General Health Care in Captive Asian Elephant

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• **Characteristics of healthy elephant**

1. Clear and bright eye, no eye discharge, pus and foreign body, the tear not stain on the face.
2. Bright pink colored mucous membrane in oral cavity, tongue, nostrils (tip of trunk), anus and vulva.
3. The ear and tail movement can observe in always time.
4. The skin is smooth and soft, moisture in hydration
5. Sweating can see in the coronet line above the toenail
6. Normal eating in quantity and frequency of the food intake.
7. Normal urinate and defecation, yellow colored urine and greenest colored feces (feces are various color depended on the food intake), and their frequency.
8. No sleep in daytime, except a baby elephants (normally, elephants are sleep after midnight)
9. Interest in the environments

*Figure 1. Sweating on the coronet of a healthy elephant*
• **Age estimation**

We can estimate the elephant age with many characters, although it is difficult to estimate in young elephants. The elephant body is usually change with age and easily observed in old elephants. The details are explained at below.

1. slowly walking and movements.
2. can see the bone projections and their grooves in the head, the ribs and vertebral spine are observed too (also found in elephants have a chronic injury or infection).
3. opaque eye, corneal opacity, and close the eye in some time, visual ability is decrease with age.
4. wrinkly trunk, and the trunk movement reduce with age.
5. the amount of tears and folds in an ear increase with age.
6. wrinkly and rough skin in the body.
7. muscular hypotrophy, can see in the leg and buttoc.
8. cracked nail, thicken skin arrange around a toenail or nail base.
9. loss of tail hair, rough and hard skin in the tip of tail.
10.rough feces mass, can see an indigested food in the feces mass.

• **Criteria for observation of ill elephant**

1. Slowly and softly ear flapping.
2. Lethargy, close the eye.
3. Non-sweating, dried coronet.
4. Pendular tail whipping, slow and soft movement.
5. Frequently yawn, sleepless in the night.
6. No or slow movement of the trunk.
7. Inappetite or anorexia.
8. Sleep in daytime, sleep in standing.
9. Weight loss, especially in young elephant.

**Health care in Asian elephants**

1. **Physical Examinations**

   **Far inspection**

   The examination is the observation the elephants in their environment and without the interferences, especially an aggressive elephants. The elephants would show the abnormal signs or behaviors. The major sings should be observe as the below.
   
   • eating and watering
• gaits and Walking
• sleeping
• sound
• urinate
• defecation
• body movements (ear, tail, trunk and other)
• environmental stimulated responses
• other signs and behaviors, wanted to observe

The optimal time for observation is the morning after an elephant wet up. The environments must be observed too, such as sleeping place, food and water, remained urine and feces or other. The examination should observe every day.

Near inspection

Similar to the far inspection, the examination can indicate more details of abnormal signs and behaviors. Because of it inspect the elephant in nearby length.

Palpation

Palpation is the method for detected mass, injury or pain on elephant body, which used hand or equipments.

Percussion

Normally, the operation of percussion is associated with auscultation for detect the abnormal sound and sound production.

Auscultation

Heart or abdominal sounds detected with stethoscope. The method should perform with quietness and small movements. The young or thin elephants are easily to hear the sound than fat or obese elephants.

Figure 2. The auscultation for detect a heart sound in elephant.
**Smelling**

The abnormal smell (pus, wound or infection, and others) and urine and feces smell should be detected by inspector.

**Pulse rate**

Elephant pulse rate detected from ear arteries, vessels are harder than veins, and located in back side of ear flap. The strong cardiac output can feel about 25-35 beat per minute in healthy elephant.

*Figure 3. (Left) The vessels located in elephant ear (Right) and pulse rate detection*

**Respiratory rate**

Respiratory rate is difficulty to observe in the elephants because the large body size and movements in always time. However the respiratory rate can observe from the abdominal expansion.

**Temperature**

Rectal temperature is a best data about fever in elephants. The thermometer held by hand which covered with glove insert per rectum of an elephant. The tip of thermometer lied on the rectal wall for 1-2 minutes. That method can read the temperature degree in directly. Beware the break of thermometer inside the rectum. If the method cannot perform such as an aggressive elephant, an elephant body temperature can measure from just dropping dung. The thermometer tip stabs the center of dung for 1-2 minutes. After that read the temperature degree is showed on thermometer and plus with 1 of degree Celsius or 1.8 of degree Fahrenheit, that is the estimated real body temperature in an elephant.
Figure 4. The correct holding of thermometer for check the body temperature in elephant.

