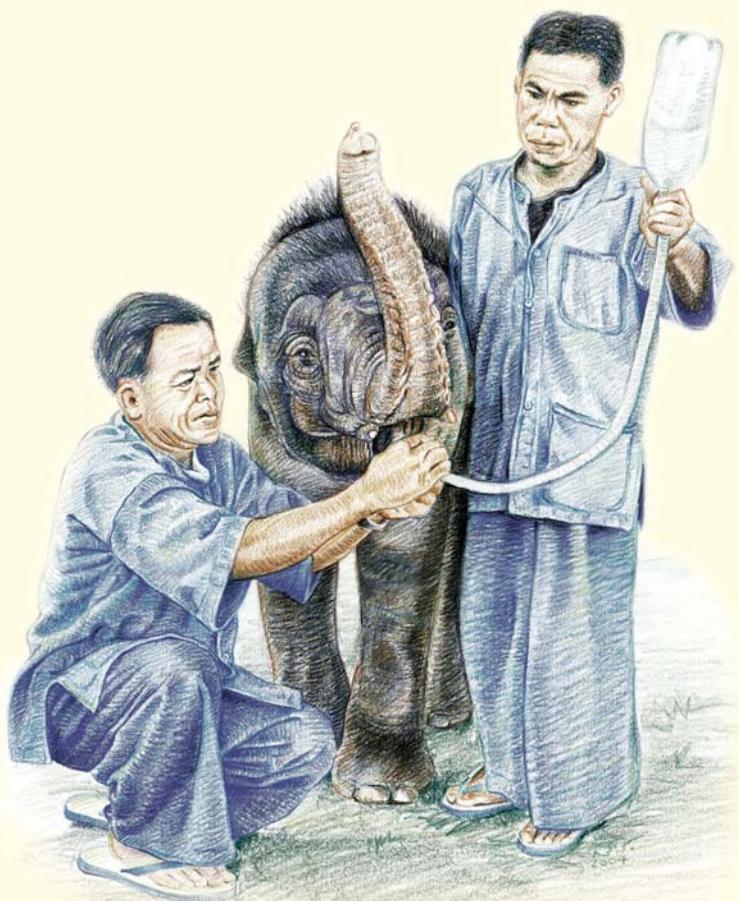


Elephant care manual for mahouts and camp managers



Elephant care manual
for
mahouts and camp managers

The designations and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its frontiers or boundaries.

The opinions expressed in this publication are those of the authors alone and do not imply any opinion whatsoever on the part of FAO.

©FAO and FIO, 2005

ISBN: 974-7946-71-8

Edited by Richard C. Lair

Drawings by Sirikorn Inkom

Printed by XX

For copies write to:

Forest Resources Officer
FAO Regional Office for Asia and the Pacific
Maliwan Mansion
Phra Atit Road, Bangkok 10200
Thailand
E-mail: Masakazu.Kashio@fao.org

Elephant care manual for mahouts and camp managers

Preecha Phangkum
Richard C. Lair
Taweepoke Angkawanith

FOREST INDUSTRY ORGANIZATION
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC

Bangkok, 2005

Foreword

The number of wild elephants in Thailand has declined steadily over the last three decades, mostly because of relentless habitat destruction, and experts estimate that at present only about 1,500 wild elephants remain. Today, better management by state agencies and increased public awareness are helping the wild elephant population to stabilize.

In the middle of the nineteenth century, Thailand had as many as 100,000 domesticated elephants. The number of domesticated elephants started to decline about fifty years ago, as rapidly improving roads eroded the use of elephants in transportation — the most common work in the old days. Since its establishment in 1947, FIO acquired working elephants and for decades operated over 200 logging elephants.

FIO's first welfare effort, the establishment of the Young Elephant Training Center in 1969, evolved into the Thai Elephant Conservation Center (TECC) as a response to the nation-wide logging ban in 1989. There, FIO started a full-time mobile veterinary clinic and a hospital. In 2002, FIO established the National Elephant Institute of Thailand (NEI) to promote the overall welfare of elephants and keepers' communities, for example, by helping to revise laws and develop self-sustaining, eco-friendly business models for the tourism industry.

In this evolution, the publication of the *Elephant Care Manual for Mahouts and Camp Managers* adds another page of history in elephant welfare. The original idea for this care manual goes back to the 1997 FAO publication, *Gone Astray: The Care and Management of the Asian Elephant in Domesticity* by Richard Lair, who now serves at FIO as the special advisor to NEI. This manual represents the latest collaboration in a long and fruitful relationship between FIO and FAO.

FIO would like to express its appreciation to Mr. Richard Lair and Mr. Masakazu Kashio, Forest Resources Officer at the FAO Regional Office for Asia and the Pacific in Bangkok, who formulated the Elephant Care Manual project. The International Fund for Animal Welfare (IFAW) provided the funding for the project, for which FIO extends its heartfelt thanks. FIO is proud of Dr. Preecha Phuangkum, eminent elephant veterinarian and director of NEI, and Dr. Taweepoke Angkawanith, elephant veterinarian serving at the TECC.

We hope that the Thai mahouts and elephant camp managers will find this manual useful in their daily work. Its application will contribute to improving the welfare of all of the domesticated elephants in Thailand.

Chanatt Lauhawattana
Managing Director
Forest Industry Organization

ADG

Page two, italic; not printed

Follow according to FAO Checklist

Foreword FIO

Foreword FAO

Preface

Contents

Acknowledgements (in Giants and GA Acknow. Comes before Contents)

Authors' preface to the English edition

Readers will necessarily wonder about the relation between the primary output of this book — the Thai language edition — and the English version. The English is in effect a literal translation of the Thai although through many drafts the two language versions have fused with different languages alternating the lead through different passages and subjects. The direct translation was mandatory because since its inception this manual was required to serve as a potential model for other country-specific manuals in the region. The second reason for a direct translation was that once asides and elaborate explanations are allowed, a flood is likely to follow, leading to an entirely different book. International readers deserve to know exactly what information is being imparted to the Thai reader.

The target audience

The target reader of this manual is the average Thai mahout. He is a fascinating character which the authors, with over fifty years of 'bush time' between them, know well. These men have many wonderful qualities but an affinity for abstract learning is usually not one of them. Nearly all Thai mahouts, probably a higher percentage than in most regional neighbors, are able to read and write, at least to the level of four years of formal education and in terms of general vocabulary probably higher than that. (Thailand has a very long history of male literacy, as in the old days boys learned to read at temples in order to study Buddhism.) Unfortunately, the mahouts' comprehension of modern science and biology is extremely rudimentary. Most will have had no formal instruction whatsoever and almost certainly none beyond fourth grade level.

Consequently, an editorial decision was made to keep the vocabulary and the science very simple; even the use of words and phrases such as 'anaerobic', 'incubation period', 'virus', etc., were considered very carefully, in some cases rejected and in some cases used only if they could be made succinctly understandable in text. We feared that mahouts might reject this manual entirely if confronted with too much material beyond their comprehension. (Another argument for scientific simplicity is that many of these men retain a very Thai, animistic cosmology which precludes any possibility of viewing the world solely in a rationalistic,

western way.) Having pointed out the mahouts' limitations, we must also stress that we strongly feel that many mahouts are naturally very bright and capable of more complex procedures than those presented herein. We felt, however, that instructions for more advanced methods should come from veterinarians in the field. Five minutes of interactive, vocal instruction by a good veterinarian on an actual case are worth far more than several pages in this book.

Over the past ten years veterinary care for elephants in Thailand has improved astronomically to become excellent, both in quality and availability. Thailand's 'old hand' veterinarians have joined with universities, NGOs, and government agencies (particularly FIO and the Livestock Department) to build a solid cadre of good 'elephant vets'. As for availability, public donations and government funding have ensured that most Thai elephants, and certainly all complex or critical cases, are treated for free. Thailand's ubiquitous and inexpensive cellular phone network means that veterinarians are now easily contacted, and the excellent road network makes travel easy in most cases. In short, probably over 90% of Thai elephants are within an hour or two's drive of a good 'elephant vet'.

The level of care presented in this book

This manual will be of some use to veterinary students and even to veterinarians with no elephant experience, but there is nothing new and startling for the experienced elephant veterinarian. As for generalist veterinarians, the very few parts of the main text directed to them are a few tips where treating elephants differs from other animals.

The aim of this book has been to enable mahouts to better support the work of veterinarians, not to do the veterinarian's job. The three primary goals are to help mahouts come to quicker diagnoses, to better communicate symptoms to veterinarians over the phone, and to improve care in follow up. An underlying goal has been to encourage prevention of diseases and conditions occurring through paying more attention to food, appropriate work, and hygiene.

The danger for experts writing an elementary book in their specialty is to get bored with simple presentation and to succumb to the temptation to include overly sophisticated content - thus alienating the original target audience. During the writing of this book much overly technical material

was discarded, for example, how to differentiate a cyst from a haematoma, complex diagnostic charts, formulae for determining weights through elaborate measurements of the elephant's body, etc.

Veterinarian readers are asked to suspend judgment on some care techniques presented which are contrary to modern Western professional norms. Veterinarians will wonder, for example, why there is no recommendation for tetanus vaccinations, why the use of cotton wool is so promoted, why the manual in extreme cases recommends cauterizing wounds, and why the use of hydrogen peroxide is suggested. Local conditions mean there are very good reasons for such seeming errors or outdated practice.

Camp managers

Besides mahouts, the second important audience for this book is camp managers, including elephant owners who run their own camps. Some camp managers are quite knowledgeable about elephants while others are simply administrators who act no differently than if they were managing a fleet of cars or trucks. Given the managers' control over food, budgets, hiring and firing of mahouts, determining work assignments and schedules, etc., camp managers often have more influence over elephants' health, for better or for worse, than do the mahouts themselves. The section on 'Food', for example, was written primarily with camp managers in mind. The section on equipment and techniques used to control elephants was written largely as background for inexperienced managers. (Neophyte mahouts will, after all, get most of their instruction on equipment orally from older mahouts.)

The inclusion of camp managers has also hopefully opened the door sufficiently that the book will be useful to other people working for the welfare of elephants: government officials, NGO staff, scientists, etc.

Editor's notes

If the English text does not occasionally seem awkward, this book is not doing its job, simply because there is no natural audience for which this book would ever have been written in English. The information and language is far too basic for veterinarians, veterinary technicians, or even for readers with a secondary education. Further, the Thai language sometimes takes a conversational tone which would be inappropriate in English.

Every effort has been made to keep the two languages in parallel. There has been no slavish devotion to internal sentence order (indeed, that would be counterproductive) but from sentence level upwards the two languages mirror each other. Layout follows the same principle; the same page numbers apply in each edition. This synchronization has been for two reasons. First, it should help readers who wish to work in both languages, primarily Thais trying to improve their technical vocabulary in English but also to support foreign veterinarians, conservationists, and scientists who read some Thai or are working in Thailand. Second, the parallel structure will keep readers reminded that what they are reading was not written with them as the primary recipient.

Many readers of the English edition, particularly hands-on keepers and veterinarians, will acutely feel a paucity of information on traditional technique, herbal medicines being the prime example in the purely medical realm. For four compelling reasons, much traditional knowledge has been kept to a minimum. First, mahouts can best learn such techniques not from a few lines in books but rather from long hours of actually doing the job alongside older mahouts. Second, in Thailand customary technique varies greatly both between regions and the ethnicity (or culture) of the keepers. Third, traditional technique is often so complex that an adequate book would be larger than the one you hold in your hands. Fourth, traditional technique is often impracticable in modern times. This care manual was written to convey modern thinking to mahouts, not to document old Asian ways for academics and professionals

The Thai language

The Thai language used is a careful mix of the formal and the colloquial. As with many Asian languages, the written word requires a degree of formality and if this courtesy were not extended to mahouts, they might feel patronized. Every effort has been made, however, to avoid technical terms and to use the simplest word which is sufficiently clear, for example 'throat' rather than 'esophagus' or 'in heat' rather than the more accurate 'in oestrus'. Nearly always the word employed is the word that would be used in everyday speech.

Each language has its shortcomings. Thai, for example, has no short, single, everyday word for 'sterile', forcing the use of 'clean' (*sa-ard*); in daily life this is no disadvantage because context virtually always clarifies that 'sterile' is meant — but the lack does pose problems in translation. English, conversely, lacks certain concise words which are commonplace in Thai; for example, the everyday mahouts' vocabulary has a lovely

word for 'perineum' (*fii yeb* or 'sewed seam') and every Thai person understands 'dyspepsia' (*thong eut*).

The English language

For some words and phrases, anomalies have been allowed - indeed unavoidable. When listing indications for diseases, for example, the Thai word *akarn* means 'conditions' or 'signs'. Neither of these words are perfectly apt in English, however, and because 'symptoms' is a bit too specific, the somewhat awkward term 'clinical signs' has been used because it perfectly captures the Thai meaning.

The extremely basic level of the Thai has meant that some sweeping generalities and oversimplifications have necessarily carried over into the English, for example, "natural food" or "untreated soil." The meaning is abundantly clear at the level of the Thai target reader and it is hoped that readers in English will make the mental leap and not castigate the authors for their perceived ignorance. Because they reflect the circumstances and the Thai language so perfectly, some words are freely employed which would never be used in scientific or technical writing: 'aggressive', 'naughty', 'nasty sores', etc.

A similar divergence from accepted scientific writing is the extensive use of feet and inches instead relying solely on the metric system. This deviation is because, perhaps surprisingly, 'feet' (*fut*) and 'inches' (*niw*) are the units used in the Thai text because those words would be used by the mahouts in speech. Any spoken approximation of an elephant's height will be in feet, and chains are sized by the *hun*, which is 1/8". Even pieces of cloth and such are usually described in feet. One reason for the use of 'feet' might be that in the old days elephants were sold, because of influence from Burma, 'by the foot' (*khaai pen fut*) of height. Another reason might be that feet and inches are more 'organic' units than metres and centimetres in describing an elephant's dimensions.

In a few instances, brief additions have been made in English within brackets. Usually these are more precise technical terms, e.g., "heat [oestrus]" or Thai concepts, objects, brand names, etc., which have no counterpart in English.

Dr Preecha Phuangkum
Richard C. Lair
Dr Taweepoke Angkwanith

Acknowledgements

The authors would like to thank the veterinarians who contributed their expertise. The main technical reviewers, Dr Michael Woodford and Dr Susan Mikota, provided both academic knowledge and the wisdom of much field experience. Dr Parntep Ratanakorn, Dean of the Faculty of Veterinary Science, Mahidol University, read parts of the manuscript and offered many useful suggestions. Dr Bjarne Clausen, a friend of the Thai Elephant Conservation Center, proffered several useful thoughts. Dr Vishnu Songkitti, Technical Assistant, Agriculture Department Group (RAPG), FAO, provided sound advice to early drafts.

Ms Sarah Scarth, IFAW's Director of Emergency Relief, provided constant support and encouragement.

Within FAO, we wish to thank Mr Masakazu Kashio, Forest Resources Officer, Forestry Department Group (RAPO), for his extraordinary hard work and dedication, and Mr Ronald Van Nijnanten, Coordinator, Regional Operations Branch (RAPR), for his patience and his understanding.

Within our own organization, we wish to thank Mr Chanatt Lauhawata, Managing Director of the Forest Industry Organization, for his solid encouragement and faith in the project. His predecessor, Col. M.R. Aduldej Chakrabandhu, provided much help and support in early days, as did Mr Manoosak Tuntiwiwat, Deputy Managing Director. Mr. Suntud Sangkul, Head of the Wood Product Division, Wood Industry Office, and Ms Sureeporn Niyomdham, Head of Technical Subdivision, Office of Administration, provided invaluable logistics support. In Lampang, Mr Nipakorn Singphutankul, Chief of General Administration, was a constant support, as was Mr Chalernsak Toomhirun, Manager for the Thai Elephant Conservation Center. Dr Sittidet Mahasawangkul, Acting Chief of FIO's Elephant Hospital, and Dr Saran Chansitthiwet offered useful veterinary advice. Mr Prasob Thipprasert, Chief of our Training School for Mahouts and Elephants proffered useful suggestions.

Miss Wikanda Wongsuk did most admirable secretarial work.

We would like to thank Mr Saksith Camluang and Mr Chalaphan Upakij who did the layout, and Ms Sirikorn Inkom, who did the beautiful pencil drawings.

CONTENTS

FIO Foreword.....	<i>iv</i>
FAO Foreword.....	<i>v</i>
Authors' preface to the English edition.....	<i>vi</i>
Acknowledgements.....	<i>xi</i>
INTRODUCTION.....	1
LEGAL OBLIGATIONS.....	2
Registration and law.....	2
Registration Certificate.....	3
Microchips.....	5
Transporting elephants.....	7
Stall in truck.....	9
SHELTER AND FOOD.....	11
Shelter.....	11
Water.....	13
Food.....	14
Social and economic factors in food.....	15
Natural food.....	16
Cultivated foods in tourist camps.....	16
Cultivated foods, practical aspects.....	19
Fodder.....	19
Vegetables and fruits.....	21
Supplements.....	22
High energy foods.....	22
Tonics.....	23
CONTROLLING ELEPHANTS.....	24
Tools.....	25
Hook.....	25
Bush knife.....	26
Ear halter.....	26
Hobbles.....	27
Tethering chains.....	28
Robe and wire rope.....	31
Elephants that fight their chains.....	33
Special equipment for problem situations.....	34
Spiked hobble.....	34

Spiked collar.....	34
Spiked grappling pole.....	35
Spear.....	36
Guidelines for tethering elephants.....	36
Absolute prohibitions in controlling elephants.....	37
Dragging gear.....	38
LIFE-CYCLE EVENTS.....	39
Determining age.....	39
Determining heat (Oestrus).....	40
Predicting heat.....	40
Coupling.....	41
Mating.....	42
Pregnancy.....	43
Birth.....	44
Weaning.....	46
Food for calves.....	46
Musth.....	52
Disposal of elephant carcasses.....	55
Methods of disposal.....	56
Diseases requiring caution during disposal.....	57
PRIMARY MEDICAL CARE.....	59
Medicines and drugs to have at hand.....	59
Tools and equipment.....	63
Equipment at an elephant camp.....	63
Equipment for a small camp and traveling.....	65
Hygiene.....	66
Collecting samples for analysis.....	68
Determining health.....	69
Using a thermometer.....	71
Medicating orally	72
Medicating rectally.....	73
Mahouts giving injections.....	74
Caring for sick elephants on the ground.....	76
Health conditions caused by humans.....	77
Overwork (Exhaustion).....	77
Malnutrition.....	77
Stress.....	80

Heat stroke.....	80
Collapse from cold.....	81
Wounds.....	82
Treating wounds.....	82
Stanching bleeding.....	83
Wound cleaning materials.....	83
Hot and cold applications.....	85
Types of wounds.....	85
Abrasions.....	85
Blunt-edge wounds.....	86
Slice wounds.....	86
Puncture wounds.....	86
Gunshot wounds.....	87
Bites.....	87
Pressure wounds.....	87
Burns.....	88
Impact wounds.....	90
Wounds from explosives.....	90
Abscesses.....	90
Acute abscesses.....	90
Chronic abscesses.....	91
Toxins.....	92
THE OUTSIDE OF THE ELEPHANT.....	94
Skin.....	94
Papilloma.....	95
Fungus on the skin.....	96
Ventral oedema.....	97
External parasites.....	98
Gad flies.....	98
Fleas and mites on the tail.....	99
Hair lice.....	99
Tabanus flies.....	100
Head.....	101
Eyes.....	101
Medicating eyes.....	103
Ear infections.....	103
Trunk.....	104

Tusks.....	105
Feet and nails.....	107
THE INSIDE OF THE ELEPHANT.....	110
Muscles.....	110
Bones.....	111
Arthritis.....	112
Alimentary tract.....	112
Parasites in the alimentary tract.....	113
Liver flukes.....	113
Cestode worms.....	114
Round worms.....	114
Recommendations on using Ivermectin.....	116
Dyspepsia.....	117
Constipation.....	117
Diarrhoea.....	118
Diarrhoea without germs.....	118
Diarrhoea caused by germs.....	119
Enterotoxemia.....	120
Salmonellosis.....	120
Colibacillosis.....	121
Disease.....	122
Pneumonia.....	122
Anthrax.....	123
Haemorrhagic septicaemia (Pasteurellosis).....	125
Tetanus.....	127
Tuberculosis.....	128
Herpes virus.....	130
Foot and mouth disease.....	130
Elephant pox.....	132
Rabies.....	133
Trypanomiasis (Surra).....	134
PHOTOGRAPHS.....	136
APPENDIXES.....	141
Recommendations for veterinarians.....	142
Table 1: Elephant food.....	146
Table 2: Medicinal plants.....	148
REFERENCES.....	150

Introduction

For people who make their living from elephants in Thailand in 2005, the world is a very strange place. Older mahouts can easily remember when as young men 30 years ago, keeping elephants was not that different than it had been since ancient times. In the north, people logged for teak. In Surin and the northeast, many people captured wild elephants, especially in Cambodia, but the last wild elephant was caught in Surin as late as 1963. In much of Thailand, especially in the rainy season, people still used elephants for everyday transportation. Life for elephant people was, as always, very difficult – but it was also very simple and very easy to understand.

Only half a lifetime later it is like the world has been turned upside down. The number of domesticated elephants has fallen from about 100 000 a century ago down to about 2 500, or a loss of 97 percent. Capturing wild elephants is illegal, whether in Thailand or going into Cambodia. The Thai government banned logging in forest concessions in 1989, and in 2005 even illegal logging has gone way down. The thought of using an elephant to regularly transport goods or people — apart from tourists — is laughable. A two-year old calf, nearly worthless in the old days, is now more valuable than many big, strong bulls — apart from those rare beautiful tuskers that are so sweet-natured they are safe around people.

Presently most of the work for Thailand's remaining elephants and virtually all of the work not against the law is in entertaining tourists, sometimes Thais but mostly foreigners. Since 2001 Thailand has received over ten million visitors a year. Without these people who board an airplane in Paris or London or New York and less than a day later reach Thailand, there would be little or no work in Thailand, certainly not enough to employ all of the country's 2 500 domesticated elephants. But the same globalisation that has brought a replacement for the loss of traditional work has also brought new problems. Modern westerners, and even Thai city people, can be very critical of the way elephants are treated in Thailand. In 2003, a traditional elephant-breaking videotaped in Mae Hong Son was broadcast on television all around the world, becoming an international scandal when an animal rights group demanded that tourists boycott Thailand. This incident was seen by the Tourism Authority



of Thailand and the Ministry of Foreign Affairs as a major problem in international relations.

In 2003 SARS, a viral disease of wild animals in southern China, suddenly entered the human population in several places around the world including Thailand. Nothing to do with our elephants, you would think, but the epidemic caused a fall in tourists visiting to Asia that so lowered the number of people coming to Thailand that some elephant camps were forced out of business and even the price of elephants was forced lower.

The point of all this is that times have changed and that mahouts (and elephant owners and managers) must change with the times. This need for change is true in the area of health care. Veterinary medicine has greatly improved over the last 100 years, but Thailand's mahouts and elephant camp managers must constantly strive to learn more about how those scientific advances can be used to improve the well-being of elephants.

LEGAL OBLIGATIONS

Registration and law

Many laws apply to owners of domesticated elephants but undoubtedly the most important one is the Draught Animal Act of 1939 [*phrarachbanyat sat pahana*, B.E. 2482], that empowers officials of the Registration Offices of the Local Administration Department (Ministry of Interior) with jurisdiction over elephants. (Unless otherwise mentioned, all of the obligations of elephant owners mentioned below are from this law.) In addition to the Draught Animal Act itself, various ministerial regulations [*kot grasuang*] issued by the Ministry also affect owners.

The Draft Animal Act is an outdated law written over 60 years ago and modified only slightly since promulgation. Its purpose at the time was to, through identifying individual elephants and their owners, establish the rights and obligations of ownership, largely to control thefts, as is shown by the fact that elephants are lumped together with cattle, water buffalo, horses, donkeys, and mules. In 1939 there were tens of thousands of domesticated elephants and they were clearly seen as private property, as they still are in Thai law. This law was geared, as was correct, to a



traditional agrarian society where the elephant had great value as a draft animal. At the time there was very little concern for the welfare of individual animals.

Many organizations, including both government agencies and NGOs, are proposing new laws that will better suit modern times in regulating the use and management of elephants in Thailand.

The two most important ways to avoid problems with the law are to (1) keep all of your registration and travel documents in perfect order and (2) do not take elephants to urban areas where it is clear that trouble is likely to arise.

Registration Certificate

ตัวพิมพ์รูปพรรณ

You are required to have a valid Registration [and ownership] Certificate [*dtua pim ruuphaphan*] for every elephant you own. If you own or keep an elephant that has no Registration Certificate (or has a Certificate that belongs to another elephant), that animal is liable to confiscation unless you are able to prove ownership and to prove that the elephant was honestly acquired. This document is legally required to be in your possession when you are with the elephant, particularly when travelling.

Acquiring or changing Registration Certificates always takes place at the Registration Office in your home district. Registration Certificates are valid for life, and only three circumstances legally require changes to the actual document: (1) calves reaching eight years, (2) a change of owners, and (3) the elephant's death.

When calves reach the **age of eight years** (or within 90 days thereafter), the owner is required to attain a Registration Certificate. Owners who wish can at an earlier age acquire an alternative document called the 'stable offspring certificate' (*bai luuk khawk*) that also indicates ownership. Until recently, at least, this document has been of questionable usefulness because government officials usually do not question the ownership of a calf younger than eight or so when the calf is with a mature female presumed to be its mother. Another problem posed by the 'stable offspring certificate' is that elephants under eight years of age change very quickly and thus have few distinct defining characteristics.



When there is a **change of owners** (or within 90 days thereafter), the new owner(s), accompanied by the old owner(s), must modify the Registration Certificate. Reporting and registering a change is required with all sales, purchases, and even inheritances within a family. An official will record the change and write the details of the new owner(s) on the back of the document. Both the old and new owner (s) should bring their Identity Cards and Household Registration Certificates.

The **death of an elephant** requires the owner to report within 15 days. The Registration Certificate must be surrendered at the Registration Office.

Before **moving the carcass of an elephant** to another province, you must take the elephant's Registration Certificate and the Certificate Allowing Transportation (see page 8) and first report to the District Veterinarian in the new location in order to request his permission to make the move and to specify the route. Violators are subject to punishment, either a fine not exceeding 1,000 baht or more than two months in jail or both. (Animal Epidemic Disease Law, 1956, Livestock Department)

Epidemic diseases

In cases of elephants having **contracted or died from an epidemic disease**, you must report the case to the District Veterinarian within 24 hours. If alive, it is forbidden to move the elephant out of the immediate area. The law has several other requirements but the wisest thing to do is if you simply follow the orders of the District Veterinarian. (Animal Epidemic Disease Law, 1956, Livestock Department)

Urban areas

Whenever you take an elephant into an urban area which is subject to municipal regulation, such as Bangkok, Chiang Mai, Pattaya, etc., you potentially face many different legal problems from many different laws. If the police or municipal officials wish to make things difficult for you, you can be charged with violations of traffic laws, laws on public order, laws on cleanliness, laws on destruction of property (such as destroying a tree), etc.



Keep copies

Keep at least two certified copies of the Registration Certificate in different places, in case one should be lost or destroyed. When at the Registration Office acquiring a Registration Certificate you can request additional copies, which if signed by the Registrar to be correct copies have equal validity as legal documents. Extra copies cost only a few baht each and they can save you much money and hassle by avoiding the expenses and problems caused by lost and damaged documents. It is not clever to have a perfectly legal elephant confiscated, even if only temporarily, because a single piece of paper has been lost or misplaced.

Keep the original document (with fee stamps on the back) in a safe place at home. When travelling, carry a certified copy with you; in fact, on the road, where accidents are more likely to happen, it is safest and easiest to have two copies with two different people in the party.

In your copy of the *Mahout's Handbook* do write down the date, location, and serial number (including receipt book number) of the Registration Certificate of your elephants. In the case of a lost certificate, this information will speed up the process of getting a replacement.

It is a good idea to buy strong plastic sleeves or envelopes to store these fragile documents. Try not to fold them.

Microchips



A microchip is a device inserted into the body of the elephant in order to identify it as an individual. The microchip system has two components, the microchip itself and a reader, a device that can determine the unique code number of a microchip.

A **microchip** is a device that is very small, about the diameter of a grain of rice and about 1 cm long. Inside a glass pellet is a unique code number which is never duplicated. The microchip is injected under the elephant's skin. Veterinarians usually implant the chip in the back of the left ear.



A **microchip reader** has the ability to read the chip's individual number from a distance of about 10 centimetres. The code usually consists of nine digits or otherwise, as below.

TN 123-456-789 or 123-456-789 A or 4D 123-456-789

The usefulness of microchips

Microchips are useful because presently there is only the Registration Certificate which can determine ownership of an elephant, and that document has insufficient details. Consequently, it is possible for illegally captured wild elephants or illegally imported elephants, or for stolen elephants, to be issued a Registration Certificate. Implanting a microchip can prevent such fraudulent registration. A microchip also makes it very easy for an official to know the animal's registration history when an elephant is being transported or its medical history when receiving veterinary treatment.

The current situation

Presently both NGOs and government agencies are for free implanting microchips in elephants all over the country.

Many people are afraid of microchips but to a law abiding owner, microchips are just like the registration papers for a vehicle, which include that vehicle's unique numbers on its engine and chassis, numbers that are hard to change or destroy. If you have registered an elephant and it is stolen and then found, you will get it back. If you are registered, you will never have to prove it is not an elephant illegally brought in from Myanmar [Burma].

In any case, microchips do not presently play much of a role legally because microchips are not required by law and because although many elephants have been microchipped by many different government agencies and NGOs, there is yet no central database that compiles all of the numbers in one central place. Further, the place where chips have been implanted has not been standardized; chips have been placed both behind the ears and in the shoulders on both the right and left sides. Further, the readers are expensive and thus inaccessible to many officials.



Transporting elephants

Before transporting elephants, make the following preparations:

1. Plan the journey
2. Prepare the elephant
3. Prepare the vehicle and the necessary equipment
4. Prepare the required documents

1. Plan the journey

Before travelling, the mahout should know following the essential details: the route to be taken, the approximate time of travel, and the destination point. This information is essential so that the elephant is assured of having sufficient food and water while on the road. The easiest thing is to prepare banana tree stalks and other food with high moisture content, as this is more convenient to carry than ordinary food and water. Also the mahout or manager should ensure that there is a suitable and easy place for the elephant to board the truck and to disembark from the truck at the destination, especially if the elephant is hard to unload. If the elephant must travel far (more than one day), the mahout should know places to buy or find food and water.

Warning: It is essential to avoid travelling in strong sunlight because the elephant can suffer from such exposure even to the point of death. Travelling at night is best.

2. Prepare the elephant

Before transporting an elephant, the animal should be given time, at least two or three days, to rest and to eat and drink to its satisfaction. For cow elephants and calves, it is not good for them to travel alone; it is best if they have an elephant they are familiar with as a travel companion. (The mother will not be apprehensive and will be easier to control.) Most importantly, in moving elephants to a location with which they are unfamiliar, it is essential that the mahout should always stay very near the elephant and should never desert the elephant.

When transportation involves a vehicle, the mahout should know whether the elephant is familiar with climbing on and off a truck. If the



elephant is difficult to load or the animal is fearful, other people must be called in to help in the loading. It is best if the elephant has been practiced and is comfortable getting on and off a vehicle, because if not the loading can be difficult: wasting a lot of time, putting the animal in great stress and possibly even wounding it with spears or elephant hooks.

3. Prepare the vehicle and equipment

If transportation is by motor vehicle, the mahout or manager must be satisfied as to the size and the condition of the vehicle, in order to assure a safe and punctual arrival. The mahout or manager should determine that the vehicle is legally registered and properly insured. The driver should have a valid commercial driver's license, either Class 2 or Class 3. The mahout should determine that the driver is even-tempered and, preferably, has experience transporting elephants.

4. Prepare the required documents

The manager, owner, or mahout should make sure they have in their possession the original Registration Certificate when they apply for travel papers. When travelling, a copy is sufficient and the mahout should be ready to at any time present a copy of the Registration Certificate to any inspecting official.

Before travel, the manager, owner, or mahout must prepare the four following documents:

1. A guarantee of the suitability of the destination as an appropriate place for the elephant. This guarantee is issued by the Livestock Department. Before travel, the owner or manager must contact responsible officials of the Livestock Department at the destination.

2. The original Registration Certificate and a copy of the same.

3. A certificate guaranteeing that the elephant has been vaccinated in the elephant's home district. The owner, manager or mahout must get this certificate from the district Livestock Department.

4. A copy of the elephant owner's National Identity Card and the Household Registration Certificate. If the owner is not the person in charge while transporting the elephant, then he must prepare a Power of Attorney designating the person who will have responsibility, and that



person must have copies of their National Identity Card and their Household Registration Certificate and of the Power of Attorney when they apply for travel papers.

