests. During 1996-1998 most of them migrated for illegal logging at "Salaween forest" Maehongson province situated in the North of Thailand at Burma border (Hutasingh, 1998). Some cross Salaween river to log in Burma. For this reason, some are drowned because of the tide in rainy season (Wildlife Fund Thailand, 1997).

According to the survey, 220 elephants are found illegal logging in "Salaween forest" area, especially "Mae-sa-leang" and "Sob-muay" at Maehongson province (Third Army Area, 1998). Three hundred logs are daily found dragged from the forest. Most of elephant were given by Amphetamine and finally dead because of overwork (Hutasingh, 1998).

2. Elephants in tourism business (Trekking)

There are around 1,000 elephants in this group (Phongkum, 1998), which serve for trekking. Elephant can earn 8,000-12,000 baht/ month (200-300 US dollar) excluding 200-500 baht (5-15 US dollar) / day in tips. The number of elephants in this group are less than the illegal logging group because:-

2.1 The monthly income is less than the illegal logging.

2.2 The elephants must be selected to be friendly with human, not dangerous and not aggressive.

2.3 There is only few Trekking business.

3. Street-wandering elephant group

The mahouts are called "Kui" (local people). They bring their elephants to Bangkok to earn their living. One hundred and sixty elephants are from Surin and Buriram province Northeastern part of Thailand (Homkrailas, 1998) where the natural forests have turn into Eucalyptas plantations during the past 10 years. This area cannot feed elephant any longer (Lair, 1997). Moreover, elephant are unemployed. For this reason, their mahout bring them to Bangkok or big town. Their income comes from selling banana, sugar cane which becomes elephant food, selling ivory and hair-tail products, getting money from people who go under the elephants's belly for good luck.

There are four men looking after one elephant (Wildlife Fund Thailand, 1997). The average income around 30,000-50,000 baht/month /elephant (750-1,250 US dollar). Some can earn up 150,000 baht/ month/elephant (3,750 US dollar) at Patpong, Bangkok, (Wildlife Fund Thailand, 1997). In the past 3-4 years, these elephant spread to big towns, such as Chiang Mai, Lampang, Nakhornratchasima, Phuket, Udornthani etc. Now it becomes a kind of business. The mahouts borrow money from capitalist to buy elephant and earn money.

Surin elephants are sold to the other places. Some are sold abroad, as well, Nowadays "Kui" also buy elephant from another place and bring some to Surin too (Waiwajjanakul, 1994).

These street-wandering elephants will go back home to join the elephant festival in Surin province in November of every year. After that, they will return to wander in big town again.

4. Wandering circus elephants group

At present, there are about 10 wandering circuses. Each circus has 5-7 elephants. This group contains in total 60 elephants (Trongwongsa, 1994), which are young elephant during 2-20 years of age. They are from Bankai district, Chaiyapoom province, where they are trained for showing. The circus name "Dok-din show" and "Pong-pat show" are two famous circuses at present.

There are 8-10 persons in one circus. The elephants are transported to various places for shows. The incomes is around 7,000-12,000 baht/day (175-300 US dollar) depend on the place. The income are from :

4.1 Selling tickets.

4.2 Selling drinks and snacks.

4.3 Renting chairs for attending the show.

4.4 Selling elephant food, such as banana, sugarcane for people to feed to the elephants.

4.5 Selling souvenirs.

The income of this group is somewhat high but the expense is also high, such as light and sound equipments, canvas fence, renting showgrounds, truck rental, worker salaries, etc.

It is found that the baby elephants in this group were caught from the jungle or their mothers were killed (Sub Nakasathion Foundation, 1994). The elephants are trained to perform unnatural tricks, therefore, they are always injured.

5. Baby elephants group at hotel and resorts

There are about 200-300 elephants between the age of 4 month - 3 years. The hotels use them to attract the tourists (Sriklajang, 1997). Most of them are wild baby elephants which are illegally caught by Karens and villagers along the Thai-Burmese border. These elephants are sold at "Dan-Sing-khon" Prachuapkhirikhan province (Phongkum, 1998). In 1993 the illegal vendors were arrested. Two elephants at 3 years old were confiscated. They were delivered to F.I.O. for better care. Some baby elephants in this group are not properly weaned (usually weaning at 3 years). Therefore, they have to face health problems, only 50% survive (Phongkum, 1997). When these elephants are older, they are sold to the illegal logging group. Then the growing elephants will be replaced with new babies and new cycle starts agains.