Figure 5. (Left) The elephant rectal temperature checking. (Right) The temperature checking from elephant dung.

**Body weight and measurements**

The real body weight can measure by the weighing machine but it is a difficulty in the practice. The estimated body weight calculated from the formulas as the following.

\[
\begin{align*}
BW &= (18.0 \times G) - 3,336 \quad \text{(used in 1-57 year old elephants)} \\
BW &= (17.9 \times G) - 3,408 \quad \text{(used in 1-13 year old elephants)} \\
BW &= (15.5 \times G) - 2,481 \quad \text{(used in 18-28 year old elephants)} \\
BW &= (19.4 \times G) - 3,786 \quad \text{(used in 29-39 year old elephants)} \\
BW &= (20.8 \times G) - 4,249 \quad \text{(used in 40-57 year old elephants)}
\end{align*}
\]

BW ; estimated body weight (kilogram)
G ; chest girth (centimeter)
Remark ; the formulas are error in 16.5 – 41.7 percent.
The formula usually used for calculate elephant weight in all age is the below. That is the wildly used formula in the northern part of Thailand.

$$BW = (21.11 \times G) – 4,425$$

The real or estimated weight is examined with the other measurements for health consideration, drug administration and growth record, the measurements are explained as the below.

L ; body length from the base of the forehead to the base of the tail  
F ; body length from the point of the shoulder to the point of the  buttock  
H ; height at the shoulder  
N ; neck girth  
C ; right forelimb circumference

Remark ; all is in centimeter

*Figure 6. (Left) The measurement of elephant body length, chest girth (Right) right forelimb circumference*
2. **Clinical Examination**

**Hematology**
- For evaluating health status
- Diagnosis of infectious and noninfectious disease
- Red blood cells of elephants are the biggest of all terrestrial mammals but fewer in number
- Red blood cell evaluation should consider age, sex, environment
- Hemoglobin content of elephant blood is higher than other terrestrial mammals (big RBC)
- White blood cells fight infection.
- In case of infection, White blood cell counts increase.
- Normally, lymphocytes are more numerous in peripheral blood than neutrophils.
- In case of internal parasites, Eosinophil counts increase.
- Neutrophils and lymphocytes increase when the elephant gets in a panic.
- White blood cell counts of young Asian elephants (3-14 years) are much higher than counts of adult Asian elephants.
- Platelet counts of elephants are higher than most other mammals.
- Hemostasis in elephants is very quick (normal clotting time is about 5.5 seconds)

**Blood Chemistry**
- For evaluating function of visceral organs.
- For liver function, check SGOT(AST), SDH, GGT, LDH, ALP
- For a convenient liver function test, we use SGPT(ALT)
- For renal function, we check creatinine
- For muscle function, we check Creatinine Kinase (found in striated muscle, cardiac muscle and brain)
- Fibrinogen is the enzyme that will be increased with inflammation.
- Total serum protein (albumin + globulin) decreases when the elephant is emaciated or malnourished or has chronic renal or liver disease.
- Ca and P are the major minerals for musculoskeletal system.
- Check Ca and P ratio to differentiate thyroid disease from malnutrition or metabolic bone disease.
**Urinalysis**
- Non-invasive technique for evaluating renal function and infection
- Easy, Useful for diagnosis.
- Should do before drug administration.

**Bacterial Culture**
- Swab from suspected organs.
- Sterile techniques to prevent contamination.
- The result is useful for selecting appropriate anti-microbial drugs.

