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The Effect of Collection Method on Urine Composition of Goat Fed Urea Treated Rice Straw

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Abstract
The study was conducted at Adamawa State University, Livestock Teaching and Research Farm Mubi, Department Animal Science to characterize urine components obtained by Free catch/voided and Cystocentesis method of urine collection in goats, through physical, chemical and microscopic examination. Sixteen (16) Bucks within the ages of 9-12 months were kept under intensive system. The goats were then allotted to four treatments Straw 1 (S1) Straw 2 (S2), Straw 3 (S3), and Straw 4 (S4), which was replicated four times. The chemical characteristics from the two methods (free catch/ voided and Cystocetesis) for blood, urobilinogen, bilirubin and leucocytes were negative test values in both collection methods, while Protein levels obtained in treatment S2, S3 and S4 were 0.3, 3.0 and 3.0 respectively, the values obtained in S3 and S4 was significantly ($P \leq 0.05$) higher than values obtained in S2. Glucose has similar values at 0.3 in both methods of collection and there was similarity between the pH values. Bacterial cells was also present in samples from free catch in all the treatment, while fungal spores was present in treatment S2 from sample obtained by free catch, this result is at disparity with those samples obtained from Cystocetesis where all the treatments had no presence of bacteria or fungi. Consequently, samples obtained by cystocetesis tend to be minimally free from contamination than those from free catch/voided method.

Keywords: Goat, Urinalysis, Voided, Cystocentesis, Urea

Introduction

Because test results can be affected by the method of urine collection as well as by sample handling, certain steps must be followed to assure accurate and reliable information. Collection of urine from experimental animals is a basic requirement in several biochemical, nutritional, urological, metabolic, toxicological, general behavioral and physiological studies (Kurien, *et al.,* 2004). The essential features of experimental animal urine collection are: (i) obtaining pure urine without contamination with faeces or animal feed, (ii) collecting urine without any direct intervention, (iii) ease and convenience of collection, (iv) efficiency of collection and (v) rapidity of collection (Biji, *et al.,* 2004). Urinalysis is one of the most informatory and commonly performed laboratory tests available to practicing Animal Scientists. Small quantities of urine will suffice for qualitative urinalysis. The fundamental features of experimental animal urine collection are: (a) obtaining pure urine without contamination with faeces or animal feed, (b) collecting urine without any compulsion and (c) ease and convenience of collection. This study was to compare urine samples obtained through two different methods of urine collection (Free catch/voided in metabolic cages and Cystocentesis methods of urine collection) using the following performance criteria: (i) ease of collection, (ii) degree of invasiveness or severity of procedures used, (iii) quality of sample, (iv) prevention of contamination and (v) different levels of pain, suffering or distress caused to the animal (Darling *et al.,* 2009). Urine collection can be performed using a number of techniques (Terril and Clemons, 1998). The urinary bladder is palpated in the caudal abdominal area and when gentle pressure is applied, a stream of urine should be produced. Care should be taken to not apply too much pressure and rupture the bladder. Cystocentesis may be used to collect uncontaminated urine using a needle inserted into the urinary bladder through the abdominal wall (Mandavilli *et al.,* 1991; Richard., 2012).

Material and Methods

Description of the study area

The experiment was carried out at the Livestock Teaching and Research Farm Yola, Adamawa State University, Nigeria. The area lies between the coordinates latitude 9˚13'48'N and 12˚27'36'E. It has a tropical climate with distrinct dry and wet seasons with mean annual minimum and maximum temperature of 22.3°C and 34.9°C. The amount of rainfall of 872.4mm (34.346 inches) per year, an average rainy days of 72 days per year. The rainfall begins in April and ends October, while the dry season commences late October and ends the following April. It has an average minimum temperature of 20.5˚C and maximum temperature of up to 40°C (Adebayo *et al.,* 2020). At the time of the study mean monthly temperatures were; for January (17.6-34.4°C), February (20.8-37.1°C) March (24.7-39.8°C), April (27.0-39.8°C), May (25.7-36.4°C), June (24.1-33.7°C), July (23.3-31.9°C). The relative humidity for January (16.5%), February (13.5), March (17.5), April (29.8), May (46.0), June (58.0), July (66.8). the monthly sunshine hours was at its highest pick of January (254.2hrs), February (229.6hrs), March (232.5hrs), April (228.0hrs) May (244.9hrs) June (228.0hrs) and July (201.5hrs), (World Meteorological Organization, 2015).

Urine sampling procedure

Free Catch/Voided: Samples in a fabricated metabolic cage were obtained in the morning by aspiration from the metabolic trays as they are voided and Cystocentesis method of urine collection was then used concurrently to collect urine samples from 16 animals from different dietary composition for the laboratory analysis. Free Catch/Voided Sample; use of metabolic cages is the easiest method, but can be very challenging, If hygiene is not maintained, contamination may be possible. A clean, dry collection tray was slotted under the cage in the urine stream cage and urine was aspirated when voided, into a syringe and poured into a sterile collection tubes. All effort was made to collect non contaminated sample to decrease potential bacterial, cellular and other contaminants (Richard., 2012).

Cystocentesis: Is a well recommended way to obtain urine for most laboratories, particularly for culture. The skin was disinfected and size of the bladder was carefully checked. Careful palpation of the urinary bladder was done prior to sample collection. This may be difficult in tense or obese animals or if the bladder is small. The bladder was palpated and isolated with one hand while a fine-gauge needle was guided at a 45° angle into the bladder via the abdominal wall and a urine sample was aspirated while the animal was positioned on its back. For consistency, a standard volume of urine was maintained in all the samples (Henry, *et al.,* 1996; Richard, 2012).