The person applying for travel papers must supply the street number, district, and province of the destination. Also, he must supply the registration number of the vehicle to be used.

With all of these documents, the responsible person wanting to transport an elephant (or the carcass thereof) should go to the office of either the district or provincial Livestock Department in the elephant's home and request a Certificate Allowing Transportation, official form *R. 4. Rachanajakr*. When returning home, the same procedure is to be followed at the district Livestock Department of the work place.

Once having acquired the Certificate Allowing Transportation at the departure point, the person named in the Certificate must move the elephant via the route described. The vehicle must stop and present for inspection both the documents and the elephant to responsible officials at all of the Livestock Department checkpoints on the route.

After having reached the destination, the elephant must be kept in the place designated by the Livestock Department veterinarian in for no less than ten days before it can be moved to another place.

If an elephant is moved without permission or moved by a route or to a destination other than the one described in the Certificate Allowing Transportation, the responsible person is liable to punishment of not more than six months in jail or a fine of no more than 10 000 baht, or both.

After the elephant has reached its destination, it is important to inspect to see if it has wounds of the mouth, feet, legs, trunk, tail, or body that come from being jostled about. Any wounds must be treated immediately. Especially important is to inspect the eyes for any irritation or infection from the wind or wind-blown foreign objects during travel. If so, wash the eyes and administer eye drops immediately; then have a veterinarian inspect the problem and provide further treatment.

Stall in truck

If an elephant is travelling by truck, it is best if a stall is built for it. (That stall can easily be dismantled and used again for the same type of truck: ten-wheel, six-wheel, etc.) To the mahout who has never seen or



used one, the stall must look like it is meant to keep the elephant from running away, or milling around, or attacking the mahout. Once in a long while it does serve all of these purposes.

The real purpose of the corral, however, is to provide the elephant with some support and, even more, to help the elephant easily find balance. When a fast moving truck goes up or down hill, or into a turn, or when the truck brakes quickly, an elephant that has no support must constantly use its muscles to correct for the ‘pull’ exerted. It looks like the elephant is doing nothing but in fact it is hard at work physically and even mentally, because the elephant must remain constantly alert. Such an elephant will arrive at the destination physically exhausted.



The situation is no different for a man and an elephant. Imagine yourself standing in the middle of a ten-wheel truck with no support for a twelve hour journey. Then imagine how much easier it would be if you could put a hand on a rail on the side of the truck. It is true the elephant has four legs, which makes it easier, but it is also harder for the elephant because it cannot react so quickly as a human can.

With a stall, the elephant can lean a modest percentage of its weight against a rail. Going uphill, the elephant will lean its rump slightly against



the rear rail. Going downhill (or when the truck brakes), the elephant will lean its chest slightly against the front rail. In curves, it will lean part of its shoulder or body into the side rails. The rails provide some support, taking the load off of muscles, but more importantly they help the elephant find balance. The elephant reaches its destination in good condition, not having wasted a lot of strength and mental energy for lack of support.

Another advantage of the stall is fewer behavioural problems, such as panic or ‘aggression’, which often arise when an elephant feels itself unsafe and in danger.

Corrals like this are quite common throughout the north but rarely used in the northeast. Making and using a stall is especially appropriate when moving elephants on highways that are steep and have many



curves, particularly when shipping over long distances. The cost of construction is very cheap, using only four poles, which must be strong and resilient, and only two bolts. As for any rope used, most mahouts will have it at hand already.

SHELTER AND FOOD

Shelter

Shelter is a critical element in any elephant facility or camp. Shelter falls into two major types according to use:



- In tourist facilities where elephants are normally kept outside feeding on natural food at night, to provide elephants with daytime protection from sun and rain during working hours.
- In facilities where the elephants must be kept in the same space day and night because there is not enough space to do otherwise or because sick elephants that must not be moved for health reasons are being treated.

The characteristics of good housing should have the following properties:

Able to protect the elephants from sun and rain, which depends on the material used for the roof. The material most often used is grass or banana tree leaves. The advantage of such materials is that they are cheap and they do offer proper protection from the sun's rays, but the disadvantage is that the roof must be changed every two to three years and that grass roofs catch fire easily.

As for other materials, such as tile, they are likely to be used in situations where the purpose is to regularly treat sick elephants because they offer good protection from heat and because they are long lasting. The disadvantage of other materials is that they are expensive. Some sites that want to filter out sun use 'sun layer' [*saleen*: A plastic screening used in plant nurseries.]

Warning: The use of galvanized tin for roofs is not recommended as

- it collects heat.

Have good ventilation. Ideally housing should be open on all four sides and the roof should be at least six metres tall. (A mature bull elephant is nearly 3 metres tall and the trunk is about 1.5-2 metres long.)

Warning: Some elephants should not be left unattended at night

- because they will attempt to damage the housing.

Have space sufficient for the number of elephants and not be cramped. A standing elephant requires about 16 square metres of space (although this varies with the nature of the elephant). Therefore, shelter for ten elephants during the day should be a shelter of 4 X 40 metres, with the elephants all in a row. (Sleeping elephants require about 19-20 square metres.)

Warning: It is best to avoid putting elephants that are unfamiliar with each other in the same housing.



- Have a floor that is easy to clean, not humid, and not slippery. Floors are of two types, tightly packed earth and concrete, and each has advantages and disadvantages. Elephants are likely to have fewer problems with footpads and nails on packed dirt floors, but concrete floors are easier to clean.
- Have a system where excretions and refuse are easily cleaned and which has channels for draining water. The best system for cleanliness is the mahout himself, for he has to clean up after his own animal. There should be a drainage system for water and the floor should be smooth without any depressions which can collect excretions and refuse. The floor should also have a slight slope towards the drain.
- Have strong anchoring points for chains. Such points should have bases that are buried 1 to 2 metres deep in the ground. The posts supporting the roof should not be used as chaining points.

Be sited in an appropriate location. The location should be chosen being aware that:

- The site should not be near the water source, or rather so near that there can be any drainage from the housing reaching the source, especially if the water is used for drinking. The site should not be located at a higher elevation than any natural water channel.
- The site should be located far from any thoroughfare. Traffic can cause elephants stress and prevent them from resting.
- The housing is best built on an east-west axis to minimize exposure to the sun.
- The housing should be built on a level area with very little incline.

Water

The elephant is an animal that is very susceptible to overheating, and consequently it is very fond of bathing and covering itself in mud. A mature elephant drinks approximately 120 litres of water daily, by sucking up water in its trunk (about 10-15 litres at a time) and then spraying it into its mouth. It is thus essential to always have clean water available for both drinking and bathing. Elephants usually drink at the same time they bathe, enabled by the mahout, usually twice a day (morning and late afternoon). Besides drinking, elephants also need water to be sprayed over their bodies to help dissipate heat.



Because elephants will often urinate and, more particularly, defecate in the water in which they bathe, this can pose health problems in transmitting infectious diseases. If at all possible the mahout should use different water sources for drinking and bathing. The mahout should also encourage the elephant to drink before bathing, so as to lessen chances for contracting a disease. If possible, elephants should not be allowed to drink from ponds or tanks used by domestic cattle or water buffalo. If the water is a moving natural source, such as a river or a stream, the elephants should be encouraged to drink first from an area upstream from the bathing area.

- The natural water sources used for elephants include streams, swamps, marshes, and canals. The mahout must know the preferences and prejudices of his elephant, for some animals will not drink from water tainted by the urine or dung of other elephants or other domestic animals.
- Human engineered sources for water include wells, ponds, canals, and piped tap water, for example, and these do not normally present any problems with contamination or contagious diseases. Even elephants that are unaccustomed to drinking from a rubber garden hose soon become adept at it.

Warning:

- Allowing elephants to drink freely immediately after hard work when the animal is overheated is likely to cause the elephant to choke and even to cause some animals to die.
- You should select a watering vessel that is totally uncontaminated, for example by petroleum products, because the elephant might not drink such water or spray with it.

Food

Food has incredible impact on the health of elephants. Proper nutrition, ensuring that appropriate foods are offered and in the right quantities, makes for healthy elephants resistant to disease. If a veterinarian inspects an elephant camp and sees the animals are generally in poor condition, the very first suspicion for a cause is not disease but rather bad food or insufficient food or both.



The subject of food is divided into two main sections, first, the social and economic aspects of food today in Thailand, and, second, the practicalities of the available food, particularly cultivated foods. The first section, social and economic aspects, should be of particular interest to caring and responsible camp owners and managers and should also be of interest to animal welfarists, conservationists and scientists. Hopefully the more thoughtful mahouts and foremen in tourist camps will see the subject of proper food as an accurate description of the problems they face.

The second section, practical aspects of food, should be of interest to all ‘elephant folk’ including all working mahouts and, even more, camp managers.

A third section on food supplements for sick and out of condition elephants applies to elephants everywhere, whether a tourist camp or a more natural environment.

Social and economic factors in food

Since ancient times until maybe 20 to 30 years ago, domesticated elephants ate almost only natural, wild foods. Since then, the 1989 ban on logging has caused the loss of many jobs in the forest and there has been a steadily increasing number of jobs at tourist camps near cities and away from natural areas. In 2004 probably more than 1,000 domesticated elephants are spending all or most of their year eating cultivated foods.

The division between natural foods and cultivated foods is not always absolute. Some elephants working in suburban areas eat a mix which includes cultivated foods and natural grass. Some elephants living in rural areas eat a mix of both natural foods and agricultural foods. Further, some elephants spend part of the year in tourist camps and part of the year at home. Still, because natural food is rarely dangerous and cultivated food often is, and because a massive but still growing tourist industry ensures that ever higher numbers of elephants will be eating cultivated foods, any discussion of food and elephants’ health must deal with this recent change.



Natural food

Natural food is the best food for elephants, because it is what they have eaten through millions of years of evolution. Wild elephants will eat as many as 200 plant species during the course of a year, but their preferred staple food is grass and bamboo (which is a kind of grass). Elephants also eat lianas, wild palms, wild bananas, various shrubs, the leaves and bark of certain trees, and even plants that serve as herbs.

Natural food has three great advantages. First, it is cheap – usually free but sometimes costing modest grazing fees. Second, in most natural environments the elephant eating natural foods will get a full range of nutritional ingredients. Third, natural food is free from chemical contaminants, most importantly insecticides, pesticides and fertilizer residues.

There is nothing that this book or any book can teach mahouts about natural food. The older mahouts are past masters of natural elephant foods, expert amateur botanists who can without exception neatly identify hundreds of species of grasses and other plants. The young mahouts might know little, but their proper teachers are not books but rather the older mahouts. Sadly, much of the older mahouts' knowledge about food plants found in the wild will surely die out unrecorded in the next few decades.

Cultivated foods in tourist camps

Times have changed, however, and with the coming of mass tourism, more and more elephants are dependent on foods grown by man. Cultivated foods frequently pose health problems associated with contaminants and nutrition, and these problems are discussed on page 19.

Cultivated foods must be bought, and they are almost always expensive. (Elephants need a great deal of food every day, on average about 100 kilograms a day.) High costs often lead to other problems. Elephants will often be fed insufficient food or poor quality food or both. Sometimes they are fed only one or two kinds of food, leading to nutritional imbalances and ultimately malnutrition. For example, in order to save money on food many elephants in the central region, Pattaya in particular,



are fed mostly on rejected pineapples and pineapple tops bought very cheaply from canneries.

Economics of food

Running a commercial tourist camp is a highly competitive, even cut-throat, business with low profit margins. Elephant food is just one expense to be budgeted along with salaries, running vehicles, site rental, etc. Scrimping on elephant food to spend on something else or to keep as profit can be very tempting to unscrupulous personnel. Another problem is that because most elephant camps for tourism have at least ten elephants, the food gets usually bought in bulk and it is hard to cater to individual elephant's needs. At certain times of year good and cheap food might be unavailable.

Food and camp owners and managers

Quite a few camp owners are very active in caring for their elephants, most particularly if they actually own them. Other camp owners will have entrusted all management to a manager. If that manager is both knowledgeable about elephant food and honest (spending all of the money given to him to purchase food for that purpose), the camp owner's lack of involvement poses no problem. If the manager is dishonest, however, or if he knows little about elephants' food needs, disaster can result.

Food and elephant ownership

Every elephant in a tourist camp falls into one of four categories:

- Owned by the camp owner.
- Owned by the mahout (or his family)
- Rented by camp owner, mahout supplied by the owner
- Rented by camp owner, who also hires the mahout

Often the quality of the food given the elephants is reflected in this relationship. Camp owners who own the elephants and mahout-owners almost always provide good food, if only because it is protecting a valuable asset. Rented elephants can end up in unfortunate situations where



owners or managers do not want to pour a lot of money into somebody else's elephant. In some cases mahout-owners work for a salary (and tips) and the camp owner is obligated to supply the elephants' food; if he provides bad food this can cause great tension between him and mahout-owners and mahouts who are responsible for their boss's elephant.

Food and the mahout

In nearly all tourist camps the mahouts have very little control over the major part of their elephant's diet. The camp owner selects the food and the mahout's duty is to make sure that his elephant gets its fair share, and to be there to give it. A conscientious mahout will also see that his elephant gets as much local grass as possible, whether cutting it and bringing it to the elephant or taking the elephant to the grass. Mahouts caring for an elephant that does not belong to them can be lazy or even downright neglectful.

Conclusions

The food situation in any camp is very complicated and a microcosm unto itself. Before any elephant is properly fed there must be a conscientious camp owner, a conscientious manager, and a conscientious mahout. Any weak link in this chain is bad for the elephant, and the higher up the fault, the worse it is for elephants. Even if the camp owner, manager, and mahouts are all well-intentioned, the camp must be making enough of a profit that the camp owner has sufficient funds to buy good food.

For people concerned with elephants' health, bad or insufficient food in a camp is a particularly frustrating issue because it is so difficult to address the problem. Veterinarians are forced to treat cases that should never have occurred in the first place. Because tourist camps are private businesses, concerned NGOs and civil servants have little power to implement improvements or force changes. In the end, all that can be said is that the thorny issue of food will require much attention in the future.



Cultivated foods, practical aspects

The good part about cultivated foods compared to natural food is that most grown foods have very high nutritional value, but grown foods also have many drawbacks. First, cultivated foods must be bought and they are most often expensive. Second, cultivated foods are often contaminated with man-made chemicals, mostly insecticides and herbicides that are highly toxic to elephants. Third, in many situations, particularly tourist camps where elephants are fed largely with cultivated foods, the elephants will often be fed insufficient food, poor quality food, or fed only one or two kinds of food. Unbalanced food can lead to nutritional imbalances and ultimately malnutrition. Many elephants in Phuket or Pattaya, for example, are fed too many pineapples and pineapple tops.

Fodder

Cultivated **fresh grass** is very palatable and comes in great variety. The grasses generally given to elephants are the same as given to other draft animals: Bana Grass, Pangola grass, Napier (or Elephant) grass, Para grass, Guinea grass, and Ruzi grass. (See Appendix XXXX AND FFF for Thai and scientific names.) These grasses are available in great quantity. Many other grasses do not have the same nutritional value but are still acceptable. Besides these, there are still other grasses found in nature that the mahout can gather or to which the elephant can be taken and tethered. There are more grasses used to feed elephants in Thailand than those mentioned above. Mahouts should observe which grasses their elephant likes and which it does not like.

What is critically important is to try to not feed the elephant with only a single species of grass because not only will the elephant not eat fully but eating only once kind of grass can cause malnutrition from lack of some essential food component or trace element.

Warning to camp managers: You should be very careful if you buy grass from outside sources. Have a highly experienced mahout inspect all deliveries for freshness, absence of dirt, etc. Inspecting for contamination by herbicides and insecticides is difficult so it is best if you have a serious discussion with your supplier, and best of all is if you inspect the growing site yourself. Many veterinarians feel that some



fertilizers have played a role in elephants made ill, even to the point of death, so you might insist that all grass comes from untreated soil.

Recommendation:

- For grasses that have been cultivated, whether by yourself or bought from someone else, all grass should be carefully inspected to make sure that is neither too young nor too old, because that can lead to dyspepsia or constipation. (See page 117)
- Grass should not be kept longer than one week.

Dried grass fed in Thailand is most often Pangola grass or Cavalcade. Dried grasses can be stored for a long time and easily transported. Dried grass is appropriate for elephants in musth because it has high fibre but little nutritional value. (The elephant has the satisfaction of eating but without getting the high calories which, it is believed, will cause a very long musth period.). Some mahouts enhance the palatability of dry grass by sprinkling it with salt water.

Warning: Dried grass scatters easily when the elephant gathers its food with its trunk, and many elephants like to play with the grass by throwing it over their bodies. Thus, dried grass should be given in small quantities at a time and replenished only after the elephant has eaten the last batch, otherwise much grass will be wasted.

Coconut fronds are good food for healthy elephants from growing calves to mature elephants. Coconut fronds are easily found over the whole country, and have the great advantage of being totally uncontaminated by chemicals.

Warning: Before giving fronds, they should be cut into pieces as long as the hand. Otherwise, the elephant will likely become constipated.

Banana tree stalks are appropriate for elephants in musth, elephants kept where water is scarce, and for all elephants when the weather is hot. Banana tree stalks have a high water and fibre content but very little nutritional value. Banana tree stalks are good when transporting elephants because they can supply much of the water the elephant needs, and because they provide the satisfaction of chewing or eating; banana stalks do all this in a ‘package’ that is much easier and cleaner to carry than buckets of water and sheaves of grass.

Warning:

- Too many banana tree stalks can cause ventral oedema.



- Stalks should be cut into pieces about one hand's length because long lengths are likely to bind or obstruct the intestines.

Vegetables and fruits

Vegetables and fruits are given as regular food only to elephants working in tourist venues in or near commercial agricultural areas. Fruits and vegetables, while excellent supplements, are usually not, and should not be, staple foods because in too great a quantity they provide neither the roughage nor the combination of nutrients that elephants require.

In tourist camps the frequently met problem is that when fruits and vegetables (apart from sugarcane and bananas) grown for human consumption are bought, they are most often bought because they are being sold very cheaply because they are not saleable on the open market, being too old or too ripe or too green, etc. Consequently great care must be given when buying and feeding with fruits and vegetables.

Another problem is that fruits and vegetables are often contaminated with chemicals (herbicides, fertilizer residues, etc.)

Sugarcane and **bananas** are probably the two most common 'treats' sold or given to tourists to feed to elephants. This frequency is partly because sugarcane and bananas are what tourists expect to give, and partly because they are easy to store and clean and easy to hold in the hand. Coincidentally, both sugarcane and bananas have very high nutritional value and can be considered high energy foods.

Pineapples have a very high sugar content. Elephants can eat all parts of the pineapple plant. Pineapples are good for exhausted elephants and elephants at hard work.

Warning:

- If you give too many pineapples, or give them too often, pineapples can lead to diarrhoea and a sore mouth.
- Eating too much pineapple makes elephants look fat and robust, but in fact they have little strength because of the high sugar content. Camp managers should supplement pineapples with other food.

Cucumbers and water melon are sometimes fed to elephants, such as elephants in musth and, especially, elephants in cities.

Warning: Cucumbers and water melon are good food but the problem is with contaminants, which the mahout must be aware of. Soak



cucumbers and water melons in a solution of clean water and potassium permanganate for 15-20 minutes before feeding.

Other fruits and vegetables are sometimes given, such as oranges, carrots, papayas, lettuce, cabbage, etc. These are not staple foods because they are quite expensive and are likely to be chemically contaminated. The mahout should give only a little bit first and then wait for 6-12 hours. If no ill effects are observed, more can be given.

Warning: Fruits and vegetable should be soaked in a solution of clean water and potassium permanganate for 15-20 minutes.

Potassium permanganate

ต่างทับทิม

Potassium permanganate is a chemical that comes in dark purple granules and is easy to dissolve in water. It is effective in killing some disease germs. Dissolve a little bit in clean water until the water turns pink. Use for cleaning vegetables and fruit and also for cleaning wounds. It can be bought in any pharmacy; it is cheap and easy to store.

Supplements

Supplements are foods and substances that are normally given only to elephants which are out of condition, whether through illness, old age, being put to overly hard work, malnourishment, etc. Supplements can be divided into two groups, high energy foods and ‘tonics’.

High energy foods

High energy foods are rarely given to healthy elephants, and never as a staple food, partly because they are expensive and partly because in large quantities they are very difficult to digest, owing to the elephant’s alimentary tract is designed for large quantities of coarse food with very low nutrient levels. In smaller amounts, however, these foods are excellent for sick elephants, overworked elephants, old elephants, etc. The reason is that all of these foods are very high in carbohydrates and calories, and some of them have good protein as well.

Unhusked rice has extremely high nutritional value and is appropriate for elephants at hard work and fattening up elephants that are underweight



from insufficient food. No more than five kilograms should be given at a time because it is difficult to efficiently digest more.

Warning:

- Do not feed unhusked rice immediately after finishing work because the elephant will eat too hurriedly and the rice might get stuck in its throat.
- Unhusked rice should never be given to old elephants.

Fresh maize [corn] is good food for elephants, especially for sick elephants, recuperating elephants, old elephants, nursing cows, etc., because it has very high nutritional value.

Warning: Maize [corn] is a crop often contaminated by agricultural chemicals, as also are cucumbers and water melons. Therefore, the mahouts and managers must take counter measures, such as selecting maize [corn] from a trustworthy source and soaking the maize [corn] in a solution of clean water and potassium permanganate before feeding it to the elephant.

Pellet food for elephants in the past was the formula made for horses, but now some feed manufacturers are making mixes for elephants, normally with high nutritional value and thus suitable for exhausted and overworked elephants. Pellet food has not become a preferred food because it is expensive compared to other foods.

Bananas, so long as they are ripe, are easily digestible and have high nutritional value and are thus suitable for sick elephants, calves, pregnant elephants, elephants at hard work, and old elephants.

Warning: Too many bananas cause smelly and watery dung.

Sugarcane has very high nutritional value and is thus suitable for elephants at hard work and for nursing mothers. Sugarcane should not be given to old elephants because it can cause teeth to break or even to fall out.

Warning: If fed too much or fed too often, sugarcane is likely to cause pain or even sores in the mouth.

Tonics

Tonics are small quantities of some substance intended to have a specific effect, such as administering medicine, freeing bowels, stimulating thirst or appetite, etc.



Steamed sticky rice is not a tonic but is often used to administer drugs or food supplements. Give only .5-1 kilogram.

Warning: You should never give an elephant steamed sticky rice that is not fully cooked. Husked rice should never be given to elephants because it can cause constipation, even to the point of death.

Sticky tamarind is a good laxative and appetite stimulant. It makes elephants stronger and is appropriate for elephants that are suffering exhaustion after hard work. Usually it is mixed with salt.

Warning: If too much sticky tamarind is given it can cause diarrhoea. Do not give more than one kilogram.

Rock salt brings an increase in appetite if a salty solution is sprinkled over grass or if rock salt is mixed with sticky tamarind.

Warning: In the right amount, salt increases appetite but if too much is given it will make the elephant very thirsty and will cause intense salivation, glazed looking eyes, and staggering and unsure walking.

Mineral salts are the same as given to cattle and water buffalos. Before giving mineral salts to elephants it should be broken into small pieces or soaked in water. Give about once a month on average.

Herbal concoctions like Mong Pho Seng [brand name of a folk medicine] are often given to logging elephants in Northern Thailand. Such medicines are a good stimulant of appetite.

Warning: Giving too much can cause diarrhoea.

CONTROLLING ELEPHANTS

Maintaining full control over elephants is a key part of the mahout's job. Beyond ensuring that work will be done properly and efficiently, full control ensures the safety of the mahout, the safety of other humans nearby, and even the safety of the elephant itself.

Controlling elephants divides into two categories, normal circumstances and when an elephant has gone out of control, whether from aggression (usually but not always when in musth), having escaped, or just out of panic. For regaining control of elephants, the normal tools are used but these are often supplemented with special equipment which is described at the end of the section.

Controlling elephants depends on three interrelated factors: (1) the level of training of the mahout, (2) the tools or equipment used, and (3)



the best ways of using the tools. A weakness in any of these areas means that both safety and the elephant's health are likely to be affected.

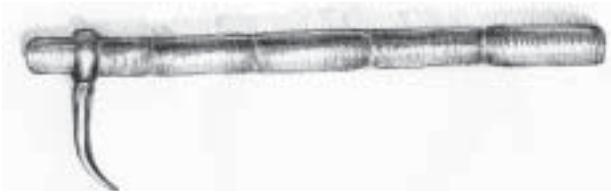
As for the quality of training of mahouts, there are disturbing signs that contemporary mahouts are losing many of the skills of the old days. This lack of skills is very likely to in the near future show up as poorer control of bull elephants, most of which are dangerous, at least part of the time. Training is, however, beyond the scope of this book.

Tools

All elephant tools are traditional, with an evolution of many centuries. The last big technological change was when chains were finally practical to use in place of rattan and ropes made from plants.

Hook

ขอช้าง



The hook [ankus, bull hook] is the mahout's most important tool. It should be with him at all times when he is with the elephant, and he should know how to use it in such a way as to not injure the elephant. Beginning mahouts should be repeatedly told that the real purpose of the hook is not to cause pain but rather to apply strong, clear pressure to very particular control points that the elephant has been trained to react to (stop, turn left, turn right, kneel, stand still, etc). The hook also extends the mahout's reach — like doubling the length of his arm.

The hook should be of a suitable size and design for the mahout's hand and for the size and nature of the elephant. The head should be on tight, and the handle should be neither broken nor slippery. The point should not be so sharp as to easily pierce the skin of the elephant.

Warning:

- Never strike the elephant, especially its head, with the hook's point.



- Never, except for the most extreme emergencies, use the shaft of the hook to strike around the eyes or eyebrows, as this can cause injuries and even blindness.
- Never use the point of the hook in the ear [auditory canal].

Bush knife

มีดโต้

Like the hook, the mahout's bush knife should be with him at all times, except perhaps when riding very safe elephants in tourist camps (the knife can frighten spectators). When logging, the bush knife is essential because in emergencies (such as a log sliding downhill) it can be used to slash the ropes holding the harness to the elephant.

The bush knife should never be used to control the elephant except when the hook is dropped or lost or in emergencies where human life is in danger. The primary purpose of the bush knife is to cut food for the elephant, clear pathways, cut firewood for the mahout, etc.

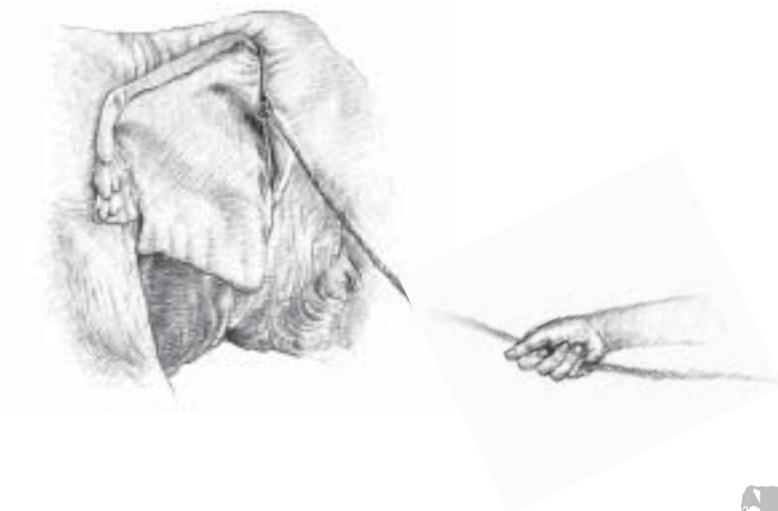
The bush knife should be in a sturdy sheath that will hold it snugly but still allow easy withdrawal. The knife should be of an appropriate size and have a handle that can be grasped firmly.

Warning:

- The bush knife should not be used to replace the hook.
- The knife should never be used to stab or slash the elephant.

Ear halter

สายหู



The ear halter is a piece of iron shaped like a fish hook, affixed over the base of the ear with light rope. It is used to lead elephants and also, for very short periods of time, to tether them. When a lead rope 1 to 3 metres long attached to the halter is gently tugged, the point of the ‘fish hook’ softly pokes behind the ear, signalling the elephant to move forward. (Or to stop when the halter is used for tethering.)

The ear halter is particularly useful in training inattentive calves to follow the mahout at exactly his walking pace; once this has been learned, the halter can often be dispensed with. The ear halter is perfectly safe and harmless when properly used but can cause injuries when carelessly used by incompetent mahouts; camp managers should keep its use under very careful supervision.

Warning:

- Never tug hard on an ear halter lead.
- Never use the ear halter to tether an elephant for long periods of time or when the elephant is absolutely unattended; if the elephant panics it might tear or wound its ear.

Hobbles

ຈະແຕະ



Hobbles are much like handcuffs, with two ‘bracelets’ joined by a ring that holds them together. Hobbles go on the elephant’s front feet to make it stay still, to slow it down, or to ensure that it cannot cross over broad objects or obstacles. Sometimes hobbles are used to prevent elephants from mating. Hobbles can be used on their own or they can be attached to tethering chains.



The elephant's feet should be checked carefully each day to ensure that its hobbles are causing no injury.

Warning:

- Hobbles must be free of any sharp edges or points that might hurt the elephant's feet.
- Hobbles must be neither too tight (that can injure the elephant) nor too loose (the elephant might get free).

Tethering chains

โซ่มัดหรือโซ่ล่ามช้าง

Tethering chains are affixed to one front feet (usually the right) with the other end secured to an anchoring point, in the country almost always a tree. In rural environments, tethering in a different place is normally done every night, allowing feeding on plants within the circle described by the chain, allowing feeding much like wild elephants.

The elephant's tethering chain must be with or near it at all times. Chains are the only piece of equipment that allows a mahout to leave the elephant with the certainty that it will not escape and cause trouble.

Three different technical qualities must be considered when buying chains: (1) length, (2) heaviness/size, and (3) quality.

The **length** used for mature elephants in natural or open environments is between 20 to 30 metres; for calves it is usually about 12 to 15 metres. When the elephant is confined areas, the chain can be shorter to suit. A long chain can, of course, be used as a short chain simply by attaching it to the anchoring point at whatever length is desired.

The heaviness or **size** is described by the diameter of the metal links. The unit of measure is the *hun*, or 1/8 inch [3.5 mm]. The normal size used for mature elephants is 4 *hun* or 1/2 inch [1.4 cm], though heavier chains are used with animals that struggle with their chains. Lighter chains can be used with animals that never fight their chains. For calves, the usual chain size is 2 *hun* or 1/4 inch [7 mm]. The lighter the chain is, the better for the elephant as it will use less strength in moving the chain and is less likely to suffer injury to the foot and ankle.

The **quality** of chains is determined largely by cost. The best chains are manufactured in Western countries and are made of excellent metal and the weld which closes each link is done to a very high standard. Quality chains are quite expensive. Local and regionally made chains



are much cheaper but the metal is of poor quality, as is the weld. These conflicting aspects lead to a complex set of trade-offs. Low quality chains are much cheaper in the short term but they wear out much faster than quality chains, leaving the cost over a lifetime's use in question. High quality chains, being stronger, can be bought in a smaller size, meaning less physical wear on the elephant. High quality chains are much less likely to break and thus can possibly save the elephant's owner from having to pay compensation for crops raided or the loss of human life.

Factors that must be considered when buying or deciding which chains to use include the size of the elephant, whether it attempts to break its chains (See page 33), and the environment in which the elephant is to be chained, especially in regard to food. A chained elephant that has access to plenty of good food and water is far less likely to try to break its chains than a hungry or thirsty elephant with little food or water inside its chaining area. Questions such as these should be left to highly experienced mahouts, not to newcomers.

The **advantages of chains** over other means of tethering are overwhelming. Chains do not stretch or shrink with changes in heat or moisture. Chains, so long as properly selected, are stronger than the alternatives. Chains, unlike rope or wire, are very unlikely to cause wounds and to get twisted up in knots or caught up in trees or rocks. Chains are very durable and last longer than the alternatives.

The **disadvantages of chains** are that the cost is more than wire or rope. Chains are heavier than the alternatives. Chains conduct electricity, leading to possible electrocution. Should chains get knotted or wrapped around an elephant's body they are harder to cut than rope.

Despite these disadvantages, chains are clearly the best form of restraint available, both for the humans and for the elephant itself.

Warning:

- Whenever the elephant must transport the chains between two places, usually the night time tethering site and the work site, never make it drag the chain when it is attached to the foot. The massive weight of 20 to 30 metres of chain can cause the elephant to sprain or dislocate its ankle. (If frequently done, it also causes the chains to wear out prematurely). If the ground is slippery, foot-dragged chains can cause accidents. The only exception to the 'foot dragging' prohibition is as



a safety measure with elephants so dangerous they are likely to try to attack the mahout walking nearby; the chains will slow them down greatly.

