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Original Research Article

Meningitis in Infant Orangutan (*Pongo pygmaeus*) at Orang Utan Island, Bukit Merah, Perak, Malaysia

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Abstract

Bukit Merah Orang Utan Island (BMOUI) serves as an *ex-situ* conservation facility for the endangered Bornean orangutans. The role of the Infant Care Unit (ICU) was to provide the veterinary care for infant orangutans, to create public awareness and to provide the public with an opportunity to view how the veterinary care was provided for the infant orangutan. Seizures were not very common in infant orangutan. Meningitis can be caused by bacteria, virus, protozoan, and other pathogenic microorganism. Seizures can occur during fever when temperature goes above 36°C. Seizures also occur in infant orangutan due to electrolyte imbalance such as Sodium, (Na^+), and Potassium, (K^+). Early diagnosis and treatment were necessary for a quick recovery.

Keywords: Meningitis, Orangutan, Seizures, Veterinary care

INTRODUCTION

BMOUI was opened to public on February 2000 and formerly known as Pulau Panjang. BMOUI is located in the Peninsular Malaysian State of Perak Darul Ridzuan. It has a climate and vegetation that closely resembles that of Borneo and Sumatra, the native lands of the orangutans.

It covers an area of approximately 35 acres of natural rainforest. Out of 35 acres, 15 acres are developed for their exhibit area with enrichment material (Dharmalingam et al., 2012). The ICU in BMOUI was established in March 2004 to provide veterinary care of infant orangutan. At 14 February 2008, BMOUI Foundation (BMOUIF) was incorporated to develop *ex-situ* conservation of orangutan focusing on research and education.

Seizures

It is the physical findings or changes in behavior that occur after an episode of abnormal electrical activity in the brain. The term "seizure" is often used interchangeably with "convulsion." Convulsions are when a person's body shakes rapidly and uncontrollably.

Neonatal Seizures

It differs from seizures in order children because of special aeiological and developmental factors, different clinical manifestations, and special consideration regarding anticonvulsant medication. Meningitis should always be considered in a febrile child with seizures (Hopkins and Harvey, 1998).

Neisseria Meningitides

Gram-negative cocci, in the genus *Neisseria* (Family Neisseriaceae) ape principally human pathogens, but some cause infection in animals. *Neisseria gonorrhoeae* (“gonococcus”) is the cause of the human venereal disease, gonorrhea. The chimpanzee is susceptible to experimental exposure to this organism. *Neisseria meningitides* (“meningococcus”) is the cause of meningitis in human patients (Jones and Hunt, 1983).

Meningitis

The membrane that covers and protects the brain and

Figure 1. Infant orangutan undergoing seizure. The first day of the seizure episode.

Figure 2. Infant orangutan blinking of the eye during seizures.

spinal cord is called as meaninges, inflammation of meninges is collectively known as meningitis. The inflammation may be caused by infection with viruses, bacteria fungus or other microorganisms, and by certain drugs. Meningitis can be life-threatening because of the involvement of the central nervous system.

Meningitis was described in five infant and juveniles and cerebral oedema in a sixth, but no cause was found. Other pathological signs in these animals suggested a septicaemia and three of the cases were associated with concurrent nephritis (de Boer, 1982).

OBJECTIVE

1) To study the treatment of meningitis in infant orangutan and their management protocol.

Figure 3. Infant orangutan showing blinking of the eye and protrusion of the tongue.