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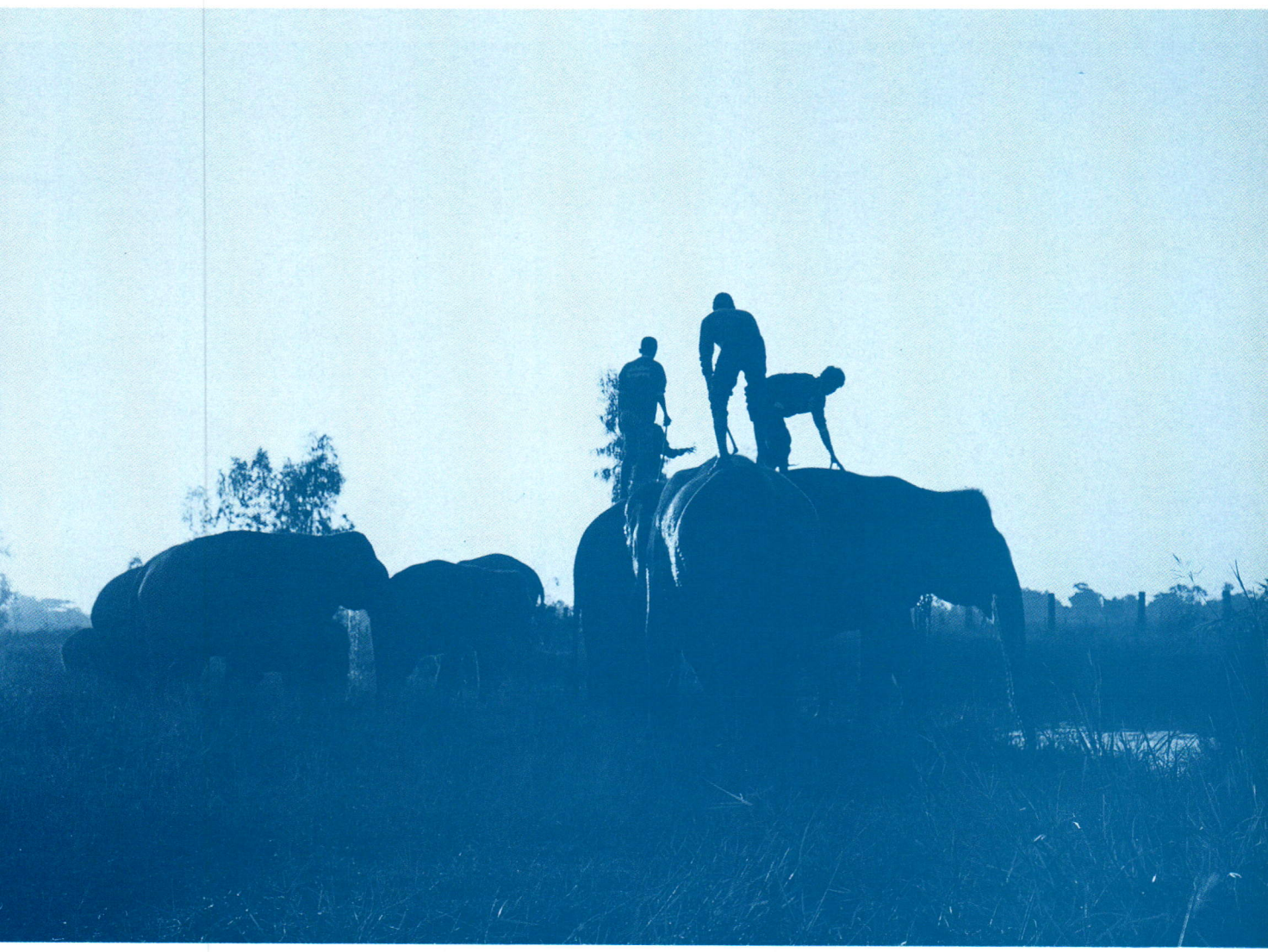


INTRODUCTION TO ELEPHANT HEALTH CARE IN HANOI ZOO

"...We look forward to having the co-operation and assistance from the association to protect and develop the elephant in Vietnam in general and Hanoi zoo ..".

Mai Que Tiep
Chief of Animal Health and Production Section,
Hanoi Zoo Garden, Thu le Zoo gardens,
Hanoi, Vietnam

Introduction

Hanoi zoo is one of the main zoos in Vietnam (the second one in Ho Chi Min City). Hanoi zoo is just stepped into the age of 22. At present, it manages 96 species and subspecies with 600 individuals including 36 species of mammal, 53 species of bird, 6 species of reptile and amphibian. 35 out of 96 species belong to the rare and precious species in Vietnam.

Despite the limited budget and condition, the Hanoi zoo has tried to do almost to protect and restore the rare gene source and has obtained some results on multiplication of rare and precious species.

The Hanoi zoo considers that the preservation and development of gene source is the first task. Up to now, the Hanoi zoo in co-ordination with other research institutes has carried out many research theses on reproduction, biology, feeding ration and diseases.

The number of elephant population in Vietnam has decreased considerably due to the lost of living habitat and the hunting.

Therefore, the elephants have to leave the natural environment to devastate the crops and be wiped out by the human. IUCN informs that 25% mammal will come to the situation of extermination.

To preserve the precious gene source, the Vietnam Government has taken consideration to two methods of preservation and development of elephant population, being on the spot and replacement preservation.

The replacement preservation method has been applied in Hanoi zoo and many other places and obtained good result, especially to elephant.

Number of elephant in Hanoi zoo:

Hanoi zoo has two elephants and they are in good status:

Name	Weight	Sex
FALAND	2,000 Kg	Female
KRONGK	1,000 Kg	Male

Stable of elephant

Total area spent for elephant 1,500 m^2, consisting of:

- Playing yard : 1,000 m^2
- House with iron ring to chain up the elephant.
- Bathing pool : 200 m^2

The house and yard are surrounded by deep moat with iron rail. The trees were planted to create the natural environment.

Health status

Some physiological indicators:

- The heart of elephant beats 60 times per minute when exercise.
- Breath : 10 -12 times/minute and decreases to 4-5 times when sleeping.
- Temperature in rectum from 36.5°C to 38.8°C and changes a bit depending on environment temperature exercise.

Diseases: Main diseases are parasite and *Trypansonma evansi.*

Clinical sign : Duration 4 - 7 days, the elephant gets fever with high temperature, walking totteringly, chronic disease gets light fever, red urine.

Prognosis: Base on the clinical sign of high fever.

Treatment: Using Naganal® 0.02 - 0.03 mg/Kg of weight in mix with solution of 10%, injection into ear vein, reinforced by vitamin C and caffein.

Prevention: "Making a test to the newly received elephants to have timely treatment and care".

The normal health status and management :-

Management of male elephant

Time of being in rut	Season	Control method
Seven years old or over	Summer and spring	Chain up two legs

Identification and mark:

Two methods: Cutting ear and naming.

We use the latter due to the limit number of elephants.

Tusk and dental care

Tusk: When the elephants grow up, the tusk are the tools to attack human. So that, when the elephants come to the age of seven years old, we have to cut their tusks and continue to cut when the tusks are over 15 cm long.

Method of cutting: Using saw to make a spurious in order to make the elephant have reflex. After 15 days, cutting 3 to 5 cm from the edge (Chaining the elephant before cutting). This method gives good result, being able to prevent post cutting catastrophe.

Management:

- Pemicious wound: Washing the wound by Hydrogen peroxide and applying by the mix of Chlorocid and Rifampicin.
- Abscess : Applying hot compresses by sticking ichiol glue and making antibiotic injection: Cefaloject 2g/50kg of weight, Streptomicin 1.5 g/50 kg of weight, vitamin C 500 - 1,000 mg/50 kg, im.