- Chains should be carried on the neck, neatly draped in equal lengths that descend to just a little bit below the shoulder.

Two pieces of equipment need to be used with chains, U-bolts and swivels. Additionally, **bolt cutters** and a **metal saw** should be kept at all facilities with sizeable groups of elephants; inevitably an elephant will end up knotting itself up in chains (the same applies to wire rope) and if it is not freed immediately injury or even death can follow.

U-bolts

สะเก็นต่อโซ่

Two U-bolts are used when tethering, one to close the loop around the elephant's foot and the other to close the loop around the tree or anchoring point. U-bolts must be at least the size and strength as the chain; the strongest chain is only as strong as the weakest U-bolt used in it. (U-bolts, like chains, are sold sized in *hun* but because the quality of the metal used is highly variable, mahouts must be very careful here.)

U-bolts have a threaded post that screws into a threaded hole. This is the weakest part of the U-bolt and when the threads get loose or show signs of wear, they should be discarded and replaced with a new one immediately, particularly because U-bolts are not very expensive. Good mahouts always have 10 to 15 U-bolts available for use.

Warning: Some elephants are very skilful at using their trunks (with a foot holding the U-bolt firm) to unscrew the post; with such elephants, the mahout should carry lengths of wire to fasten the post, which has a hole on top, securely to the 'U' itself.

Swivels

กะหลั่น



Swivels are a metal device that fits into the middle of a length of chain. A swivel is like a chain link where the ends of the link are able to



freely revolve around each other full circle. Swivels, like U-bolts, must be as strong or stronger than the chain links or they weaken the chain. Swivels are not needed in all chains but they are essential when the elephant is unaccustomed to chains and very often when the elephant is in musth and/or aggressive, because the mahout cannot work near the elephant. The purpose of swivels is to prevent an elephant from breaking its chains by getting them all tangled up and thus easy to break.

The weakest point in a link of chain is on the side with the weld made to join two links. Normally the greatest strain is the round ends which connect with other links, but when chains get kinked, a strong round end can press against a weak weld, making it easy to break .

Swivels for elephants must be custom made because they are not made commercially. They are exactly the same as those used with buffalo and cattle, so borrow one of those to use as a model. Swivels are simple and inexpensive to have made at a machine shop or blacksmithy. Two examples are shown, one modern and one old-fashioned style.

Warning: A swivel must be strong and smooth, with no sharp edges. It must rotate freely and easily and thus the mahout should inspect it daily and oil it when necessary, certainly before and after every use.

Rope and wire rope

เชือกและลวดสลิง

Rope comes in many types. Rope is sometimes used to tether elephants or otherwise control their movements, but its use is limited mainly to calves. Some types of rope are traditional but two others, wire rope and nylon rope, are modern inventions that require very careful, short-time use because they are capable of causing horrendous injuries.

Rope has various advantages and disadvantages when compared to chains, but these vary with the type of rope.

Manila rope is made from coconut shell fibre [coir] so when new it is quite stiff. The sizes used with elephants normally range from 2 to 4 *hun* [1/4 to 1/2 inches or .7 to 1.4 cm]. Manila rope is mostly used to tie body parts — such as the legs, tail, and trunk — during training.

Good properties: After some breaking in, manila rope becomes soft and pliable and thus it does not cause as many injuries as do other types of rope. So long as it is dry, manila rope does not shrink or stretch.



Bad properties: Manila rope is expensive and hard to find for sale. It wears out quickly and requires work to maintain properly. When wet manila rope stretches and then when drying, it shrinks; this can cause injuries.

Nylon rope is made of synthetic fibre and available in sizes from one *hun* (1/8 inch or 3.5 mm) up. Nylon rope is useful for securing hardware but should not be used to tether elephants, as it can cause horrible injuries. Unfortunately, many bad and inexperienced mahouts now use it in training and restraint, resulting in wounds. If circumstances require the temporary use of nylon rope for restraint, the elephant should be inspected frequently for wounds and the rope for possible breakage.

Good properties: Nylon rope has a long working life and is easy to care for. It is cheap and easy to find. When wet, it neither stretches nor shrinks.

Bad properties: Nylon is abrasive and irritating and easily causes wounds. It becomes harder and loses suppleness with age. Once past the expiry date, it breaks easily.

Wire rope, made of twisted wire strands, is stronger than chains. It is excellent for emergencies, such as where a dangerous elephant must be restrained but when chains are broken or not present. Wire rope should never be used for more than a day, and when used on feet, wire rope should be checked often and carefully. Frequently switch the wire rope between the two front feet to lessen the chance of injury.

Wire rope also has some use, under careful supervision, when leading elephants into spaces they do not want to enter or out of spaces they do not wish to leave.

Good properties: Wire rope is incredibly strong and it is very inexpensive and easily available.

Bad properties: Wire rope can easily tear into flesh. When used to tether or tie elephants, it can twist and coil, making it difficult for the elephant to walk. It can cause accidents. Wire rope shreds easily, leaving individual wires to pierce the elephant's skin.

Hemp rope, made from the fibre of the hemp plant [in fact, *paw saw*], shares some the characteristics of manila rope. It is never thicker than 4 *hun* [1/2 inch or 1.4 cm] and never longer than 6 feet [1.8 metres]. It is used for tying legs and for securing bits of equipment, such as breast bands, rattan hobbles, etc.



Rattan is smooth and non-irritating and thus is used for girths and hobbles because it has good properties of expansion. Rattan of too small a diameter can dig into flesh and cause deep wounds. Thus, rattan used to tether or tie elephants should be plaited together to make it thicker.

Elephants that fight their chains

Many elephants like to repeatedly try to break their chains in an attempt to get free. Some elephants which fight their chains are harmless but a sizeable majority, not surprisingly, are aggressive and dangerous.

Such attempts are an understandable try for freedom, but all mahouts will try to stop them because a loose elephant can cause huge damage to property, to crops, and to human beings.

Beyond being a danger to human beings should they get free, elephants fighting chains also often bring serious injuries upon themselves. Some elephants will, holding a section of chain in their trunk, flail the chains against a hard object. The usual technique is to wrap the chains around a body part — the tusks, trunk, head, or even the torso — and then pull against the chains. Sometimes elephants will back off and charge away from the anchor, greatly amplifying the force which they could apply by simply tugging. Wounds, bruises, dislocated ankles, etc., are common, as are split, chipped, and broken tusks. Fatal falls are not unknown. Some elephants will try to bite the chains, chipping their teeth.

The best way to deal with chain-inflicted injuries is to do your best to ensure that they do not occur in the first place:

- Be especially careful with elephants that have a **history of fighting** their chains; many logging elephants are true experts.
- Never use **inadequate chains** (or U-bolts and swivels) that are too small or too worn; many elephants will sense the weakness and be tempted to struggle whereas they would be quiet with stronger chains.
- If the **anchor point** is too fragile, such as a tree that is too small, many elephants will sense the weakness and be tempted to struggle.
- Do not tether elephants at rest near **disturbances** that might irritate them such as loud noises, strangers, unfamiliar elephants, etc.
- Always ensure that a tethered elephant has sufficient **food and water**; a hungry or thirsty elephant is far more likely to fight chains than an elephant contentedly chewing or with a full belly.



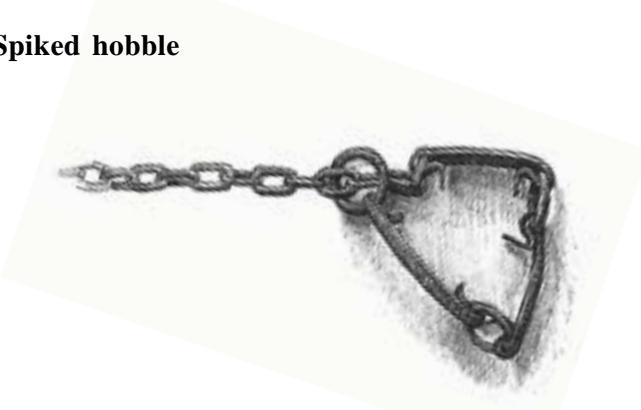
Special equipment for problem situations

Several types of equipment have long been used to train or condition elephants not to fight their chains; another device based on the same principles is designed to stop elephants from trying to throw their riders. In all cases the goal is to ensure that elephants do not escape to cause damage to crops or property and most particularly to kill people.

The following devices should be used, if at all, only by true experts and never for more than a day or so. The elephants should be frequently inspected for serious injury and any small wounds should be treated immediately. The gear should be carefully cleaned before and after use.

Spiked hobble

မင်းချပ်



This is a hobble with ‘spikes’ about 4 *hun* long [1/2 inch or 1.4 cm]; the tethering chain is attached to it. If the elephant stands still or moves slowly and carefully, it will feel no pain. If the animal moves very quickly or with force, the spikes will dig in and cause great pain.

There are spiked tethering chains built on the same principle. If the elephant handles them gently, there will be no pain, but if handled roughly or with force there will be great pain.

Spiked collar

မိုက်ချာဝ



The *mai kham khaw* is a rope collar, fitted neither too tightly nor too loosely, with knotted-in spikes made of iron or hard wood. Thai mahouts usually work their elephants, whether logging or giving tourists rides, while sitting perched on the neck. Some elephants have the bad habit of vigorously shaking and rolling their necks, often strongly enough to throw the mahoutk. (A few elephants have the special skill of twitching their skin so vigorously that that action can forcibly dismount mahouts.)

When the spiked collar is fitted to the neck, the mahout mounts. If the elephant stands or walks normally, it will feel no pain. If it twists, turns, rolls or shivers its neck, it will feel great pain.

Looking at pictures, the spiked hobbles and spiked collar look cruel and they have indisputably been designed to cause pain. But rather than being cruel, that pain is quite humane in a curious way. These seemingly cruel and primitive devices are actually quite sophisticated because the elephant itself determines the amount of pain. The struggling animal gets progressive negative feedback — increasing pain — as it more rigorously struggles. The mahout has no direct role in applying pain at the moment it is felt. Spiked hobbles and collars can do the job with the mahout far away, which is normally when elephants fight chains.

These devices are, in expert hands, far better for the elephant than the usual contemporary method to counter ‘chain fighting’: the mahout physically punishing the elephant. The trouble here is that the elephant can get confused and not understand the reason for which the man is causing it pain. Such unskilled ‘disciplining’ is counterproductive and far more likely to cause serious injuries than the above devices. Abuse by mahouts traumatizes elephants more than this passive equipment.

Spiked grappling pole

๒๒๓๖



This U-shaped device with two inward facing spikes at the open end is affixed to a long pole. It was used to recapture escaped elephants by slipping it over a hind foot. When the elephant moved, the pole would hit against rocks, trees, etc., causing the spikes to dig in painfully and slow the elephant down. With the invention of tranquillising drugs fired from special rifles, there is no longer any justification for using this device.

Spear

หอก

Spears are used to control elephants from a distance when circumstances are so dangerous that mahouts cannot approach closely. The use of spears is acceptable only when elephants pose a clear and imminent danger to humans or to other elephants (often calves and cows).

The need to use spears is, apart from emergencies, an admission of incompetent mahouts who are neither loved nor trusted by their elephants. The most common use for spears is to force (by ‘pricking’ their feet and rumps) frightened, traumatized, or stubborn elephants to exit a space they do not want to leave or, more often, into a space that they do not want to enter, most often loading onto trucks.

In the rare instances with a justifiable need to use spears, the traditional elephant spear is far superior to make-shift spears such as a bush knife on a pole. The traditional spear has a metal head with a sharp point (but not so sharp as to draw blood) no longer than six *hun* [3/4" or 2 cm.]; behind that point is a thick rim preventing the spear from entering deeply. The spear thus causes pain but the rim makes it impossible to cause a wound whereas an ordinary spear can cause horrendous wounds.

Guidelines for tethering elephants

- Never tether an elephant in a place that is steep and slippery because if the elephant falls it can be crippled or killed.
- Mahouts must check chains to ensure they have not kinked, making them easily caught in trees or rocks, rendering the elephant immobile and vulnerable to fires and attacks from other elephants.
- If the elephant is tethered in an urban space or a village, the mahout must carefully inspect the site for exposed live electrical wires. Chains conduct electricity and the elephant can be electrocuted.



- If the elephant is tethered in an area with garbage or trash, the area must be inspected for plastic bags (especially bags with food remnants) that the elephant might swallow, for toxic chemicals, etc.
- If the elephant is tethered at a building site in a city, the area must be very carefully inspected for metal scraps, nails, sharp pieces of wood, glass shards, etc.; these must all be removed.
- Do not tether an elephant at a site that once held a house, particularly around the area which had been the kitchen or dining area or where dishes were washed; there will be salt in the soil and the elephant will likely dig up and eat the soil, causing an obstruction of the intestines.
- Before tethering an elephant, the mahout must ensure that the vicinity is free of aggressive or rambunctious elephants, particularly males (most particularly males in musth) that have not been chained.
- Do not tether elephants too closely together because their chains can get entangled, which is dangerous.
- Do not tether elephants unfamiliar with each other close together because this places them under great stress, hampering their eating, drinking, and resting, which leads to deteriorating physical condition. (Such elephants should be tethered at least 100 metres apart.)
- When elephants need to be tethered in one place for a long time, such as musth elephants or situations where the mahout must go away for a long time, the site should have very good shade and water.
- Never tether an elephant near very bright lights at night because the elephant will not dare to sleep and will stare at the lights until its eyes get irritated and susceptible to infection.

Absolute prohibitions in controlling elephants

- Never, for whatever reason, feed an elephant with addictive drugs such as amphetamines, opium, marijuana, or any other drug.
- Never pour or spray turpentine over an elephant's body [usually trying to force a sick elephant to its feet] because it will cause the skin to be infected and peel off in sheets. Successful treatment is very difficult.
- Never use heat (boiling water or fire in close proximity or actual contact) to force an elephant to load onto a truck, to do work, or anything else because it can get injured and possibly die or become mentally disturbed.



- Never use a slingshot, arrows, crossbows, shotguns, cap guns, gas-powered guns, .22 calibre rifles, air guns, or any other weapon to shoot at elephants to intimidate them into doing something. If a projectile should hit their body or a vital organ, it can injure or cripple the elephant and possibly even kill it.
- Never take a mother elephant and her calf younger than three years of age near other elephants unfamiliar with the pair, because the calf might get attacked and even killed.

Dragging gear

Dragging gear, the harness used to drag logs through the forest, looks quite simple but in fact is incredibly complex. The two simple looking ‘saddle pads’ (*nang awn* and *nang khaeng*), for example, not only require bark from two trees that are found only in natural forest, they require great craftsmanship in the preparation. The breast band is a piece of equipment that requires complex weaving (also from a special plant); in the old days, each mahout was very adept at making his own although today very few can. Thus, to try to teach the true old craft is far beyond the scope of this book, and in any case those relatively few people still involved in logging are mostly great masters of the art, and writing for them would be like “teaching the supreme patriarch how to read” [a Thai idiom much like ‘teaching your grandmother to suck eggs’].

Dragging equipment is these days most often used in simple demonstrations for tourists, almost always with very light logs over smooth ground. For any camp manager who is thinking of adding a logging demonstration to his show we recommend simply hiring an old time mahout for a few days for help in acquiring the equipment and teaching its proper use. The most important warning is that if heavy logs are being dragged, the breast band (*pa ok*) should be made of sisal (*paw*) rather than nylon rope, which is both very hot and which causes much more abrasion and pressure than a breast band made of natural materials.

The advice for managers of camps which offer rides is similar, because bad-fitting saddles or wrong-sized saddles or inappropriate girths can cause saddle sores and wounds. If you have a good master mahout, you will have no problems. If you don’t have a good head mahout, then hire one as a consultant or, better, put him on permanent staff.



LIFE-CYCLE EVENTS

Determining age

Determining the age of an elephant is useful when ascertaining whether or not an elephant fits with the age given on the Registration Certificate. Usually determining the approximate age of an elephant is possible with young and elderly elephants. In elephants in the middle age group there is room for much error. The characteristics are as follows:

	Young (Under 12 years)	Mature (13-45 years)	Old (Over 46 years)
Head	Skin fits tightly Temples are smooth	Skin fits tightly Temples are slightly depressed	Temples are deeply concave
Ears	No curl at top of ear No tears at bottom of ear	Forward curl at top of ears Some tears at bottom of ear	Deep forward curl at top of ears Many tears at bottom of ear
Skin	Thick, taut, smooth, and unblemished Supple to the touch	Thick and not very wrinkled Supple to the touch	Wrinkled, droopy, rough and dry
Muscles	Bundled, strong	Bundled, strong	Flabby and weak
Feet and nails	Circumference of foot and ankle are about the same Toenails are smooth	Circumference of foot is a bit larger than the ankle Toenails are smooth Footpad is not cracked	Circumference of foot much larger than ankle Toenails are spread apart Toenails are chalky/rough
Tail	Not knotted/kinked Tail hairs are orderly	Not knotted/kinked Tail hairs are orderly	Knobby Missing tail hair
Dung	Finely textured	Finely textured	Coarse, with undigested leaves or even bananas



Determining heat (Oestrus)

Most female domesticated elephants begin to come into heat starting at about 9 years old or later and enter their ‘heat cycle’ which has a length of about 16 weeks or 4 months. Thus, in a period of one year, the average female elephant will be able to breed and become pregnant only about three times in a year. Elephants do not show any blatantly obvious external physical signs that clearly indicate that they are in heat, which is different from other animals such as cattle, pigs and dogs, which have swollen genitalia or secrete blood or mucous when they are in heat. Therefore the mahout must very carefully observe and notice subtle differences in behaviour.

A good mahout will always know when his cow elephant is in oestrus. If a female is in heat, males will use their trunks to frequently smell the female’s sexual organ or her urine. If you are a skilful observer you will see that the cow elephant’s vulva slackens or droops a bit and she dribbles urine often. Many cows will repeatedly swat their tail against their vulva and some will then lift the tail into the air, as if advertising. Sometimes cows ready to mate will show excitement, irritation, cry out and even cause damage to other elephants nearby. Some cows will secrete a modest amount of a clear, mucous-like fluid. If an elephant exhibiting such behaviour is mated, there is a very high chance for pregnancy.

For accurately determining if the elephant is in heat, it should be inspected every day. The best time for inspection is in the morning before the elephant is sent to work. Especially in large camps this can be done by lining up all the females of breeding age, presenting their rumps, and then having a bull ‘sniff test’ each cow. If a cow is in heat, the bull will show great interest and be determined to use his trunk to smell.

Predicting heat

Determining heat [oestrus] is often not useful unless there is a good breeding bull already present. In cases where there is no breeding bull, by the time you have determined heat it is usually too late to arrange for a sire, arrange for transportation, and, most importantly, to give the two animals time to feel comfortable with each other before actual breeding takes place.



Thus, it is predicting when heat will occur rather than determining heat which is already heat which is truly useful to an owner who wants to breed his cow. The period between heats is on average about 16 weeks (112 days), but many elephants will cycle slower or faster than that by a few days or even weeks. Luckily, there is a way to predict, within a week or two, when a cow will probably come into heat.

1. When your elephant comes into heat the first time

Go to a calendar, mark the date and write it here: / /

2. When your elephant comes into heat the second time

Go to that calendar, mark the date and write it here: / /

Using the calendar, count the number of days
between the two heats

Write the number of days here: days

On the calendar, from the date of the second heat count forward
the number of days written above.

Mark that date and write it here: / /

The last date will be the day that your elephant is most likely
to come into heat for the third time.

Knowing the likely day of heat, some weeks before this date you can arrange for a sire, transport the cow to the bull (or vice versa), and have a week or so for the animals to get to know each other before heat sets in.

This method of prediction will usually work quite well but it can be wrong, particularly if the cow has been ill, been overworked, been poorly fed, or been psychologically upset, such as moved to a new site she does not like or exposed to another elephant she does not like.

Coupling

Usually before setting two elephants to mate, it is best to give the pair an opportunity to get to know each other and to both get in the mood. If they do not like each other enough, it is possible that they will do damage to each other or that the bull will try to ‘rape’ the female, possibly even killing her. Normally, females prefer the larger and older males. Some females do not like males with tusks.



You should not pair elephants that are related as the calf is likely to be feeble or deformed.

The place selected for the elephants to mate should be peaceful, quiet, shady and near a stream or water. The period of time where the elephants will be interested in mating is anywhere from one week up to a month, depending on the desire of the male and the willingness of the female. The bull's tethering chain should be tied so as to be very long. The female should be unchained in order to prevent a frustrated bull from damaging her if she is not willing to mate.

Before mating the elephants will engage in courtship behaviour. The male will use his trunk or his tusks to push the female so as to get her in front of him. The female will use her trunk to smell or touch the male's penis, and the male will use his trunk to do the same to the female's sex organ. When the male has a full erection, the penis will be distorted into an 'S' shape (1.5 to 2 metres in length). The male will mount the female from behind, and each congress will normally last between one and two minutes. At first, the elephants are likely to mate up to ten times a day but after a while this will reduce to two or three times a day. Mating usually occurs in the morning and around dusk, when the temperature is cool. (While elephants are mating, mahouts and other people in the area should be very quiet; do not make noises or do activities that might disturb the elephants.)

After a period of mating, some bulls will go into musth and if this happens, the male should be taken away immediately if the situation seems dangerous or if the male cannot be controlled.

Mating

Selection of breeding animals

Sire

- Aged between 20-50 years
- The body should be massive, well-configured, and robust. When the elephant walks, his muscles should bunch up. Folds on the skin should not droop.
- No diseases
- No wounds or physical deformities



- No bad personality, such as is suggested by much swaying of the head
- Not particularly aggressive, such as having a history of attacking mahouts or other elephants
- With a strong sexual urge, shown by having the penis descend from its sheath often and showing that it wants to mount when females are near
- Has a reputation of being a good breeder and of actually fathering calves

Dam

- Aged between 15 and 50 years. (If over 20, the animal has probably already been pregnant or calved.)
- Fit body condition, neither too fat nor too thin
- Good health with no diseases or crippling conditions
- Good temperament
- No problems with giving birth, such as having aborted, had a difficult delivery, or attacked its own calf.

Pregnancy

Pregnancy lasts for 20 to 23 months. Most mahouts believe that male calves spend a significantly longer time in the womb than do female calves.

It is very difficult to tell if a female has conceived until very late in the pregnancy, though a good mahout will usually know by observing that his cow has not come into heat again. After one year of pregnancy the breasts and the belly enlarge, and for about a month before birth if you squeeze a breast, a clear fluid will be emitted. Pregnant cows are slow, lethargic, and move in a lumbering manner. Pregnant elephants should not be worked hard because being overworked can lead to a spontaneous abortion. Pregnant cows should be given supplementary food such as bananas, unhusked rice, and rock salt (by grinding up salt from a salt lick to small bits and soaking it in water and feeding it to the elephant or by mixing it with food) but supplementary food or extra food should not be given too late in pregnancy because the foetus can become too large, leading to a difficult delivery.



Birth

An elephant near to giving birth should be separated from other elephants. She should be taken to a quiet, shady place that is not steep and has a smooth surface, such as soft dirt or a grassy field. If there is a senior cow elephant that is familiar with the mother, she should be brought near to the mother in order to be the ‘receiving mother’ [*mae rab*, much like the Indian “Auntie”] in order to comfort the mother and look after the calf at birth.

Most cows give birth during the night. When close to dropping the calf, the mother will show agitation, will not eat or drink water, and will seem to be tired. Sometimes cows will use their trunks to blow grass, sand, dirt, etc., over their backs. The end of the tail tenses up. The elephant will alternatively lay down and stand up and make sounds suggestive of pain. A clear fluid with some blood will discharge from the birth canal. At times the hind legs will be spread wide, much like a triangle. The elephant will lift its tail constantly and the area of the *fii yeb* [perineum] will be swollen and enlarged for about 3 or 4 hours. The actual birth is a matter of a few minutes.

The newly born calf usually weighs about 70 to 100 kilograms and stands about 80 to 90 centimetres tall.

Either the front feet or the rear feet emerge first in a normal delivery. When the calf reaches the ground it is still largely covered by the foetal sac. The mother will use her feet or her trunk to tear away the sac, and she might use her trunk to blow sand over the calf or use grass to wipe down the calf in order to clear the sac and the mucous. The mother will use her feet to stroke or gently kick the calf to stimulate breathing. Sometimes cows use their trunks to suck mucous and fluid from the amniotic sac from the calf’s mouth and trunk. The calf should not be separated from the mother at this time because it can make her scared or angry, even to the point of trampling the calf to death.

The calf will take about half an hour attempting to get to its feet, stand, and walk to the mother in order to nurse. The milk is of the highest quality and is called ‘yellow milk’ [*nom nam leuang* or colostrum], which has great nutritional value and also antibodies against illnesses. If calves do not get colostrum, which flows for only about the first two days, they will likely be feeble and susceptible to disease.



Normally the placenta will be expelled from the birth canal between 1 and 30 hours after the birth.

When the elephant is pregnant the owner should know its history and temperament, such as if it has ever aborted before, ever had a calf before, ever had a calf which died, or ever injured its own calf. If it has ever experienced any of the above, a veterinarian should be present.

Cows that are giving birth for the first time should be watched especially carefully because they are inexperienced and their reaction to the calf is unpredictable. Inexperienced domesticated elephants are likely to become confused by the pain of the delivery and the blood from the birth canal. The resultant fear can cause them to attack and even kill their calves. (With wild elephants, young cows have usually helped their own mother with 3 or 4 calves before they have a calf of their own.)

Choosing the site

The birthing site must be an area that is shady, peaceful, cool, and well ventilated. There should be no people, animals, or vehicles to cause disturbance. The site must be level and free of holes, garbage, sharp and pointed objects, chemicals, and other dangers. There must be a post or a tree to which to chain the mother.

Preparing the people

People who assist in the birth or in caring for the newborn calf must be brave, strong, and intelligent because if the mother turns violent and tries to injure or kill the calf, they must immediately rush in to separate the calf. They must wipe the calf clean and dry and help the calf to stand. At the same time they must control and try to comfort the mother and quiet her down. Then the people must bring the calf closer to the mother to determine if she will accept the calf or not. If the mother accepts the calf and does it no harm, then observe the calf to see if it is able to nurse by itself and if the mother shows love and concern.

Two special preparations are essential for first births and births by cows with troublesome histories:

1. Stay close and observe very carefully, with the mahout having at hand the equipment that he needs to control the elephant. A bamboo



spear about two meters long and sharpened to a point should be available; if the cow tries to injure her calf, use the spear to separate her from the calf immediately.

2. Your veterinarian should be informed and be prepared to help if there is a problem and the mother turns aggressive or tries to injure the calf. The veterinarian can use a sedative to quiet her down sufficiently that the calf can usually be safely introduced to her so that bonding might be attempted once more.

The relationship of calf and mother

Usually calves should be kept with their mothers for three years before undergoing training, which is about the time when most cows will wean on their own. Calves will begin to eat food such as bananas and soft grass from about 3 to 6 months. Starting from 6-8 months calves will eat some of their mother's dung (or that of another adult elephant) to infect themselves with beneficial micro-organisms needed to digest food. During these three years the mother will teach the calf how to find food and how to avoid dangers such as snakes. During this time the mother should not be made to work since this can be dangerous, with the mother distracted and worried about her calf. Further, the calf itself being very 'naughty' [playful and adventurous], which can easily cause accidents.

Weaning

In domesticated elephants, weaning at the age of 3 is best. With really healthy calves, weaning at 2 is possible so long as excellent food is provided, because a two-year old is able to eat natural food and is big and strong enough to train. Males are temperamentally suited to be separated from their mother earlier than females.

Food for calves

- From birth to the age of four months, calves eat only mother's milk.
- From the age of five months, calves make attempts at chewing and eating the food that the mother is eating.



- From the age of six months, calves will eat the mother's dung in order to infect themselves with micro-organisms that are essential in the digestion of the coarse vegetation that is the staple diet.
- From the age of eight months, calves will begin to eat ripe bananas and other soft, easily digested foods.
- From the age of ten to twelve months, calves will begin to eat various hard foods, including plants and vegetables.
- Still, for the first year of a calf's life, the principal food is mother's milk.

After one year, calves will increasingly eat foods found in nature until the calf is two or three years old. At about three, usually, the mother will instinctively choose to wean the calf and then will come into oestrus and breed. Almost two years later she will give birth to the second calf, meaning that a healthy mother able to breed at every oestrus period will have a calf about every five years. This is true of both wild and domesticated elephants.

In present day Thailand, elephant calves live in, roughly speaking, one of two circumstances. In the first case, in the way of the past, the calf is far off in the countryside and spends much time with the mother in the forest. In such a case, which is much like with a wild elephant calf, the calf will with the mother's help make a switch over to the abundant natural vegetation with little or no need for supplemental foods. As long as the calf is strong and healthy, the usual case, there is no need for mahouts or owners to supply supplemental food.

In the second case, the mother and calf are kept in a tourist camp or other setting where most of their food is supplied by humans. Given this, the food of the calf during the first three years or up until weaning should be soft food that is easily chewed and digested (ripe bananas, peeled sugarcane, etc.) and given in small amounts until the calf is able to eat on its own. Any grass given should be clean and given in small amounts. Elephant calves raised in such artificial environments are far more likely to have problems with nutrition and digestion than calves raised in totally natural settings.

From the age of three, calves can eat the same food as adults although the food should be cut or sliced into smaller pieces so as to make it easier to eat.



Food for orphaned elephants during the first three months

If the mother attempts to damage a newborn calf, or if she is unwilling or unable to nurse it, then the mahout must milk the mother so as to get colostrum that the mahout must feed the calf. (This must be done within twelve hours of birth.) There should be an attempt to find a nearby nursing mother to serve as a wet nurse, but if this is impossible then there is the need to supply milk from another source, usually powdered milk which is easily available in the market place. But the easily available powdered milk types are usually difficult to digest and can lead to feebleness, stunted growth, constipation, diarrhoea, and even death.

1. Powdered milk for infant animals such as the young of cattle, pigs or dogs. Sold in animal supply stores everywhere, it is the cheapest milk available. But cheap powdered milk can cause both diarrhoea and constipation. Before using it, it is best to consult a veterinarian, or if you use it and the calf has digestive problems, stop immediately and consult a veterinarian.

2. Powdered milk for human infants is for sale in shops everywhere but it is expensive and likely to cause diarrhoea by being difficult to digest, as can be noticed through off-white coloured, liquid stool. If this is observed, consult a veterinarian immediately.

3. Powdered formula for human infants with difficulties digesting lactose is made mostly of soy beans. It is more expensive than ordinary infant powdered milk, but sometimes it also causes either diarrhoea or constipation. If so, stop immediately and consult a veterinarian.

4. Formula especially made for elephant calves is best but it must be ordered from overseas.

Many calves die in Thailand every year simply because they are given inappropriate milk that they cannot digest. In selecting the best powdered milk or formula for elephant calves a veterinarian should be consulted.

Mixing powdered milk

In mixing or blending, you sterilize with boiling water both the drinking vessel and the mixing vessel each and every time before preparing milk



or giving milk. Feeding calves requires very strict attention to cleanliness and sanitation because calves can very easily contract infectious diarrhoea and die. (See Diarrhoea caused by germs, page 119) In mixing milk, you should very carefully study the instructions printed on the side of the can.

It is very important to not mix in any granulated sugar as this can cause diarrhoea. The calf should also be given multi-vitamins and calcium pills every day.

Calves should be fed small amounts of milk every time but should be fed often. The caretaker or mahout must be with the calf day and night, never leaving it for more than an hour under any circumstances. The elephant must be fed every time it is hungry, which it will show by calling out or walking to the keeper.

Warning to camp managers: Caring for a calf is not a job that you can assign to just any mahout as it is like being the nurse for a sick elephant. Often the best person is an elderly mahout or even the wife of a mahout, as the job requires similar sacrifice needed to care for a human child.

Method of giving milk

There are many methods of giving milk, such as putting a rubber nipple in a milk bottle or using a hose coming from a milk bottle, the hose being long enough to reach past the tongue to the swelling of the throat. Very young elephants should be fed every two or three hours. When they get older, middle-of-the-night feedings can be skipped. After the calf is nine months, four feedings a day are sufficient. Feedings should always happen at the same time every day, changing only rarely, and the feeding should always be done by the same person, as calves will bond incredibly tightly with their care giver. Calves should be fed infant formula until aged 15 to 18 months, after which they can eat only grass and other plants.

If the elephant develops diarrhoea, you should immediately stop feeding milk and as a substitute start giving electrolytes (*nam gleua*) [cheap and available in all pharmacies], those made from a powder, by adding water. Then consult a veterinarian immediately.



Food for orphaned calves aged 3 to 6 months

After the age of three months, calves can begin on solid foods starting with boiled rice in the following formula:

Ground-up rice	1	Cup
Ripe bananas (<i>gluay nam waa</i>)	5	Fruits
Clean water*	3	Litres
A pinch of salt		

*The water should be boiled and then left until cool.