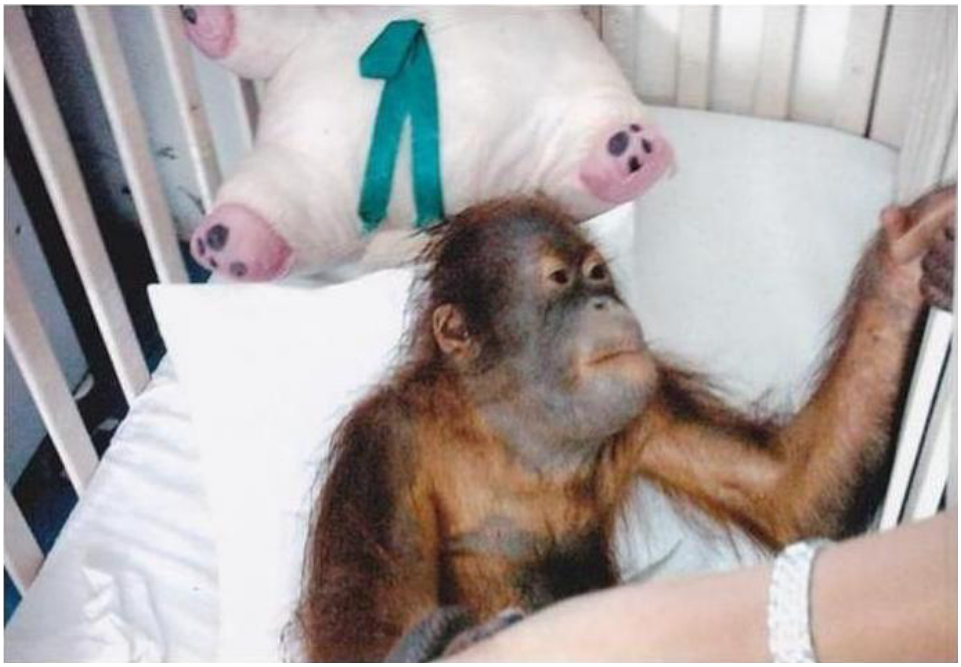

Figure 4. Buccal-oral symptom and lip smacking.

MATERIALS AND METHODS

Meningitis in Infant Orangutan

An infant orangutan age 2.5 years old showing symptoms of seizure was immediately admitted to the ICU. The infant was placed on 24 hours observation. Physical examination of the infant orangutan by the veterinary nurses before it was released into the excise yard, showed no sign of any illness.

Clinical Symptom

The infant orangutan showed aggressive behavior towards the veterinary nurse (figure 1). The infant orangutan was not responding to call. The eye signs were staring, deviation and blinking (figure 2). Excessive salivation was also notice (figure 3). The infant was exhibiting buccal and oral cavity chewing, sucking and lip smacking symptom (figure 4). For the initial two days the infant orangutan was unable to sit and was lying on the

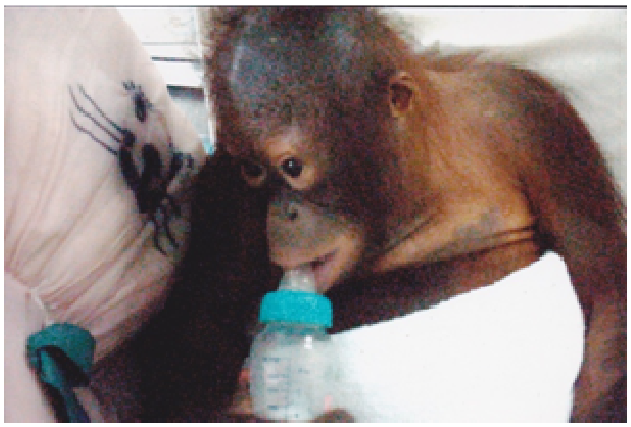

Figure 5. Infant orangutan unable to hold the feeding bottle.

Table 1. First blood analysis Haematology and Biochemistry.

Full blood count	Values	Units	Normal range
Haemoglobin	*10.6	g/dl	11.5-16.5
Total RBC	5.2	million	3.9-5.4
Total WBC	*25 900	cu.mm	4 000-11 000
Neutrophils	*80	%	40-75
Lymphocytes	15	%	15-45
Monocytes	5	%	0-10
PCV	37	%	35-47
MCV	*71	fl	76-96
MCH	*20.3	pg	27-32
MCHC	*28.6	%	30-36
Platelet	*144	cu.mm	150-400

Table 2. Electrolytes (Na,K,Cl).