Control:

Body control: Using hammer and chain when training.

Direct injection: Using hammer to make the elephants knee and then injecting directly by hand i.e. to anaesthetize by M-99 (Etorphine) in mix with Xylazine or Promazine 10-60 mg. To anaesthetize slightly by dosage of 10-60 mg when transportation.

Schedule of dewonning:

Stomach worms: (nematodiasis). Using Mebendazone 100 mg per 1 kg of weight.

Cestode worms: *(Anoplocephala wolgaris).* Using Diphenthane (Taniatol), orally at the rate of 40 mg/1 kg of weight.

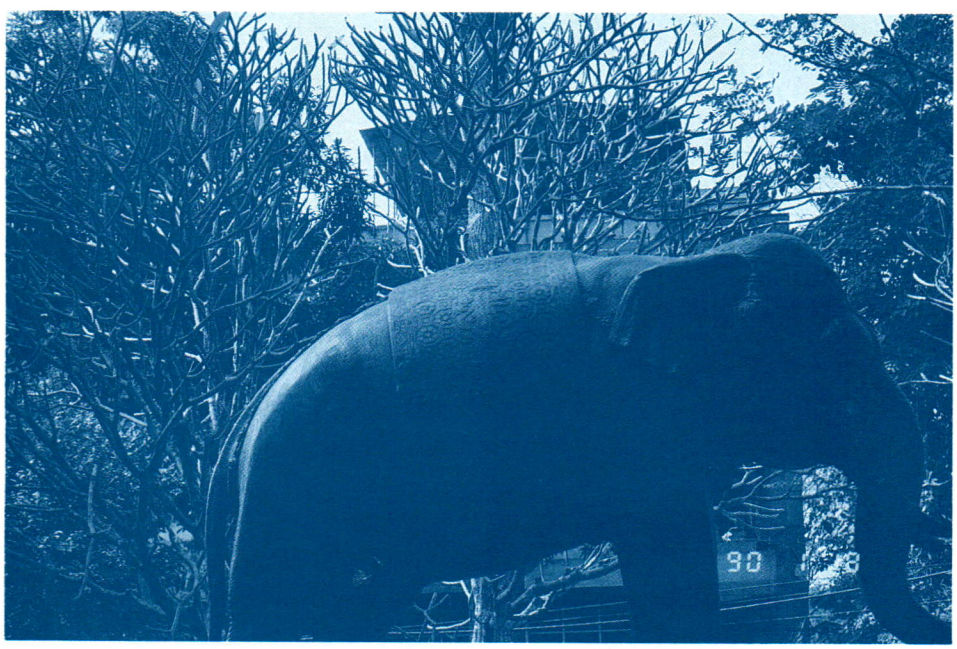
Frequency of deworming: once per 4 months.

Feeding and care

Type of food		Quantity	Schedule of feeding
Group 1:	Grass	200 kg	10h-15h, 18h
	Sugar- cane	10 trees	
Group 2:	Sweet potato	15 kg	14h
	Banana	20 fruits	
	Red pumpkin	10 kg	
Group 3:	Rice	3 kg	14h
	Sugar	0.5 kg	
	Salt	65-85 g/day	

CONCLUSION

The above mentioned points are some experiences drawn in Hanoi zoo. I hope that the information will make a little contribution to the association in order to preserve the Asian elephant. We look forward to having the co-operation and assistance from the association to protect and develop the elephant in Vietnam in general and Hanoi zoo in particular.



Bronzed Asian elephant statue in Saigon Zoo (Ho Chi Minh City), Vietnam.
Photo by Dr. Parntep Ratanakorn

Bronzed elephant
in front of Ho Chi Minh City Zoo
presented to Vietnam by King Rama the VII of Thailand
during the first visit to Vietnam (Indochina) in 1930.
Photo by Dr. Parntep Ratanakorn

STATUS OF HEALTH CARE AND THE CONSERVATION OF ELEPHANT IN VIETNAM

"...In general the Government of Vietnam has paid attention to wildlife conservation in particular elephant conservation and health care...".

Dr. Nguyen Thuy Hong,
Veterinarian Officer,
Department of Animal Health, Cuc thuy,
Phoung Mai, Dong Da, Hanoi,Vietnam

I. General situation

Vietnam is a country endowed by nature with a high diversity of ecosystems, species and gene resources. Environmental protection, in particular nature, conservation and sustainable utilization of natural resources are the common concern of all nations in the world.

Asian elephant *(Elephas maximus)* is the largest land mammal in Vietnam, which has long standing close multiple relationship with human. It is a respected animal in cultural sites. It has been used in battlefield, for economic purposes such as transport and logging. It is also present at various cultural ceremonies and entertainment programs.

In general the Government of Vietnam has paid particular attention to wildlife conservation and in particular elephant conservation and their health care as follows:

1. Reviewed the system of protected areas and established new nature reserves in areas where protection are needed. This has safeguarded habitats of elephants and thus has contributed to their health care effectively.

ments to safe places were implemented but did not show expected results.

We all know that elephant ivory is a valuable commodity, which attracts illegal hunters for profit. The kill of male ivory bearing elephant is the most serious threat, which can lead to extinction of elephant populations. There are elephant groups, which consist of only females or of only 1-2 immature males. In the 70s of this century, elephant's population was estimated with confidence between 1,500-2,000. Most of them occurred on Daklak, Koutum, Nghe An, Ha Tinh and Kong Nai. In the recent years, a number of elephants has been reduced considerably due to various reasons. Unfortunately, there are no accurate dates on elephant populations in Vietnam at the present. Surveys were carried out in Mubng Te (Lai Chau province) in 1974 and 1991 showed that the number of elephant was reduced from 150-180 individuals (reduction rate of 91 -93%). In particular there was only one single male individual in the 1991 survey (M. Giao, R. Cox, et al. 1991).