Method of preparation: Boil the rice until it is cooked, then squeeze the ripe bananas into a mush with your hands and add them to the rice and boil further until they are liquid. Add a pinch of salt. Let stand until cool. Feed the calf about 1.5 litres a time two or three times a day, gradually increasing the amount of boiled rice. Be careful not to overfeed or the calf might become constipated.

Also give very ripe bananas three or four times a day by kneading them into a mush. After feeding (whether ripe bananas, or the boiled rice-and-banana mixture, or milk), you must each time use a clean cloth soaked in water to clean up around the mouth. Use this cleaning as an opportunity to carefully inspect the inside of the mouth, because if the calf's mouth or tongue develops sores it will be unable to eat, even to the point of starvation. When feeding calves, the proportion of milk, bananas, and boiled rice must be considered as follows: If the calf has liquid stool or diarrhoea, then reduce or eliminate the milk but if the calf is constipated or has dyspepsia then reduce the boiled rice but increase the milk. Thus, when rearing orphaned calves, the mahout must observe the dung every time the calf defecates. If the stool is loose or has bloody mucous or if the calf is constipated, the mahout must call a veterinarian for treatment as quickly as possible.

Food for orphaned calves aged 6 to 18 months

When the calf reaches the age of six months, you must find dung from a mature elephant (usually it is the calf's own mother) and that dung must be fresh and from a fit, healthy elephant. Offer a lump about the size of a fist to the calf every day for a month or two, leaving it up



the calf whether or not it eats it. At the same time, find some Para grass (*Brachiaria mutica* [Forsk.] Stapf.) or *Yaa tawngkong* grass so the calf can practice eating. Gradually increase the amount of grass.

For elephants in this age group, beyond the daily milk, boiled rice, and bananas, other supplements are peeled sugarcane, grass, calcium, vitamins, and whatever else the veterinarian stipulates.

Food for orphaned calves aged 18 to 36 months

Calves of this age can be taken off of milk and boiled rice, but they should be given steamed sticky rice with a bit of salt added. Sometimes they can be given sugarcane juice with fresh coconut meat. The major part of the food given should come from the following group:

1. Various grasses, including bamboo leaves and shoots
2. Coconut fronds
3. Banana stalks cut into very short lengths
4. Ripe bananas (*kluay nam waa*) and sugarcane
5. The cobs (core) of ripe maize [corn]
6. Horse pellets, about 1.5 kg a day, giving two or three fistfuls at a time
7. Various mineral salts, vitamins, supplementary foods, etc., as directed by the veterinarian.

Tips to practice when feeding

1. When giving a food for the first time, give only a little bit and then observe whether it was easily digested or not by later inspecting the stool. If the food is not well digested, then that food should be chopped up, ground up or boiled until well cooked (such as maize [corn]). If the calf gets constipated or gets diarrhoea, then that food should be decreased or stopped entirely.

2. All food given to calves should always be chopped or sliced into small pieces.

3. You must be sure that all food given to calves is fresh, clean, and uncontaminated by toxic elements and chemicals.

After the age of three years, calves can be given ordinary food for adult elephants.



Musth

Musth is a natural phenomenon of nearly every healthy male elephant the age of 18 years and above. With some elephants their behaviour and personality do not change, that is they do not become aggressive, but most elephants experience a behavioural shift and become stubborn, dangerous, and aggressive for a period of one to four months until the condition runs its course. The musth fluid that flows has a foul smell and has a grey or dark grey colour.

Aggression can be directed at the mahout, at any and all humans, or at other elephants, even cow elephants. Some elephants will tolerate humans and be aggressive only to other elephants.

Some male elephants from about the age of twelve years and up begin to show signs of musth. If the elephant is in good health and has been receiving abundant food and water, and sufficient rest, that first musth is called ‘grass musth’ (*tok man yaa*). ‘Grass musth’ [honey musth] is shown by a secretion oozing from the temporal gland and agitation and stubbornness in the animal’s behaviour. Sometimes such elephants will play very roughly or injure other elephants or their keepers — but this is not the same strength as true musth. Elephants will generally come into true musth about 4 or 5 years after the first ‘grass musth’.

Sometimes female elephants which are fat and healthy will also come into ‘grass musth’, most often when some outside influence makes them nervous or before giving birth. The secretion exuded is greyish and pasty without a particularly bad smell. Beyond some agitation, there are few of the behavioural problems posed by males in true musth.

Coming into musth (1 - 5 days)

- The elephant’s neck will thicken (as felt by the mahout on the neck) and the elephant will seem fatter.
- The temporal gland on the forehead swells and seepage begins.
- The elephant will resist authority and become stubborn, refusing orders.
- The elephant’s eyes will change to become very alert, staring for a long period of time at the mahout, at other elephants, or at something else.



- The penis frequently becomes erect, and the elephant will slap it up into its belly while at the same time urinating in a dribbling manner.
- Finally, the elephant becomes listless and begins to eat less.

Full musth (1 - 5 months)

- The temporal gland swells greatly, and there is a smelly secretion that exudes in increasing quantity. Sometimes the secretion actually flows into the mouth.
- The penis is continually erect, secreting a stinky, mucous-like substance that falls onto the hind legs, making them moist, in a condition called *long bawng* [green penis syndrome].
- The elephant will be aggressive and will not recognize its mahout and elephants it has known. The mahout and others near the elephant must be very careful at all times.

Ending of musth (2 weeks - 2 months)

- The temporal gland will shrink back to normal at the same time as the amount of secretion reduces.
- The elephant becomes more peaceful and begins to follow the mahout's orders.
- The elephant is normal.

Preparing for musth

When the elephant shows the very earliest signs of musth, the mahout should choose a site and prepare as follows:

- Select a tethering place that is quiet and apart from other elephants. Critically important is to keep at a distance people who have no duties with the elephant.
- The tethering site must be cool and in the shade all day long.
- The tethering place should have clean water that flows continually. If this is not possible, it must be possible to bring clean water so the elephant can bathe and drink safely and conveniently every day.
- The tethering place must be smooth, with no holes or depressions and no garbage and sharp edges dangerous to the elephant.



- Choosing a site on a slight rise is extremely important because that will facilitate drainage of rain, of bathing water, and most particularly of the elephant's urine. Good drainage will also minimize the ill effects of foot and nail problems that can arise when a musth elephant is confined for months to a wet or muddy place. Similarly, choosing a site that has soil that absorbs water well is very useful in forestalling foot and nail problems.
- For safety, there should be a tree or some other secure tethering point that is strong enough to hold the elephant.
- All of the equipment used for musth elephants must be strong enough to withstand the elephant's strength and must be readily at hand. Every link in the tethering chain should be carefully inspected, the swivel should be strong and not defective, moving freely. The U-bolt should be oiled so that the post screws easily and securely into the threaded holes.
- Consideration should be given to providing musth elephants with special foods.

Diet in musth

When the elephant is in musth, the most appropriate food has low nutritional value, such as banana tree stalks (always cutting it to about a hand's length before feeding), green squash (*fak khiow*), and dried grass (which can be sprinkled with salt water to improve palatability), because such foods have a low nutritional value. When the elephant eats such food, it will feel full very quickly.

Other foods are possible but the amounts given should be decreased from when the elephant is not in musth. High-energy foods such as unhusked rice, sticky rice, etc., should be absolutely avoided.

High-energy foods are in no way dangerous to the elephant's physical health, but feeding high-energy foods will ensure that the musth period will endure much longer than if provided with foods with low caloric value. Low value foods in the proper amount will keep the animal in good health and will also give it the contentment of eating and having a full belly.

Warning: It is important that a musth elephant be given sufficiently clean water.



Disposal of elephant carcasses

When elephants die, the carcass is in one of two conditions, either safe for humans to dispose of or dangerous towards humans or to other elephants. In the first case, where the carcass is 'safe', the elephant has died of old age, a bad fall, a bad heart, being struck buy a truck, etc. You can burn or bury the elephant, or even butcher it for the meat, without any worry, although in fact no animal that dies on its own should ever be eaten. (Whether the person reading this thinks eating elephant meat is appropriate or inappropriate doesn't matter; villagers do it all of the time so the important thing is to do it safely.)

Warning: In any case where an apparently perfectly healthy elephant dies within one or two days with little or no obvious cause, that elephant's carcass should undergo a post-mortem by a veterinarian (to ascertain whether or not it died of a dangerous contagious disease).

The second case, where the carcass poses danger to humans or elephants, is where the elephant has probably died of a contagious disease (the different types are discussed below) that can kill people or kill elephants — or both. In such dangerous cases, there are two further types: (1) cases where the elephant has been treated by a veterinarian and you already know the exact cause, and (2) cases where the mahout or camp manager knows or suspects that the elephant has died of a disease but does not know what that disease was.

If the elephant died of what you think was probably a disease, immediately consult a veterinarian and have the him do a post-mortem on the animal. Sometimes the veterinarian will be able to tell you the disease immediately, sometimes he will have to take samples to analyse in a laboratory. Only when you know the exact cause of death can you and the veterinarian decide how to safely deal with the carcass.

Warning: Never deal with the carcass of an elephant that might have died of a contagious disease (like anthrax) without a veterinarian first inspecting the animal. (In fact, it is best if every elephant that dies is necropsied by a veterinarian, but whether because of the trouble or the wasted time or the expense, to the mahout's thinking, it often doesn't happen.) If you ignore this, you can easily kill yourself and everybody who has helped you. Most especially, never sell the meat of such an animal because you could cause many people to die.



Place of disposal: Conducting the post-mortem is obviously the business of the veterinarian but because disposal is usually done at the place where the elephant died, the mahout or the manager is usually the person who ends up selecting the site, and therefore they should consider it very carefully. The post-mortem site should normally be where the carcass will be disposed of, because if not that will mean renting a truck with a crane or a hoist to move the carcass.

The disposal site should be (1) far away from inhabited areas, (2) far from streams, ponds, and natural water supplies, and (3) away from where other elephants or other animals are raised. The three conditions are especially important when the elephant died of certain contagious diseases. Thus, if an elephant is being treated in a place that does not meet the three safety conditions but it looks likely to die, if it can still walk, it might make sense to take it to an appropriate disposal site. This is particularly true with elephants that might have a contagious disease but are being kept in a place that will be used for keeping elephants in the future.

Methods of disposal: According to the national law governing the control of epidemic diseases of animals, carcasses of infected animals must be disposed of as follows. There are two accepted methods of disposing of carcasses, burning and burying. Each has disadvantages and disadvantages.

1. **Burning:** If there is an appropriate furnace, then burning is very easy; unfortunately, this is rare. Otherwise, the carcass can be burned by piling firewood or old rubber tyres very near it and on top of it. (If firewood is put right against the elephant, escaping steam and gases will interfere with efficient burning and the fire will not be as hot.) Petrol can be used to help start the fire. Personnel should be very careful to ensure that the carcass is completely burned and be very careful that the fire does not spread. The ashes should be buried in the case of contagious diseases.

Advantages:

- Burning is very effective at destroying germ organisms, but only if great attention to detail is paid.
- Burning uses little space.



Disadvantages:

- It is much work to gather the combustible materials, such as wood, tyres, fuel, etc.
- There is the potential for accidentally starting a large fire that can spread.
- The carcass might not be incinerated perfectly.
- Burning takes much time as the fire must be very carefully tended for 48 to 72 hours.
- Burning is not a good idea during the rainy season.
- If rubber tyres are used, the smell is very bad.

2. ***Burial:*** The carcass must be buried deeply enough that it will be covered with at least one metre of dirt. In cases of anthrax sprinkle the carcass liberally with lime before filling the hole. All dung, bedding, and even topsoil should also be buried. A fence should be built around anthrax cases because the spores can survive for many tens of years.

Advantages:

- Convenient, quick and not difficult.
- Burial is good at stopping the spread of disease.

Disadvantages:

- Burial uses extensive space.
- If no back hoe is available, digging is very hard and time-consuming work.
- If a back hoe is used, this method is expensive.

Diseases requiring caution during disposal

Diseases dangerous to both humans and elephants are anthrax, rabies and tuberculosis. Before contact with a potentially carcass, prepare as follows: (1) wear rubber gloves or, if that is impossible, rub the hands and arms with the head of the tumeric plant before and after contact to counter infection, (2) inspect yourself carefully for cuts and sores and bandage the wounds or, better, do not take part as germs might enter the wound, and (3) any workers ill or not feeling well should take no part because their immune systems will be compromised, making them more likely to contract the disease. Use a mask or cloth to cover the nose and mouth.



Contagious diseases transmissible to humans

Anthrax is primarily an animal disease but it can also infect humans and it is often fatal. Anthrax can be easily contracted through spores entering open cuts or sores, or by inhalation of spores, while disposing of an elephant carcass. Therefore, after the the burning or burial of an elephant, the mahout should bathe very carefully and he should change to new, clean clothing before entering into contact with other elephants. Wear your oldest clothes, because the clothing must be burnt after the work.

The clinical signs of a person infected by anthrax are high fever, vomiting, and respiratory problems. Some cases have erupting sores and/or boils on hands and arms or wherever the organism has entered. Death can follow after 10-15 days.

See Page 123.

Tuberculosis can be transmitted from people to elephants or from elephants to people. Therefore, anybody working on a post-mortem or disposing of an elephant carcass thought to be infected with tuberculosis must take preventative measures to avoid inhaling the germs by wearing a mask.

See Page 128.

Rabies can afflict humans, elephants, and all mammals. The means of infection is through the bite of a rabid animal or by contamination by blood, lymph secretions, or saliva of an infected animal. Any mahout or worker with open cuts or sores should avoid working with the carcass of an elephant that has died from rabies. Rabies in humans is always fatal.

See Page 133.

Internal parasites should be considered. Even though there is no evidence that internal parasites of elephants can infect humans, all of the people involved in post-mortems of animals with worms should be careful. In particular, eating the meat of worm-ridden elephants should be avoided.



Contagious diseases transmissible to elephants

Haemorrhagic septicaemia is highly contagious disease capable of infecting other elephants in a very short period of time. Therefore, anybody who was involved in disposing of the carcass of an elephant which has died of haemorrhagic septicaemia should avoid contact with other elephants or with mahouts until having cleaned his body very carefully and having changed his clothing.

See page 125.

Diarrhoea from contagious diseases may be transmissible through humans, so all workers should bathe carefully and change their clothing before contacting other, healthy elephants.

See Diarrhoea from germs, page 119.

All tools and implements used should be disinfected after use. (See Hygiene, page 66)

PRIMARY MEDICAL CARE

Primary medical care is a very important and mahouts should study it and practice until they are proficient. Always keep in mind that a sick elephant will not return to normal if it does not get correct treatment, even if the medicines are there.

Primary medical care is very useful because the mahout can provide proper care for his elephant before the veterinarian comes to treat it, can provide follow-up care after the veterinarian has visited, and the mahout or camp manager can treat minor injuries and conditions on his own.

Medicines and drugs to have at hand

There are certain common medicines and drugs that the mahout can easily keep nearby at all times in order to treat minor or emergency health problems. Most of the medicines to be kept at hand are for external use (eye drops, pain-relief ointments, oral pain relievers, etc.) and are



useful in emergency situations where there is no veterinarian nearby or where the veterinarian can not be contacted and the mahout or manager must provide the initial treatment.

1. Medicines used on wounds:

Tincture of iodine. A dark brown colour, it can be bought at any pharmacy or veterinary supply store.

Method of use: To put in new, fresh wounds (but not deep wounds) one time only and to cause abscesses to ripen.

Povidone-iodine 1%. A dark brown colour like tincture of iodine, but ten times less concentrated and not so irritating to wounds. It is very widely available and can be bought at any pharmacy or veterinary supply store.

Method of use: Only for treating fresh wounds, sores, scaldings, etc., where it should be mixed one part Povidone-iodine 1% to ten parts water. Dilution is essential because stronger solutions will cause irritation. When washing infected tusks, Povidone-iodine 1% should be diluted 20 to 1.

Acriflavin solution. A yellow coloured liquid. In fact, Thai mahouts call it 'yellow medicine' (*yaa leuang*). Acriflavin is applied after a wound has already been cleaned. It can be bought at any pharmacy or veterinary supply store.

Method of use: Apply to chronic wounds with pus and decomposing/rotten wounds.

Gentian violet. A deep purple coloured liquid. Gentian violet can be bought at any pharmacy or veterinary supply store.

Method of use: Gentian violet is used with wounds in the mouth, trunk, and soft tissues [mucous membranes]. Gentian violet is particularly efficient with wounds that have come about as a side effect of fungal infections.

Hydrogen Peroxide. A colourless transparent liquid. It can be bought at any pharmacy or veterinary supply store.



Method of use: Use to clean infected and decomposing/rotten wounds that have pus. After application, let it sit for about five minutes before washing off with clean water. Hydrogen peroxide should be used only once or twice at the initial treatment for cleaning the wound in order to clear the pus in a wound.

Warning: Absolutely never use hydrogen peroxide on a fresh wound.

Alcohol. A transparent, colourless or blue liquid. It can be bought at any pharmacy or veterinary supply store.

Method of use: Alcohol is used to clean skin before giving an injection or before operating. Alcohol should never be applied on or in a wound.

Antibiotic ointment. A yellowish cream. It can be bought at any veterinary supply store or in any large market area. Brands include Bactacin, Mytocolin, etc.

Method of use: Applied to chronic wounds, ulcers, decomposing/rotten wounds, scaldings, etc., two or three times daily. Antibiotic ointments stay with the wound reasonably long and help to promote tissue growth. A disadvantage of the stickiness is that it easily attracts dust and dirt to the wound. After application, it helps if the wound can be covered with gauze.

Antibiotic spray. An antibiotic most often mixed with gentian violet. Sprays can be bought at any veterinary supply store or in any large market area. Brands include Alamycin spray, Tetravet aerosol, etc.

Method of use: Spray on chronic wounds (decomposing/rotten areas, ulcers, etc.) after cleaning.

Anti-insect powder. A mixture of insect-killing compounds and antibiotics that helps wounds to heal. Available at veterinary supply stores. The usual brand is Negasunt.

Method of use: Sprinkle the powder over the wound after having cleaned it and after having applied the primary medicine. The purpose is to prevent infestation from insects, particularly those that attempt to lay eggs in wounds.



2. Medicines for the skin and for muscles:

Inflammation-reducing medicines for the skin. Used after conditions such as damage from chemicals, insect bites, etc. Most often these are steroids applied topically, and most often they come mixed with antibiotics. Available at veterinary supply stores. Brands include Beta-Cream, Beta-Met [Betamethazone cream], etc.

Method of use: Rub inflammation reducers onto the affected area quite frequently because such medicines are absorbed into the skin very quickly.

Analgesics for muscles and tendons. Used for strains, sprains, swellings, etc. There are two types, ointments and oils. Brands include Voltarene ointment, Muay Oil, St. Luke Oil, etc.

Method of use: Rub into painful, swollen or inflamed muscles at least twice a day.

3. Eye medicines:

Eye drops. Liquid. Antibiotics are the most important ingredient. The advantages of eye drops are that it is easy to keep the eye clean and that results come faster than with ointments, usually in about two days. Can be bought at any pharmacy. Brands include Vanafen, Chloramphenicol, etc.

See Medicating eyes, page 103.

Method of use: Use on eyes that are weeping more than usual, eyes with pus, wounds of the cornea, etc. Apply hourly until the condition disappears.

Eye ointments. Ointments will stay in the eye longer than drops, but with the disadvantage that their stickiness attracts dirt, bits of grass, etc. Available in markets. Brands include Vanafen ointment, Tetracycline ointment, Kemicitin, etc.

Method of use: Use on eyes weeping more than usual, eyes with pus, wounds of the cornea, etc. Apply at least twice a day.

Warning: Never use eye drops or ointment that contain steroids in cases of an ulcerated cornea. Leave this for a veterinarian to treat.



4. Medicines to kill pain:

Pain relievers. Have the power to alleviate pain in suffering elephants. Brands include Daga, Nutamol, Paraset, Sara, Bayer aspirin

Method of use: Grind the pills to a powder and dissolve in water and have the elephant drink or, alternatively, place the pills in ripe bananas or some other favourite food. For mature animals give about 40 to 60 pills at a time, once or twice a day until a veterinarian comes.

Warning: Aspirin and Daga have the power to irritate the stomach wall if administered on an empty stomach. Never give aspirin on an empty stomach.

Tools and equipment

There are two basic groups of tools and equipment, those required at an elephant camp with more than five elephants and those necessary when travelling with an elephant.

Equipment at an elephant camp

This equipment is used by mahouts both for medical care and also daily needs in routine camp life.

A plastic or metal **5-litre bucket** is necessary for bringing the elephant drinking water, for bathing the elephant, for cleaning wounds, for giving pellet foods, for unhusked rice, etc. There should be at least two buckets for each elephant. The buckets should be free of any bad smell and chemical contamination.

A **100-litre drum** is needed to hold drinking water for elephants when they are far from the watering site. The drum should be washed so it is clean and there is no smell. There should be 3-4 drums for every 5-10 elephants because some elephants are not willing to drink from the same vessel as other elephants, which the mahout should know.

Warning: If either the vessel or the water has a bad smell, the elephant is likely to be unwilling to drink it, such as tap water with chlorine or a vessel that has held petroleum products. The vessel must be washed thoroughly and left full of water until any smell has disappeared before using it to water elephants.



A **20-litre metal pail** or a tin with the top cut off used for boiling water and fomentations to reduce pain, swelling, and oedema.

A **pail for mixing insecticides** used to spray and kill insect parasites and for mixing germicides used to clean wounds and infected tusk cavities, and for sanitizing the floor of keeping sites. This pail should not be used for any other purpose.

A **thermometer** for taking temperatures of elephants that seem not well. (For method of use, see page 71)

A **50 cc. plastic syringe**. For washing wounds or spraying wounds in situations where the elephant is not willing to have the wound handled. The syringe can be boiled and reused but it should never be cleaned or sterilized with an antiseptic. (See page 66 for the method of cleaning.) Such syringes can be used for all elephants so there should be 3 or 4 of them in a sizeable camp.

A **plastic syringe** with a capacity of 1 to 3 cc. to be used to apply eye drop medicine. The eye drop applicator can be re-used but it should be used for only one elephant. Keep it in a clean place.

Clean cloths of about 1 X 2 feet square. There should be 3 to 4 clean [sterile] cloths for each elephant. They are used for cleaning the skin, for cleaning skin around wounds, cleaning medical implements, stanching wounds, etc. Under some conditions such cloths might be used instead of gauze for wiping tears from the elephant's eyes or cleaning before applying eye drops. Use clean cloths only with one elephant.

The cloth used should be soft and highly water absorbent, such as terrycloth. Cloths should be boiled after each use for 15 minutes.

Small clear plastic bags of various sizes starting from 6 X 9 inches for holding syringes for injecting medicine and other implements in order to keep them clean and dust-free.

Large plastic garbage bags suitable for soaking foot wounds. Garbage bags are also suitable for storing implements.

Small plastic bags (6 X 9 inches) for holding and keeping various implements used in treating the elephant clean and dust-free.

Small garbage bags for soaking the elephant's foot when it gets an infection in the foot.

Pliers for grabbing and pulling out nails, glass shards, stones, or other objects embedded in the elephant's foot.

Liquid soap, such as dishwashing detergent, for cleaning tools.



Equipment for a small camp and traveling

These objects are essential for situations that arise very quickly. It is difficult if you are caught without such implements for giving food and water and for treating the elephant immediately.

A **5-litre water pail** is essential for carrying and holding drinking water, for bathing , and for holding food such as unhusked rice.

A **10-litre water pail** with a secure lid for drinking water which the mahout must ensure is at hand at all times.

A **thermometer** for taking temperatures of elephants that seem not well.

Chains and U-bolts and other implements used to control the elephant, such as the hook, knife, and hobbles.

A **1 to 3 cc. plastic syringe** to apply eye drops. The syringe can be re-used but only for one elephant. Store in a clean place.

A **50 cc. plastic syringe**. For washing wounds or spraying wounds in situations where the elephant is not willing to have the wound handled. The syringe can be boiled and reused but it should never be cleaned with an antiseptic.

Small plastic bags (6 X 9 inches) for holding and keeping various implements used in treating the elephant clean and dust-free.

Garbage bags for soaking the elephant's foot when it gets an infection in the foot.

Pliers

Clean cloths, about 3 or 4 pieces, for cleaning the skin, for cleaning around wounds, and for stanching blood flow, etc. Sterilise all cloths after use by boiling for 15 minutes.

Medicines that should be at hand when travelling

- Medicines for treating fresh wounds, such as tincture of iodine or Povidone-iodine 1%.
- Medicines for treating abscesses and chronic wounds, such as Furazone ointment or Acriflavin solution.
- Insect repellent powder such as Negasunt.
- Eye ointment or eye drops, such as Vanafen or Kimicitin.
- Cream or ointment such as any Betamethazone cream.



Hygiene

Everybody knows that germs are tiny little organisms that bring illness and death. Nonetheless, when looking at the tools you are using, the place you are working, or even your own hands, it is all too easy to think, “They look clean, so they must be clean.”

Unfortunately, this is not so. A cloth or a knife that looks perfectly clean, without a speck of dirt, might contain many germs. Therefore, each and every time you do a treatment, you should meticulously clean and disinfect all of your tools and, as far as possible, the place where the treatment will occur. Sometimes the lack of spending five or ten minutes on hygiene can cause the death of an elephant worth hundreds of thousands of baht.

Hygiene for the care giver

The most important habit to keep when working with medical tools and with open wounds on the elephant is to be very careful that your hands are clean. Best is to wash them carefully with soap, dry them, and then wash them again. Also make sure that your fingernails are short and clean.

Cleaning medical implements

Most of the implements that are used with elephants are ordinary household items and therefore they are fairly easy to clean and to look after. You wash them with clean water and with soap (dishwashing detergent is fine), wipe them clean, and then store them in a tightly sealed container. Before they are used again, it is a good idea to wash them once more. The exceptions are syringes and the pail which is used to mix medicines for cleaning wounds. If they are not new, syringes without needles used for applying topical medicines should be washed with water alone.

Cloths are not clean unless boiled for 15 minutes and then carefully dried in the sun away from dust and other air-borne contamination. After boiling, store the clean dry cloths in plastic bags or some other sealed container.



Metal pails are expensive and noisy to use but are strong and can be sterilized with boiling water. Plastic pails are liable to break and are more difficult to keep clean.

Cleaning the stable

Most stables in Thailand consist of a hard-packed dirt floor covered by a grass roof. Tile or concrete floors are a rarity. The two types require a different method of cleaning.

Grass roof with packed dirt floor:

- It is best to gather newly-fallen dung very carefully, immediately if possible, and also to collect the scattered remains of food about one hour after the food was given.
- Areas where elephants urinate frequently will be damp and foul-smelling. The mahout should, if possible, change the chaining place, or use clean dirt or sand to spread over the surface.
- Stables with grass roofs should change the grass every 2-3 years. While changing, it is best to leave the earth exposed to the sun for 3-5 days so as to dry it out and to destroy some microbes.

Tile roof and concrete floor

- Gather and collect dung upon its emergence and wash down urine immediately.
- Gather the remains of food and fodder one hour after it was given.
- Wash the floor twice a day, once in the morning and once in the afternoon.
- Wash the floor very carefully with a disinfectant (such as Dettol solution) at least once a month and even more often if infectious disease is present.

Disposal of waste

The waste that comes about from work and other activities of elephant camps requires appropriate disposal because waste may be a repository of infectious germs and toxins that can impact on elephants and humans health.



Waste that derives from elephants and elephant-related activities:

- Dung should be collected daily, both in stables and environs, and then buried and covered. (At present the Thai Elephant Conservation Center, Lampang, collects elephant dung and turns it into fertilizer, paper, and, after fermentation, into biogas for domestic cooking.)
- Garbage associated with related activities, such as trash deposited by tourists, should be carefully collected and buried or burned. Garbage that is hard to dispose of, such as glass bottles, soft drink cans, etc., should be separated and put in carefully sealed containers and left for municipal trash collectors, because such garbage degrades very slowly and will remain in the environment for a long time.

Warning: Sometimes elephants will accidentally eat garbage discarded by tourists, particularly plastic bags and candy wrappers, and then develop intestinal obstructions.

- Garbage that carries germs usually comes from having treated sick elephants, such as old bandages, cotton wool and bodily discharges. Such garbage should be carefully separated and burned apart from other garbage. After incineration such waste should be buried at least one metre deep, but only after covering it with a layer of lime as another level of disinfectant. Syringes and needles should be gathered and taken away from the site as recommended by a veterinarian.
- Waste water and water used when washing down floors should be released into the earth, which serves as a filter, at least 50 metres from any standing or running water. Facilities with sufficient funds should invest in equipment to treat waste water before it is released into any standing or running water.

Collecting samples for analysis

Collecting samples is very important, especially when an elephant is sick and the cause is unknown. Only a veterinarian can investigate and analyse and determine the cause, but many times it is impossible to find the cause because the veterinarian does not see the elephant when it is showing the signs of disease. Therefore the mahout, who is with the elephant all of the time, should be the person who helps by collecting samples for the veterinarian, in order to make the diagnosis quickly and with certainty. Improperly collected samples are a waste of time.



Collecting samples of parasites

Often elephants deposit **internal parasites** in their dung. The mahout should collect some parasites and then wash them in clean water and put them in a container filled with a 10% formalin solution (one part formalin, nine parts water) or into alcohol. The parasites in formalin solution or alcohol will keep for a long time at ordinary temperatures. Make a label for the container which includes the name of the elephant, the date, the place, and the elephant's name and the name of the mahout or owner.

As for **external parasitic insects** (ticks, lice and other blood suckers) the mahout should collect some samples and simply put them in a plain container or one with formalin or alcohol exactly as with internal parasites. Place a label on the container with the parasites, recording the details as above but also including the part of the elephant where the parasites were collected.

Collecting faecal samples

Dung is a very good indicator of the health of elephants. The mahout must examine his elephant's dung every day. If he finds loose stool, bloody mucous, parasites, etc., then he should collect a sample and consult a veterinarian. This is done as follows:

- Get a bolus of fresh dung. (Do not use dung more than one hour old.) Take a sample the size of a chicken egg from the middle of the bolus.
- Put the sample in a clean plastic bag. Before sealing it, force as much air as possible out of the bag. Write down the elephant's name, the date, the place and your own name.
- Put the samples in another plastic bag with ice (or in an ice chest) and quickly take it to your veterinarian.

Determining health

Most mahouts know their own elephant very well. They know what it likes to eat and what it likes – and doesn't like – to do. A good mahout knows the month when his elephant usually falls into musth and knows its changes in mood. Such knowledge is very useful to the mahout and to



the elephant's owner in caring for the animal. But there is much other knowledge that a person in the process of becoming a mahout should study and learn. For example, what goes on inside the elephant's body? When it eats, where does the food go and what benefit does it have for the elephant? Or if the food is toxic, what effect will that have?

Thailand has nearly 3,000 domesticated elephants but there are not even twenty veterinarians who are expert in treating elephants. At the same time, there are over 3,000 mahouts and thus the profession of being a mahout has great value in conserving Thailand's elephants.

Indicators of good health

- The elephant shows constant movement as seen in flapping ears, sweeping tail, and using the trunk to throw dirt.
- The elephant constantly eats and is always ready to eat. The dung shows the food to be well chewed. The dung has no bad smell.
- The eyes are clear, bright and well lubricated. The inside of the mouth and the trunk, the tongue, and other soft tissues are a rich pink colour.
- The skin is thick but soft and feels moist. The skin right above the toe nails is moist.

Indicators of bad health

- The elephant is listless; the ears, tail, and trunk hardly move.
- The elephant is exhausted, as noticed by little movement and the end of the trunk being rested on the ground for long periods of time.
- The elephant stands, eyes closed, and frequently yawns.
- When bulls urinate, the penis does not emerge from the sheath.
- The elephant is agitated and sometimes goes to the ground and bellows. It uses the trunk to gather dirt and apply it to the affected area. It uses the trunk to blow air on the affected area.
- The elephant eats and drinks very little or not at all
- The eyes are dull, sunken, and with copious tears. There is a mucous-like discharge from the trunk. The skin is dry and stiff to touch.
- The inside of the mouth, the tongue, and the inside of the trunk are very pale or, alternatively, very muddy or bright red rather than the normal pink. The skin above the toe nails is dry.



Reviewing a sick elephant's recent history

The largest part of an elephant's life is eating, followed by drinking and sleeping. Therefore, a review of the animal's recent eating, drinking, and sleeping in the 3-5 days before it has shown symptoms must come from the mahout.

Feeding: If the elephant has been eating food that is difficult to digest, for example very long-fibered food (such as lianas, banana tree stalks, or palm fronds) that has not been cut to suitable lengths, the elephant can become constipated. Or if the elephant has been eating foods that can cause gas, such as maize [corn] or unhusked rice or wheat or cassava, the elephant can have dyspepsia. These conditions can cause an elephant to die in one to three days.

