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Urine Chemistry Profile of Captive Sumatran Elephant (*Elephas maximus sumatranus)* in Bali Elephant Camp, Carangsari, Petang, Badung, Bali

(PROFIL KIMIA AIR KENCING GAJAH SUMATRA (ELEPHAS MAXIMUS SUMATRANUS) DALAM PENANGKARAN DI BALI ELEPHANT CAMP) DI CARANG SARI, PETANG, BADUNG, BALI

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ABSTRACT

Sumatran elephant (*Elephas maximus sumatranus*) is the biggest land mammals in Indonesia in criteria A2c category Critically Endangered (CR) dan Appendix I in Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Considering the importance of conservation and health maintenance of Sumatran elephants, various diagnostic tests must be carried out to determine the health status of elephants ranging from physical examination to blood chemistry tests and urinalysis. This study aimed to obtain the urine chemistry profile of the Sumatran elephant (*Elephas maximus sumatranus*) held captive in Bali Elephant Camp, Carangsari, Petang, Badung Regency, Bali. The urine sample taken is midstream (middle emission) urine. Sampling was carried out 5 times for 2 weeks with 2-3 days distance between samples taken and the dipstick test was carried out twice in one sample. Based on the results of this study, it can be concluded that out of the 8 Sumatran elephants maintained at the Bali Elephant Camp were all 100% negative for glucose. Protein, blood, bilirubin, ketones, and nitrite traces were found in deviant values in few individuals whereas it should be negative. Urobilinogen is found to be normal in most individuals at 0.2 mg/dL. pH in the range 6-9 while specific gravity is in the range of 1-1.020. Leucocytes value found in most individuals were 70 Leu/µL. It is important to note that a dipstick kit is used to indicate components in urine but it can not be used as a standard to diagnose a disease. Further examinations need to be carried out to find the definite value of the components found in urine.

Keywords: Sumatran Elephants (*Elephas maximus sumatranus*); dipstick; urine chemistry profile

ABSTRAK

Gajah Sumatra (*Elephas maximus sumatranus*) merupakan mamalia darat terbesar yang ada di Indonesia yang masuk kedalam kriteria A2c kategori *Critically Endangered* (CR) dan Appendix I dalam *Convention on International Trade in Endangered Species of Wild Flora and Fauna* (CITES). Pentingnya konservasi dan menjaga kesehatan gajah Sumatra, berbagai tes diagnostik harus dilakukan untuk mengetahui status kesehatan gajah mulai dari pemeriksaan fisik hingga uji kimia darah dan urinalisis. Tujuan penelitian ini adalah untuk mendapatkan profil kimia urin gajah Sumatra (*Elephas maximus sumatranus*) yang dipelihara di *Bali Elephant Camp,* Desa Carangsari, Kecamatan Petang, Kabupaten Badung, Provinsi Bali. Sampel urin yang diambil adalah urin *mid stream* (urin pancaran tengah). Pengambilan sampel dilakukan sebanyak lima kali selama dua minggu dengan jarak antar pengambilan sampel 2-3 hari kemudian dilakukan uji *dipstick* yang dilakukan sebanyak dua kali untuk satu sampel yang sama. Berdasarkan hasil penelitian ini, dapat disimpulkan bahwa dari 8 ekor gajah Sumatra yang dipelihara di *Balli Elephant Camp* semuanya (100%) negatif terhadap glukosuria. Sementara itu, terjadi proteinuria pada 5 individu (62,5%), bilirubinuria dan hematuria terjadi pada satu individu (12,5%).

Terjadi ketonuria pada tujuh individu dalam rentang 0-160. Sebanyak 84,7% data urobilinogen (mg/dL) bernilai 0,2. Nilai pH ada dalam rentang 6-9, sedangkan nilai berat jenis ada dalam rentang 1-1,020. Kadar leukosit (Leu/µL) bernilai 70 (91,3%)..