II. Status diseases of elephants in Vietnam.

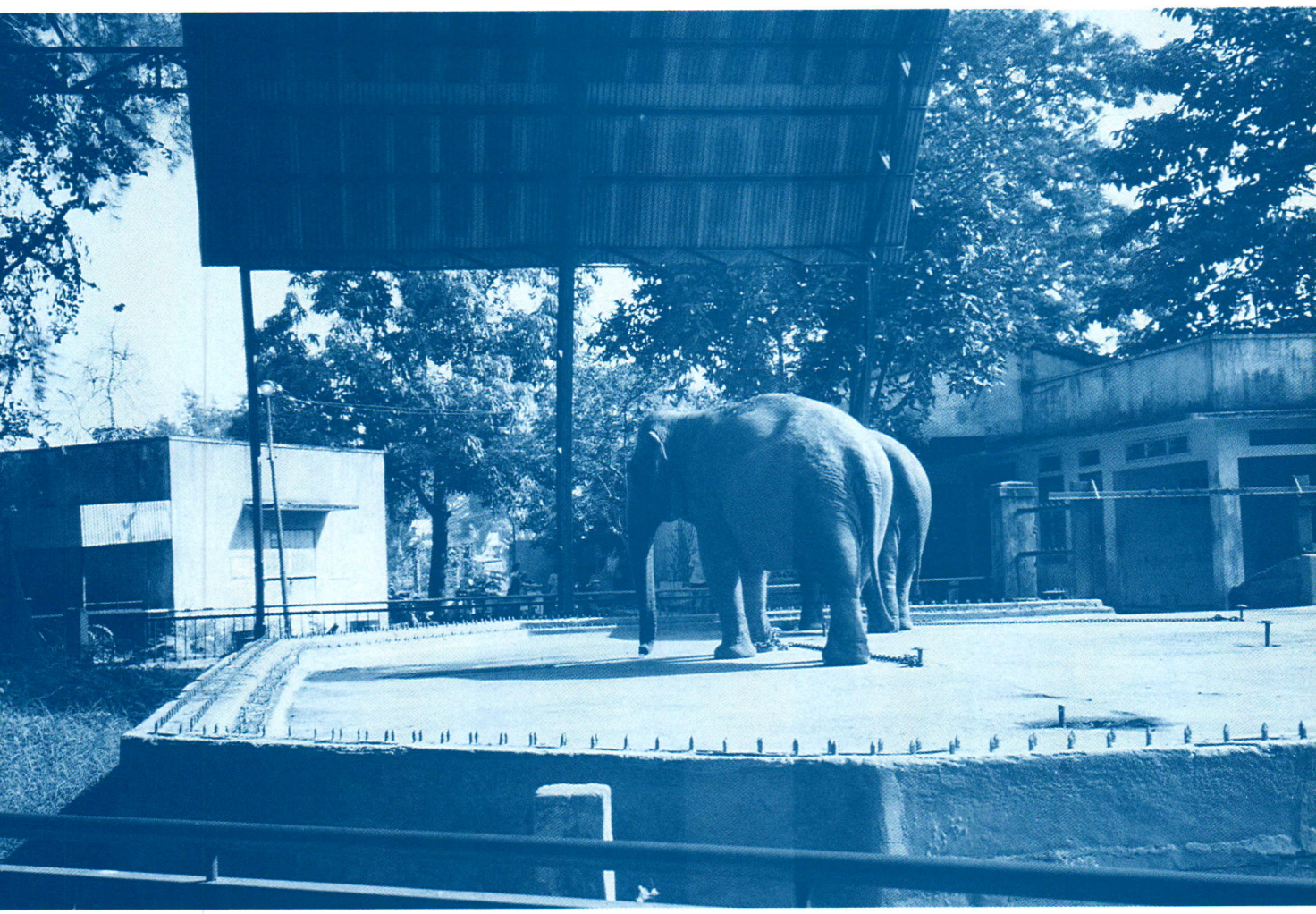
For the time being in Vietnam there is not any sufficient report on elephant's diseases. But according to the some report of the Sub Department of animal health of some provinces where the elephant occurred, diseases of the elephant's as follow.

1. Foot and Mouth disease
2. Pasteurellosis and Anthrax
3. Trypanosomiasis
4. Tympanites
5. Dermatitis
6. Dental decay

At present there is not any method applied to treat elephant's diseases in the forest except elephants in the Zoo. Mrs. Mai Que Tiep who works in Hanoi Zoo Garden of Vietnam will present methods of treatment and medicine for diseases of elephants.

III. Program for the coming years:

1. Continue the work undone in health care of elephant's and their conservation action plan in Vietnam.
2. Strengthening propaganda of elephant health care and conservation with abundant contents on public media in order to increase awareness and knowledge of elephant conservation for local people in forest protection and elephant health care and their conservation.
3. Strengthening capacity for central and local steering committee to implement the action plan efficiently. The operation of elephant health care and conservation specialist group should be carried out frequently and particularly.
4. First and foremost, facilitate collaborative action group in Daklak province to efficiently implement activities according to the planned program.
5. Organize training courses for staff in charge of elephant health care and conservation.
6. Develop an elephant conservation center in Tan Phu (Dinh Quan District, Dong Nai province) to create a pilot: elephant health care, elephant conservation, solution of human beings/elephant conflicts, and the development of social economy for communities.
7. Develop a feasible study for the proper solution of human beings/elephant conflicts according to the situation in Vietnam.
8. Strengthening international cooperation in close collaboration with **"Asian Elephant Conservation Specialist Group"** and sub regional group as well as national and international agencies concerning with elephant conservation.
9. Take all opportunities in experience and financial assistance from national and international agencies to implement elephant health care and conservation action Plan in Vietnam. All funding should be used efficiently according to the purpose proposed.