Drinking water: Illness can come if an elephant has been drinking water that was contaminated with chemicals, because it can be poisoned. Or an elephant might refuse to drink water because the mahout has changed the watering place.

Sleeping: If an elephant will not or does not sleep, it might be because of something wrong with a leg. Or it might be so ill that it will not go to the ground to sleep for fear of not being able to stand up again. If an elephant sleeps during the day, the elephant is exhausted, possibly because the sleeping area has been shifted, or there was a disturbance at the sleeping area, or because the animal was too ill to sleep properly.

Work: The recent work history of the elephant is also important. For example, if the elephant was dragging logs yesterday, extreme fatigue can be considered normal or that work might explain a soreness in a leg.

Using a thermometer

Many mahouts think that using a thermometer is a matter only for veterinarians but this is not so. Taking an elephant's temperature is as easy as measuring the air pressure in the tyres of a car. A thermometer, which you can buy in any store that sells human medicine, costs only 50-100 baht or about as much as a good tyre gage.



Many experienced mahouts feel that they can tell if there is a fever by feeling the elephant's exhalations. This can be a guide but is never as good as the results from a thermometer. Taking an elephant's temperature can save you a lot of time and money. If an animal looks a bit sick but has a normal temperature, you can usually wait a while to see if it goes away before you need to spend time and money for a veterinarian. If there is a fever, a thermometer will let you know very quickly and accurately that you must find a veterinarian, hopefully saving the life of your valuable elephant.

Method of use: Take the thermometer and shake it briskly to make the mercury inside to go low down in the tube. Then stick the hand holding the thermometer wrist-deep in the elephant's rectum; leave it in for one or two minutes while holding onto it, until it is as hot as it will get. If the elephant is struggling or writhing, the thermometer can be inserted into a just dropped bolus of dung. The normal temperature of an elephant ranges between 97.5° and 99° Fahrenheit and in Celsius between 36° and 37°. If the temperature is 100° F or over or 37.8° C or over, the elephant has a fever and you should call a veterinarian. After use, the thermometer should be washed well in a disinfectant solution.

The temperature should be taken at least twice a day, morning and evening. If the elephant is truly ill, you should do it more often. Write down the time and the temperature each time so that you can show it to the veterinarian. He might see a pattern that helps to diagnosis the illness (for example, normal in the morning but a fever in the afternoon).

Medicating orally

Giving medicine through the mouth is usually for pain relievers and restoratives. The elephant is different than other animals because it can use its trunk, which can be compared to a hand, to extract things that have been put in its mouth. If the elephant doesn't want to swallow the medicine it will pull or drag it out.

The most appropriate methods to give medicines to elephants:

- Put the medicine in food that the elephant especially likes, for example, ripe bananas or sticky tamarind.



- Especially for calves, grind up tablets to a fine powder and mix them in sweetened, condensed milk or fruit jam so as to hide the taste from the tongue.
- Grind up tablets to a fine powder and mix the powder with clean water, but you must dissolve it very vigorously because the elephant is likely to know about the medicine. Put the liquid in a bottle and hand feed it to the elephant a bit at a time until the desired amount has been consumed.

Medicating rectally

The most common substance administered rectally is water in cases of severe dehydration, most especially in case of tetanus. Before inserting the water you must with a hand remove as much dung as possible and then insert a garden hose. It is very important not to cause any injury to the rectum.

- Wash your hands very carefully. Make sure your fingernails are very short.
- As a lubricant, apply liquid soap or dishwashing detergent all over your hand and arm.
- As gently as possible, insert the hand and remove as much dung as possible.
- Insert the rubber hose, which must have its end smoothed off completely so there is no sharp edge.
- The water must be warm, very near the body temperature of the elephant.
- Turn on the water at an appropriate flow. You can feel boluses that are ‘floating’ and you should pull out as many of those as you possibly can. Sometimes when the water has entered, the elephant will defecate on its own.
- Give warm water until the elephant shows discomfort and then stop the flow of water and wait for 30 minutes. The arm must remain inside so as to plug the rectum.

Warning: Be sure to lather your arm each and every time you insert it in the rectum.



Mahouts giving injections

In Thailand it is illegal for anyone other than a veterinarian to give an injection to any animal, including an elephant. But in treating elephants, veterinarians often meet circumstances where having a mahout give injections makes sense. Elephants are far more likely than any other valuable animal to be found in the middle of the jungle or in remote villages. Consequently, veterinarians sometimes treat elephants that, if they are not injected by a mahout, will not be injected at all.

A typical case might be an elephant with an infection easily cleared by ten days of antibiotics given as two injections a day — but the elephant is 90 kilometres away from the veterinarian’s office, the last 15 kilometres down a very bad dirt road impassable in the rainy season. The veterinarian cannot stay with the elephant for ten days. The elephant is healthy enough that it does not need a hospital, and it would be risking the animal’s health unnecessarily to subject it to the stress of a 10-wheel truck ride and adjusting to strange circumstances. Plus, the owner might not be able to afford to rent the truck.

In such a case, any intelligent person will agree that common sense should take precedence over the law, and that mahouts under a veterinarian’s strict supervision should be allowed to give injections. This is particularly so because the real purpose of the law is not to stop people from sticking needles in animals but rather to stop people from giving animals the wrong medicines or giving the wrong dosage.

If a veterinarian trusts a mahout enough to give him syringes and drugs, the mahout should repay that trust by using the drugs exactly as the veterinarian orders: never more, never less. Never decide on your own that an elephant has been healed and so you can stop treatment before the time the veterinarian specified. Ten days is ten days. If you stop too early, the infection might return and be made worse because the elephant has developed a resistance to the drug.

Similarly, never use old medicines laying around. Never think, “Eeeh, I have that medicine left over from Phlai Gaew; I think I’ll use it with Phlai Bunrawd.” Choosing medicines and dosages on your own is not only illegal, it is not smart. You can end up with a dead elephant.

Never inject medicines except under instructions and orders of a veterinarian. Do use the techniques given below.



Method for giving intramuscular injections

Giving injections is supposed to be done only by veterinarians, because it can be dangerous if the proper method is not used. But sometimes an elephant is so aggressive that only the mahout can approach and therefore he must give the injection, with the veterinarian nearby supervising.

1. Get a new disposable syringe of the right size for the dose of medicine to be given, usually a 50 cc syringe. Prepare an unused, sterile needle, 1.5-3 inches in length, number 14~16 gauge.

2. Choose the place where you will inject, picking an area with muscles. With elephants, use the shoulder muscles if you are on foot. Use the neck muscle if you are mounted. (See page 144 for sites)

3. Clean the area where you are going to inject with cotton wool soaked in alcohol.



4. Draw the medicine from the bottle into the syringe in the quantity determined by the veterinarian. (See picture.) Expel any air that remains in the syringe.



5. With your clenched fist strike the area to make the animal aware so that it is prepared and is not startled when you insert the needle.

6. Stick the needle in the muscle, up to the base of the needle.

7. Take the filled syringe and connect it with the base of the needle already in the elephant.

8. Before injecting the medicine, pull back the plunger a bit to ensure that the needle is only in muscle and not in a blood vessel. If the needle is in a blood vessel, you will see blood enter the syringe. If you hit a nerve the elephant will writhe struggle more than usual. If you hit a blood vessel or a nerve, remove the syringe and start over.

9. Inject the medicine entirely. Take the syringe out and then immediately rub the injected area with your hand to help distribute the medicine. Clean the area with alcohol-soaked cotton wool again.

Warning: Some medicines can cause the area to become swollen but this usually soon subsides. The mahout can help to lessen the swelling by using hot compresses or fomentation.

Caring for sick elephants on the ground

Normally elephants sleep four to five hours a day, mostly at night some on the ground and some standing. Elephants sleeping on the ground are very good at sensing when something strange happens nearby, and thus, apart from calves and sick elephants, it is unusual for the mahout or keeper to actually see an elephant sleeping on the ground.

If an elephant is so sick that it cannot rise on its own, the mahout should consult with a veterinarian about how to arrange the position that the elephant has assumed so that it represents the least danger.

- The elephant should be made to lie on one side or the other. A sick elephant should never under any circumstance be allowed to lie couched on its belly because it will be unable to breathe properly and can even suffocate because of pressure placed on the lungs.
- With sick elephants that are resting on their sides, the side should be changed at least twice a day to prevent a build-up of blood on one side [hypostatic congestion].
- If an elephant is on the ground for over one week, bed sores [pressure wounds or sores] are likely to develop. (See page 87.) Good bedding material, such as dried grass or straw, helps prevent pressure sores.



Health conditions caused by humans

There are four major health conditions caused by humans which in extreme cases have the same medical urgency as a real disease: overwork, malnutrition, stress, and heat stroke. (Humans can also be a contributor to a fifth, much less common disease-free health condition, collapse from cold.) All of these conditions can befall wild elephants, but they are rare in nature because wild elephants are free to avoid them. Humans, who can restrain and confine elephants and who can send them to inappropriate places, cause these debilitating conditions to occur far more often than they do in wild elephants.

The first four of these health conditions are very common afflictions amongst domesticated elephants in Thailand and they cause great damage, perhaps as much or more as damage from real diseases. Indeed, many cases of real diseases occur only because human-caused health conditions have so weakened elephants that become easy prey to disease. The sad part is that with professional management and humane principles of care, all of these conditions are usually easily avoided.

Overwork (Exhaustion)

Overwork is simply working an elephant so hard that it becomes exhausted and its physical health degenerates to the point where it requires medical treatment, at very least complete rest and improved feeding. Exhaustion can weaken the elephant to the point where its body's immune system weakens and the animal becomes susceptible to real diseases. Overwork, beyond using too much of an elephant's energy, also uses too much of its time, and often much of that time would have been spent feeding. Overwork thus often leads directly to a closely related human-caused health condition, malnutrition from having eaten too little food.

Malnutrition

โรคขาดสารอาหาร (ภาวะทุพโภชนา)

Malnutrition is often found in elephants that are working to make money doing piece work, such as elephants giving rides at tourist venues, elephants panhandling in cities, etc. The more hours the elephant is made to work, the more money the people make. The result is that the elephants



are getting insufficient food or that the food they are eating is not as varied as they would get in more natural circumstances. Sometimes elephants get bored with the food given and sometimes they stop eating. Orphaned elephants are very often malnourished. (See page 46.)

Malnutrition comes in two basic forms, although the two can happen at the same time. First, and simplest, is simply not getting enough food. Second is when through eating only one, or only a very few kinds of food, the elephant is deprived of some essential nutrient, such as protein, minerals, a trace element, or something else.

Human-caused malnutrition is rare in Thailand, except perhaps in some old and crippled animals of little economic value, but many overworked elephants in poor condition suffer borderline malnutrition.

Underweight elephants are usually working elephants that have been given insufficient food, although the problem is also found in old elephants with old and inefficient teeth and digestive systems.

For mahouts and owners, the most important thing is to provide the elephant with the best food available and enough time to eat it. Giving the elephant very good food might appear expensive, but in the long term the poor health that results from inadequate food can cost a great deal of money in lost work time and expensive veterinary treatment, and perhaps even the cost of a dead elephant

Clinical signs: The elephant is thin, swollen with fluid under the jaws, listless, has little strength, and the skin is hard and wrinkled.

Treatment:

- Take the elephant off of work and rest it.
- Supplement the animal's diet with nutritious foods such as ripe bananas, unhusked rice, sugarcane, pineapples, and steamed sticky rice.
- Give the animal medicinal herbs such as heart-leaved moonseed, or *bawraphet* (*Tinospora tuberculata* Beum.), *masaan* (*Dillenia aurea* Smith.), sticky tamarind, *makham piak* (*Tammarindus indica* Linn.), or *phluu chang* (*Cissus quadrangularis* Linn.).
- If there is swelling, apply a hot compress or hot fomentation.
- *If the condition does not improve, consult a veterinarian for a full diagnosis.*

Spasms from a calcium deficiency are usually found in tourism camps where elephants do not get a chance to eat natural mineral salts.



Elephants which are forced to do very hard work with insufficient rest are also often affected, as are elephants made to travel very long distances.

Clinical signs: The elephant has spasms and cannot control its muscles.

Treatment:

- Rest the elephant
- Supplement the food with mineral salt, such as the mineral salt blocks given to cattle and water buffalo. Or you can give calcium pills, but you should consult with a veterinarian about the amount to be given daily.
- *If the condition doesn't improve, consult a veterinarian.*

White muscle disease, which is not encountered very often, is found in newborn elephants born in areas where the soil and vegetation is deficient in selenium. White muscle disease is a condition that is very difficult to treat and thus prevention is much better. If you have a pregnant cow that is thin or in less than perfect health, especially in the last 3-6 months of her pregnancy, consult a veterinarian who can prescribe appropriate food supplements. The mineral selenium is often called for, but because administering it is complicated, it is best done under the supervision of a veterinarian.

Clinical signs: The calf is not able to get to its feet and stand after birth. Most such calves die within two weeks.

Treatment:

- In the last 3-6 months of pregnancy consult a veterinarian
- *Consult a veterinarian immediately.*

Lack of mother's milk in orphaned calves means that orphans often die because the calf gets diarrhoea from germs introduced in preparing powdered milk. Another cause of diarrhoea and often death is because the wrong kind of milk is given, such as powdered cow's milk, which many calves cannot digest properly. The best answer is to buy a special infant formula, such as Prosobee, for example, that is not based on milk.

Clinical signs: The calf does not develop normally, shows stunted growth, suffers diarrhoea often, has coarse and wrinkled skin, and has soft bones.

Treatment: Feed the same as other orphans. (See page 46)



Stress is often the cause for other illnesses and conditions. In elephants, stress often arises when elephants are overworked, when elephants are put to unusual or unnatural work, when elephants have not had enough to eat, are in too hot a place, are in an environment that is too noisy or too confined, when people are moving around in a disorderly fashion, etc. Getting a new mahout often causes stress in an elephant.

Clinical signs: Generally, the elephant does not show clear, easily readable signs of stress, but usually there are indicators such as when the elephant is chained, the elephant sways its head and body regularly, often increasing in speed. Some elephants will take their tethering chain and rhythmically strike it against the tree it is tied to or even against its own tusks. In some situations where nothing seems out of the normal and the elephant has been behaving well, the elephant suddenly become ‘crazy’ and dangerous to people. Thus, each mahout must be good at ‘reading’ whether his elephant is happy or unhappy.

It is also important to consider the other elephants nearby. Sometimes an elephant will become upset just because it is too near an elephant it does not like or is afraid of.

When elephants showing such conditions are not properly cared for, when the ultimate causes are allowed to occur, they are susceptible to conditions such as constipation, not eating, exhaustion, etc.

Treatment: Use the elephant only for inappropriate work. Take care of the elephant like a friend taking care of a friend. Do whatever is needed to keep the elephant from developing stress. Do not keep elephants, especially young elephants and female elephants, in isolation.

Advice to camp owners: If an elephant is out of condition in a way hard to explain by physical causes, consider changing mahouts or assigning a highly experienced mahout to observe the situation.

Heat stroke

พิษแดด

Heat stroke [heat stress] is found in elephants that have been worked very hard or made to walk long distances in hot direct sunlight. Heat stroke is also common in elephants that have been given insufficient food and rest.



Clinical signs:

- The elephant has a dazed look and cloudy eyes.
- The elephant breathes hoarsely in rapid succession.
- Usually the elephant will walk with a stagger and sometimes will collapse to the ground unconscious; if left untreated, the elephant can die.

Treatment:

- Prevention is best. Take care of the elephant with love: feed it well, rest it, and don't work it beyond its strength or under a hot sun.
- If it is possible, walk the elephant to a shady place; if that is not possible, build some sort of shade over it.
- Pour water over the elephant's entire body, but most especially the ears.
- Give the elephant only small amounts of water, because drinking too much at one time can obstruct breathing, even to the point of death.
- *If the condition does not improve, consult a veterinarian.*
- Any elephant that has suffered heat stroke should be given two or three days of rest after recovering.

Collapse from cold

อาการป่วยจากความหนาวเย็น

Elephants collapsing from cold are quite common in the cool season, especially in the North. Collapses occur in all cold weather but especially when it is both cold and wet. The best form of prevention is to keep all animals under observation and be ready to treat affected elephants as below.

Most cases are elephants that are old, ill, thin, or just not strong. Also particularly vulnerable are elephants that are under stress or that have just moved from a warmer area. Elephants in any of these categories should be observed especially carefully.

Clinical signs:

- Collapse from cold usually is in the middle of the night or near dawn.
- The elephant will tremble over its whole body, and especially the skin will continuously twitch or tremble.
- The end of the trunk, the lips, and other soft tissue is very pale.
- If the elephant is not helped, it is likely to suffer regular spasms, a sign that it is soon to die.



Treatment:

- Remove hobbles.
- If the elephant is on the ground, try to get it to its feet, although do not rush it.
- Feed the elephant with highly nutritious food such as ripe bananas and sugarcane. Warm unhusked rice, wrapped in banana leaves or the like, is particularly good and will usually be eaten even by elephants on the ground.
- Relieve the elephant's cold by building fires alongside where it is lying down. (If a calf, be sure to have somebody watch over it continually.)
- Try to find a nearby place which is well protected from the wind, such as a tall building, a 10-wheel truck, a tall rock or whatever. Even the slightest breeze will blow away some of the elephant's body heat.
- *If the elephant does not improve, consult a veterinarian for treatment.*

All elephants that have suffered a collapse from cold should be given complete rest (about 1-2 weeks).

Wounds

www

Wounds are very common with elephants. If you see an elephant with no wounds or scars, you know that the elephant has an excellent, caring mahout.

Treating wounds

Wounds, whether open wounds or wounds about to become open, can easily become infected. Infected wounds can in turn lead to systemic infections that are extremely dangerous to the elephant. Therefore, when following up on treating a wound it is best if the elephant is kept in a stable with an easily cleaned concrete floor so that the elephant can not blow unclean substances such as dung or dirt into the wound. If there is no stable nearby, then the area where the elephant is chained should be very carefully cleaned so there is no dung or droppings from other animals.



Stanching bleeding

Being able to stop bleeding is of the highest importance when elephants have open, bleeding wounds. Bleeding can be stopped using several easy techniques. You can select just one method, or use any or all of them, but generally you should try them in the order given below.

After the bleeding has stopped or if the bleeding does not stop, call a veterinarian.

- Use a clean, boiled cloth to press against the wound or to stuff into a deep wound with strength for about five minutes until the blood stops. If the first cloth you use becomes soaked in blood, apply another clean cloth on top of it rather than removing the first one.
- If the bleeding is occurring on the legs or tail and cannot be controlled with pressure, a rope or cord can be used as a tourniquet. The tourniquet should be applied above the area that is bleeding. Never apply a tourniquet for more than five minutes; if upon release of the tourniquet blood still flows appreciably, then tighten it again or apply pressure again. (Do not use rope that is too small because it can cut into the skin.)
- Take a knife or a spade [*siam*, a very thin Thai shovel] that is clean, put it in a fire until very hot and then press it against the bleeding wound until the flow stops.
- After the rapid bleeding has stopped, use the stalks and tips of the *saab seua* grass (*Eupatorium odoratum* Linn.), squeezing it into a gelatinous mix and applying it to the wound until the bleeding stops.

Wound cleaning materials

When cleaning fresh wounds, infected wounds and lanced abscesses, the cleaning material used must be as free from germs as possible. There are three main choices: a clean cloth, cotton wool, and sterile gauze (such as used in hospitals). Mahouts treating wounds should know the characteristics of each.

When cleaning a specific wound, the mahout should consult with and strictly follow the instructions of a veterinarian.

1. Clean cloths, uncoloured, are easily available and cheap. Usually they are used for cleaning around wounds or pressing against or stuffing



into wounds to stop bleeding in emergencies. Such cloths should be boiled for at least 15 minutes and hung to dry and then stored in a plastic bag. If stored for long, they should be boiled again before use.

2. Cotton wool is very cheap and also very easy to find. When used to clean wounds it should be used only with water containing an antiseptic and used only under the instructions of a veterinarian

3. Sterile gauze is used normally only at an elephant hospital or under the instructions of a veterinarian.

Cleaning fresh, infected wounds

1. With clean water, wash all dirt, mud, and foreign matter away from the wound. If deep, then use water pressure, such as water from a garden hose. Search for and remove any foreign bodies. Wash the wound with Povidone-iodine 1% (diluted to 1:20 solution).

2. Dry the water off the surrounding area and inside the wound with a clean cloth or gauze. If the wound is deep, use cotton buds.

3. Wipe the area with cotton wool or gauze soaked in alcohol.

4. Wipe the wound with cotton wool or gauze dipped in undiluted Povidone-iodine 1% or tincture of iodine. If a deep hole use cotton buds.

5. Apply an anti-insect powder to the skin around the wound.

Cleaning chronic or infected wounds

1. With clean water, wash all dirt, mud, foreign matter and pus away from the wound and the surrounding area. Then wash with hydrogen peroxide once a day for two or three days until all of the pus is gone.

2. Leave the hydrogen peroxide for about half a minute. Rinse the wound with clean water until all of the hydrogen peroxide is cleared away. Then wipe the inside of the wound with a clean cloth.

3. Disinfect the area surrounding the wound by wiping with cotton wool or gauze soaked in alcohol.

4. Use cotton wool or gauze soaked in 'yellow medicine' [*yaa leuang*, Acriflavin] to wipe the wound. If the wound is deep, use cotton buds. In big wounds, use an antibiotic ointment such as Bactacin. The ointment will help promote tissue growth and control infection.

5. Sprinkle anti-insect powder all over the area of the wound.



Hot and cold applications

Hot and cold applications are used to reduce swelling, alleviate pain, and oedema; heat and cold are the operative agents.

Cold compresses: Take ice and wrap it in a clean cloth, and then press it over the affected area. Use cold compresses within the first 24 hours after an injury or condition. Cold applications are good for acute sprains when these involve lameness, pain, heat, and swelling.

Massage with Muay Oil or other analgesic balms. Rub over the area that is swollen or painful, using the palm of your hand. It is best not to use your fingers to press or massage. Treat two or three times a day.

Hot compresses: Take a brick, a stone, a banana tree stalk, or a bundle of the stalks of the crinum lily (*Crinum asiaticum* Linn.) and leave it in a fire until it is hot, and then wrap it in a clean cloth. Another method is to put hot water in a hot water bottle and apply it to the affected area. Hot compresses should be used after the condition has existed for 24 hours or more.

Fomentation: Using a mop-like device to ‘swat’ hot water, usually mixed with medicinal herbs, is a common traditional technique in Northern Thailand. The best way to learn this technique is to consult with an expert mahout.

Types of wounds

Wounds can be divided into the following types:

1. Abrasions occur when elephants rub up against trees and boulders until wounds appear. Abrasions are most common on the sides, the head, the feet and the rump. Abrasions often begin when elephants alleviate itching caused by burrowing insects or by small skin wounds.

Treatment:

- Letting elephants ‘play’ with dirt and mud helps to prevent the problem of elephants rubbing against trees and boulders.
- Apply an antibiotic ointment such as Bactacin with an insect repellent such as Negasunt to abraded areas to keep them from expanding.

Warning: When allowing elephants to ‘play’ with dirt and mud, make sure it is not contaminated with urine or dung.



2. Blunt-edge wounds [contusions] such as being struck with the back of a knife, back of a hook, or by a wooden implement are common. They usually occur around the head, sides, back, and ankle joints. The affected area is bruised and sometimes very swollen. If you squeeze such wounds, they are soft. If left untreated, strike wounds will often harden and develop into internal [subcutaneous] abscesses.

Treatment:

- Cease any more striking in the affected area.
- Apply a hot compress or do fomentation on the wound daily.
- *If the wound does not improve, consult a veterinarian.*

3. Slice wounds, such as from a knife or a spear thrust, are usually found on the head, trunk, or the ankles. Sharp-edge wounds are usually long or wide but not deep. Normally, there is not much bleeding.

Treatment:

- Take the elephant to a shady, dry, and quiet place.
- Stop the bleeding with a clean cloth or cotton wool.
- Wash the area around the wound with clean water or Povidone-iodine 1% and wipe it dry with a clean cloth or cotton wool.
- Clean the inside of the wound with a cloth soaked in Betadine or Povidone-iodine 1%. Dust the wound with insect repellent powder.

4. Puncture wounds, being pierced by a foreign object such as a nail, wire, a glass shard, or a sharp stone, are usually on the footpad. Often the elephant will limp. The wound can be shallow or deep. There might be bleeding but usually not very much. Puncture wounds can easily become infected with tetanus. With a large blade such as a machete the wound will be wide, deep and bleed copiously.

Treatment:

- Take the elephant to a shady, dry, and quiet place.
- Wash the foot (or wound) with clean water in order to inspect the sole of the foot
- If the foreign object is still there, pull it out.
- Clean the area around the wound with Povidone-iodine 1%.
- Smear the wound with antibiotic cream or ointment because that will stay longer than other types
- *If the blood will not stop flowing, seek out a veterinarian.*



5. Gunshot wounds are usually found on the trunk and the legs, particularly the feet. You can see the bullet or pellet hole, often with flowing blood. Usually the wound is swollen.

Treatment:

- *If the wound is in a critical area such as the forehead, chest, barrel or major blood vessels, quickly bring a veterinarian.*
- If the wound is in a non-critical area, such as the leg, and the slug or pellet is small, take the elephant to a shady, clean and quiet area.
- Use a clean cloth or cotton wool to stanch the bleeding.
- Wash or wipe the wound with clean, boiled water.
- Clean the wound with Povidone-iodine 1%.
- Get a veterinarian to take an X-ray to determine the location of the slug or pellet and to extend further treatment.

6. Bites from being attacked by another animal, such as an elephant [on tail] or a dog usually occur on the tail or legs. (Snake bite is covered on page 93.)

Treatment:

- Take the elephant to a quiet place, so as to dissipate the fear.
- If there is much bleeding, stanch the wound by pressing with cotton wool or a clean cloth.
- Clean around the wound with clean water and dry it with cotton wool or a clean cloth.
- Clean with tincture of iodine, Betadine or Povidone-iodine 1%.
- If the bite is on the tail, firmly wrap a clean cloth around it and hold the tail still until the bleeding stops.
- *Consult with a veterinarian.*

Warning: If an elephant is bitten by any animal, but especially a dog, it could contract rabies. (See page 133.)

7. Pressure wounds are caused by hard pressure, such as from a logging harness breast band, a too tight saddle girth, or from lying too long on the ground, such as a sick elephant. Pressure wounds most frequently occur at joints, bone protrusions, cheek bones, and on the back from logging or saddle harness. The wound is an ulcer with a thick edge or rim and sometimes has pus; if left untreated, it is likely to turn into a 'pus hole' [*phroong nawng* or fistula].



Treatment:

- Solve the problem that is causing the condition.
- Take the elephant to a shady, dry and quiet place.
- Use clean water to wash off any dirt or other material.
- Smear the wound with ‘yellow medicine’ [*yaa leuang*, Acriflavin] or with an antibiotic ointment. Apply insect repellent powder.
- If the wound is large, take the elephant off of work.
- *If the condition is severe or does not respond to treatment, consult a veterinarian.*

8. Burns are often found at the end of the trunk, on the back, and legs. Burns can be broken down into four main types: tree sap burns, sunburn, burns from fire or boiling water, and chemical burns.

Warning: Nearly all of this class of wounds are open or can become open, so they are extremely susceptible to secondary infection. Consequently, for convalescence try to find a shelter with a concrete floor so the elephant cannot throw dirt on the wound. If you cannot find a concrete floor, pick a place where there is no residue from dung from elephants or other animals.

Burns from corrosive tree sap of various kinds, such as the papaya plant or the black varnish tree, usually cause the skin to break into a rash and become itchy, but if the condition is not treated it can turn into an infected [septic] wound.

Treatment:

- Determine the kind of plant that did the damage and move the elephant to an area free of that plant.
- Wash the affected area with clean water and then use a clean cloth or use a piece of coconut shell to rub off the sap. Dry the area.
- Apply an antiseptic cream such as Travogen or Caladryl.
- *If the condition doesn't improve, consult a veterinarian.*

Sunburn comes from overexposure to the sun, often occurring in bulls in musth that are chained in open areas. The sores are swollen, red, and infected. The skin can split open from internal pressure and can slough off in sheets. The flesh can die and pus can form under the skin. The elephant will constantly try to use its trunk to spray water or spread dust over the sores. If not treated, the animal will quit drinking and eating and will die. (For heatstroke, see page 80.)



Treatment:

- Take the elephant to a cool place with good air circulation.
- If the elephant is still in musth or cannot be approached or moved, bring water for the elephant to drink and to spray on itself.
- Clean the wound with clean water, and gently dab it clean.
- Treat the elephant with a burn salve.
- *See a veterinarian immediately.*

Chemicals burns, such as from oil fuels and acids, for example, are common. After exposure to such caustic chemicals, the skin will swell and turn red and often become infected and in the end decay. Most often chemical burns are from liquids that leak from a container kept in the elephant's saddle.

Treatment:

- If the elephant is wearing a saddle and the chemical burn is on the back, take the gear off.
- Take clean water and gently flood the wound clean.
- Take the elephant to a shady, dry, well-ventilated, and quiet place.
- Clean the affected area with water, using cotton wool or a clean cloth and then dry it.
- Smear the affected area with a burn salve or with an antiseptic cream such as Cibis or Fennistil.
- *Consult a veterinarian as soon as possible.*

Burns from fires and from scalding water usually happen to young calves, because the keepers build fires near them at night, especially for orphaned calves. Special precautions should be taken with fires and boiling water around young calves because mahouts often leave them free, unchained or unpenned. If the burns or scalds are large, the elephant is likely to die. Such wounds are often swollen and they are prone to slough off.

Treatment:

- Try to calm the animal, restrain it, and keep it still.
- Take the elephant to a cool, shady, dry place.
- *Consult a veterinarian urgently, but if you must wait for him, first use an anti-infection powder or apply a burn salve.*

While waiting for the veterinarian, give a pain killer every 4 hours; keep the label of the pain killer to show the veterinarian. (For how to give painkillers, see page 72.)



9. Impact wounds come from a strong blow, being struck by a vehicle, a fall, being struck by a log, an accident during a performance, etc. Such wounds are usually found on the legs, shoulder joint, other joints, or on the back. Impact wounds range from bruises and swelling to internal bleeding, external bleeding, and broken and cracked bones.

Treatment: Consult a veterinarian as quickly as possible.

10. Wounds from explosives are usually on the front feet and legs. There will be torn skin and tissue. Usually some tissue will die. There is a sooty residue of the explosive over the whole wound.

Treatment: Consult a veterinarian as quickly as possible.

Abscesses

ฝีหนอง

Abscesses come in many kinds, so the easiest way to think of an abscess is as an infection out of control locally. Some abscesses become so bad that they lead to systemic infections of the blood.

Abscesses occur quickly under the skin, in the muscles, and in internal organs. In elephants abscesses usually occur under the skin. Abscesses are often associated with wounds and injuries. Some abscesses start with small wounds that then become larger when the elephant, to ease its irritation, rubs the wound against a tree or a boulder. Sometimes the condition begins with a small abscess but when the abscess erupts, it becomes an infected wound. Sometimes it is hard to tell which came first, the wound or the abscess, because they are so interrelated.

Abscesses start from many causes. A common cause is being regularly struck by the mahout. Another cause is wounds from breast bands from logging harness or from saddle girths that have pressed deeply into the skin for a long time. Some abscesses start where insects have laid eggs and or where medicine has been injected.

The abscesses that are found in elephants can be divided into two main types, acute abscesses and chronic abscesses

Acute abscesses

ฝีหนองชนิดเฉียบพลัน

Acute abscesses begin very quickly, within two weeks from when a foreign object pierced the skin or an infection occurred. If you press on the abscess, the elephant clearly feels pain. The wound area feels hot.



At the start of the condition, the abscess feels hard but as the abscess ‘ripens’ it becomes softer and then opens.

Abscesses can begin in deep muscle. In the beginning the elephant will have a fever but the abscess will not be swollen; still, the elephant will not be able to use that organ or to move as normal. About two to four weeks after infection, pus erupts or there is swelling in the surrounding area. Sometimes there is a deep hole leaking pus [fistula].

