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Abhishek Kain
Department of Animal Husbandry, Veterinary Officer, Govt. of Rajasthan, Rajasthan, India

Sunil Arora
Assistant Professor, College of Veterinary and Animal Science, Navania, Udaipur, Rajasthan, India

Kartar Singh
Teaching Associate, Department of Pharmacology and Toxicology, PGIVER, Jaipur, Rajasthan, India

Nalini Kataria
Professor and Head (Retd.) Department of Veterinary Physiology, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan, India

AK Kataria
Professor and Head (Retd.) Department of Veterinary Microbiology, College of Veterinary and Animal Science, RAJUVAS, Bikaner, Rajasthan, India

Corresponding Author
Abhishek Kain
Department of Animal Husbandry, Veterinary Officer, Govt. of Rajasthan, Rajasthan, India

Urine metabolites exploration during various ambiences in Tharparkar cows from Bikaner district of Rajasthan

Abhishek Kain, Sunil Arora, Kartar Singh, Nalini Kataria and AK Kataria

Abstract
Present exploration was planned to know the urine metabolites in relation to various ambiences and physiological states of Tharparkar cows from Bikaner district of Rajasthan. Apparently healthy 180 Tharparkar cows were screened from private dairies located in and around Bikaner district, Rajasthan. The urine samples were collected under standard management conditions during moderate ambience (October-November), dry-hot ambience (May and June) and humid-hot ambience (July-August). Maximum level of urine urea and urine creatinine were observed during humid-hot ambience. During humid-hot, the per-cent variation in the value of urine urea and urine creatinine were found to be maximum (+148.91) and (+16.81), respectively. Urine urea gauging is a chief aspect to evaluate renal function. Hydration states can affect urea excretion in ruminants. Urine creatinine level examination also reveals the depiction of renal clearance. Higher environmental temperature probably helps in generating slow dehydration resulting in greater urine creatinine revealing renal lilts.

Keywords: Tharparkar cows, urine urea and creatinine, environmental periods

Introduction
Variation in ambiences causes the alteration in metabolism of animals. These alterations are further exemplified with higher temperature and humidity combination. Renal functions in animals can be evaluated on the basis of certain urine analytes. Urine analytes can be important indicators of health status in animals (Arora 2022) [2]. Higher environmental temperature combined with higher humidity probably generated stress to Tharparkar cows producing a rise of urine metabolites level. The environmental stress modifies the metabolic functions resulting in change in urine metabolites status of goats (Arora and Kataria, 2022) [2] The findings of exploration tended to show variations in urine urea and creatinine levels with ambiences, which clearly divulged renal intonations. Perhaps changes in hydration status of cows during extreme EPs can be attributed to higher urine urea. It can be opined that influence of humid-hot was maximum in terms of urine urea intonations followed by dry-hot and cold EPs. It can be asserted that humid-hot and dry- hot EPs were able to produce changes in urea metabolism effectively as compared to cold EP, which although divulged a rise intonations in renal functions.

Materials and Methods
To investigate the urine metabolites in Tharparkar cows from Bikaner district of Rajasthan during moderate, dry-hot and humid-hot ambiences, urine samples were collected from 180 cows maintained under standard management conditions by private owners from unorganized sector. Collection of urine samples was carried out by non-invasive method when voided (Joshi, 2018) [5]. A midstream urine was collected cleanly from the cows when voided and stored in the sterilized containers. Cows in each ambience were broadly divided into group A and group B according to physiological states. Animals of group A included non-pregnant milch; pregnant milch and pregnant dry cows. Animals of group B were classified according to parity and included primipara and multipara cows. All primipara were between 3.5 and 6 years whereas all multipara were between 6 and 8.5 years of age. The mean value obtained during moderate ambience was considered as control for comparison from the mean values obtained during dry-hot and humid-hot ambiences. Distinctive computer programmes were used to various statistical analysis. (http://miniwebtool.com) and (www.danielsoper.com).

The alteration in the means were assessed by Duncan's new multiple range test.

1. Urine Urea (Uurea)
It was determined as described by Varley (1988) [20].

2. Urine Creatinine (U_{Cr})
It was determined as described by Oser (1976) [16] by employing standard method (Folin's method).