Full blood count	Values	Units	Normal range
Sodium	144	mmol/l	135-152
Potassium	*3.16	mmol/l	3.5-5.2
Chloride	101	mmol/l	96-108

bed most of the time.

There was muscle tremor and incardination of the limb. Jitteriness was notice in forelimb and hind limb. The infant orangutan was unable to hold the feeding bottle (figure 5). Swallowing was difficult due the twisting of lips. The stomach was bloated.

Bacterial meningitis is preceded by colonization of the upper respiratory tract. A rare exception is where direct spread from mucocutaneous surfaces to the meninges occurs via an anatomical defect (Grimwood, 1998).

RESULT AND DISCUSSION

Clinical Finding

The body temperature recorded was above 38.0°C, normal is (36.5°C). The infant orangutan vital sign was closely monitored. A full blood count, biochemistry and electrolytes analysis was conducted. The blood samples were collected on the first day of admission and on the fourth day. The blood sample was sent to an independent Pathology Laboratory for analysis. The first blood sample of the infant was collected immediately after admission to the ICU, before any antibiotic treatment (table 1).

The electrolytes sodium and chloride were normal but potassium was slightly high on first blood analysis. On the second blood test all electrolytes level were normal (table 2).

The second blood test was conducted on the 4th days after admission (table 3). Since the infant was not feeding properly, the infant blood glucose level was regular check for hypoglycaemia. The normal glucose level of infant ranges from 4-5/mmol. From the 1st blood test the white

Table 3. Second blood analysis Haematology and Biochemistry.

Full blood count	Values	Units	Normal range
Haemoglobin	*10.1	g/dl	13.6-19.6
Total RBC	5.0	million	4.0-5.6
Total WBC	23 400	cu.mm	4 000-11 000
Neutrophils	*79	%	40-75
Lymphocytes	20	%	15-45
Monocytes	1	%	0-10
PCV	*35.4	%	44-62
MCV	*71	fl	88-111
MCH	*20	pg	27-32
MCHC	*28.4	%	30-36
Platelet	224	cu.mm	150-400

Table 4. Biochemistry.

Liver function test	Values	Units	Normal range
Protein	84	g/dl	66-87
Albumin	44	g/l	35-40
Globulin	40	g/l	22-40
A : B	1.1	ratio	1.0-2.2
Bilirubin (Total)	20	umol/l	1-24
Alkaline phosphatase	*280	Iu/l	38-140
ALT (alanine aminotransferase)	40	Iu/l	5-40
AST(aspartate aminotransferase)	*70	Iu/l	5-54
GGT(y –Glutamyltransferase)	50	Iu/l	10-55
Urea	4.0	mmol/l	1.66-8.70
Sodium	141	mmol/l	135-152
Potassium	4.6	mmol/l	3.5-5.2
Chloride	100	mmol/l	96-108
Creatinine	41	umol/l	1-124
Uric acid	177	umol/l	142-339

blood cell counts were very high suggestive of an infection. There was slight decrease in the haemoglobin and total red blood cell between first and second blood analysis. The Packed Cell Volume (PCV) was within the normal value. The Mean Cell Volume (MCV), the Mean Cell Haemoglobin (MCH), the Mean Cell Haemoglobin Concentration (MCHC) and blood platelets were below the normal range during the first blood analysis. But during 2nd blood analysis there was a further drop in the (PCV, MCH, and MCHC). The MCV remained the same but there was an increased in blood platelet. There was an increase in the total white blood cell in the 1st blood analysis compared to the 2nd analysis. The lymphocytes and monocytes were within the normal ranges.

The total neutrophil counts were above the normal level indicating of a bacterial infection. The neutrophil polymorph is the body's first line of defense against acute infection and it is the main type of cell involved in acute inflammation. Neutrophils are the nemesis of bacteria. These highly mobile cells spend most of their lives wandering in the connective tissues killing bacteria. They do this in 2 ways by phagocytosis and digestion, and by a reaction called the respiratory burst (Saladin, 2004).