Kata-kata kunci: gajah sumatra (*Elephas maximus sumatranus*); *dipstick;* profil kimia urin

INTRODUCTION

Sumatran Elephant (*Elephas maximus sumatranus*) is one of the three Asian elephant sub-species and is currently the most endangered (Fahrimal and Sudarwati, 2006). This population decline is mostly caused by forest conversion into agricultural land which caused elephants to enter human settlements and considered as threats, resulting in them being poisoned, snared and poached. Sumatran elephants are "umbrella species", namely animals that depict biodiversity in ecosystems (WWF, 2013). Conservation and efforts to maintain the health of elephants are important given the decreasing numbers of Sumatran elephants. However, until now the publication of research on the chemical profile of urine in elephants are only based on species, namely Loxodonta (African elephant) and Elephas (Asian elephants) by Wiedner (2009), Kingsukorn (2006), Fowler and Mikota (2006) who researched Asian elephants. Specific research on Sumatran elephants has not yet been published, especially those that are kept captive in Bali and other provinces in Indonesia.

As one of the body's excretions can show health status because the urine released by the body is blood processed through filtration, reabsorption, and augmentation by the kidney (Toribio, 2007). If residue found in urine still contains the body's reusable substance, a disease or pathological abnormality can be suspected especially in the cardiovascular system, metabolic system, or urinary system. Urine consists of 95% water and 5% other compounds. The simplest urinalisis can be carried out by performing subjective examination by examining appearance of the urine i.e. color, transparency, turbidity, and odor. Whereas contents of chemical components in urine can be found through an examination using a dipstick includes glucose, blood, protein, bilirubin, urobilinogen, ketones, nitrites, leukocytes, pH and specific gravity.

The purpose of this study is to obtain the urine chemistry profile of Sumatran elephants captive in Bali Elephant Camp, Bali. Bali Elephant Camp is one of the conservation institutions in the village of Carangsari, Petang District, Badung Regency, Bali Province which is under the management of PT Kasianan-True Bali Experience and under the supervision of the Bali Province's Conservation and Natural Resources Center. There are 15 elephants in Bali Elephant Camp consisting of four adult male elephants, eight adult female elephants, and three infants consisting of two females and one male. This research is expected to add the database of urine chemistry profile of Sumatran elephants and to know the health status and management of one of the conservation institutions in Bali.

RESEARCH METHODS

This sample for this study are eight adult female elephants held captive in Bali Elephant Camp, Carangsari, Bali. The tools and materials used in this study were urine samples of Sumatran elephants in Bali Elephant Camp, cleaning paper, dipstick kits, bucket, urine container, note book, and glove. This research was an explorative study to obtain urine chemical profile data of Sumatran elephants that were held captive in Bali Elephant Camp. The variables of this study were glucose (mmol/L), protein (mg/dL), bilirubin (mg/dL), urobilinogen (mg/dL), pH, specific gravity, blood (+ or -), ketone (mg/dL)), nitrite (+ or -) and leukocytes (Leu/µL). Urine samples taken were midstream urine. Sampling was done five times every 2-3 days for two weeks at 07.00-09.00 am. Each urine sample obtained was tested twice using dipsticks. The data obtained would be tabulated and averaged. The results were presented in table form and explained descriptively. The study was conducted at Bali Elephant Camp, Carangsari, Bali in March 2019.

RESULT AND DISCUSSION

The average results of the 10 parameters used in the dipstick test are glucose (mmol / L), protein (mg / dL), bilirubin (mg / dL), urobilinogen (mg / dL), pH, specific gravity, blood (+ or -), ketones (mg / dL), nitrite (+ or -) and leukocytes (Leu / µL) described in Table 1 below.