Results and Discussion
1. Urine urea and Creatinine
The Mean± SEM values of urine urea and creatinine in Tharparkar cows of different physiological states i.e. group A (non-pregnant milch, pregnant milch and pregnant dry) and group B (primipara and multipara) during moderate, dry-hot and humid-hot ambiences are presented in table 1 and table 2, respectively. In moderate ambience the mean value of urine urea obtained during corroborated the earlier research (Charan, 2002 in goats; Meena, 2002 in sheep; Kataria *et al*., 2005a in cows; Kataria and Kataria, 2005b in heifers; Joshi, 2018 in cattle; Promila, 2018 in sheep and Singh, 2018 in goat) [3, 14, 10, 9, 5, 17, 18]. Protein metabolism is reflected effectively by Urea levels denoting nitrogen prominence. Use of urea in ruminants is an important character to appreciate urea excretion (Möller and Farries, 1969) [15]. Scientists have also attempted to correlate nitrogen status and urea levels in ruminants (Leng *et al*., 1985) [12]. Urine urea gauging is a chief aspect to evaluate renal function (Kataria, 2000) [11]. Hydration states can affect urea excretion in ruminants (Kataria, 2000 and Kachhwaha, 2001) [11, 7]. In urine creatinine findings corroborated the earlier research in different animals (Charan, 2002 [3] in goats; Meena, 2002 [14] in sheep; Kataria and Kataria, 2010c [8] in camel; Joshi, 2018[5] in cattle; Promila, 2018 [17] in sheep and Singh, 2018[18] in goat) [3, 14, 8, 5, 17, 18]. Urine creatinine is an indicator of immense significance in evaluation of renal function tests (Promila, 2018) [17].

1.1 Effect of varying ambiences on the values of urine urea and creatinine
The overall mean values of urine urea and creatinine were significantly ($p \leq 0.05$) higher during dry-hot and humid-hot ambiences as compared to moderate ambience mean value. Maximum level of urine urea and creatinine was observed during humid-hot ambience. During humid-hot, the per cent variation in the value of urine urea and creatinine were found to be maximum (+148.91) and (+16.81), respectively.
Alterations related with harsh ambiences in the urine urea have been appreciated by earlier workers (Charan, 2002 in goat; Meena, 2002 in sheep; Promila, 2018, in sheep; Joshi, 2018 in cattle and Singh, 2018[18] in goat) [3, 14, 17, 5, 18]. Urine urea level was higher in humid-hot which was probably a result stress. The presence of stress was also confirmed by higher HLI during humid-hot. This was also accompanied by higher THI. Elevated urine urea levels also revealed lilts in renal functions. Scientists discoursed that higher environmental temperature can produce slow water deficit in animals giving rise to higher urine urea clearly divulging renal intonations (Kataria, 2000; Singla, 2005 and Joshi, 2018) [11, 19, 5]. Water deficit associated increase in urine urea was also described by Kachhwaha and Kataria (2016) [6]. In present study, alteration in hydration status during humid-hot can be proposed to be potent (Kataria, 2000) [11] showing impact of humid-hot ambience (Joshi, 2018) [5].
Urine creatinine levels indicated changes related with environmental temperature variations by earlier workers in animals (Charan, 2002 in goat; Meena, 2002 in sheep; Joshi, 2018 in cattle; Promila, 2018 in sheep and Singh, 2018 in goat) [3, 14, 5, 17, 18]. Renal clearance measurement in dromedaries during summer and winter months was carried out by urine creatinine (Kataria, 2000) [11]. In present study, urine creatinine level was found higher during humid-hot. Perhaps elevated environmental temperature coupled with greater humidity caused stress to cows causing an increase of urine creatinine levels. Determination of creatinine clearance has been done during various ambiences to appraise renal functions (Kataria, 2000 and Meena, 2002) [11, 14]. Higher environmental temperature probably helps in generating slow dehydration resulting in greater urine creatinine revealing renal lilts (Kataria, 2000; Meena, 2002 and Joshi, 2018) [11, 14, 5]. Outcome of present investigation divulged that influence of humid-hot was maximum in terms of urine creatinine intonations.