Elephant house in Ho Chi Minh City.
Photo by Dr. Parntep Ratanakorn

Resolution for the Minimum Requirements for Health Status and Management for Asian Elephant in South East Asia

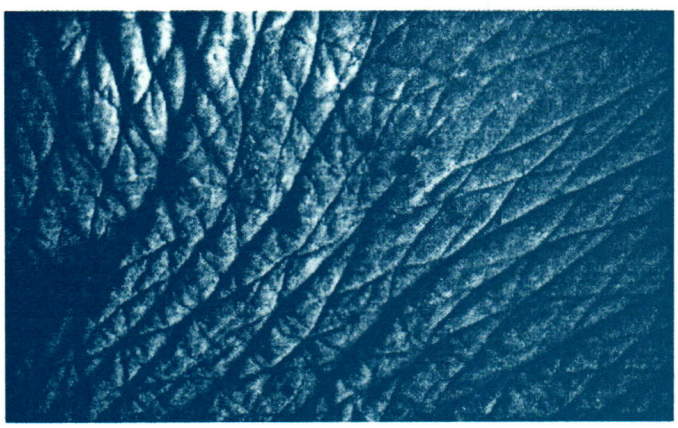
After 3 days of discussion, the participants who represented member countries of South East Asian region have agreed and adopted this resolution. They all developed together for management of Asian elephant health as follows;

General Health Care

A. Quarantine Programme

During the quarantine period, minimum requir ement for health status and some procedures should be performed as follows :

1. Fecal examination: for helminths and protozoa using fresh smear method and floatation method.
2. Blood examination: for hematology, blood chemistry and blood parasite screening.
3. Physical examination : according to the routine systematic physical examination and special examination will be emphasized on ears, eyes and teeth.



Ectoparasites on elephant skin
Photo by Dr.Pornchai Sanyathitiseree

4. External parasite control such as lice and insect larvae etc.
5. Vaccination for prevention of some important diseases.
6. Period of quarantine at least 30 days.
7. Specific test : Tuberculosis test and Brucellosis test.

B. Vaccination Programme

It depends on variable situation of each country but obligatory required vaccination for

- Tetanus
- Haemorrhagic septicemia

With strict aseptic injection technic, every year.

Abscess caused by improper aseptic injection technique.
Photo by Dr. Pornchai Sanyathitiseree,.

C. Deworming Programme

It is based on the routine fecal examination and at least twice a year by using Ivomec®.

D. Specific test : Tuberculosis

By using the following techniques

- Skin test, PPD intradermal injection.
- Serological test, ELISA (if available).
- Bacterial culture and isolation, using specimens from trunk wash and/or feces, should be performed at least once a year.

FEEDING

Most of domestic Asian elephant are roaming and eating as much as they want. But those in captivity such as in the zoos must be fed in an exact amount and variety of food. Zoo elephants feeding frequency is normally 2 to 3 times per day and food provided are fresh grass, hay, branches of tree, fruit, vegetable, rice, concentrate and water adlib.

Supplement : if horse supplement is available, it is recommended. In case of low feeding of fruit, vitamin C is recommended. Tamarin and salt are also suggested.

One and a half year old calf which was wild caught, shows sign of ricket due to too early weaning and in appropriate fed of milk replacer formula and supplement. Photo by Dr. Pornchai Sanyathitiseree,.

NEONATAL CARE

It is recommended to follow "Fowler" (see Appendix I). Be advised to add butter into milk fed to elephant calves as its needed of fat and animal protein.

RESTRAINT

Three major restraint techniques for elephant :

1. Manual restraint which still be practices in every South East Asian (S.E.A.) countries. Voice order and contact from mahout are the basic manual restraint together with hook and chain.

2. Chemical restraint

   Remote or tele injection of immobilizing agents or tranquilizers are essential. It is highly recommend to have darting equipment ready prepare for treatment and control of elephants.

   Etorphine hydrochloride and Xylazine hydrochloride are drugs of choice for immobilization while Acepromazine and Chlorpromazine are sedatives.

3. Mechanical restraint

   Conventional mechanical restraint equipments are being used effectively, especially with young elephant or small size elephant such as chute and crate.

MUSTH MANAGEMENT

To control and manage elephants in musth are very important because of the serious damages to human properties and themselves.

1. Provide isolated area for elephant without any disturbances.
2. Chain elephant securely to big tree or pole with provided shade.
3. Reduce storage energy by decreasing of food supply and increasing of water supply.
4. If needed, chemical control can be proceeded.
5. Notification of animal going into musth period is very important for the prevention of untoward effect.
6. Establishment of the emergency control team for elephant in musth which is well trained and equipped.
7. Standard operating procedure (SOP) for handling of elephant in musth situation must be prepared. (As been done in Thailand by Ratanakorn, P.)

IDENTIFICATION

To provide appropriate identification to each individual elephant in captivity which will be very useful for registration and health management. Every domestic Asian elephant must be marked according to the following techniques which are suitable for their facilities of each countries.

1. Microship transponder injection
   - Recommendations for Thai and Indonesian elephants (at this moment).
   - Recommendations for Zoo elephants.
   - Recommendations for International transportation of elephants.
   - Recommendations for standard injection site ; intramuscularly into the base of left ear. (see Appendix III)
2. Hot or cold branding are still being use in some countries.
3. Technology of Molecular Genetics
   - DNA fingerprinting or microsatellite analysis are being developed in Thailand which can be a future help for S.E.A. region.

TUSK AND DENTAL CARE

Most oral problems of elephant in S.E.A. are the infection of tusk root canal which resulted from improper cut or trim of tusk. Root canal when exposed to the bacterial infection particularly tetanus are incurable. We recommend to trim elephant tusk carefully not to expose pulp or root canal according to "Fowler"[2]. In case of root canal exposed or infection, Tetanus toxoid or antitoxin must be given to elephant. Appropriate treatment must be applied such as bacterial sensitivity test for suitable antibiotic, daily flushing and filling.