Laboratory analysis: Urine analysis Reagent strip: The urine samples obtained were immediately analyzed by automatic analyzer (URIT-50) and the results were recorded.

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) using statistical package (SAS, 2002).

Result and Discussion

Free catch/voided in metabolic cages

The physical characteristics: Physical characteristics (Table 1) of the sample obtained by free catch for colour, odour, and transparency was similar to those obtained by cystocentesis in all the treatments and it was within recommended limits (Radostitis, 2008). The values obtained for specific gravity in the two was not significant. Bacterial cells were present in urine collected from metabolic cages in all the treatments as reported by (Biji, *et al.,* 2004), in similar findings. Fungal spores were also present in treatment S2.

Table 1: Physical Examination; urinalysis of goat fed urea treated rice straw (Free catch method of urine collection)

	Treatments			
Parameters	S1 (0%urea)	S2 (4%urea)	S3 (5%urea)	S4 (6%urea)
Urine volume (ml)	211	320	329	310
Color	Pale yellow	Pale yellow	Pale yellow	Pale yellow
Odour	Aromatic	Aromatic	Aromatic	Aromatic
Transparency	Clear	Clear	Clear	Clear
Specific gravity	1.04	1.04	1.03	1.03
Bacteria	Positive	Positive	Negative	Negative
Fungi	Negative	Positive	Negative	Negative

n=16 **Note:** Straw 1 (S1) Straw 2 (S2), Straw 3 (S3), and Straw 4 (S4).

Chemical characteristics: The result obtained for free catch sample for blood, urobilinogen, bilirubin and leucocytes were all negative as shown in Table 2.

Table 2: Chemical Examination; urinalysis of goat fed urea treated rice straw (Free catch method of urine collection)

	Treatments			
Parameters	S1 (0%urea)	S2 (4%urea)	S3 (5%urea)	S4 (6%urea)
Blood	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Urobilinogen (mmol/L)	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Bilirubin	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Protein (g/l)	0.00^{a}	0.30^{c}	3.00^{d}	3.00^{d}
Ketones (mmol/L)	0.00^{a}	0.00^{a}	0.00^{a}	0.20^{ac}
Glucose (mmol/L)	0.00^{a}	0.00^{a}	0.00^{a}	0.30^{c}
pH value	7.7^{b}	8.0^{b}	8.1^{b}	8.1^{b}
Leucocytes (cell/uL)	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}

n=16 **Note:** Straw 1 (S1) Straw 2 (S2), Straw 3 (S3), and Straw 4 (S4),

Protein levels obtained in treatment S2, S3 and S4 were 0.3, 3.0 and 3.0 respectively, the values obtained in S3 and S4 was significantly ($P \leq 0.05$) higher than values obtained in S2. The differences might be due to the method of collection (Radostitis, *et al.*, 2008).

Because voided urine traverses several anatomical areas or from dietary proteins (Darling, *et al.*, 2009) and debris from these areas are more likely to be present in the voided sample (Parrah, *et al.*, 2013). The urine in treatment S1, S2 and S3 are free of ketones, while S4 has 0.2 of ketones.

Table 3: Chemical Examination; urinalysis of goat fed urea treated rice straw (Cystocentesis method of urine collection)

	Treatments			
Parameters	S1 (0%urea)	S2 (4%urea)	S3 (5%urea)	S4 (6%urea)
Blood	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Urobilinogen (mmol/L)	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Bilirubin	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Protein (g/l)	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Ketones (mmol/L)	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}
Glucose (mmol/L)	0.00^{a}	0.00^{a}	0.00^{a}	0.30^{d}
pH value	7.70^{b}	8.00^{b}	8.10^{c}	8.20^{c}
Leucocytes (cell/uL)	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}

n=16 **Note:** Straw 1 (S1) Straw 2 (S2), Straw 3 (S3), and Straw 4 (S4),

Cystocentesis

The chemical values for samples obtained by Cystocentesis method in table 3 were negative test values for blood, Urobilinogen, Bilirubin, Protein and Ketones and Leucocytes, but positive value for

glucose in treatment S4. The value for glucose was 0.3 in treatment S4, which was considered a trace value with no consequences as opined by (Parrah, *et al.,* 2013). The physical (Table 4) parameters for samples from Cystocetesis for bacteria and fungus was negative test value in all the treatments, this is in lined with the findings of (Kannan and Lawrence, 2010) that urine sample from cystocetesis tends to be minimally free from contamination.

Table 4: Physical Examination; urinalysis of goat fed urea treated rice straw (Cystocentesis method of urine collection)

	Treatments			
Parameters	S1 (0%urea)	S2 (4%urea)	S3 (5%urea)	S4 (6%urea)
Urine volume	10	10	10	10
Color	Pale yellow	Pale yellow	Pale yellow	Pale yellow
Odour	Aromatic	Aromatic	Aromatic	Aromatic
Transparency	Clear	Clear	Clear	Clear
Specific gravity	1.03	1.04	1.04	1.04
Bacteria	Negative	Negative	Negative	Negative
Fungi	Negative	Negative	Negative	Negative

n=16 **Note:** Straw 1 (S1) Straw 2 (S2), Straw 3 (S3), and Straw 4 (S4),

Conclusion

Generally, the chemical characteristics from the two methods (free catch/ voided and Cystocetesis) for blood, urobilinogen, bilirubin and leucocytes were negative test values, while protein and ketones were positive test values in all the treatments. Glucose and pH are similar in both methods of collection. Bacterial cells were present in free catch in all the treatments, fungal spores were present in treatment S2. Those samples obtained from cystocetesis were free from bacteria or fungi. Therefore samples obtained by cystocetesis tend to be minimally free from contamination.

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