1.2 Effect of physiological states of on the values of urine urea and creatinine
In the present investigation, Tharparkar cows had two major groups according to physiological states (group A and group B) in all the three ambiences. Statistical analysis revealed significant ($p \leq 0.05$) variations among all the three overall mean values according to ambiences. In each ambience, in group A, mean value of pregnant dry cows was significantly ($p \leq 0.05$) higher than the respective mean values of urine urea and creatinine of non- pregnant milch and pregnant milch cows. In each ambience, in group B, mean value of urine urea and creatinine of multipara cows was significantly ($p \leq 0.05$) higher than the respective mean value of primipara cows. In urine urea physiological states like age can modify urea metabolism affecting urine urea (Charan, 2002; Meena, 2002; Joshi, 2018; Promila, 2018 and Singh, 2018) [3, 14, 5, 17, 18]. An opinion made by researchers have advocated that grazing of different animals can also change urea contents (Chikwanda and Muchenje, 2016) [4]. Outcome of present exploration lucidly divulged the impact of humid-hot ambiences on urine urea in the cows of all physiological states.
As in urine creatinine physiological states including age can change creatinine metabolism thus affecting urine creatinine (Charan, 2002; Meena, 2002; Joshi, 2018; Promila, 2018 and Singh, 2018) [14, 5, 17, 18]. Creatinine excretion with size of cattle has been associated (McCarthy *et al.*, 1983) [13]. Physiological states like pregnancy and lactation can also influence excretion of creatinine (Joshi, 2018) [5]. Upshot lucidly revealed the influence of humid-hot on urine creatinine in the cows of all physiological states.

Table 1: Mean ± SEM values of urine urea (U_{Urea}, mmol L^{-1}) in the Tharparkar cows during varying ambiences

S. No.	Effects	Mean ± SEM values during varying ambiences		
		Moderate	Dry hot	Humid hot
1.	Overall values (60)	$72.97^{b} \pm 0.47$	$157.64^{b} \pm 0.52$	$181.63^{b} \pm 0.71$
2.	Categorization according to physiological states (A & B groups)			
I.	Group A cows (60), Physiological states: Pregnancy and milch status			
a.	Non-pregnant milch (20)	$68.66^{bd} \pm 0.34$	$153.15^{bd} \pm 0.23$	$175.12^{bd} \pm 0.46$
b.	Pregnant milch (20)	$73.14^{bd} \pm 0.22$	$157.13^{bd} \pm 0.23$	$182.13^{bd} \pm 0.46$
c.	Pregnant dry (20)	$75.31^{bd} \pm 0.22$	$162.63^{bd} \pm 0.33$	$187.64^{bd} \pm 0.35$
II.	Group B cows (60), Physiological states: Parity			
a.	Primipara (30)	$71.81^{be} \pm 0.68$	$156.47^{be} \pm 0.68$	$179.78^{be} \pm 0.98$
b.	Multipara (30)	$74.14^{be} \pm 0.60$	$158.80^{be} \pm 0.75$	$183.49^{be} \pm 0.91$

- Figures in the parenthesis = Number of Tharparkar cows
- 'b' = Significant ($p \leq 0.05$) differences among mean values for a row.
- 'd' = Significant ($p \leq 0.05$) differences among mean values for an ambience
- 'e' = Significant ($p \leq 0.05$) differences between mean values for an ambience

Table 2: Mean ± SEM values of urine creatinine (U_{Cr}, µmol L^{-1}) in the Tharparkar cows during varying ambiences

S. No.	Effects	Mean ± SEM values during varying ambiences		
		Moderate	Dry hot	Humid hot
1.	Overall values (60)	$4128.16^{b} \pm 4.93$	$4412.39^{b} \pm 0.68$	$4822.24^{b} \pm 1.03$
2.	Categorization according to physiological states (A & B groups)			
I.	Group A cows (60), Physiological states: Pregnancy and milch status			
a.	Non-pregnant milch (20)	$4110.75^{bd} \pm 0.68$	$4406.16^{bd} \pm 0.44$	$4812.72^{bd} \pm 0.46$
b.	Pregnant milch (20)	$4122.47^{bd} \pm 0.45$	$4412.76^{bd} \pm 0.35$	$4822.71^{bd} \pm 0.57$
c.	Pregnant dry (20)	$4130.26^{bd} \pm 14.96$	$4418.27^{bd} \pm 0.45$	$4831.29^{bd} \pm 0.56$
II.	Group B cows (60), Physiological states: Parity			
a.	Primipara (30)	$4121.73^{be} \pm 0.78$	$4410.57^{be} \pm 0.91$	$4819.91^{be} \pm 1.37$
b.	Multipara (30)	$4134.59^{be} \pm 9.78$	$4414.22^{be} \pm 0.92$	$4824.56^{be} \pm 1.44$