Blood biochemistry profile was carried on the 4th day of the treatment. There was an increased in alkaline phosphatase enzymes, which are usually high during infancy and infant development. Aspartate aminotransferase (AST) are generally found in heart, liver, skeletal muscle, kidney, erythrocytes any damage to this tissue may increase the AST level. The liver enzymes also can be raised during antibiotic treatment. Transaminases-Raised level of transaminases is found in whatever the cause of liver cell damage. Mildly raised levels occur in cholestasis and some cases of cirrhosis. Both AST and alanine aminotransferase (ALT) are slightly elevated in the infant (table 4).

AST is present in both mitochondria and cytoplasm whereas ALT is found in the cytoplasm only. In condition in which there is cytoplasmic damage, but in which relatively few cells are totally destroyed, as in hepatitis, ALT levels are relatively higher than those of AST; in conditions in which damage, however focal, involves the whole cell (as in space-occupying lesions), AST level are relatively higher than those of ALT. As ALT has a longer half-life than AST, raised levels usually persist for a

Table 5. Test 1.

No.		Normal	Negative	Positive	Remarks
1.	Bilirubin		✓		
2.	Urobilinogen	✓			
3.	Ketone		✓		
4.	Ascorbic Acid			✓	$20(1.14)^{+}$
5.	Glucose		✓		
6.	Protein			✓	30^{+}
7.	Blood	✓			
8.	pH	✓			6
9.	Nitrite		✓		
10.	Leukocytes			✓	26
11.	Specific Gravity				1.035
12.	Pregnancy Test				

Table 6. Test 2.

No.		Normal	Negative	Positive	Remarks
1.	Bilirubin		✓		
2.	Urobilinogen		✓		
3.	Ketone		✓		
4.	Ascorbic Acid		✓		
5.	Glucose		✓		
6.	Protein			✓	
7.	Blood		✓		
8.	pH				6
9.	Nitrite		✓		
10.	Leukocytes			✓	75
12.	Specific Gravity				1.030

longer period of time (Zilva and Pannall, 1983). y–Glutamyltransferase (GGT) level is slightly elevated.

Urinalysis

Urinalysis was conducted on 2 urine samples. On the 1st sample the protein reading was 30mg/dL, pH 6, the leukocytes was 25leu/ul (table 5). Other parameters such glucose, haemoglobin or red blood cells (RBC), specific gravity was normal. A 2nd urine sample was collected after 3 days of treatment the following reading were obtained the protein was same as the 1st reading, the leukocytes has increased to 75leu/ul. Other parameter readings were negative indicating the parameters were normal (table 6).

Treatment

After admission to the ICU the infant orangutan was immediately sedated with diazepam rectally at a dosage of (0.1 to 0.2mg/kg bwt) was given twice daily (figure 6) or whenever there was sign of seizures. Other sedative drugs used were *phenabarbitone* – 30kg/kg bwt. Ibufen was given at a dosage 5ml every four hour to control the body temperature. The body temperature can also be reduced by sponging the body with lukewarm water.

Ceftriaxone (Rosephine®) was given at a dosage 100mg/kg bwt once daily for seven days. The first dose of antibiotic was given intravenous (I/V) and on the second day the antibiotic was given intramuscular (I/M). All the antibiotic treatments were given in the morning. Active ingredient of ceftriaxone in the form of the disodium salt substances. Ceftriaxone is usually active against Gram positive, Gram negative and anaerobic bacteria. Ceftriaxone can penetrate the inflamed meninges of neonates, infant and children. Ceftriaxone concentrations exceed 1.4 mg/l in the Cerebro-Spinal Fluid (CFS) 24 hours after I/V. injection of Rocephine in doses of (50-100mg/kg) (neonates and infants respectively).

Supportive Treatment

The infant orangutan was given supportive treatment which includes multivitamin and Neuroboin.