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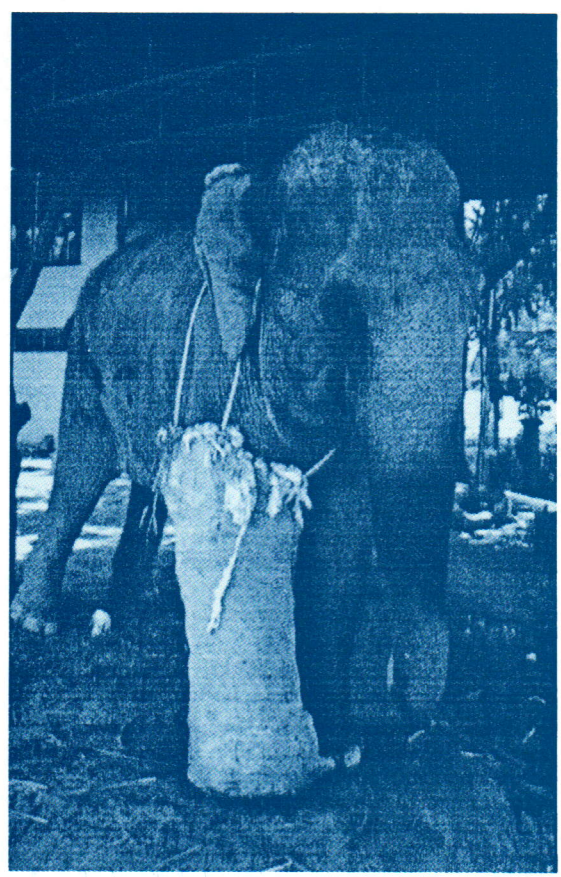
[2] Fowler, M. (1978). Zoo & Wild Animal Medicine, First edition, W.B. Saunders Company, Philadelphia, 951 pp.

EYE MANAGEMENT

Infection, irritation and trauma to the elephants eyes are found quite often. It is suggested that "Eye First Aid Kit" with essential drugs must be prepared such as antibiotic ointment, eye washing solution, etc. If the situation is not improved, veterinary attention must be performed as soon as possible.

FRACTURE MANAGEMENT

Due to a huge and massive structure of elephant, fracture of bones are very hard to manage effectively, especially long bone, femur, humerus, etc. Immobilization of fracture is a criteria of management. If a fracture can be immobilized by any kind of treatment, (fiberglass cast or etc), prognosis befair to good and treatment should be continued. But if failed to immobilize, fracture prognosis will be poor to grave, that animal should be euthanized.



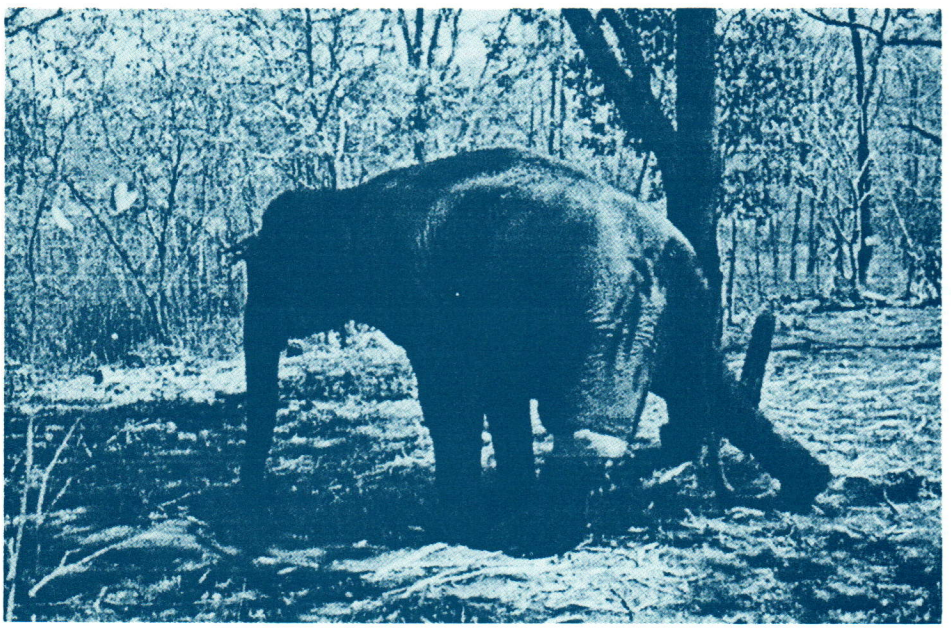
Fiber glass cast for treatment of minor fracture which can be immobilized.
Photo by Dr. Pornchai Sanyathitiseree

EUTHANASIA

To Kill or put to sleep of elephant in a humane way under supervision, must be judged and performed only by a qualified veterinarian who incharges of that case under these criteria :-

- Elephant is suffering from such incurable disease.
- Elephant with accidental complex fractures which can not be immobilized and affect their living.
- Uncontrolable elephant in violent musth.

It must be performed in a humane technique under a qualified veterinarian supervision.



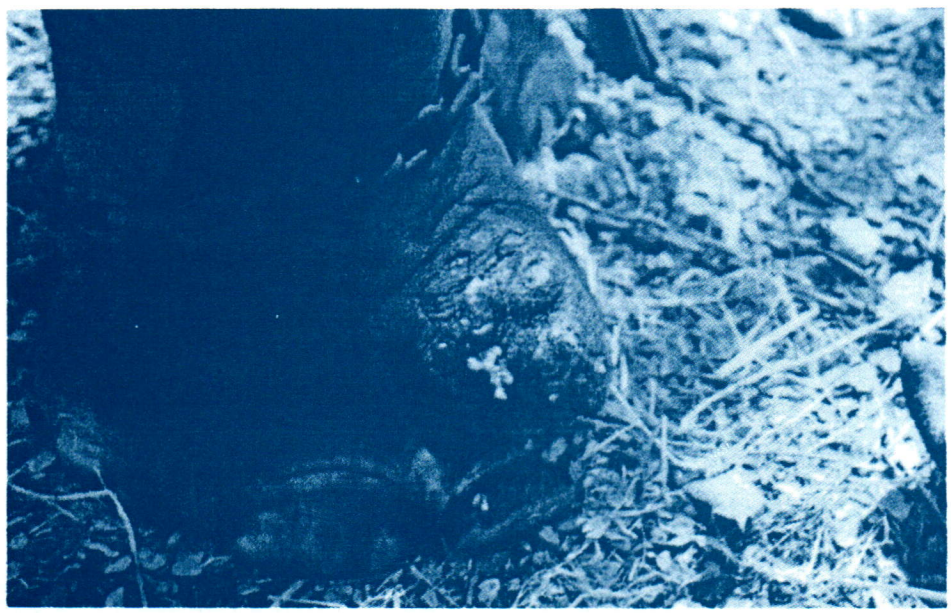
Elephant suffered from injured by car accident.
Photo by Dr. Pornchai Sanyathitiseree

POST MORTEM EXAMINATION

Post mortem must be performed to every dead elephant by a qualified veterinarian. Similary technique for cattle can be applied. Specimens submitted for histopathology and microbiology should be despatched to more than one laboratry. Some specimens should be kept for the future study.