**Fecal Examination**
- For parasite screening.
- For selecting appropriate anti-helminthic drugs for the elephant.

**Other diagnostic techniques**

**Radiography**
- Useful for only the elephant’s leg and tusks.
- Can’t use for visceral organs (the body of elephant is too thick and large)
- Best for young elephants.
- Mobile unit is better.
- More than 80 KV
- High sensitivity film.
- Good restraint for good image.
- Protect thyroid gland and genital organs.
- The procedure for detecting a fracture of an elephant’s tusk

**Ultrasonography**
- Mostly used in reproductive assessment, gastrointestinal and eye examinations.
- Per-rectal procedure is used for ultrasonography of the abdominal cavity
• Medical administration

_**Intramuscular injection, IM**_

The injected sides are the triangular region of the neck, between shoulder and elbow region and buttock region. The needles used in IM should be 18-16 G and 1 ½ inch in length or more because the thick skin, especially the buttock region. The needle should be stab on skin in right angle position. The aseptic technique must be use in the injection, besides this injection, the technique should be use in all of injections. The elephant are easily to develop abscesses in that sides which septic injection. The drug volume is least than 20 milliliter per injection side, especially the drug which had suspension or oil adjuvant. However the drug can administrate with 50 milliliter of solution drug in one injection side.

![Figure 7. The locations for intramuscular injection](image)

**Subcutaneous injection, SC**

Normally the route is not good for drug administration in elephant, due to an abscess would be develop in poor practice. However that route is the Ivermectin injection side, for example, the neck and behind the elbow joint. There are loses skin and easily to hold for performing of the injection, beware missing to the intradermal route, ID. The performing is under an aseptic technique.
**Intravenous injection, IV**

The optimal side is the ear vein, the soften vessels located at the hind side of pinna. The vein is blocked with finger at the base of ear for observe that vessel and insert needle for injection. Aseptic technique is used in the always working time. The drug should be slow releasing in this method.

![Intravenous injection](image)

*Figure 8. Intravenous injection, and blood collection in this side also.*

**Oral medication, PO**

The per oral administration in baby or young elephant can use force feeding method. The syringe or silicone tube used as loading equipment for the liquid drug which added syrup conceals the drug flavor, associated with mount gag in some time. A pills or tablets are stuffed in food bolus (tamarind paste, ripe banana, or glutinous rice added with salt) for feed an elephant. Not only that used in stuffed food, tamarind is a laxative, banana and glutinous rice are appetizer. The elephants are sensitive in flavor of drug. The drug should be has high concentration and small amount and side of pills.

![Oral medication](image)

*Figure 9. The oral medication in adult elephant which used silicone tube.*
Figure 10. The mixed food is composed of tamarind, banana, gains, mineral and many herb, and other. The hole is made for fill the pills or tablets.

**Suppository**

Suppositories are used for long releasing the active substances to cure an elephant. Beside that, an enema is used in elephant which had constipation, dehydration and fever (reduce high temperature with watering).

Figure 11. The elephant treated a constipation with enema method.
**Tropical medication**

The method is easily to use in animals. However an elephant has a largest body size, caused amount or volume of drugs are higher.

*Figure 12.* The alternative medicine, acupuncture, used for neurological treatment of elephant in some time.

**Fluid therapy**

Like an intravenous injection, the fluid therapy in elephant can perform with IV catheter is inserted and fixed at ear vein. Catheter has a 18-16 G and 1½ - 2 inch in length. The fluids used in elephant are NSS, Lactate Ringer’s solution, Acetar, D5 ½ S, and D10S. Amount of those is 50-100 milliliter per kilogram in dehydrated elephant, and 150 milliliter per kilogram in high dehydration. The fluid should be warm equal to body temperature.
• **Preventive medicine**

The captive elephant should be screen for any health problems, at least one time per year. The program for screening is explain as the below.

*Annual physical examination*

The examinations are include body weight (real weight as possibility), body temperature, pulse rate, respiratory rate, hematology and blood chemistry, fecal examination, Tuberculosis testing and other physical or clinical examinations.

*Quarantine*

The period of quarantine is 30 day at least, during the period must screen the health problem as same as the annual physical examination.

*Immunization*

Vaccination can perform with follow the criteria which regulated in each country, especially endemic area.

*Deworming*

The elephant should be has a deworming twice a year at least. Ivermectin is a first authority drug for deworming in elephant.

*Foot care*

Many problems can found in the elephant foot, for example, a long time standing on a smooth floor caused a overgrowth of nail and foot pad from, hard and rough floor can resulted a cracked nail or wound in foot area. The hoof trimming knifes or equipments are used for trimming the elephant nail, and wound must treat with medication.

*Diet review*

Elephant should be fed with high quality and optimal quantity diet, especially in young, old and ill elephant. Vitamin and mineral are used for supplements in elephant diet.