Multivitamin® contains all vitamins that are essential for cell replication, tissue respiration, haematopoiesis, nucleopoiesis, nucleoprotein and myelin synthesis, normal function of the retina, growth of bone reproduction, epithelial integrity, absorption and utilization

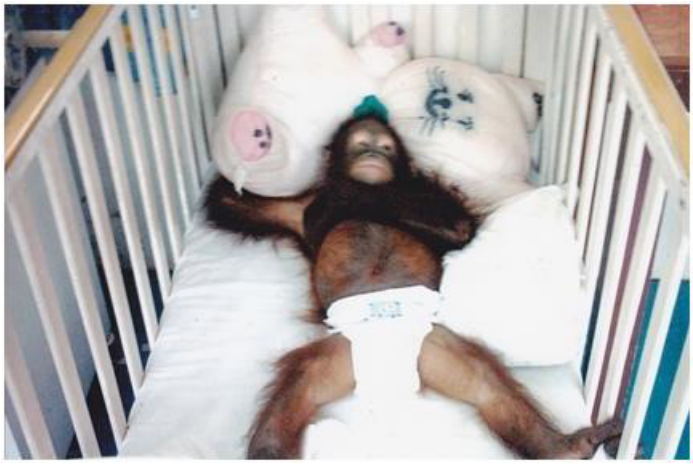

Figure 6. Infant orangutan sleeping after sedation with diazepam.

Table 7. Composition: To provide symptomatic relief of hyperacidity plus alleviation of gas symptoms, each teaspoonful/tablet contains.

	Maalox® Plus	
Active Ingredients	**Per Tsp (5ml)**	**Per Tablet**
Magnesium Hydroxide	200 mg	200 mg
Aluminium Hydroxide	225 mg	200 mg
Simethicone	25 mg	25 mg

of calcium and phosphate and other regulatory roles in the body. It is well absorbed orally and is excreted mainly in the urine and faeces. Multivitamin was given in the morning once daily at a dosage of 5ml.

Neurobion®-5000 is a combination of three essential neurotropic vitamin of the B groups A pronounced analgesic and neuro-regenerative effect is produced by this high dosage combination and neuroboin is therefore particularly valuable in the treatment of disorder of the peripheral nervous system; polyneuritis, neuralgia, sciatic sand shoulder-arm syndrome, lumbago-lumbalgia, intercostal neuralgia, trigeminal neuralagia, facial palsy, herpes zoster, diabetic neuropathy, optic neuritis, numbness of the extremities, as a supplement to therapy 1NH, vitamin B deficiency, cerebro-vascular accidents. Dosage 1ml intramascular was given once daily.

Maalox® Plus: As an antacid for symptomatic relief of hyperacidity associated with the diagnosis of peptic ulcer, gastritis, peptic esophagitis, gastric hyperacidity, heartburn, or hiatal hernia. As an anti flatulent to alleviate the symptoms of gas, including postoperative gas pain. Dosage 5ml was given orally twice daily morning and evening. (Table 7)

Physiotherapy

The infant orangutan recovered after a week of treatment. There was no coordination between the forelimbs and the hind limbs. The locomotion of the infant orangutan was unsteady. The infant orangutan was transferred to the excise yard for Physiotherapy for period two months. After two months of physiotherapy infant orangutan was able to seat without support and able to hold the feeding bottle. Locomotion of the infant orangutan was still unsteady (figure 7).

During the initially stages of physiotherapy procedures the infant orangutan was reluctant and refusing to hold or touch the enrichment materials (figure 8). With the assistance of the veterinary nurses the infant orangutan gradually learned to use enrichment materials provided and orangutan infant was able to balance itself (figure 9).

After the second day of the treatment, the infant orangutan was showing sign of improvement, the frequency of the seizures symptom reduced, the eye signs were coming back to normal, staring and blinking were reducing. The infant orangutan was able to feed independently (figure 10).

After two months of supportive treatment and physiotherapy the infant orangutan completely recovered, the infant orangutan was able to walk, and stand without any support. The infant orangutan was hyperactive and feeding was normal, Neurological test such as pedal reflex were carried out to asset the respond of infant orangutan to extend stimuli. The responds was good. The infant orangutan which is now 12 years old showed no sign of seizure or meningitis.