GENERAL CARE

It is recommended that health examation must be performed at least once a year. Regular daily bathing and cleaning of skin, nail and feet[3] should taken care. As their responsibilities, the mahouts or keepers who incharge of elephants must inform veterinarians when the animal health problems are noticed as early as possible.



Infected foot due to nail punctured.
Photo by Dr. Pornchai Sanyathitiseree

VETERINARIANS AND ELEPHANT HEALTH CARE

1. All elephant veterinarians in S.E.A. should conduct practices and consistant health cares to elephants.
2. Cooperation among field elephant veterinarians, veterinary faculties and private practitioners should be established.
3. There should be continuing education programmes for elephant veterinarians.
4. The minimum requirements for health status and management for Asian elephant in South East Asia should be revised at recent period.

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[3] Fowler, M. (1993). Zoo & Wild Animal Medicine. Third edition, W.B. Saunders Company, Philadelphia, 617 pp.

INFORMATION EXCHANGE, EDUCATION AND COLLABORATION

We agree that :

1. Basic information data centre should be established.
2. Thailand should be a linkage centre for data and training.
3. Exchanging and updateing information through different medias: internet, newsletter, journal, etc. regularly and truly to all participants and others who are interested in elephant health cares.
4. Organized workshop, conference or seminar which correlate to Asian elephant health should be performed on the regular basis.
5. More N.G.O. support will be reached to and assist the elephant health care programme.

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APPENDIX I

Orphaned elephant feeding[1]

Rice-based formula

Dried whole milk	0.5 kg
Cooked brown rice	0.5 kg
Sucrose	0.2 kg
Water	8.5 L
Ca : P	1.4 : 1
(Bone meal	825 mg per 100 gm formula)

feeding per day

Calve weight	Rice-based formula (oz)
100 kg	400-550
200 kg	1100-1333

Enfamil ® (Mead Johnson)

Protein	1.5 %
Fat	3.7 %
Carbohydrate	7.0 %
Solids	12.5 %
Fiber	0 %

feeding per day

Calve weight	Enfamil (oz)
100 kg	300-400
200 kg	800-1000

Method for Artificial Feeding Elephant Calves

Technique 1. using regular calf nipple attached to bottle.

Technique 2. using hose diameter 2.5 to 5 cm. attached to bottle.

Technique 3. force into pharyngeal pouch using syring pump through hose diameter 2 to 5 cm.

[1] Fowler, M. (1986). Zoo & Wild Animal Medicine, Second edition, W.B. Saunders Company, Philadelphia, 1127 pp.

Weaning

Weaning age ; 15 to 18 months.

APPENDIX II

Asian Elephant Hematological Values

A. Fowler *

Rbc	2 - 4	(x 10^6/mm^3)
Hct	33 - 44	(%)
Hb	10 - 13	(g/dl)
Wbc	8 - 15	(x 10^3/mm^3)
Wbc differential		(%)
Neutrophils	20 - 40	
Lymphocytes	50 - 75	
Monocytes	2 - 8	
Eosinophils	0 - 4	
Basophils	0 - 2	
MCV	130 - 170	(μm^3)
MCH	42 - 50	(μg)
MCHC	30 - 36	(%)
Platelet	491 - 975	(x 10^3/mm^3)

B. Mikota **

Rbc	3.212 (M)	3.10 (F)	(x 10^6/μl)
Hct	39.97 (M)	37.8 (F)	(%)
Hb	13.61 (M)	13.34 (F)	(g/dl)
Wbc	16.49 (M)	13.46 (F)	(x 10^3/μl)
Wbc differential		(x 10^3/μl)	
Neutrophils	6.133 (M)	4.708 (F)	
Lymphocytes	8.181 (M)	6.60 (F)	
Monocytes	1.371 (M)	2.441 (F)	

* Fowler, M.E. (1986). Zoo & Wild Animal Medicine. Second edition, W.B. Saunders Company, Philadelphia, 1127 pp.

** Mikota, S. K., et.al., (1994). Medical Management of the Elephant. Indira Publishing House, Michigan, 298 pp.

Eosinophils	0.647	(M)	0.473	(F)	
Basophils	0.088	(M)	0.053	(F)	
Band	0.198	(M)	0.237	(F)	
MCV	128.7	(M)	144.3	(F)	(μm^3)
MCH	42.25	(M)	44.23	(F)	(μg)
MCHC	33.77	(M)	35.29	(F)	(%)
Platelet	517.9	(M)	301.1	(F)	(x 10^3/(l)

(M) = Male, (F) = Female

C. Siruntawineti ***

Rbc	3.59	(M)	4.63	(F)	(x 10^{12}/L)
Hct	33.1	(M)	34.2	(F)	(%)
Hb	11.6	(M)	12.36	(F)	(g/dL)
Wbc	16.4	(M)	15.91	(F)	(x 10^9/L)
Wbc differential		(%)			
Neutrophils	27.9	(M)	25.3	(F)	
Lymphocytes	36.1	(M)	36.7	(F)	
Monocytes	5.9	(M)	6.9	(F)	
Eosinophils	7.5	(M)	9.5	(F)	
Binucleated Lymphocyte	21.8	(M)	21.5	(F)	
MCV	97.85	(M)	82.7	(F)	(μm^3)
MCH	33.19	(M)	30.00	(F)	(μg)
MCHC	35.21	(M)	36.19	(F)	(%)

(M) = Male , (F) = Female

*** Siruntawineti, J., et. Al. (1995).

Blood collection from ear vein for health monitoring and genetic study.

Photo by Dr. Parntep Ratanakorn

APPENDIX III

Transponder Injection for Permanent Identification of Captive Elephant

Purpose : To make a permanent identification of individual elephant by using microship transponder injection.