Treatment:

- If the abscess is on the skin but the ‘wall’ over the abscess has not yet thinned, the wound is not yet ‘ripe’. Use hot compresses or fomentation two to three times daily. You can also apply tincture of iodine liberally over the area because this can stimulate the abscess to ripen.
- When the abscess is ripe, lance it in the thinnest part.
- Squeeze out all of the pus. Use clean water to wash the inside of the incision. Dry the inside of the abscess. If the abscess has opened on its own, squeeze out all of the pus and clean the wound as above.
- Use hydrogen peroxide to rinse out the last of the pus. Use plain water to rinse out all of the remains of the hydrogen peroxide. Dry the wound with a clean cloth or with cotton wool.
- Clean with Povidone-iodine 1% until the inside is clean
- Apply either an antibiotic cream or powder.
- *If the abscess is very large, or if it is under the skin or deep in tissue, quickly call for a veterinarian.*

Chronic abscesses

ฝีหนองชนิดเรื้อรัง

Chronic abscesses develop very slowly, often over one or two years but sometimes as long as ten years. The walls are very thick and like a thick scar. Sometimes chronic abscesses are called ‘cold abscesses’ sometime they are sometimes called ‘easy abscesses’ [*fii sabai*].

Treatment:

- *Call a veterinarian to lance such abscesses because the walls are very thick.*
- If the abscess has opened on its own, lance it to drain pus.
- Clean the abscess with Povidone-iodine 1%
- Apply either an antibiotic cream or powder.



Elephants are liable to be poisoned by chemicals either through contact on the skin or through ingestion. In the past, elephants were often bitten by snakes, but today elephants are more likely to be affected by toxic chemicals in insecticides and herbicides, such as Diquat, Paraquat, etc. Consequently, the mahout must be very careful about where he takes his elephant to keep and to eat.

Naturally-occurring substances

Toxic metals are found in earth, rock, and in some water sources. Nitrates that are suffused in some water sources can, if a sufficient quantity is drunk, kill elephants. Or elephants can absorb metallic toxins in food, such as minerals found in red dirt, selenium for example.

Clinical signs: Symptoms usually manifest long after ingestion and absorption, which can make it difficult to ascertain the cause. But it is easy to tell the cause when more than one elephant becomes ill at the same time after ingesting the same contaminated food or water, because the condition is most likely to have come from the same source.

Treatment: Consult with a veterinarian and an environmental official to try to diagnose the condition and to analyse the real cause.

Toxins in plants, both by contact and ingestion, such as, for example, cassava, monkey pod (*Samanea saman* Merr.) or velvet bean (*Mucana pruriens* [L.] DC.). Often the symptoms are obscure. The possible presence of toxic plants is something that the mahout should think about both before taking his elephant to eat in a particular place. If the elephant shows signs of poisoning, it should be taken off of work immediately and a veterinarian should be called.

Man-made toxins (Insecticides, herbicides, and industrial waste)

Insecticides can be contacted either by ingestion or through the skin. The most important are the organophosphates (such as Malathion, Parathion) and the organochlorines (such as DDT, Aldrin, carbamate insecticides, etc). Poisoning is often found in elephants wandering in cities where they eat many contaminated cucumbers, guavas, etc.



Clinical signs: Insecticides affect the central nervous system, causing nervousness and apprehension and suppressing breathing. These toxins can cause salivation, vomiting, colic, diarrhoea, tremors of the skin, convulsions, laying on the ground and ultimately death. The elephant will begin to show signs within about 12 hours after having ingested the toxin. Nervous signs can be delayed for up to two days.

Treatment:

- If you know the cause, keep the container or the label to aid in prescribing treatment.
- *Call a veterinarian immediately.*

Herbicides like Diquat and Paraquat are often ingested when, after the harvest, elephants are let free to feed in the villagers' fields and paddies. Animals are sometimes poisoned after drinking from contaminated containers.

Clinical signs: Affects the central nervous system and causes the elephant to vomit, salivate, have diarrhoea, tremble and die.

Treatment:

- If you know the chemical, keep the container or the label to aid in prescribing treatment.
- *Call a veterinarian immediately.*

Industrial wastes that have contaminated grass and water frequently affect elephants that wander in cities.

Three chemicals in the environment are a particular danger to elephants. Arsenic will cause elephants to have great stomach pain, to go the ground, and to ultimately die. Strychnine causes elephants to suffer convulsions. Lead causes elephants, for about three days, to walk unevenly, to salivate, and to have glazed eyes; elephants will become excited, tensing and suffering convulsions.

Treatment: *Call a veterinarian immediately.*

Snake bite is most often suffered by calves.

Clinical signs:

- Symptoms vary according to the type of snake.
- Cobras and king cobras will leave two large fang marks and two rows of small teeth marks. The elephant will show signs of the central nervous system being affected, particularly paralysis, and the animal will often die. The above conditions occur within 1-2 hours of being bitten.



- Russell's pit vipers and kraits will leave two fang marks that are larger and deeper than a cobra's or a king cobra's fangs. The venom affects the blood and causes swelling and severe local tissue damage from which a dark bloody fluid may ooze. The elephant is likely to die from kidney failure.
- If stung by a wasp or scorpion or bitten by centipede the elephant will not exhibit a severe condition but there will be some swelling and some infection in the area of the wound.

Treatment:

- Knowing the type of snake will make determining the course of treatment easier but usually there is only the bite marks with the snake never seen.
- Take the elephant to a shady place.
- Wash the wound with copious clean water and also with *dang thap tim* [potassium permanganate solution].
- *Then, as quickly as possible, bring a veterinarian.*
- In the case of insect bites, apply an anti-infection cream in the area of the bite or sting.

Note: Old-time mahouts say that in cases of snakebite, besides looking for fang puncture marks, you should also check to see if hairs can be pulled out easier than usual.

Advice to camp managers: Very often when an elephant has died quickly with no immediately apparent cause, the mahout will say that it is from snakebite, because that is a very easy answer. But often the real reason is that the mahout hasn't moved the elephant to new feeding sites, has chained the elephant where there is no water, and the elephant has actually died for lack of food or water.

THE OUTSIDE OF THE ELEPHANT

Skin

The skin of the Asian elephant is 1-3.5 centimetres thick. The skin on the back and the haunches is the thickest and the skin behind the ears is the thinnest. The skin is important in controlling temperature, especially dissipating heat. The elephant's skin is so wrinkly partly to increase surface area to shed warmth from its body. Oddly, the skin has no sweat



glands except for those right above the elephant's toenails. Healthy skin plays a great part in an elephant's vitality. Elephants love to roll in mud and to throw dirt over themselves, both of which protect against sun and insects. They also love to bathe for long periods, and bathing is a good opportunity for the mahout to look for anything unusual with the skin, such as wounds, abscesses and parasites.

Papilloma

๒๑๑



Papilloma warts, which are caused by a virus, are not found very frequently in elephants. Papilloma warts most often arise in calves, particularly those that have not drunk mother's milk regularly since birth, the lack of which causes the calf to be deficient in antibodies against the virus.

The warts are characteristically like round balls of flesh, much like warts in people but larger. Warts are often found on the trunk, from the tip to the base. Mostly you find only one wart, but sometimes there are many.

Clinical signs:

- In some cases where there are many warts on the trunk, the elephant will only be able to use its trunk clumsily. Sometimes the elephant will be noticeably irritated but still be able to use its trunk normally to gather grass and to drink water.
- Warts develop quickly, growing in size and in number in 2-4 weeks, and they often fall off and disappear on their own.



Treatment:

- If papilloma warts are found where they do not interfere with the life process or where there are not enough to be very ugly, leave them alone because the warts are likely to fall off on their own.
- If the elephant shows irritation or if the warts interfere with feeding, consult a veterinarian and he will twist them off completely. Never use a knife or scissors to cut off warts because that will cause bleeding; also, if cut, there will be a new wart in about a day's time. (Like weeds, these warts have roots buried in the skin.)
- If the wart falls off by itself, wash the base that remains with Povidone-iodine 1% diluted to a 1:20 solution or use an antibiotic spray or apply Furazone ointment or Acriflavin. Then call a veterinarian.

Fungus on the skin

โรคเชื้อราที่ผิวหนัง

In the old days, there were basically no fungal infections on the skin because elephants were kept in appropriate, natural conditions and not overworked, which is quite different from today.

Fungal infections are often found on elephants fed insufficient food, or poor food, or on elephants that have been worked to the point of exhaustion. The fungi are found everywhere in the environment. Infection often comes when elephants are kept in a very confined space.

Path of infection:

- Through an elephant that already has the disease
- Through fungi spores found in food and the soil

Clinical signs:

The fungus first appears as specks, often starting as small grey-white spots on the back of the ears or on the throat. If left untreated, these spots will enlarge into blotches and can spread all over the body. Some cases have distinct blotches of bright pink with a diameter of up to 10 centimetres. (The pink is in not the colour of the fungus but rather the colour of the skin after the fungus has caused depigmentation.) These blotches cause irritation and itching in the elephant, so it will often scratch the infected area or rub it against a tree until wounds form. The condition can effect eating and sleeping, ultimately leading to secondary illnesses.

See photograph, page DDDD



Treatment:

- Separate the infected elephant from other elephants.
- Take the elephant off of work or put it on very light work.
- Provide sufficient food of high nutritional value such as bananas, unhusked rice, and fresh grass.
- With newly infected elephants, the condition can be alleviated by smearing an anti-fungal ointment such as Travogen ointment or Ketoconazole, which can be bought in any pharmacy. Anti-fungal ointments are expensive, often too expensive for treating full-blown cases. The money is well-spent, however, for cases just beginning because eliminating the fungus early can alleviate the need for injected drugs, which are toxic in overdoses and thus very dangerous.
- Smear the infected skin with olive oil [‘Thai olive’ or *makawk*], which will keep the skin moist and slow the spread of the infection.
- *If the condition has not improved within a month, consult a veterinarian to diagnose and treat the disease.*

Warning: Fungal infections require a methodical and often very long course of treatment. Very often the condition proves drug resistant, and thus treatment can become very expensive. Therefore, if you have an elephant that is just starting to show the signs, even a very little bit, treat it as quickly as possible. In the end you will save much money.

Ventral oedema

ลำบอง

Ventral oedema is a swelling caused by water [fluid] collecting in the tissues under the skin on the elephant’s under surface. Ventral oedema is a sign of something wrong inside the elephant’s body. It is often found in elephants that have been fed an unbalanced diet, such as eating too many banana tree stalks. Ventral oedema is also common in elephants under stress or with low protein levels in the blood.

Clinical signs: A watery swelling on the under side of the body, the throat or the belly or the sex organ or any combination thereof.

Treatment:

- Prevent or correct the stressors that are likely causes of ventral oedema.
- Apply hot fomentation or hot compresses daily to the affected area.
- *If the condition does not improve, consult a veterinarian.*



Note to camp managers: Ventral oedema is a condition that manifests itself externally but indicates some internal abnormality. There are many possible causes. Beyond causes described above, oedema can be caused by liver flukes, renal failure, heart disease, tuberculosis, or even simply an upset digestive tract. Thus, only a veterinarian can diagnose the real cause in order to alleviate or treat the condition.

External parasites

พยาธิภายนอก

Most Thai elephants still spend their lives in nature and therefore they often come into contact with external parasites. The parasites that are most often found on elephants are gad flies, fleas, hair lice, lice, and bot flies. External parasites harm elephants in various ways:

- Irritated adults will eat less, and calves will grow slowly.
- Some parasites suck blood, which weakens animals and leaves them susceptible to disease.
- Some parasites feed on flesh and skin.
- Many flies and some ticks carry disease that they transmit when they bite and suck blood.

Warning: If one elephant is infested with ticks, lice or fleas, you can assume that all other nearby elephants are also infested.

The best way to prevent or lessen external parasites is to maintain cleanliness by careful collection and disposal of dung and urine. It is essential to cleanse the elephant's body carefully every day by using half of a coconut shell to scrape the elephant on a daily basis.

Gad flies

ด้วงแมลงวันป่า

Gad flies [*duang* or *malaeng wan pa*] lay their eggs on the skin, where they become larvae. When mature, they bore out and fall to and enter the earth, where they pupate to become adult gad flies.

Clinical signs: The elephant's skin has many bumps the size of soy beans, particularly on the sides, hips, and belly. The elephant is irritated, which it shows by rubbing against trees and rocks. Some of the bumps break open and turn into nasty sores as the larvae emerge, especially in the area of the belly. If you dig into one of the bumps, you will find a white worm [larva], with both the 'mouth' and the rear end being black.



Treatment:

- Use the sea bean liana (*Entada pursaetha* DC.). Cut it into lengths, pulverize it, and then dip it water and rub it over the affected areas until it turns frothy. Let it dry on its own. Treat in this way every day until the bumps disappear.
- Spray a preventative medicine such as Neguvon, Diclofos, or Arsuntol, against the flies laying their eggs. These medicines should be used with great care, especially that they do not enter the eyes, trunk, mouth, or any open wounds. After spraying, let the medicine dry on its own and wait for about half a day before bathing.
- Allow the elephant to wallow or daub itself with mud.
- Give a drug of the Ivermectin group. (See page 116.)
- *If not cleared in 2-4 weeks, consult a veterinarian*

Warning: Insecticides are dangerous to elephants and people and should not be used as a preventative. Spraying works only temporarily.

Fleas and mites on the tail

หมัด, ไรที่หางช้าง

Fleas and hair lice are the primary cause of tail hair dropping out and of sores at the end of the tail.

Clinical signs: The elephant will swing and rub its tail against trees, rocks, posts, etc., and against its own body. Hairs will break off and fall out, and this activity often results in open sores.

Treatment:

- To eradicate fleas and hair lice use a medicine against external parasites. Spray a preventative medicine such as Neguvon, Diclofos, or Arsuntol (leave the medicine on as long as the label says), or scrub with the sea bean liana (*Entada pursaetha* DC.).
- Wash the wound and let the lice or fleas fall off.
- Use a medicine in the group of gentian violet with an antibiotic such as Oxytetracycline, spraying it each day until the wound has healed or apply an anti-fly powder such as Negasunt.

Hair lice

เหาช้าง

Hair lice [*Haematomyzus elephantis*] irritate elephants so much that some become exhausted. Some elephants become bad-tempered.



Clinical signs: The elephant will show indications of itching. If you look very closely, you will notice lice as small red or brown lumps the size of the head of pin. The lumps will be found in groups in creases in the elephant's skin. Lice are mostly found in the soft tissue behind the ears, at the end of the trunk, the reproductive organs, and the tail. Elephants will often rub up against trees, and many are so constantly agitated that they get no rest and become exhausted and finally contract a secondary disease.

Treatment:

- Allow the elephant to play in dirt and mud.
- Wash the elephant very carefully and then scrub the elephant's body with the sea bean liana (*Entada pursaetha* DC.) until the liquid becomes sudsy. Leave the fluid to dry naturally and to eradicate the insects.
- Spray the area with a medicine against external parasites such as Neguvon or Arsuntol.
- Give, under direction of a veterinarian, a medicine belonging to the Ivermectin group. (See page 116.)
- *If the elephant's condition does not improve in 2-4 weeks, consult a veterinarian.*

Tabanus flies

เหล็กือบ

Tabanus flies are blood suckers. They are extremely aggravating to elephants and they can be transmitters of contagious diseases such as anthrax and trypanosomiasis (Surra).

Clinical signs: The elephant will move continuously to keep the flies away.

Treatment:

- Bathe every bit of the elephant carefully, scrubbing with a piece of dried coconut shell each day.
- Allow the elephant to 'play' in dirt and mud.
- Spray with a medicine against external parasites such as Neguvon or Arsuntol
- *If the elephant's condition does not improve in 2-4 weeks, consult a veterinarian.*



Head

Eyes

๓๗

The elephant's eyes are small, about the size of a horse, and nearly all books say that its vision is not very efficient compared to its hearing and smell. Still, the elephant's ability to move around quite well in dim moonlight suggests their eyes are well adapted for low light levels. Elephants do not like it when it is totally dark or very bright, rather preferring the light at dawn and at dusk or in shady areas during the day.

Healthy elephant eyes are clear and are well lubricated.

Eye conditions are a big problem with elephants, whether they are kept in the forest or are wandering city streets. Eye problems tend to arise very quickly and it is best to see a veterinarian for all eye problems.

The most commonly met problems are:

Conjunctivitis comes from irritation caused by dust, wind (especially from being trucked), smoke, or tree leaves, etc.

Clinical signs: The elephant will have copiously flowing tears, red eyes, swelling and signs of infection. The eyes blink frequently and most elephants will use their trunk to rub the eyes. In some cases there will be a yellow discharge.

Treatment:

- Take the elephant to a shady place.
- Wash the eye with a cleaning fluid or boric acid.
- Dry the eye and then apply eye drop medicine or apply an eye ointment. (See page 103) If you use antibiotic eye drops you should apply the medicine every hour all day long. If you use eye ointment, apply it twice a day, morning and evening. (It is best if a veterinarian chooses which kind of medicine.)
- In situations where you do not have a medicine specific for eyes, take a stem from the red castor oil plant (*Ricinus communis* Linn.) and heat it in a fire; then blow the smoke inside the stem into the eye(s). Or take the ground-up shell from a land snail and mix it with leaves from thatch grass (*Imperata cylindrica* Beauv.) and heat it over a fire until it is charred; then take a drinking straw and blow the smoke into the elephant's eyes. This gives good results.
- *If the condition does not improve, see a veterinarian.*



Infected cornea [keratitis] can come from disease but usually proceeds from mechanical injury. Infected corneas cause many elephants to go blind. Keratitis can be divided into four types.

Treatment: All four types of keratitis are treated exactly the same as conjunctivitis.

1. Infected cornea with highly visible blood vessels [superficial keratitis with vascularization] arises from irritation and a subsequent infected conjunctiva that has been left untreated.

Clinical signs: The eyes are red with copious tears. Blood vessels are seen in the cornea. The elephant rubs its eyes with its trunk.

2. Ulcerated cornea [ulcerative keratitis] comes from the eye being struck hard, or pierced by a thorn, twig, etc., until there is a wound. The eye becomes opaque and there will be pus. Blindness often follows.

Clinical signs: There is an ulcer on the cornea. Often the eye is opaque. There are copious tears.

3. Infected cornea with an infected eyelid [keratoconjunctivitis] comes from irritation caused by a foreign object (usually a twig, leaf, etc.), smoke, etc.

Clinical signs: There are copious tears. The eyes are red and infected and there is frequent blinking. The elephant rubs its eyes with its trunk. Sometimes there is a yellow discharge.

4. Infected cornea with a puncture [punctate keratitis] often comes from being frequently struck hard on the brow. There is an opening on the cornea, and there is pus from the eye chamber.

Clinical signs: A puncture on the cornea with tissue drooping. Sometimes there is pus. There are copious tears. If the condition is not treated, the eye will become opaque. The elephant may become blind.

Cataracts, lesions of the lens that become opaque, arise from many causes, such as an injury to some other part of the eye that spreads to the cornea. Cataracts affect mainly old elephants but malnutrition can cause cataracts in elephants of any age. Too much exposure to direct sunlight (or any other strong light) can also cause cataracts. Cataracts cause opacity and the elephant will become progressively blind.

Clinical signs: The lens is opaque and sometimes becomes hard and dry. Some eyes will exhibit a milky discharge. The central eye can bulge.

Treatment: See a veterinarian.



Medicating eyes

The elephant's eyes are very small in proportion to the size of its body. The eye has three lids to protect the eye. When the eye is infected or irritated by a foreign body, the third eye lid becomes very prominent and often red coloured. The mahout should be expert in the following technique.

How to apply liquid eye medicine:

- Take a clean cloth wet with clean water or disinfectant and gently clean the area around the eye.
- Wash your hands very carefully and wipe them dry.
- Using a 3 cc disposable syringe, through the needle draw some medicine from the bottle.
- Remove the needle from the syringe.



- Quickly squirt the eye medicine in the open eye. Do so hourly.
- *Eye ointments should be used as advised by a veterinarian.*

Ear infections

หูอักเสบ

An elephant's ears are a primary indicator of the animal's health. A healthy elephant will constantly, vigorously flap its ears, but an elephant in poor health will do so only very slowly.

Ear infections can be divided into two types, infections of the external ear and infections inside the ear [the auditory canal].



Infections of the external ear [Otitis Externa] and auricle come from two sources.

- The mahout uses his hook to gouge and probe the upper part of the auricle until it becomes infected.
- Lice, ticks or a fungus infect the auricle and the elephant uses a stick or its trunk to rub the area until it becomes infected.

Clinical signs: The auricle is swollen and red. The wound emits pus and a foul smell. The elephant shows pain. If you explore the wound, sometimes there will be maggots.

Treatment:

- Make the elephant couch or stand perfectly still.
- Clean the area surrounding the auricle of the ear with cotton wool soaked in an antiseptic such as Povidone-iodine 1%.
- If there is pus, clean the area around the auricle and the auricle itself with a solution of clean water and hydrogen peroxide (10:1).
- Treat using ‘yellow medicine’ (*yaa leuang*, Acriflavin) or, if there are maggots, use a maggot killer such as Negasunt.
- Do the above every day until the condition is healed.
- *If the condition does not improve, see a veterinarian.*

Infections of the internal ear [Otitis Media] begin with external infections that, if left untreated, spread to the inside. Sometimes germs will enter the ear and an infection will erupt.

Clinical signs: When the elephant lies on its side or if you press the sore ear’s auricle, pus will come out. If you get close to the ear it will have a bad smell.

Treatment: *Consult a veterinarian.*

Trunk

၅၃၄

The elephant’s trunk is a critical organ in the life process. The trunk can be compared to a human’s hand. It plucks grass from the ground and pulls food down from places as high as 4 or 5 meters. The elephant uses the trunk as weapon to defend itself, as a way to communicate with its fellows, to smell, and, of course, to breathe.

The trunk is composed of 40,000 muscle bundles. The trunk has very extensive networks of both blood vessels and nerves. A desirable elephant



will have a trunk with a very thick base, muscular throughout its length, and the end of the trunk must be able to be closed tightly. Thus, any significant injury to the trunk can cause death. Because the trunk is very sensitive, an experienced mahout will therefore use only the tip of his hook in order to control the elephant.

The only conditions that afflict the trunk are papilloma (see page 95) and wounds. There have been unsubstantiated reports from southern Thailand of a condition that sounds similar to floppy trunk disease, a mysterious condition that affects African elephants, leaving the trunk paralyzed and pliable. We would very much appreciate being informed about such cases.

Tusks

งาอีกเสบ

What we call a tusk is actually an incisor tooth, and not a canine tooth as would be logical. If you read about tusks of Asian elephants in Thai books, you will always read that only males elephants have tusks. If you read just a bit further, though, you will be told that some male elephants [*chang si daw* in Thai], and all female elephants have tusks that are too small to be called tusks and are called *khanai* [tush].

From a medical point of view, all elephants have tusks, with the variation being only in size. It is true that what we call a tusker (*chang phlai*) is more likely to have more problems with its tusks, both because of their size and because they are made to use their tusks to do hard work. Still, any elephant can suffer infected tusks,

The base of the tusks are embedded deeply in the elephant's skull, set in sockets under the eyes. Tusks are very strong and in a mature male elephant grow on average about 17 centimetres a year. A hollow inside the tusk [pulp cavity] contains blood vessels and a nerve. Consequently, before cutting or trimming an elephant's tusks you should know how much is to be cut off in order to not cut the blood vessels and the nerves. Opening the pulp cavity can cause the elephant to die through loss of blood or infection or even through contracting tetanus.

Recommendation to camp managers: When trimming tusks always seek the advice and services of an expert mahout. Because there is so much variation between tusks, never follow any rules for cutting that you read in a book.



Tusk infections are of many kinds:

1. Tusks that have cracked from elephants that habitually ‘play with their chains,’ that is, try to break them. The tusk can suffer a great deal of impact force.

2. Tusks that wobble because they are loose in their socket come from elephants that ‘spear’ the earth or trees for fun. The socket becomes infected.

3. Tusks that are broken or cut so close to the base that the pulp cavity becomes infected. This condition often arises when tusks are cut by ivory thieves.

4. Tusks that have fallen out but the socket is still infected.

Cracked tusks

Clinical signs: The crack may be only near the tip or it may extend up to and into the base. In the latter case, the tissue that covers the base may be swollen. The elephant has copious tears from its eyes if the tusk is infected. If left untreated there will be pus seeping from the cracked tusk and there will be a foul smell.

Treatment:

- If the tusk is cracked or split near the tip, and if it is not severe, quit working the elephant and the condition will heal itself. If the split is bad, it is good to help by binding wire around the tusk and checking for infection and for swelling. After that, consult a veterinarian.
- If the condition is chronic, the tusk is usually infected and should be washed clean with a solution of clean water and Povidone-iodine 1% (mixed 1:20) on a daily basis.
- *Then consult a veterinarian.*

Loose, wobbly tusks

Clinical signs: Foul smelling pus secretes from the tusk base, not the tusk itself. The elephant will regularly blow air or dirt on the area with its trunk. If you move the tusk, the elephant will show pain.

Treatment: Wash the area where there is pus with a solution of clean water and Povidone-iodine 1% (mixed 1:20) on a daily basis. Then consult a veterinarian.



Tusk broken or cut too close to the base

Clinical signs: There is pus in the pulp cavity and the elephant will usually spray dirt with its trunk and use sticks to probe into the cavity. If the tusk is newly broken or cut, there will likely be blood seeping from the tusk.

Treatment:

- In the case of newly broken or cut tusks, if there is bleeding, stanch it with cotton wool or with a clean cloth. (You can also use a green banana to insert and plug the bleeding.) Then wash the cavity with a solution of clean water and Povidone-iodine 1% (mixed 1:20) on a daily basis or after having washed the cavity with clean water, soften a candle over a flame and insert it to block the cavity.
- In tusk cases that are long and chronic, wash away all dirt and pus completely, and then wash the cavity with a solution of clean water and Povidone-iodine 1% (mixed 1:20) on a daily basis. Be very careful to prevent infection by tetanus. Call a veterinarian to inspect the condition and advise.

Empty sockets

Clinical signs: The elephant will use its trunk to blow or stuff dirt into the empty socket. There is likely to be pus

Treatment:

- Clean the cavity with a solution of clean water and Povidone-iodine 1% (mixed 1:20) on a daily basis.
- *Have a veterinarian inspect the condition.*

Feet and nails

เท้าและเล็บช้าง

Asian elephants usually have between 16 and 20 toenails. The normal elephant has 18 toenails, with 5 in front and 4 in back. The nails are shaped as elongated semicircles, and emerge from the skin spaced apart. The front feet are round while the hind feet are more oval and smaller. The bottom of the elephant foot has a thick footpad (1–2 centimetres). The ideal footpad has grooves [fissures] in order to prevent the elephant from slipping, much like the treads on a tyre.



Elephant toenails are likely to break, split, and fall off. Without treatment, such conditions will damage the animal's general health. Movement becomes difficult and it is possible the elephant will die.

There are two general causes of problems in feet and toenails:

Internal causes: Sometimes problems arrive from poor nutrition, lack of minerals and certain vitamins. Sometimes problems come from conditions within the animal's own physiology. The elephant's toenails can become thin or brittle and can peel [exfoliate] or crack easily. Elephants can have abnormal or crippled feet from birth by accident. Movement is made difficult by, for example, stiff legs, stiff joints, sprains, twisted legs, etc. An elephant might drag a leg or stand in an abnormal posture, causing toenails to grow unusually long.

External causes: If the surface where the elephant walks or is working is potholed and not smooth, if it is slanted or hard or is rocky, nails will be prone to split and break. If the elephant stands for a long time in dirty water or water fouled by its own urine and dung, or by chemicals, the quality of the nails can deteriorate.

Prevention in ordinary, healthy elephants:

- Do not restrain or chain the elephant for long periods where the ground is wet, muddy, or fouled by elephant urine and dung.
- Avoid having the elephant walk and work on rough surfaces, areas with sharp rocks, slanted areas, and steep hills. Avoid very dry and hot areas for this makes it easy for nails to peel, split, or fall off.
- Make sure the elephant gets sufficient food, minerals and water.
- Inspect and treat the toenails and footpad before and after each time the elephant travels for a long distance.

Cracks in the footpad are often found in the footpads of elephant made to walk in cities or elephants housed on concrete floors.

Clinical signs: The footpad peels off from the foot. The elephant will not put its full weight on the foot. In some cases, the elephant will use its trunk to spray or put dirt or mud in the crack or cracks.

Treatment:

- Take the elephant off of work
- Soak the foot in potassium permanganate solution daily for 15 to 20 minutes. Also possible is Povidone-iodine 1% diluted 1:20.

Split toenails are often found in elephants that must often walk in steep and hilly areas. Nail problems are particularly common in elephants



that do illegal logging in northern Thailand and also in elephants that spend much time on concrete. Poor nutrition or malnutrition also lead to split or broken nails.

Clinical signs: The elephant avoid putting weight on the foot and limps.

Treatment:

- Take the elephant off of work
- File across the split horizontal to the ground; file the bottom of the split down so it is smooth and does not cause the elephant to catch its foot and stumble and cause the crack to grow.
- Soak the elephant's foot in a diluted solution of copper sulphate.



Abnormal nail growth is often found in elephants that must walk in steep and hilly terrain. Abnormal nails are frequently found in elephants doing illegal logging in northern Thailand and also elephants that spend much time on concrete.

Clinical signs: The elephant will not walk smoothly. Some animals will hobble. Often the nail grows very long.

Treatment:

- Rest the elephant
- Trim any excessive growth of the nail and then file it smooth.
- Soak the elephant's foot in a diluted solution of copper sulphate.

Treating foot and nail problems should be started very quickly and done correctly. If not, the problem can compound itself and the elephant can become crippled or even die.



THE INSIDE OF THE ELEPHANT

Muscles

กล้ามเนื้อ

Elephants have very strong muscles. Mahouts say that the elephant's 'muscle bundles' are tighter than those of other animals, especially the leg muscles that must support such great weight. The legs must bear a weight of about 2,000-3,000 kilograms in the case of mature elephants. The front legs bear two out of three parts of the weight.

The feet and legs are like those of the hippopotamus and the tapir with the front legs longer than the back. The weight is distributed on a foot pad. The elephant has only one gait, the walk, so, unlike a horse, it can neither trot or gallop. Still, using the walking footfall pattern, elephants can 'run' quite quickly. The world record was set by a Thai elephant electronically measured at 23.84 kph. In a working day, a mature elephant can safely transport goods or people over level ground for 25 kilometres. Going up and down hills, that distance should not exceed 15 kilometres. (Wild elephants on average cover only 4 kilometres a day.)

In Thailand today some mahouts force elephants to walk on two hind legs, which can lead to injuries of the pelvic area.

Strained muscles

Muscle strains are found mostly in elephants that are at very hard work or are put to unusual work or are fed an unbalanced diet. Most muscle strains are found in the legs.

Clinical signs: The elephant limps and shows it does not want to walk or refuses to make steep climbs. The muscles will be hot and swollen in the strained area, especially if it is on the legs, but if the strain is elsewhere, such as the back, the elephant will use its trunk to suck up water, dust, or dirt to spray on the afflicted area.

Treatment:

- Take the elephant off of all work until the injury has healed .
- Apply hot compresses to the area by soaking a clean cloth in warm water or using a hot water bottle of the appropriate size wrapped in a clean cloth. Hot fomentations are also good.
- *If the condition does not improve, see a veterinarian.*



The elephant has a very large body, weighing on average 2,000 to 4,000 kilograms. The bones thus need to be very big and very strong in order to support the animal's weight and to withstand the activities of daily life. But if the bones that support the massive body are damaged, such as a crack or a dislocation, the elephant — unlike other animals — normally has but little chance of recovering to an ordinary life.

The bones most likely to suffer damage are the hind legs, the ribs, the pelvic girdle, and the lower [lumbrosacral vertebrae].

The major cause of cracks, breaks and dislocations are accidents such as being struck by a vehicle or another elephant, being struck by a large log, falling downhill, or a landmine explosion. Immediately after an elephant suffers a bone injury, the mahout should help the elephant thus:

- Comfort the elephant so that it loses its fear.
- If there is bleeding, hurry to stanch the flow by pressing a clean sterile cloth or cotton wool on the wound.
- Do not move the elephant and try to keep it from moving until a veterinarian has come. If, however, the elephant is in the sun and can still walk, take it to the nearest shady place (no further than 100 metres).
- Try to find a temporary leaning place for the elephant such as a tree or a large boulder, for example.
- *Consult a veterinarian as quickly as possible.* Have the mahout or the person who the elephant trusts the most stay with the animal. Send somebody else either to fetch the veterinarian or telephone him all of the details so that he can diagnose the condition and arrange for transportation to move the elephant or, if necessary, help devise a means to support the elephant and keep it on its feet.
- Apply cold compresses to any swollen areas.

Bone problems are also often found in calves that have received inadequate nutrition, particularly an insufficient amount of mother's milk that has caused weak bones or incomplete growth, leading to abnormal development. In some cases, such calves are prone to being injured easily, even by minor accidents. Therefore, if you have a calf with such a history, you should avoid putting it to work where accidents are likely to occur. You should also consult a veterinarian.



Warning: Diagnosing whether a bone is broken, cracked, or dislocated is quite difficult because an accurate analysis requires taking X-rays.