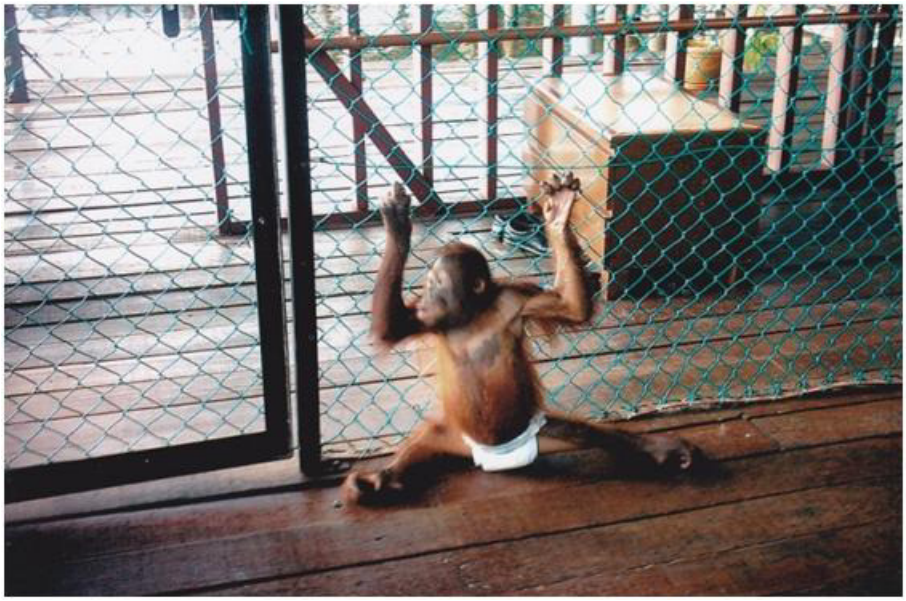

Figure 7. The first day at the excise yard showing weakness of the hind limb.

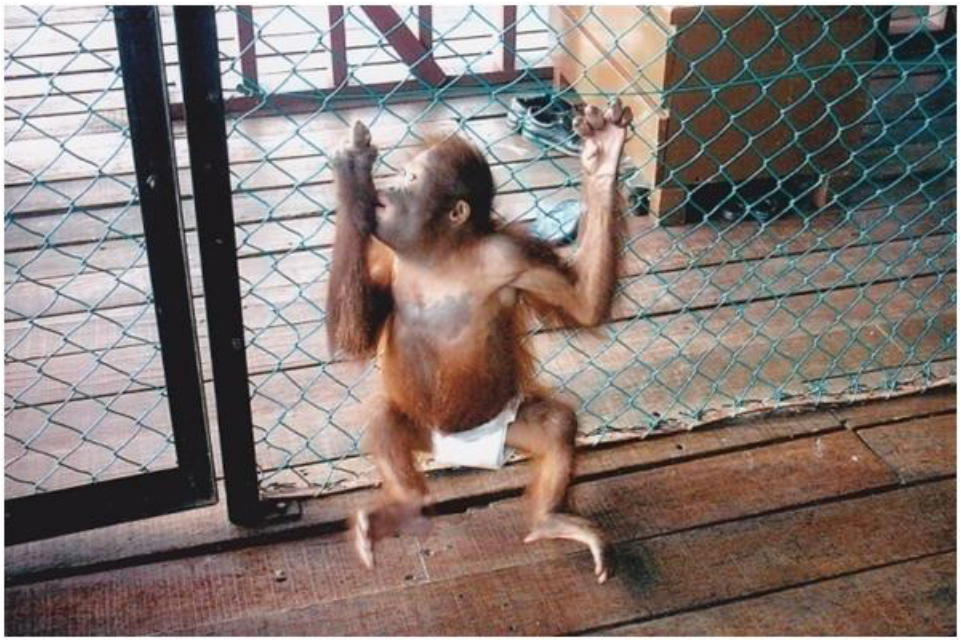

Figure 8. Few days later infant orangutan attempting to stand with support for limb.