Table 1. Urine chemistry profile of Sumatran elephant held captive in Bali Elephant Camp

Parameter	Value
Glucose (mmol/L)	All samples negative (100%)
Protein (mg/dL)	3 negative samples (37.5%); 5 positive samples (62.5%)
Bilirubin (mg/dL)	7 negative samples (87.5%); 1 positive sample (12.5%)
Urobilinogen (mg/dL)	84.7% data value 0.2
Blood (+ atau -)	7 negative samples (87,5%); 1 positive sample (12,5%)
Specific Gravity	Range 1-1.020
pH	Range 6-9
Ketone (mg/dL)	Range 0-160; 5 positive samples (62,5%)
Nitrite (+ atau -)	7 negative samples (87.5%); 1 positive sample (12.5%)
Leukosit (Leu/µL)	91.3% data value 70

Examination of the chemical profile of urine using a dipstick was obtained from 8 female elephants who were physically healthy at Bali Elephant Camp. Based on the results of the examination, it was found that there were some deviations in some parameters despite healthy appearance of the urine. All elephants also appeared healthy. This shows the importance of laboratory diagnostic examinations as support in diagnosing the existence of a disease.

Glucose content in the elephants' diet in Bali Elephant Camp is within normal limits. Absence of glucose contents in urine is considered normal (Parrah, et al. 2013; Toribio, 2007). Elephants in Bali Elephant Camp obtain glucose needs through fruits such as watermelon, guava, papaya, and pineapple given every morning. The glucose consumed then use as source of energy in daily activities. Glucose in the urine indicates chronic hyperglycemia, shock, and impaired reabsorption in the kidney tubules. Therefore, kidney tubules reabsorption of all elephants used as samples are considered healthy.

A small amount of protein presence found in urine is normal (Parrah *et al.,* 2013). Based on the results obtained from examined samples, 62.5% were positive with different results per individual in the range 0-2000. The presence of protein in urine (proteinuria) may be caused by high protein diet, stress or excessive activity. While the pathological reasons are the possibility of kidney disease that disrupts glomerular filtration results in blood and protein leak (Parrah *et al.,* 2013). Urinary tract infections can also be considered if indication of bacterial infection showed by presence of nitrite and leukocyte occurs.

pH in the urine can show kidney and overall body health. The results of the examination of the urine pH of the sample are in the range of 6.0-9.0. Herbivores such as elephant have have a neutral-alkalic pH of urine that is generally found around 6.5–8.0 with an average of 7.7 ± 0.54 (Wiedner *et al.,* 2009). Whereas carnivores i.e. lion has acidic pH of urine. This is a result of the type of diet consumed and body metabolism. Urine that is left in the open air is more alkalic due to the reaction of microorganisms in the air and the compounds in the urine itself. This reaction also causes urine to have bad odor. In pathological conditions, alkalic urine can be caused by urinary tract infections, metabolic or repiratoric alkalosis, disturbance in kidney tubules, regurgitation or disinfectant toxicity (Jameison, 2009).

Urobilinogen comes from the same source as bilirubin, which is the result of the breakdown of hemoglobin by the reticuloendothelial system which in serum binds to albumin which is transported to the liver. In liver cells, bilirubin binds to glucuronide acid and is released through bile into glucuronic bilirubin (bile II or direct bile). In the colon, bacteria convert glucuronic bilirubin into urobilinogen which will then be oxidized to stercobilin and urobilin which are partially reabsorbed (mainly urobilinogen) to be re-excreted with bile.

Thus, urobilinogen levels in the urine should be negative (-) or at very low levels (0.2 mg/dL). If urobilinogen is detected at high levels, there is a disruption in absorption. There is a small range of bilirubin presence of the kidney. Even slight rise in the range could indicates bilirubinuria. Therefore, this causes jaundice or hyperbilirubinemia.

Some urine samples are dark yellow and

more cloudy. Sediment can also be found if left idle. The sediment found in urine can be RBC (red blood cells), WBC (white blood cells), and proteins for example in the form of albumin. The yellow color in urine is caused by processed bilirubin in the form of urobilin. Bilirubin found in urine can indicate a disturbance in the liver. Normally, the interpretation of bilirubin levels must be negative (-).