Arthritis

ข้ออักเสบ

Arthritis is a painful condition affecting the joints that comes from both internal causes, such as old age or being overweight or being fed insufficient or poor quality food, and from external causes, such as an elephant being worked beyond its capacity or doing inappropriate work.

Arthritis comes in both acute and chronic forms. The chronic form is very difficult to heal completely, especially because the condition is very difficult to diagnose accurately and because treatment requires such a long period of time. Veterinarians treating chronic cases generally recommend taking the elephant off of work and stopping all activities that might pose danger to the joints and cause the arthritis to worsen.

As for acute cases of arthritis, the onset can happen very quickly. Acute arthritis is usually brought about by overwork or by inappropriate work such as hind-leg walking, head stands, etc. Arthritis can also occur as the side effect of an injury to the feet or legs.

Clinical Signs: The elephant will not use the affected limb or will do so only with great difficulty. The affected area is often swollen.

Treatment:

- If the case is new, in the first 24 hours, take the elephant off work
- Have the elephant be still and apply cold compresses, a clean cloth wrapped around ice or a cloth dipped in cold water over the swollen area or to the area where the elephant seems to be having pain.
- If the condition has not resolved after 24 hours, apply hot compresses or hot fomentation every day
- *Quickly consult a veterinarian.*

Alimentary tract

ทางเดินอาหารของช้าง

There are four very interesting facts about the elephant's alimentary tract that are very different from other animals. First, the elephant's digestive system is that of a single stomach, unlike cattle and water buffalo, and it is not very efficient; an elephant digests and absorbs only about 44 percent of the food ingested whereas cattle and water buffalo absorb about 60 percent of what they eat. Second, elephants eat a great



amount of food, over 100 kilograms a day or 6-12 percent of their own body weight. Third, to get so much food, elephants will eat plants of such poor nutritional value that other animals will not normally eat them. Fourth, much of the digestion of nutrients is done not by the elephant's own digestive juices but by tiny germs [bacteria] and animals [protozoa].

With elephants you have huge amounts of poor quality food passing through a tube 40 to 70 meters long and very wide, with much of the digestion being done by guest creatures — the whole process taking 24-50 hours before the dung emerges. Given these strange facts, it should not be surprising that the elephant's guts are perhaps its weakest point.

Parasites in the alimentary tract

พยาธิในทางเดินอาหาร

There are two important types of worms in the alimentary tract, flatworms and roundworms. They are often found in elephants that are raised in natural conditions. The spread of worms can be controlled by daily cleaning of the elephants' living and working areas, specifically by systematically collecting and processing dung. Mahouts should visually inspect the dung of their elephant every day. If they find worms they should consult a veterinarian.

Recommendation to camp managers: An inspection of each elephant's dung for parasites should be done every three months.

1. Liver flukes

พยาธิใบไม้ในตับ

Liver flukes (*Fasciola gigantica*, *Fasciola hepatica*, *Fasciola jacksoni*) are a kind of flatworm found in the liver and the bile duct. Infection comes from snails on the food that the elephant eats.

Clinical signs: The elephant is very thin and has little strength. The skin is rough and the eyes, mouth, and the end of the trunk (on the inside) are very pale and with a yellowish. Digestion is imperfect. The belly is often bloated with water, sometimes leading to dropsy [subcutaneous ventral oedema]. In extreme cases the elephant can die.

Treatment:

- Separate the affected animal from other elephants.
 - Take the elephant off of all work.
 - *Consult a veterinarian for treatment and diagnosis through examining the dung to identify the species or type of worm.*
- Treatment is usually through Ivermectin-F. (See page 116)*



2. Cestode worms



Cestodes are about .5-1 cm long and have a sucker-like mouth that attaches to the wall of the stomach and both the short and long intestines, which the worms then eat. At present in Thailand it is not possible to identify exactly which species of cestode worms infect elephants or exactly how the elephants get infected, but it seems most likely that elephants ingest worm eggs found in insects eaten with their food.

Clinical signs: The elephant is listless and remains thin no matter how much it eats. The skin is rough, and hairs are brittle from poor nutrition. The inside of the end of the trunk, the mouth, and the soft tissue of the eyes are very pale. The elephant has little strength because of insufficient nutrients.

Treatment:

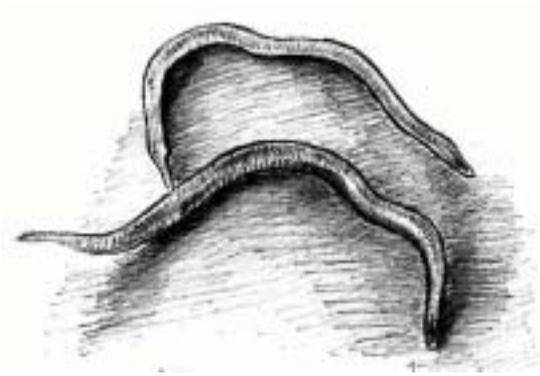
- Separate any suspicious animal from other elephants.
- Take the elephant off of all work.
- *Consult a veterinarian to treat the elephant and to make a plan to protect other nearby elephants.*

Warning: If one elephant is infected with cestodes, you can assume that all nearby elephants are probably infected as well.

3. Roundworms

Roundworms (mostly Strongyle species) resemble the roots of onions and are 1-2 centimetres long. Infection is through worm eggs on the elephant's food.





Clinical signs: Usually the elephant exhibits no strong symptoms, but it might show the following signs. The elephant is emaciated and exhausted. In young elephants, worms will cause its growth to be stunted. The dung will have many worms.

Treatment: Normally elephants will purge themselves of worms, mostly roundworms, once a year. You can see worms in the dung. As a vermifuge, the elephants eat the leaves or roots or stems of the thorny plant *ton jii* (*Harrisonia perforate* Merr.) or mineral earth at a salt lick to disinfect themselves naturally. The mahout can help by taking the elephant off of work. Many other plants can be consumed:

- The sea bean liana (*Entada pursaetha* DC.)
- The leaves or roots or stems of the thorny plant *ton jii* (*Harrisonia perforate* Merr.)
- The leaves or stems from the black catechu (*Acacia catechu* Willd.)
- The *boraphet* plant (*Tinospora tuberculata* Beaumee)
- The fruit of the ebony tree (*Diospyros mollis* Griff.)
- The bark of the forest siris (*Albizia procera* [Roxb.] Benth.)
- The bark, flowers, and fruit of the golden fig tree (*Elaeocarpus grandiforus* J.E. Smith)
- The roots and flowers of the bael fruit tree (*Aegle marmelos* [L.] Corr. ex Roxb.)
- The roots of Job's tears (*Coix lachrymal-jobi* Linn.)
- If the condition does not improve, consult a veterinarian.

Advice: In some areas where there are no natural salt licks, the mahout can, in consultation with a veterinarian, make an artificial one or can supplement mineral salts.



Ivermectin is a drug that can legally be given only by a veterinarian. It is very effective against parasites in the alimentary tract and comes in two types: Ivermectin, which works against roundworms; and Ivermectin-F, which works against both roundworms and flatworms and is particularly effective with liver flukes. Both drugs work through paralysing the nervous system of the parasites, causing them to lose their grip and to be purged from the elephant's body.

Ivermectin should be given as a preventive [prophylactic] twice a year. If you are working for a long time in a camp where there is a veterinarian or if you always work very closely with the same veterinarian, he will see to this schedule. But for the mahout who moves around or uses different veterinarians, you should keep very careful records of (1) the day of injection, and (2) the dose. If you do not ensure that your elephant is dosed twice a year, it might get parasites. If the elephant is dosed before scheduled, the elephant is given an expensive drug unnecessarily, since a dose will keep the parasite at an acceptable level for a full six months.

Do keep good records. You can write the date and dose given on a calendar, including the next bi-annual treatment. Best, though, is to use the treatment form provided in the *Mahout's Handbook*.

Like many medicines, if too much Ivermectin is used the drug can have bad side effects. If Ivermectin causes your elephant to salivate continually and its eyes to cloud, appearing as if it cannot focus, that is a sign of an overdose. Ivermectin is so powerful that residues in the urine can poison and kill earthworms that are very useful to the soil.

Camp managers: If you own all of the elephants in your camp, it's best if you get a good veterinarian but even then it is best if you keep health records of your own. If you employ good numbers of elephants owned by other people, you have a choice to leave worming and inoculations to each owner or you can coordinate (and possibly even pay for) treatments. Considering how closely together most camp elephants live, there is a great likelihood of parasites being transmitted between the other owners' elephants. Planned prevention is something you must think about and you should consult with a veterinarian about a program.



The elephant is unable to excrete waste from its body, which comes about from various causes:

- Eating too much, such as at the beginning of the rainy season when there is much succulent grass
- Eating food that is hard to digest, such as palm fronds or rattan
- An obstruction of the intestines from a foreign object, such as an elephant in the city or a tourist camp ingesting a plastic bag

Clinical signs: The elephant is listless, not interested in food and sometimes is agitated or uses its trunk to strike its belly or apply dirt or mud to its stomach. The belly is swollen or inflated beyond normal and may have involuntary tremors. Some animals will repeatedly stand up and lay down. Some will trumpet or bellow in pain. If the condition is not treated, the animal can die.

Treatment: Usually dyspepsia arises from poor management, such as the mahout giving the elephant food that is hard to digest or repeatedly giving too much food. Thus, the first step of treatment is to find the cause and stop it. Treatment is as follows:

- Take the elephant to a shady, peaceful and clean place
- Stop food. The elephant will probably not want to drink but if it does, allow it to drink.
- Apply a compress of warm water to the stomach.
- Make the elephant walk so as to stimulate movement of the intestines.
- *If the elephant doesn't improve, consult a veterinarian as quickly as possible.*

Constipation

The elephant cannot evacuate its bowels.

Clinical signs: The elephant is listless and moves nervously in obvious discomfort. It doesn't eat or drink. The bowels do not move. Some animals will repeatedly lay down and stand up. Constipation is an important factor in causing dyspepsia.

Treatment: With old elephants, it is important to carefully analyse the food they are given. Old elephants should be given food that is easily digested such as ripe bananas. For ordinary healthy elephants it is



important to consider how the food is given, such as whether banana stalks and palm fronds have been properly cut into short pieces.

- Take the elephant to a shady, peaceful and clean place.
- Stop all food. The elephant will probably not want to drink but if it does allow it to drink.
- Use warm water and soap (ordinary hand soap or dishwashing soap are fine) to lubricate one hand and arm and then insert the hand into the rectum and try to pull out as many boluses of dung as possible.
- Give the elephant sticky tamarind (*Tamarindus indica* Linn.) or leaves from the black catechu (*Acacia catechu* Willd.) to stimulate the process of evacuation
- *If the condition does not improve in one or two days quickly consult a veterinarian for help.*

Diarrhoea

ท้องเสีย

There is a watery, loose discharge that can lead to serious dehydration. There are two major kinds of diarrhoea, non-infectious and infectious.

Diarrhoea without germs

Three main kinds of diarrhoea that do not involve infection by germs.

Diarrhoea from ‘self de-worming’: Normally elephants will purge themselves of internal parasites once or twice a year over two or three days. The elephant will seek out a natural vermifuge such as mineral earth, tree bark, or the roots of, for example, a shrub called *ton jii* (*Harrisonia perforate* Merr.).

Clinical signs: The elephant is listless and does not eat normal food. The dung is loose and watery, often with bits of undigested grass.

Treatment: Generally, this kind of diarrhoea or purging goes away on its own after two or three days.

- Rest the elephant.
- Take the elephant to a shady and easily cleaned place.
- Keep the elephant isolated to prevent spreading parasites.
- Provide a plentiful supply of clean water.
- Supply easily digested food such as ripe bananas in generous amounts.



- Either burn the dung, after it dries, or sprinkle it with lime and bury it.

Warning: Worm eggs emerge with the dung. These eggs can infect other elephants if you do not destroy or bury the dung and control the dispersal of worm eggs. For details on internal parasites, see page 113.

Diarrhoea from bad or inappropriate food: This condition can occur from the elephant, for example, eating too much of one kind of food, such as too much sticky tamarind, too much of commercially-bought pellets, or eating only ripe bananas. Diarrhoea can also come from eating food that is difficult to digest or food contaminated with sand or earth or some kinds of antibiotics or disinfectants, for example Povidone-iodine 1%, which can cause irritation that leads to diarrhoea.

Clinical signs: The discharge is much like with self-purging diarrhoea, but you will not normally find many parasites. You will sometimes find some bits of blood if sand or earth was eaten.

Treatment:

- Try to determine the exact cause of the condition, and then immediately stop any contact with that cause.
- Care for the elephant much as you would with self-purging diarrhoea.

Warning: If the diarrhoea extends beyond three days or is very bloody or the elephant shows other signs such as pain, straining, weakness, or extreme listlessness, urgently bring a veterinarian.

Diarrhoea from stress: Elephants, particularly calves and females, are also highly susceptible to sudden diarrhoea when frightened or stressed (See page 80.) This is what we mean by the idiom ‘excrement splits’ [*khii taek*]. Elephants that are being trucked or separated from familiar companions or their mother can suffer such diarrhoea within 2 or 3 minutes. Sometimes the stress happens over a longer period of time, such as when when a strange elephant is chained nearby.

Diarrhoea caused by germs

Several kinds of germs can cause diarrhoea, including bacteria (e.g., *E. coli*, *Salmonella*, *Clostridium*, *Pseudomonas*).

Clinical signs: Symptoms are much like non-infectious diarrhoea but if the condition continues past three days the cause is probably germs.



Treatment: Apart from keeping the elephant cool, watered, and rested, there is nothing the mahout can do but call a veterinarian.

Enterotoxemia

ท้องเสียจากการติดเชื้อคลอสตริเดียม

Enterotoxemia is due to infection with a bacterium called *Clostridium perfringens*, and the disease has a history of killing many elephants. Enterotoxemia infects mostly elephants that have eaten contaminated food. Enterotoxemia is common in Thailand.

Clinical signs:

- The elephant is uncomfortable and restless or agitated.
- The elephant suffers a loss of appetite
- Diarrhoea is possible to the point where death comes from dehydration, especially in calves.

Treatment:

- Separate the infected elephant from the rest of the herd.
- Take the elephant off of work
- Take the elephant to a shady, quiet and clean place.
- Keep very sanitary conditions in regard to dung, other excretions, and uneaten food. Bury or burn waste so that it will not be able to infect other elephants.
- The mahout and anybody who has been in contact with the elephant and its bedding and food remnants should avoid contact with healthy elephants without having first carefully bathed and changed to clean clothes.
- Give highly nutritious food that is easily digested, such as ripe bananas.
- *Quickly contact a veterinarian.*

Salmonellosis

โรคท้องเสียจากซัลโมเนลล่า

Salmonellosis is a disease that causes diarrhoea and that can kill elephants, especially calves. Caused by a bacterium called Salmonella, it is most often found in enclosures or camps with poor sanitation. It can spread amongst elephants very quickly.

Path of infection: Salmonellosis is spread through food and water contaminated with the bacteria, especially food that has been stored for a long time, because that enables the germs to multiply.



Clinical signs:

- Continuous, watery diarrhoea
- The discharge has a foul smell.
- The watery discharge contains mucous that may be mixed with blood.
- No appetite, exhaustion
- Fever

Treatment:

- Separate the afflicted animal from all other elephants and supply water to that elephant at a source different from the other elephants.
- Take the elephant to a clean and quiet place.
- Very carefully clean the place where the infected elephant is kept, taking special care to ensure that germs in its dung do not infect other elephants. Salmonellosis can also be spread by flies.
- Give the elephant small amounts of soft easily digested food, such as ripe bananas.
- Make sure there is a sufficient supply of clean drinking water at all times.
- *Consult a veterinarian as quickly as possible.*

Warning: The mahout should be careful to practice good hygiene and wash his hands because salmonellosis is transmissible to other elephants and may be transmissible to humans.

Colibacillosis

ท้องเสียจากเชื้ออีโคไล

The cause of the diarrhoea is the bacterium *Escherichia coli* (which everybody simply calls “E. coli”) that has contaminated the elephant’s food, water or some other ingested source. Colibacillosis is very often found in newly born calves with weak immune systems from having received insufficient colostrum. Also particularly susceptible are young elephants that receive dirty food or that live in unsanitary and improper conditions.

E. coli infects many different mammals, including humans. One common path of infection is when a human, after having had a bowel movement, has not properly washed his hands, and then transmits faecal matter to an elephant by feeding it by hand.

Warning to camp managers: Many zoos in the West have totally banned hand-feeding elephants out of fear of spreading *E. coli* and similar



bacteria. While stopping hand-feeding is probably impossible in Thailand, where it generates much income, camp managers should be aware of the danger of infection.

Clinical signs:

- Fever
- Not interested in food
- Diarrhoea to the point of severe dehydration, even until causing death

Treatment:

- Separate the infected individual from other, healthy elephants.
- Take the elephant to a shady, clean and quiet place.
- Provide small quantities of soft food, such as ripe bananas.
- Have plenty of clean drinking water available to the elephant at all times.
- Clean the keeping area of the infected elephant very carefully, being especially careful to make sure that neither its urine nor dung can contaminate nearby areas holding healthy elephants. (Drainage of cleaning water should flow to an area where there are no elephants or people.)
- Care providers and others who have contact with the infected elephant should bathe very carefully and should change their clothes before contacting non-infected elephants.
- *Consult a veterinarian as quickly as possible.*

Disease

Pneumonia

ปอดบวม

Pneumonia is a disease of the elephant's respiratory system. Pneumonia comes in both viral and bacterial forms, so the exact cause is usually not clear, at least unless very sophisticated testing is done in a laboratory. Pneumonia often attacks after an elephant has been debilitated by another disease.

There is presently no vaccine or other medical means to prevent the disease, but it is clear that pneumonia often effects elephants exhausted from overwork; also particularly susceptible are poorly fed or underfed elephants, as are elephants in prolonged stress.

Pneumonia is found in elephants of all ages.



Clinical signs:

- Mucous drips from the trunk; and the elephant salivates copiously, drooling from the mouth.
- Loss of appetite
- Fever

Treatment:

- Separate the elephant from other elephants.
- Take the elephant to a shady place or a roofed enclosure with good ventilation.
- Provide supplementary food such as ripe bananas, unhusked rice, sugarcane, and fresh grass.
- Provide ample clean water.
- *Consult a veterinarian immediately, especially for calves.*

Anthrax

โรคแอนแทรกซ์หรือโรคกาฬ

Anthrax is a highly infectious disease, a bacterium that strikes elephants of all ages. Anthrax also attacks cattle, horses, water buffalo and other warm-blooded animals, including humans who work with those animals. When the bacteria enter the bloodstream, they multiply very quickly. Septicaemia, a blood infection usually follows. Death happens very quickly, usually within one or two days. Sometimes the elephant dies very soon after the sickness is recognized. Even after elephants' deaths, the anthrax bacteria infect not only their carcasses but also their skins and even their ivory.

The path of infection: The anthrax bacteria create spores, very hardy organisms that can survive for many decades and are highly resistant to heat and to chemical disinfectants. Domesticated elephants usually catch anthrax when grazing on infected pastures or eating contaminated food. Infection happens most often when grass is low and scarce, and often becomes epidemic when heavy rains follow the dry season. Infection can occur through respiration, exposure to blood, lymphatic fluids, and dung.

Clinical signs:

- The elephant will have a very high fever, which can be observed through reddishness of the eyes, mouth, and the inside of the tip of the trunk.



- Take the elephant's temperature often; write down the time and the temperature for the veterinarian's use.
- The elephant has hot breath and can experience difficulty breathing.
- The elephant is very listless; the trunk, ears, and tail do not move.
- The elephant seems to be staring and has dilated pupils.
- The elephant may collapse very suddenly.
- The elephant eats and drinks much less.
- The elephant may have diarrhoea which may contain blood.
- Sometimes there is swelling under the skin (usually at the throat, back of the ear, shoulders, abdomen and between the anus and the sexual organ). At first these swellings are hot, hard and painful but later become cold and do not elicit pain when touched.
- There can be bleeding from the nostrils, inside of the mouth, birth canal, penis, or anus.

Treatment:

- *Seek a veterinarian as quickly as possible. The only treatment consists of antibiotic drugs that can be prescribed only by a veterinarian. (Treatment is often futile, and elephants infected with anthrax usually die.)*
- In the chronic stage of anthrax, the disease often resembles other diseases; consequently, an accurate diagnosis is possible only by testing in a laboratory.
- The elephant must be isolated as quickly as possible, and all other elephants should be moved as far away as possible.
- Mahouts and other people who touch or handle the sick elephant should never go near or touch other elephants that have not yet been infected.
- The elephant should be kept in a clean, shady, and quiet place.
- Highly nutritious and tempting food such as ripe bananas, sugarcane, and green grass should be offered.
- If it is clear that the animal is going to die but it can still walk, you can move it to a site where disposal is more convenient or better protects against future infection.
- If the animal should die, if possible the carcass should be burned, as should all ruined fodder, dung, bedding, etc. If the carcass can not be burned, it must be buried in a very deep pit, with the carcass well covered with lime before filling with earth. (See page 55.)



- If the animal should die, it is highly recommended that the tusks not be removed but rather buried or burned with the animal. Any removal of tusks without disinfecting the head, the tusks, and the workers and their tools can result in human infection and death.
- If while butchering a carcass (or doing a post mortem) of any elephant that has died of unknown causes, you encounter purple or dark red coloured blood (rather than the usual bright red), stop your work immediately and consult a veterinarian. Purple or dark red unclotted blood is a sign of anthrax.

Haemorrhagic septicaemia (Pasteurellosis)

โรคคอบวม

Haemorrhagic septicaemia is a virulently infectious and contagious disease with a very high death rate. It is very easily confused with anthrax because the symptoms are similar and because, like anthrax, more victims die than respond to treatment. The infection can run through a herd of elephants very quickly, in about 10-15 days. Elephants usually die within 3-36 hours, although some last for 15 days.

Path of infection:

- Elephants often contract the disease from cattle and water buffalo.
- Haemorrhagic septicaemia is often found in low-lying flooded areas and often occurs with changes in season.
- Infection comes through drinking contaminated water or eating contaminated food or inhaling infected droplets, usually from living in association with cattle and especially water buffalo.
- Elephants, especially mature elephants, normally have some pasteurella bacteria in their body at all times without impairing their health. Stress is often the precipitating factor that leads to full blown haemorrhagic septicaemia. When an elephant becomes weak or is malnourished or overworked, when the weather or diet changes, or the elephant is transported, etc., the bacteria may erupt quickly, leading to clinical infection, especially in young calves just past weaning and as yet without a strong immune system.

Clinical signs:

- There is a high fever. Take the elephant's temperature. (See page 71.) If it is over 37.8° C or 100° F, that is a sign of danger.
- The breath exhaled from the mouth and trunk is very hot.



- There is a bright red at the eyes, mouth, the end of the trunk, and other soft tissue.
- Swelling is found in body parts such as the throat, the shoulders, the base of the tail, the anal flap, on the belly under the legs.
- The elephant is listless, the trunk rests on the ground, and the ears don't flap.
- The elephant doesn't eat.
- The elephant frequently opens its mouth to 'yawn'.
- The body trembles and has spasms because breathing is difficult.
- The urine is cloudy and richly coloured.

Treatment:

- *Consult a veterinarian immediately to treat the infected animal and also to make a plan for protecting other nearby elephants.*
- Immediately separate the infected elephant and keep it as far away as possible from other animals.
- Take the infected elephant to a clean, quiet and shady spot that is easily cleaned and where run-off water and waste, such as dung and uneaten food, do not contaminate other areas.
- Most importantly, ensure that the water source for sick animals and healthy animals is separate. If there is only one source of drinking water, it is likely contaminated. If so, try to get the healthy animals to a new source of water. You might even have to truck water in, but you must ensure your animals are drinking pure water free of infection.
- Make sure that no mahouts or other people who have been in contact with the ill elephant have any contact with the healthy elephants.
- The healthy elephants should be taken to a place where they have no contact with dung, urine, or uneaten food of the infected elephant.
- Feed the elephant with items of high nutritional value, such as bananas, unhusked rice, sugarcane, and fresh grass.
- When an elephant dies of haemorrhagic septicaemia, the carcass must be buried or burned. The carcass should not be butchered for meat or to remove the tusks to sell because this can spread the disease to other elephants and to other animals.

Prevention: Haemorrhagic septicemia is preventable by an annual vaccination good for a year, but this vaccine often causes the area around the injection to have an allergic reaction and to swell for three or four days. This swelling can be treated by hot compresses and fomentation



Tetanus is caused by a long-living anaerobic bacterium that is found in the soil and in moist areas. Tetanus is usually found in elephants that have suffered deep wounds, usually in the foot and particularly through the footpad being pierced by a metal object such as an old, rusty nail. After the bacteria have entered the elephant's body they thrive and, after an incubation period of 15-20 days, neurotoxins are produced that damage the nervous system and cause typical muscular spasms.

Between about 1977 and 1992 Thailand experienced, on a massive scale, thieves cutting off elephants' tusks by stealth in order to sell them. One result was that many tuskers contracted tetanus and died.

Path of infection: Infection proceeds from stepping on a piece of metal or other contaminated object that causes a deep wound. With elephants, however, the wound might not be obvious because elephants can and do use their trunks to gather dirt (which might be contaminated) to stuff in wounds, including cut tusks. When tetanus enters a tusk's pulp cavity, it spreads very quickly because it thrives in environments where there is no oxygen.

All wounds must, of course, be carefully cleaned but be especially careful where the puncture is from nails or rusty old metal, especially in an area that has long housed many animals. After infection, the disease does not progress quickly and the elephant will appear normal for 15-20 days (sometimes even longer) before symptoms appear. Even if the elephant receives treatment, the survival rate is very low.

Clinical signs:

- The elephant often has a temperature of over 37.8° C or 100° F, although this is not certain. The breath will be noticeably hot to feel.
- The eyes will be very red, and the soft tissue inside the mouth and the trunk will be a dark red.
- The elephant is listless and does not eat or drink water.
- The nervous system is affected, and the leg muscles harden in muscular contraction; the tail has a supple, snake-like feel.
- There are periodic spasms, particularly when the elephant is startled, as by a loud noise or bright light.
- In following days, it becomes difficult for the elephant to walk and stand because of the contraction of the leg muscles.



- The jaws lock tightly, making it difficult to chew food. Eating and drinking become very difficult and the elephant dies.

Treatment:

- *Consult a veterinarian immediately.*
- Even though tetanus is not contagious to other elephants, separate the elephant from other animals as it will be more peaceful.
- Take the elephant to a shady shelter with a clean surface, such as a concrete floor (it should not be slippery) to prevent it from introducing earth or other unclean materials into the wound or the pulp cavity.
- The area should have good ventilation.
- In cases of an exposed pulp cavity, it is best to clean it with running tap water through a hose. Wash all wounds thoroughly with clean water then flush with an antiseptic solution such as Betadine or Povidine-iodine 1% in a 20:1 solution. Finally, apply an anti-insect powder that includes an antibiotic, such as Negasunt.
- Hand feed the elephant with small amounts of easy to eat foods with high nutritional value, such as ripe bananas, sticky rice, ripe papayas, etc. (See page 22.)
- Clean the wound every day.

Prevention: For elephants that have open wounds or exposed pulp cavities in tusks, prevent the elephant from contracting tetanus by daily cleaning of the wound and by keeping the elephant on a clean surface. Otherwise the elephant is likely to introduce dirt or other unclean material that could contain tetanus germs into the wound.

No vaccine yet exists for elephants but if an elephant with a wound seems to have been exposed to tetanus, a veterinarian can inject an antitoxin to prevent infection from the bacteria.

Tuberculosis

วัณโรค

Tuberculosis is a chronic disease of the respiratory system that usually enters the body through the trunk, the windpipe [trachea], and the lungs. Tuberculosis is a bacterial disease (*Mycobacterium* spp.) that can infect both elephants and humans. Tuberculosis is a critically important disease because it can be transmitted from people to elephants, from elephants to people, and from elephants to elephants. Besides people and elephants, tuberculosis also affects primates, cattle, horses and other animals.



Tuberculosis in elephants has been reported in Thailand, but in the early stages the disease is notoriously difficult to diagnose and to verify. The high human rate of infection and the intimacy of mahouts with their elephants strongly suggest that there are many tuberculosis-infected elephants in Thailand.

Today in Thailand the disease AIDS is epidemic in humans. A major cause of death brought about by AIDS, which compromises the immune system, is tuberculosis because tuberculosis is an opportunistic disease that attacks when the body's defence systems are weak. Consequently, tuberculosis in humans is spreading in Thailand, and thus the chances of elephants contracting tuberculosis are increasing.

Tuberculosis in elephants can be very expensive and very difficult to treat. The disease is a big problem in European and American zoos.

Path of infection: The bacteria is usually transmitted directly through exhaled air [infected respiratory droplets] and phlegm. Transmission can also occur through contaminated food or water and also dung, urine, milk, semen, and other bodily secretions.

Clinical signs:

- Symptoms may be lacking until after 1-2 years and the disease is quite advanced.
- The elephant is weak and unable to work normally.
- The elephant loses weight when it is eating normally, in some cases very rapidly.
- The elephant loses its appetite.
- The elephant becomes thin.
- Mucous and discharges are emitted from the trunk.
- The breath smells bad.
- Sometimes there is a dry cough and breathing difficulties.
- When you see an elephant infected with tuberculosis that is very thin, drools saliva continually and sometimes involuntarily 'coughs' as if it has something in its throat, it is usually about five days before the animal will die.

Treatment:

- *Consult a veterinarian, because only a veterinarian can diagnose and treat this disease.*
- When you first suspect an elephant might have tuberculosis, immediately separate the suspect elephant from all other elephants.



- Consult a veterinarian familiar with the disease; he will conduct a trunk wash to collect samples in order to make an accurate diagnosis.
- Rest the elephant in a shady place or, better, in an easily cleaned enclosure with good drainage.
- Supply the elephant with as much highly nutritious food as it wants.
- Supply plenty of clean water.

Prevention: Annually inspect the health, including chest X-rays, of all mahouts, care givers and other involved persons. If an infected person is found, provide treatment and keep that person from having any contact with elephants until the condition is cured. Camp managers of large facilities, especially, should be careful to follow this procedure; while it will entail some inconvenience and some costs, they are far less trouble and expense than if tuberculosis should erupt in your camp.

Herpes virus

เฮอร์ปีส์ ไวรัส

Herpes virus has a history in African elephants, where it is found in the lungs as has been shown by necropsies. The disease is usually found in elephants kept in confined enclosures with poor air circulation. In Western zoos, herpes virus has been found in both African and Asian elephants. Young animals are particularly susceptible.

Herpes virus has not been reported in Thailand. In any case, the symptoms are not very obvious and thus a confirmed diagnosis can only come from a veterinarian, and even then only after extensive laboratory testing. In some elephants, especially calves, the tongue, mouth, and the inside of the tip of the trunk will show a blue discolouration [cyanosis].

Symptoms are likely to appear at times when elephants are in poor condition or their immune systems are low, leading to secondary infections such as respiratory diseases.

Foot and mouth disease

โรคปากเปื่อยและเท้าเปื่อย

Foot and mouth disease is an important contagious disease of hoofed livestock. This highly infectious disease is often found in cattle, water buffalo, and pigs. Foot and mouth disease is a virus that in Thailand is contracted by elephants mainly through contact with infected cattle and water buffalo. The disease is not common among elephants.



Livestock infected with foot and mouth disease are usually destroyed, but because elephants are considered to be very important, having spiritual importance in Thai culture, they are not destroyed.

The path of infection:

- Infection can come from inhaling the virus which can be carried in the air.
- Infection can come from direct contact with other animal's sores and bodily secretions.
- Foot and mouth disease virus is also found in faeces, urine, milk, saliva and even in the blood, bone, meat, etc., of infected livestock. Infection can come from infected food and water.
- After infection, the virus incubates for 2-5 days before the symptoms are noticeable.

Clinical signs:

- A low fever
- Listless and inactive
- The elephant's mouth has blisters [vesicles], that are at first white and small but then grow. The feet also suffer blisters that turn to open sores, making it difficult for the elephant to eat and to walk.
- Limping is sometimes the first indicator of the disease, and sometimes the footpad will slough.
- The elephant salivates copiously and often appears to be drooling.
- Loss of appetite

Treatment:

- Immediately separate the infected animal from other elephants.
- Take the infected elephant to a shady, clean and quiet place.
- Feed the elephant with soft, highly nutritious, and easy to digest food, such as ripe bananas.
- Keep a careful eye on all the uninfected animals in the herd.
- Prevent any mahouts who have had contact with the infected animal from having contact with any other elephants (or other hoofed livestock) until they have bathed and changed clothing.
- *Quickly consult with a veterinarian in order to treat the sick animal and to consider vaccinating the as yet uninfected elephants in the herd.*
- Mahouts must be very careful that elephants with FMD do not get secondary infections, to which they are very vulnerable.