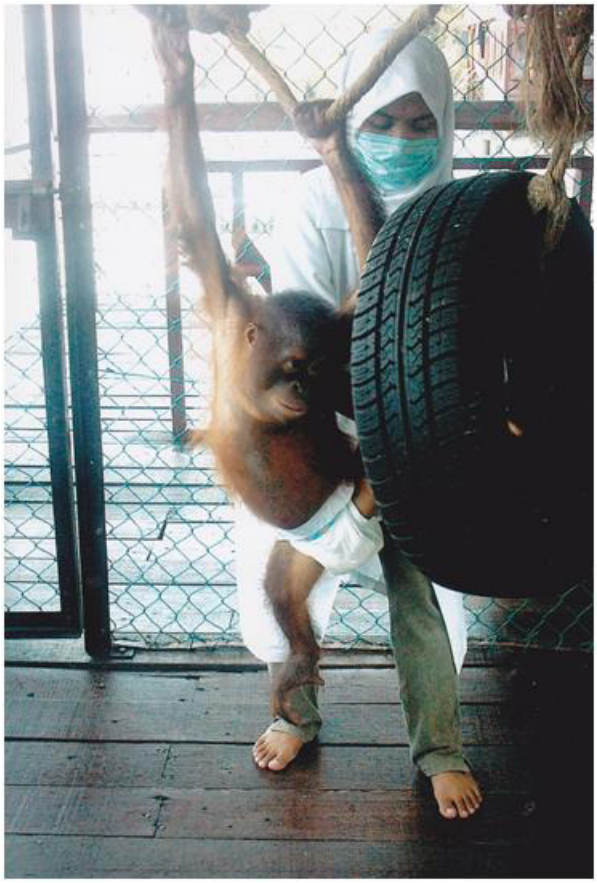

Figure 9. Getting assistance from veterinary nurse to familiarization with the enrichment materials.

Figure 10. Infant orangutan recovery after 2 months.

CONCLUSION

Bacterial meningitis can be treated with sensitive antibiotic. The antibiotic used should be able to pass the blood brain-barrier. Other antibiotic which do not have this properties will generally not be effective in controlling the infection. During the initial stage of the infection infant orangutan should be constantly sedated to reduce the

incident seizure and prevent neurological damages. The nutrition of the infant orangutan should be closely monitored. Supportive treatment like Neurobion®-5000, Multivitamin® and Maalox® Plus should be given to enhance the infant orangutan for recovery. Physiotherapy should be given as a daily routine, as part of their rehabilitation programme. Vital signs such pulse, respiration rate, SPO_2 and temperature should be closely monitored.

REFERENCES

de Boer LEM (1982). *The Orang utan: Its biology and conservation*. (pp.171-199). Dr.W. Junk Publisher, Netherlands.

Dharmalingam S, Hapiszudin NM, Roslan R (2012). *The Orangutans of Bukit Merah.* Bukit Merah Orang Utan Island Foundation, Perak, Malaysia.

Grimwood K (1998). Meningitis and encephalitis in infancy and childhood. In M. J. Robinson and D. M. Roberton (4th ed.). *Practical Paediatdrics* (pp. 355-363). Churchill Livingstone, Edinburgh, UK.

Hopkins IJ, Harvey AS (1998). Seizures and epilepsies. In M. J. Robinson and D. M. Roberton (4th ed.). *Practical Paediatdrics* (pp. 526-535). Churchill Livingstone, Edinburgh, UK.

Jones TC, Hunt RD (1983). *Veterinary Pathology* (5th ed.). Bailliere Tindall, London, USA.

Saladin KS (2004). *Anatomy & Physiology The Unity of Form and Function* (3rd ed.). McGraw Hill, New York.

Zilva JF, Pannall PR (1983). *Clinical Chemistry in Diagnosis and Treatment* (3th ed.). P G Publishing Pte Ltd, Singapore.