*Past control*

The pasts (such as rat, cockroach and fly) are vector of many diseases, prevent and eradicate the pasts.
**Staff health monitoring**
Veterinarian, mahout, keeper or other staffs should be has an annual examination for avoid the disease transmission between man and elephant, zoonoses.

**Behavioral enrichment**
The enrichment is importance for abnormal psychological solving in elephant, stimulate the behaviors to prevent border and stress in captive elephant.

**Sanitation and disinfection**
The poor environments are caused a health problem in some time. Sanitation and disinfection should be performed weekly at least.

*Table 1. Annual Health monitor*

<table>
<thead>
<tr>
<th>Disease</th>
<th>Method</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis</td>
<td>Tuberculin test</td>
<td>Annually</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>Plate agglutination test (Rose Bengal)</td>
<td>Anually</td>
</tr>
<tr>
<td>Internal Parasite</td>
<td>Fecal examination</td>
<td>Every 6 month</td>
</tr>
<tr>
<td></td>
<td>• Simple floatation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Simple sedimentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood smear</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Blood parasite</td>
<td></td>
</tr>
</tbody>
</table>

**Vaccine and Vaccination**

*Principles of Immunization*
- Intentional immunity or artificial immunity
- Natural immunity or passive natural immunity
- Passive natural immunity is function only 28 days

*Vaccine*
- Nonreplicative or Killed or Inactivated Vaccine
- Replicative or Live or Attenuated Vaccine
Vaccination

- Shall do after maternal immunity drop
- Give killed or lived antigen to stimulate the immunology

Table 2. Vaccination and Deworming Program

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Age</th>
<th>Route</th>
<th>Doses</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemorrhagic septicemia</td>
<td>At 6 month</td>
<td>Intramuscular</td>
<td>2 ml</td>
<td>Annually</td>
</tr>
<tr>
<td>vaccine</td>
<td>Then annually</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anthrax vaccine</td>
<td>At 6 month</td>
<td>Subcutaneously</td>
<td>1 ml</td>
<td>Endemic area</td>
</tr>
<tr>
<td>Tetanus toxoid</td>
<td>At birth</td>
<td>Intramuscular</td>
<td>80 IU / 1,000 kg BW</td>
<td>In risky case</td>
</tr>
<tr>
<td>Foot and mouth disease</td>
<td>At 6 month</td>
<td>Subcutaneously</td>
<td>2 ml</td>
<td>Endemic area</td>
</tr>
<tr>
<td>Deworming</td>
<td>At 3 month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rintal® (Fenbendazole)</td>
<td></td>
<td></td>
<td>1 Tab (600 mg) / 200 kg BW</td>
<td>Every 6 month</td>
</tr>
<tr>
<td>:PO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ivermectin</td>
<td></td>
<td>Subcutaneously</td>
<td>1 ml / 200 kg BW (100 mg/kg)</td>
<td></td>
</tr>
</tbody>
</table>

- Neonatal care

Newborn elephants must be received a colostrum from their mater. The colostrum is yellowish colored milk secreted by mammary gland for a few days after parturition, and also called foremilk. Their important components are rich of antibody and mineral that confer passive immunity to the newborn. If an elephant maters cannot secrete colostrum, we can treat the elephant calve with milk from other elephant that added with their mater serum, or other elephant. Beside that, we can inject the serum with subcutaneous injection.

An orphaned elephant should be not fed with milk had high fat level such as cow milk is not diluted, the optimal fat level is less than 2 percent. The formula of milk replacer is used for raise orphaned elephants as the below. Rickets is big problem in orphaned elephants, calcium : phosphorus ratio and vitamin D are involve in the problem. Should be add the supplements (vitamin and mineral) to milk replacer and feed in optimal volume which following the age, body size and feeding frequency.
Figure 13. The orphaned elephant fed with milk replacer.

- **Identification**

Elephant identification mostly is identification paper which has a detail of marking of each elephant, especially the individual natural marks such as scar, ear characters, back shape, nail number or other. In the present, microchip is used for identification in elephant. The equipment is composed of transponder, the chip is injected intramuscular or subcutaneous at the base of the left ear, and reader, the equipment used for read the identity number in the transponder. The DNA analysis is used for elephant identity and paternity test from their blood and hair, or the other DNA source.
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