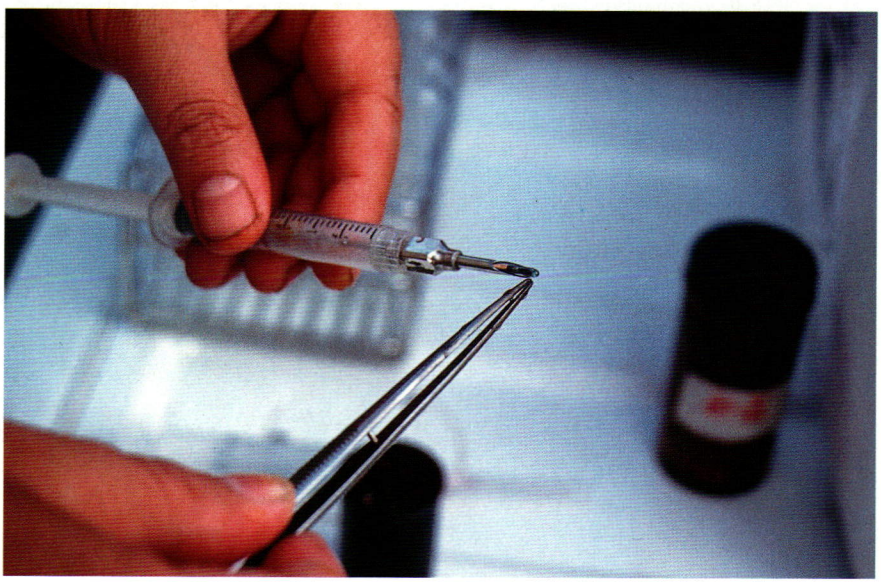
Standard injection site : Intramuscular injection at base of "Left - ear" (behind left ear).

Materials :

1. Microship transponder, medium to large size.
2. Injector, standard syringe type or pistol type with at least 1 inch needle.
3. Standard hand held reader (scanner).
4. Disinfectant; 70% ethyl alcohol, glutaraldehyde or chlorhexidine.

Method :

1. Scan injection site (benind left ear) every time before each injection in order to confirm that no transponder ever injected in that elephant.



Loading of microship transponder into needle for permanent identification in elephant.
Photo by Dr. Parntep Ratanakorn

2. Sterile transponder and needle using cold sterilization or gas sterilization.
3. Sterile injection site according to aseptic technique using 70% ethyl alcohol scrub.
4. Insert needle perpendicular to the skin surface.
5. Slightly push injecter plunger then transponder will be embeded into muscle.
6. Withdrawn needle and swab injection site with 70% ethyl alcohol.
7. Scan injection site again to recheck the ID. number.

Remark :

Do not forget to test microship transponder before each injection.

After microship transponder for indentification of elephant was injected intramuscularly at base of left ear (standard microshiping site). Scanner was used to read the individual number of microship.

Photo by Dr. Parntep Ratanakorn

Appendix IV
Elephant drug dosage mentioned in text

Houck

1)	Penicillin G benzothine	150,000	units
	and		
	Penicillin G procaine	150,000	units/ml.,
2)	Amoxicillin	3-5	mg/kg, IM, SID
3)	Enrofloxacin	2-5	mg/kg, PO, IM, SID
4)	Flunixin meglumine	1-2	mg/kg, IM as needed.
5)	D-Panthenol	5	mg/kg, IM or IV
6)	Fenbendazol	5	mg/kg, PO
7)	Pyrantel tartar 1.06%	30	mg/125 kg, PO
8)	Ivermectin 1%,	10	mg/50 kg, PO
9)	Furosemide	0.5-1	mg/kg, PO or IM or IV
10)	Atropine	0.8-1	mg/kg, IM or IV
11)	Ampicillin	3-5	mg/kg, IM, SID
12)	Trimethoprim-Sulfadiazine	15-20	mg/kg, PO, SID
13)	Penicillin G	30,000	IU/kg, IM, SID
14)	Ceftiofur	1-5	mg/kg, IM, SID
15)	Polysuffated aminoglycans	2.5	gm, IM, 1/wk x 4
16)	Ibuprophen	16	gm PO, BID
17)	Ketoprofen	0.2	mg/kg, IV
18)	Phenylbutazone	2-4	gm/500 kg, PO
19)	Oxytocin	20	IU/animal, IV
20)	Lupron hydrochloride	35-45	mg/animal, SC

Rietschel

21)	Xylazine	100-700	mg/animal, IM
22)	Yohimbine	100-150	mg/100 kg, IV
23)	Atipamezol	1	mg/10 mg Xylazine, IV
24)	Tetanus antitoxin	250,000-500,000	IU/animal

Asvan

25) Penicillin-Streptomycin	20,000	IU/kg, IM x 4 days
26) Rintal® granule	7.5	mg/kg, PO
27) Panacur®	5-25	mg/kg, PO
28) Flagyl	500	mg/kg 100 kg, PO

Vellayan

29) Isoniazid	5	mg/kg/day, PO
30) Rintal®	7-10	gm/100 kg, PO
31) Mebendazole	10	mg/kg, PO
32) Flubendazole	30	gm/50 kg, PO x 5 days
33) Levamisole	10-20	mg/kg, PO
34) Diphenthane	40	mg/kg, PO
35) Nithoxymil	10	mg/kg, PO

Ratanakorn

36) Ivermectin	1	ml/500 kg, SC
37) Chlorpromazine	0.5-1	mg/kg, PO
38) Acepromazine	0.03-0.07	mg/kg, IM
39) Xylazine	0.04-0.08	mg/kg, IM
40) Xylazine	0.02	mg/kg
plus		
Ketamine	0.25	mg/kg
		IM
Acepromazine	0.06	mg/kg

Teip

41) Cefaloject	2	gm/50 kg, IM
42) Streptomycin	1.5	gm/50 kg, IM
43) Vitamin C	500-1000	mg/50 kg, IM

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MINIMUM REQUIREMENTS FOR HEALTH STATUS AND MANAGEMENT OF ASIAN ELEPHANTS IN SOUTHEAST ASIA

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