- Treating elephants afflicted with foot and mouth disease takes many months before complete, and recovery is usually slow because in Thailand conditions are usually very unsanitary and FMD-infected animals are highly susceptible to secondary infections.

Prevention:

- Foot and mouth disease can be prevented by regularly vaccinating cattle, water buffalo, goats, and pigs that are raised near the elephants. Vaccinating these animals is easier and more convenient than vaccinating elephants, because there is at present no vaccine especially prepared for elephants.
- If forced to work in border areas where elephants and livestock might have come from Myanmar [Burma], Lao PDR [Laos], and Cambodia, be very careful that elephants should not come into contact with livestock where it is unclear whether or not they have been vaccinated against foot and mouth disease.
- Consult with the district Livestock Department veterinarian about the presence of the disease before coming to work in any border area.

Elephant pox

ฝีดาษ

Elephant pox is a serious, infectious viral disease that has a history of being epidemic. (Out of 18 elephants in a European circus, 11 became infected and one died.) Elephant pox, which is related to the human disease smallpox, can be contracted by humans. Asian elephants are more susceptible to pox virus infection than are African elephants.

Wild rodents are suspected of being the reservoir of elephant pox virus. It seems that there has never been a case of elephant pox in Thailand, but the disease has been reported in Myanmar [Burma].

Path of infection: Elephant pox is contracted, both by elephants and humans, by direct contact with the sores or mucous of an infected elephant.

Clinical signs:

- The first clinical signs of elephant pox are difficult to detect.
- A high fever may be present.
- The elephant may become lame.
- Membranes of the eye become infected and swollen.



- Later, the elephant develops pustules on the skin on the front of the head and on the trunk. These may spread over the whole body. The pustules may rupture and discharge a clear, bloody or purulent fluid. Later, they become dry and crusty and finally unpigmented scars.
- Seeping from the temporal gland — in both sexes — is a fluid that is either clear or with a milky colour; this fluid smells rotten and is not like the musty, sour smell of the normal secretion of musth males.
- The mouth has sores that make swallowing difficult.
- A serious secondary complication of elephant pox is undermining of the nails and soles, which can produce fatal complications.

Treatment:

- Immediately separate the elephant from other animals in the herd.
- Take the elephant to a shady, clean, and quiet place.
- Feed the elephant with highly nutritious food that is easy to swallow, such as ripe bananas or other fresh fruit.
- Mahouts who have had contact with the elephant should bathe and change clothes before contact with uninfected elephants.
- *Immediately contact a veterinarian*

Rabies

โรคพิษสุนัขบ้า

Rabies is a viral disease contacted by being bitten by an infected animal, in Thailand almost always a dog. The virus germs are found in the dog’s saliva and some will stay with the wound. The virus will then incubate in an elephant for a period of up to 30 days, depending partly on the severity of the bite wound. After the incubation the virus will find its way to the elephant’s nerves, spinal cord, and the brain. In elephants, rabies almost invariably brings paralysis and then death.

Anytime an elephant is bitten, particularly if the bite has drawn blood, the mahout and owner should take four actions. First, write the day on a calendar; then you will be able to predict when the elephant may show clinical signs if it was infected. Second, talk to people who know the dog and ask about its behaviour in the days prior to the attack; if the dog has been acting strangely (staring fixedly, foaming at the mouth, etc.) there is a good chance the dog is rabid. Third, inform everybody in the community of the health hazard, because the disease also attacks humans, and ask them to help track down the dog. Fourth, very carefully capture



the dog, confine it securely, and observe its condition; if after ten days it is normal then the elephant does not have rabies.

Clinical signs:

The initial signs of rabies in elephants may be vague but most often the elephant:

- is listless.
- prefers to stay in dark places.
- eats very little.

As the disease progresses the elephant likely:

- writhes in pain.
- does not recognize the mahout.
- chases and attacks humans and animals.
- has eyes that roll and wander.
- does not eat.
- walks unsteadily and the legs lose strength.
- goes to the ground in paralysis.
- has locked jaws and the tail hangs still.
- has saliva flowing continuously.

Death may shortly follow the appearance of these more severe signs. If the elephant dies, consult Disposal of carcasses, page 55.

Treatment:

- *Quickly consult with a veterinarian.*
- There is no effective treatment once the symptoms have appeared.
- Immediately after a dog bite, wash the wound intensively with soap and water. Then apply tincture of iodine or Povidone-iodine 1%.
- Even though the disease is not contagious to other elephants, separate the elephant, taking it to a shady, clean and quiet place
- Make sure the elephant is chained tightly and securely.

Prevention: Because rabies is incurable the best prevention is to eradicate all stray dogs from the area and to annually vaccinate all the dogs and cats in the community.

Trypanosomiasis (Surra)

พริปปาโนโซมหรือเซอร์รา

Trypanosomiasis comes from a protozoal blood parasite. This disease can infect horses, donkeys, mules, camels, cattle, buffaloes, dogs and elephants. While not often seen in elephants, cases have occurred in Thailand.



The trypanosomes are carried by jungle flies and gadflies [Tabanids and Stomoxys spp.] that suck blood from infected animals and then transmit the parasite to healthy animals when they bite them.

Trypanosomiasis is most often found in elephants that have been worked very hard and is usually found in the rainy season, when biting flies are in great abundance.

Clinical Signs:

The clinical signs of trypanosomiasis are very hard to observe.

- Before the point where visible symptoms appear, elephants will progressively get thinner and lose strength. The inside of the mouth and the inside of the trunk become very pale.
- The elephant will make sounds that suggest pain, show signs of stomach pain, and breathe hoarsely. It will appear dull, listless and sleepy.
- The hair will become coarse and brittle.
- Sometimes there is a swelling of the lymph nodes under the jaw.
- Infected animals do not die immediately but rather suffer a chronic condition of becoming thinner, increasingly more listless, and suffering progressively debilitated health.
- The elephant is likely to die within 2-4 months of infection.

Treatment:

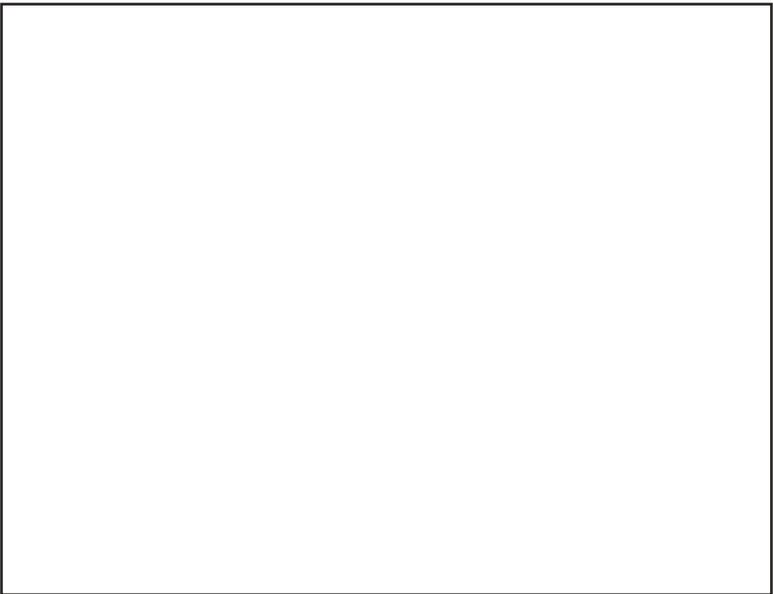
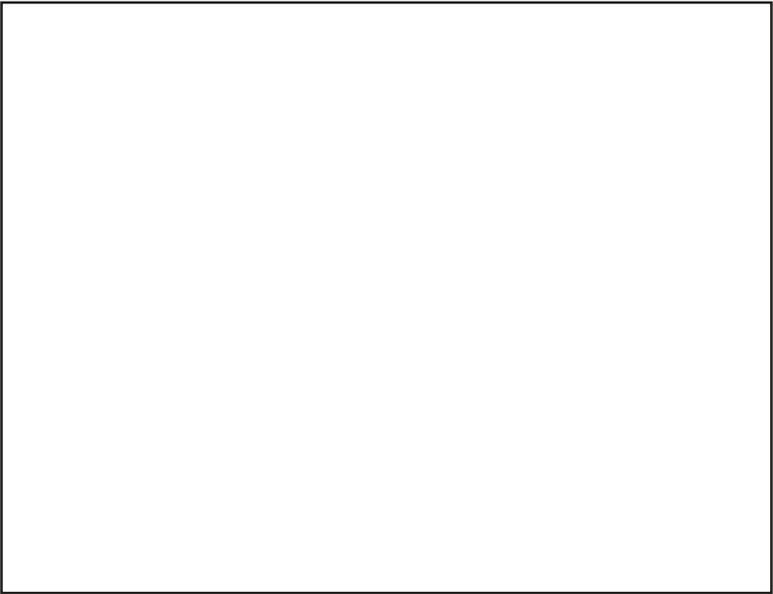
- Quickly separate the animal from other animals in the herd.
- Take the elephant to a shady, peaceful and clean place, away from biting flies.
- Carefully and regularly inspect all the other elephants.
- *Consult a veterinarian to make a diagnosis and to apply treatment, including a plan to keep nearby uninfected elephants healthy or at least to treat them immediately after infection becomes apparent.*

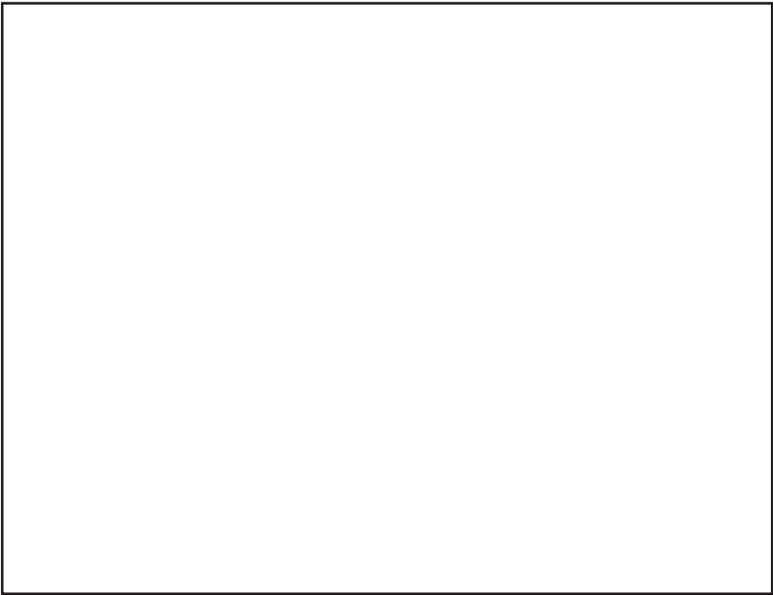
Prevention: The best prevention is to keep the flies from biting the elephants by spraying them with a mixture of medicines such as Arsuntol and Neguvon. (See page 61)

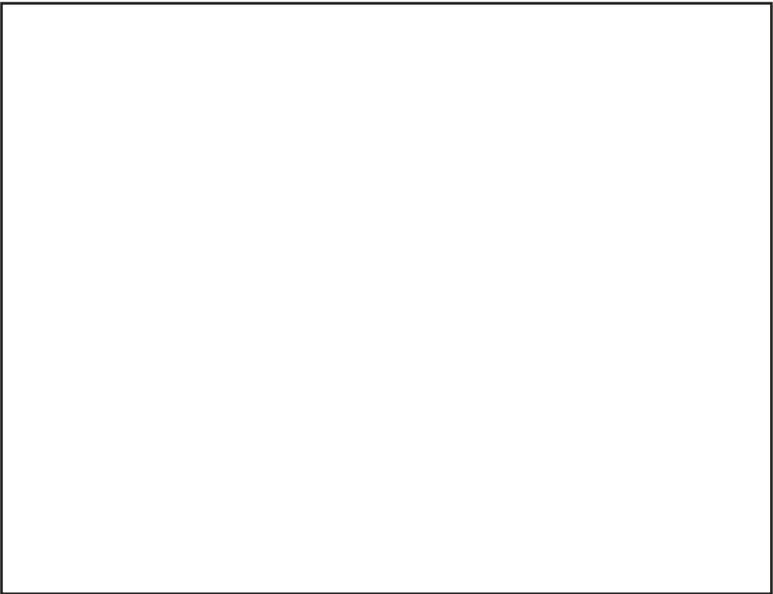
Biting flies may be reduced in numbers by regular disposal of the dung and soiled bedding in which some species breed.

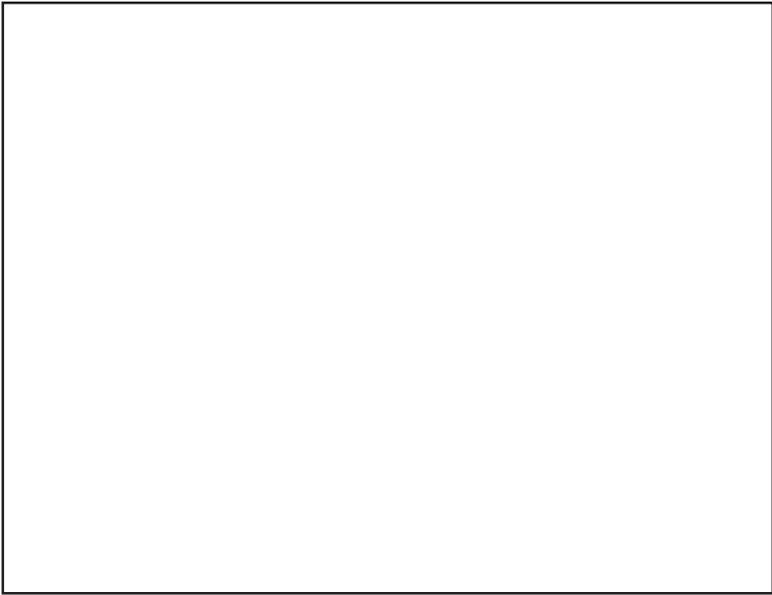


Photographs









Appendixes

Appendix 1: Recommendations to veterinarians

Knowledge of the techniques which veterinarians use to treat and diagnose the diseases of animals does not differ greatly, whether talking of dogs, cats, swine, horses, cattle, or elephants. Therefore, even a veterinarian with no prior experience of looking after and treating elephants can still help elephants, at least with some preparation first. Before treating an elephant you should make several preparations as follows:

The veterinarian should gather full details about the specific **location and history** of the elephant in order to plan for travel, for treatment, and for preparing the right drugs and instruments.

The veterinarian must prepare complete **drugs and instruments** because usually the elephant is far from roads and human settlements and getting to it sometimes requires 5 or 10 kilometres of walking. If something has been forgotten or the drugs and instruments are incomplete, then time is lost and the results are less than they should be.

The **site for treatment** must have a tying post or a tree so as to immobilize the elephant. The area must be smooth and flat, hard, not slippery, and with no holes or stones which can cause slipping or tripping of the veterinarian when the elephant struggles or becomes uncontrollable.

The veterinarian should wear very simple, unencumbered clothing for convenience and for avoiding harm should the elephant make a surprise attack during the treatment.

There should be an **assistant**, such as a mahout or somebody very familiar with the elephant or somebody who can control it, because when the veterinarian is working, the elephant is likely to try to flee or to hurt the veterinarian or nearby people.

Before the veterinarian enters to inspect or treat the elephant, he must be certain it is under **control and restraint**. There must at least two mahouts or people to assist in controlling the elephant, one person in front, in the case of full-grown elephants. (Beware of the elephant's trunk, tusks, and front legs.) The second person is behind to watch over the tail and the hind legs.

After the veterinarian has treated the elephant and **before returning home**, if he is unable to return to provide further treatment and inspection, he must give the owner or the mahout the drugs (and instruction on their use) needed for full recovery. The veterinarian should also arrange for the mahout to call him with periodic reports. Besides these general recommendations, the veterinarian must necessarily know how to approach and work with the elephant.

How to safely approach an elephant

When an elephant is sick, the veterinarian must consider that it is an animal which is large, strong, clever, and agile. An elephant is dangerous and can very easily use various body parts, such as its trunk, tusks, tail, feet, and even its mouth to cause injury or even death to the person treating it.

If the elephant can be made to couch or to lay on its side during inspection and treatment, that will be much safer.

Before getting close to an elephant, it is best to signal that you are approaching, such as making a sound or walking in slowly from the side, where the elephant can see you.

Notice the elephant's behavior before getting close. If it has its ears folded to its head or if it appears to be staring at you, do not approach. If the elephant is moving its ears, swinging its tail, or if it turns its rump to you, that means its mood is normal.

Do not approach elephants from the front.

Most elephants have been trained to, and are accustomed to, receive the mahout for mounting on the right side. Therefore, if it is necessary to approach the elephant from the left, ask the mahout if this is possible.

Do not approach an elephant from a direction where it cannot see you, for example, the side where it has a blind eye or from the rear.

The safest place to be is on the side, near the elephant's front legs.

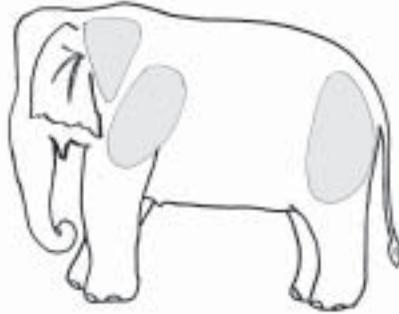
If it is necessary to work from the rear beware of the tail and the hind legs. Working on the front, be aware of the front legs.

Be as careful as you can be because elephants are big and can move very quickly. When your work is done, withdraw as quickly as possible. When approaching an elephant, keep the side of your body towards the elephant.

Techniques for giving medication for veterinarians

You can administer medication using many methods: orally, rectally, intramuscularly, and subcutaneously. Administering eye drops and collecting samples are also done much as with any other animal.

Intramuscular injections can be given in the muscles of the shoulder, the rump, and the top of the neck as pictured



Use a needle between 1.25 and 2 inches long; numbers 16, 18, and 20 are all good.

Clean the area to be injected with a disinfectant in the pre-determined position.

With the back of your hand, strike the area four or five times.

Insert the needle into the muscle

Slowly inject the medicine until it is all gone.

Gently massage the area so as to distribute the medicine.

Subcutaneous injections are for absorption under the skin, such as the antiparasitic Ivermectin, saline solutions, etc., where the elephant will absorb the drug very slowly. Subcutaneous injections often show swelling in the area injected. Behind the front leg and the side of the neck are the best areas, as pictured.

Use a needle between 1.25 and 2 inches long; numbers 16, 18, and 20 are all good.

Clean the area to be injected with a disinfectant in the pre-determined position.

With the back of your hand, strike the area four or five times.

Intravenous injections are given in the back of the elephant's ear because the skin there is very thin and the vein is very easy to see.



Use a needle between 1.25 and 2 inches long; numbers 16, 18, and 20 are all good.

With a disinfectant, clean the area of the vein behind the ear to be used.

Press the vein very lightly and insert the needle.

Clean the injection site once again with a disinfectant.

Gently massage the area so as to distribute the medicine.

Clean the injection site once again with a disinfectant.

Taking blood samples uses the same methodology as giving intravenous injections, but before sucking the blood into the syringe press on the vein for about 1 to 2 minutes in order to allow enough blood to back up as is desired for the sample.

Table 1: Elephant food

Scientific name	Common name		Part(s) eaten
	English	Thai	
<i>Ananas comosus</i> Merr.	Pineapple	<i>Saparod</i>	Fruit and leaf
<i>Arundinaria pusilla</i> A. Chevalier & A. Camus	-	<i>Yaa peg</i>	Leaf and stem
<i>Arundo donax</i> Linn.	Spanish reed, Giant reed	<i>Aw</i>	Leaf and stem
<i>Bambusa spp.</i>	Bamboo	<i>Mai phai</i>	Leaf, stem, shoot
<i>Benincasa hispida</i> Cogn.	Wax gourd, White gourd	<i>Fak khiow</i>	Fruit
<i>Brachitaria mutica</i> (Forsk.) Stapf.	Para grass, Buffalo grass	<i>Yaa khon</i>	Leaf and stem
<i>Brachitaria ruziziensis</i> Germain and Everard	Ruzi grass	<i>Yaa rusii</i>	Leaf and stem
<i>Brassica oleracea</i> var. <i>capitata</i> Linn.	Cabbage	<i>Kalamphliti</i>	Leaf
<i>Brassica pekinensis</i> Lour.	Chinese cabbage	<i>Pakadd</i>	Leaf
<i>Carica papaya</i> Linn.	Papaya	<i>Malagaw</i>	Fruit
<i>Centrosema pascuorum</i> Mart. ex. Benth.	Cavalcade	<i>Thua khawekhaed</i>	Leaf and stem
<i>Citrullus vulgaris</i> Schrad.	Watermelon	<i>Taengmo</i>	Fruit
<i>Citrus nobilis</i> Lour.	King orange, King mandarin	<i>Som</i>	Fruit
<i>Cocos nucifera</i> Linn.	Coconut	<i>Maphraw</i>	Leaf
<i>Cucumis sativus</i> Linn.	Cucumber	<i>Taengkwa</i>	Fruit
<i>Daucus carota</i> Linn.	Carrot	<i>Khe-rawd</i>	Leaf and stem
<i>Digitaria eriantha</i> Steudel	Pangola grass	<i>Yaa pan-go-laa</i>	Leaf and stem
<i>Hymenachne pseudointerrupta</i> C. Muell	Del or bamboo grass (India)	<i>Yaa phlong</i>	Leaf and stem
<i>Lycopersicon esculentum</i> Miller	Tomato	<i>Makheua thet</i>	Fruit
<i>Manihot esculenta</i> Crantz.	Cassava	<i>Man sampalang</i>	Stem
<i>Musa sapientum</i> Linn.	Banana	<i>Gluy</i>	Fruit and stem

<i>Oryza sativa</i> Linn.	Rice	<i>Khaaw</i>	Seed
<i>Panicum maximum</i> Jacq.	Guinea grass	<i>Yaa ginii</i>	Leaf and stem
<i>Panicum plicatum</i> Willd.	-	<i>Yaa gong gai</i>	Leaf and stem
<i>Pennisetum purpureum</i> Schumach.	Napier grass, Elephant grass	<i>Yaa naepia, Yaa chang</i>	Leaf and stem
<i>Pennisetum purpureum</i> x <i>P. americanum</i> (hybrid)	Bana grass	<i>Yaa banaa</i>	Leaf and stem
<i>Psidium guajava</i> Linn.	Guava	<i>Farang</i>	Fruit and leaf
<i>Raphanus satibus</i> Linn.	Chinese winter radish	<i>Hua pakadd</i>	Leaf and stem
<i>Saccharum fuscum</i> Roxb.	-	<i>Kham</i>	Leaf and stem
<i>Saccharum officinarum</i> Linn.	Sugar cane	<i>Aoi</i>	Leaf and stem
<i>Saccharum spontaneum</i> Linn.	Wild sugar cane, Thatch grass	<i>Pong</i>	Leaf and stem
<i>Solanum tuberosum</i> Linn.	Potato	<i>Man farang</i>	Leaf and stem
<i>Zea mays</i> Linn.	Maize, Corn	<i>Khaw phood</i>	Leaf, stem, cob
<i>Calamus</i> spp., <i>Daemonorops</i> spp., etc.	Rattan	<i>Wai</i>	Stem
Many species in certain genera of the palm family (except for the rattan group)	Palm	<i>Ton paam</i>	Leaf

Table 2: Medicinal plants

Scientific name	Common name		Part(s) used	Indication
	English	Thai		
Internal use				
<i>Acacia catechu</i> Willd.	Black catechu, Cutch	<i>Som poy</i>	Pod & leaf	Laxative/purgative
<i>Aegle marmelos</i> (L.) Corr. ex Roxb.	Bael fruit tree, Bengal quince	<i>Matuum</i>	Fruit	Antidiarrheal Mood enhancer
<i>Albizia procera</i> (Roxb.) Benth.	Forest siris, White siris	<i>Thawn</i>	Bark	Digestive
<i>Coix lachrymal-jobi</i> Linn.	Job's tears	<i>Deuay</i>	Root	Anthelmintic
<i>Dillenia aurea</i> Smith	-	<i>Maa san</i>	Bark	Tonic
<i>Diospyros mollis</i> Griff.	Ebony tree	<i>Ma gleu</i>	Fruit (ripe)	Anthelmintic
<i>Entada pursaetha</i> DC.	Sea bean	<i>Kheua sabaa</i>	Seed	Tonic
<i>Ficus benjamina</i> Linn.	Golden fig, Weeping fig	<i>Sai yoi</i>	Fruit, flower & bark	Anthelmintic
<i>Harrisonia perforate</i> Merr.	-	<i>Ton jii</i>	Leaf, stem & root	Anthelmintic
<i>Ricinus communis</i> Linn.	Castor-oil plant, Castor bean	<i>Lahoong</i>	Seed	Laxative/purgative
<i>Scindapsus officinalis</i> Schott	-	<i>Phluu chang</i>	Leaf & stem	Tonic
<i>Tamarindus indica</i> Linn.	Tamarind	<i>Makhaam piak</i>	Fruit	Laxative/purgative
<i>Tinospora tuberculata</i> Beunee	-	<i>Boraphet</i>	Stem	Tonic, digestive
External use				
<i>Bambusa spp.</i>	Bamboo	<i>Mai phai</i>	Stem	Blister treatment
<i>Capsicum frutescens</i> Linn.	Chilli	Phrik	Fruit	Anti-infective (skin, eyes) Hot fomentation (ingredient)

<i>Cocos nucifera</i> Linn.	Coconut		<i>Maphraaw</i>	Seed (oil)	Fungicide, anti-infective (skin, especially for burns)
<i>Columella tenuifolia</i> Merr.	-		<i>Yaa pogtaw</i>	Stem	Hot fomentation (ingredient)
<i>Crinum asiaticum</i> Linn.	Crinum lily, Asiatic poison lily		<i>Ton plab phleuang</i>	Leaf	Reduce swelling
<i>Curcuma longa</i> Linn.	Turmeric		<i>Khamin chan</i>	Rhizome	Anti-infective (skin, eyes)
<i>Entada pursaetha</i> DC.	Sea bean		<i>Kheua sabaa</i>	Bark & stem	Hot fomentation (ingredient)
<i>Eupatorium odoratum</i> Linn.	-		<i>Yaa saab seuu</i>	Leaf	Anti-infective (skin, eyes) Prevent/eliminate insects
<i>Imperata cylindrica</i> Beauv.	Thatch grass		<i>Yaa khaa</i>	Rhizome & root	Haemostatic
<i>Mimosa pudica</i> Linn.	Sensitive plant		<i>Mai yarap</i>	Stem Leaf	Anti-infective for eyes
<i>Musa sapientum</i> Linn.	Banana		<i>Gluay</i>	Fruit (unripe)	Anti-pruritus Anti-infective for skin
<i>Pterocarpus indicus</i> Willd.	Narra, rosewood		<i>Praduu</i>	Bark	Haemostatic (for bleeding from cut tusks)
<i>Ricinus communis</i> Linn.	Castor-oil plant, castor bean		<i>Lahung daeng</i>	Branch	Anti-infective for skin (esp. abscesses, wounds, feet)
<i>Tamarindus indica</i> Linn.	Tamarind		<i>Makham</i>	Fruit	Anti-infective for eyes
<i>Thunbergia laurifolia</i> Linn.	Blue trumpet vine, Laurel-leaved thunbergia		<i>Rang jeud</i>	Stem & leaf	With lime, on abscesses
<i>Zingiber cassumunar</i>	Cassumunar		<i>Plai</i>	Rhizome	Hot fomentation (ingredient)

References

- Aiello, S.E. (ed.) 1998. *The Merck Veterinary Manual, 8th edition*. John Wiley & Sons. (available at www.merckvetmanual.com/mvm/index.jsp)
- Baker, I. & Kashio, M. (eds.) 2002. *Giants on our hands: Proceedings of the international workshop on the domesticated Asian elephant*. Bangkok, FAO(RAP). RAP Publication: 2002/30. (available at www.fao.org/DOCREP/005/AD031E/AD031E00.HTM)
- Davis, J. & Anderson, R. (eds.) 1971. *Parasitic diseases of wild mammals*. Iowa State University Press.
- Davis, J.; Karstad, L. & Trainer, D. (eds.) 1973. *Infectious diseases of wild mammals*. Iowa State University Press.
- Evans, G.H. 1910. *Elephants and their diseases*. Rangoon, Government Printer.
- FAO. 1994. *A manual for the primary animal health care worker*. Rome, FAO.
- Ferrier, A.J. 1947. *The care and management of elephants in Burma*. London, Steel Brothers & Co.
- Fowler, M.E. (ed.) 1993. *Zoo and wild animal medicine, current therapy 3*. Philadelphia, W.B. Saunders & Co.
- Fowler, M.E. & Miller, E. (eds.) 1999. *Zoo and wild animal medicine, current therapy 4*. Philadelphia, W.B Saunders & Co.
- Lair, R. 1997. *Gone astray: The care and management of the Asian elephant in domesticity*. Bangkok, FAO (RAP). RAP Publication: 1997/16.
- McDiarmid, A. 1969. *Diseases in free-living wild animals*. The Zoological Society of London
- Mikota, S.; Sargent, E. & Ranglack, G. 1994. *Medical management of the elephant*. West Bloomfield, Indira Publishing House.
- Milroy, A.J. 1922. *A short treatise on the management of elephants*. Shillong, Government Printer.
- Namboodiri, N. (ed.) 1998. *Practical elephant management: A handbook for mahouts*. Coimbatore, Elephant Welfare Association.

- Pfaff, G. 1940. *Reports on the investigation of diseases of elephants*. Rangoon, Govmt. Printing and Stationery.
- Reibel, J. 1984. *Caring for livestock: A veterinary handbook*. New York, Arco Publishing.
- Roberston, A. (ed.) 1976. *The handbook of animal diseases in the tropics*. London, British Veterinary Association.
- Samuel, W.M.; Pybus, M.J & Kocan, A.A. 2001. *Parasitic diseases of wild mammals, 2nd edition*. Ames, Blackwell Publishing.
- Schmidt, M. J. 1986. Proboscidea (Elephants). In Fowler, M. E., ed. *Zoo and wild animal medicine, 2nd edition*. Philadelphia, W.B. Saunders.
- Schmitt, D. L. 2003. Proboscidea (Elephants). In M.E. Fowler and R.E. Miller, eds. *Zoo and wild animal medicine, 5th edition*. St. Louis, Elsevier Science.
- Sharma, P. & Baldock, C. (eds.) 1999. *Understanding animal health in Southeast Asia*. Canberra, Australian Centre for International Agricultural Research.
- Silas, E.; Nair, M.K.; & Nirmalan, G. (eds.) 1992. *The Asian elephant: Ecology, biology, diseases, conservation and management*. Trichur, Kerala Agricultural University.
- Tesapruteep, Ted. (ed.) 1999. *Proceedings of the International Conference on Regional Workshop on Asian Elephant Health Care*. Chiang Mai, Faculty of Veterinary Medicine, Chiang Mai.
- Van Heerden, J. & Penzhorn, B. (eds.) *The African elephant as a game ranch animal*. Onderstepoort, South African Veterinary Association.
- Williams, E. S. & Barker, I. K. (eds.) 2001. *Infectious diseases of wild mammals, 3rd edition*. Ames, Iowa, USA, Iowa State University Press.
- Wobeser, G.A. 1994. *Investigation and management of disease in wild animals*. New York & London, Plenum Press.
- Woodford, M.H. (ed.) 2000. *Post-mortem procedures for wildlife veterinarians and field biologists*. Canberra, Australian Centre for International Agricultural Research. (available at www.elephantcare.org/protodoc_files/afrnecro.pdf)

Thai language references*

Elephant and Wildlife Club. 2001. *Project to disseminate knowledge in basic elephant health care*. Elephant and Wildlife Clinic, Companion Animal, Faculty of Veterinary Medicine, Chiang Mai University

Laoprasert, Churai. (compiler) 2000. *Knowledge about elephants, Volume I*. Large Animal Group, Research and Elephant Health Care Institute, Surin Province.

Laoprasert, Churai; Tungsuwan, Malinee & Sarnpechudayan, Prasert. (compilers) 2000. *Knowledge about elephants, Volume II*. Large Animal Group, Research and Elephant Health Care Institute, Surin Province.

Lunga, Grissada. (ed.) 2002. *Manual of elephant health care*. Elephant and Wildlife Clinic, Companion Animal, Faculty of Veterinary Medicine, Chiang Mai University.

Phuangkum, Preecha. 2001. *Project for training elephant keepers in basic care*. Thai Elephant Conservation Organization, Forest Industry Organization.

Teak Division. 1962. *Knowing about elephants*. (Mimeo) Forest Industry Organization, Lampang Province.

* All titles are given in Thai script in the Thai edition of this book.