Specific gravity (SG) is a ratio of the density of a substance to pure water. So, the density of urine should be at least greater than or equal to 1,000. The value of specific gravity according to Rishniw and Bicalho (2015), can show the process of kidney function. The greater the specific gravity, the greater the density of the urine, the worse the process of kidney function. Because the process of tubules in the kidney is to concentrate and dilute the substances dissolved in the urine, especially urea and NaCl to maintain fluid homeostasis. According to the results of the research by Wiedner *et al*. (2009) obtained from 22 Asian elephants, the density of elephants is around 1.007-1.025 while in this study, the specific gravity of Sumatran elephants is around 1.000 to 1.020 with an average of 1.007.

The presence of blood in the urine (hematuria) indicates a serious disturbance in kidney function or a lower urinary tract. Disorders of the kidneys can include tumors, kidney stones or urinary tracts, infections, or injuries to the tubules, ureters, urethra, or bladder (Radiological Society of North America, 2018). Of the eight samples obtained, one positive sample was found. The presence of blood in the urine must be examined further because the positive results of the dipstick examination are categorized as non-visible hematuria (Reynard *et al.,* 2013). To obtain visible hematuria, microscopic examination is needed to determine the findings in the sample. This could consist of hemoglobin, myoglobin, red blood cells (erythrocytes), or false results in very alkaline urine (Toribio, 2007).

In this study, many ketone bodies were found in the urine. The presence of ketones in urine should be interpreted negative (-) because presence of ketones in the urine indicates the use of fat as energy. In Bali Elephant Camp, 62.5% of the data was found to be ketone positive. Herbivores such as elephants obtain energy intake from glucose and protein in the diet. The discovery of ketones in urine indicates the use of fat as energy, meaning that the elephants at Bali Elephant Camp consume less glucose-containing food and it is all used up as energy or the elephants do not eat according to their weight. Therefore, elephants in Bali Elephant Camp should be given more daily energy intake or daily activities should be lessen. According to Parrah *et al.* (2013) in pathological condition ketosis could be caused by diabetes, whereas non-pathological conditions could be caused by cold, diarrhea, starvation, and dehydration.

From samples examined, positive results of nitrite content were found in 6 samples. Low level of nitrate in urine is normal depends on the feed consumed. Presence of bacteria in the urinary tract which converts nitrate to nitrite therefore indicates infection. Nitrituria indicates urinary tract infection (UTI) or urinary tract infection (UTI) (Mazutti *et al.,* 2013). To confirm the diagnosis, microscopic or culture examination is needed to look for bacteria. Animals suffer from urinary tract infections could experience stanguria, pollakiuria, dysuria, and urinary incontinence, but not all animals show symptoms (Dunning and Stonehewer, 2002). Organisms could enter the urethra through catheter, environmental, and fecal contamination.

Small amounts of leukocyte in the urine is considered normal, however if it is present in large amounts it could indicates an infection in the urinary tract. Leukocyte are part of the immune system which is used to protect the body from infectious diseases and foreign objects. Therefore, if inflammation occurs, leukocyte level will increase. Leukocyte are divided into neutrophils, basophils, eosinophils, lymphocytes, and monocytes which have different functions. So to find out the severity of the infection, microscopic examination is needed to find out the types of leukocytes and their levels in the urine. From the samples obtained in this study, 70 leu/ìL leukocyte were found in all samples meanwhile positive nitrite content is only found in one elephant sample. However, the presence of UTI is not always characterized by nitrite. Sometimes the presence of leukocytes is sufficient to indicate a UTI. Further examination must be carried out.

CONCLUSION

Based on the results of this study, it can be concluded that from 8 Sumatran elephants held captive at Bali Elephant Camp, all (100%) were

negative for glucosuria. Meanwhile, proteinuria occurred in 5 individuals (62.5%) while bilirubinuria and hematuria occurred in one individual (12.5%). Ketonuria occurred in 7 individuals in the range 0-160. A total of 84.7% of urobilinogen data (mg / dL) worth 0.2. pH value is within range 6-9. Specific gravity value is within range 1-1.020. Leukocyte level (Leu / μL) is worth 70 (91.3%).

SUGGESTION

More attention is needed to improve feeding management and further health checks are needed to determine the health status of elephants and the presence or absence of pathological disorders in the Bali Elephant Camp.

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