Conclusion

In present investigation the findings regarding urine urea and creatinine revealed the presence of water deficit during dry-hot and humid-hot ambiences in the cows as urea and creatinine were distributed in smaller volume of urine. Urine urea appeared to be the most perceivable indicator of allied analytes in urine in the present study as it divulged maximum per cent change during humid-hot ambience.

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References

1. Arora S, Kataria N. Heat load index vis-à-vis changes in metabolic functions of Sirohi goat from semi-arid tracts of Rajasthan**.** Journal of Entomology and Zoology Studies, 2021, 9(3).
2. Arora S. Environmental correlates *vis-à-vis* physiological lilts in *sirohi* goat from udaipur, rajasthan enfolding hormones, water deficit markers, metabolic regulators, oxidative stress indicators and organ function variables. PhD. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal Science, Bikaner, RAU, Bikaner, Rajasthan, 2022.
3. Charan RS. Filtered and excreted loads of some serum constituents in goats during moderate and extreme ambience. M.V.Sc. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal Science, Bikaner, RAU, Bikaner, Rajasthan, 2002.
4. Chikwanda AT, Muchenje V. The effects of grazing system and floor type on blood biochemistry, growth, body condition score and carcass characteristics of *Nguni* goats. Asian-Australas. J Anim. Sci. 2016;30(9):1253-1260.
5. Joshi A. Dynamics of environmental correlates *vis-à-vis* appraisal of physiological strategies in female *Rathi* cattle implying modulations in endocrine, organ and tissue functions, energy metabolism and cellular oxidative stress responses. Ph.D. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, 2018.
6. Kachhwaha S, Kataria N. Urea clearance in goats during dehydration and rehydration. Vet. Pract. 2016;17(1):108-109.
7. Kachhwaha S. Effect of dehydration and rehydration on

some renal functions in goat. M.V.Sc. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal science, Bikaner, RAU, Bikaner, Rajasthan, 2001.
8. Kataria N, Kataria AK. Can prolactin be a measurable marker of stress in dromedaries. Slo. Vet. Res. 2010c;47(3):133-138.
9. Kataria N, Kataria AK. Studies on urine analytes in heifers of *Rathi* breed. Indian Cow. 2005b;2(3):15-18.
10. Kataria N, Ruby, Singla B, Kataria AK, Arya RS. A report on titratable acidity in *Rathi* cows. Indian Vet. Med. J. 2005a;29(2):209-210.
11. Kataria N. Hormonal and renal regulation of fluid retension in dromedary camel. Ph.D. thesis submitted to Department of Veterinary Physiology, CCSHAU, Hisar, Haryana, 2000.
12. Leng L, Szanyiovi M, Boda K. The renal response of sheep to a low dietary nitrogen intake. Physiol. Bohemoslov. 1985;34:147-159.
13. McCarthy FD, Bergen WG, Hawkins DR. Muscle protein turnover in cattle of differing genetic backgrounds as measured by urinary N tau-methylhistidine excretion. J Nutr. 1983;113(12):2455-2463.
14. Meena RC. Effect of change in environment temperature on some renal function in sheep. M.V.Sc. thesis submitted to department of Veterinary Physiology, College of veterinary and animal science, Bikaner RAU, Rajasthan, 2002.
15. Möller PD, Farries FE. Studies on the utilization of urea in ruminants. A. Lactation. IV. Ammonia concentration in the rumen juice and urea content in blood plasma and urine after the administration of urea. Z Tierphysiol Tierernahr Futtermittelkd. 1969;25(5):290-301.
16. Oser BL. In: Hawk's physiological chemistry. 14th ed. Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1976, 900-1280.
17. Promila. Hydration status *vis-à-vis* antioxidant level in non-descript sheep from arid tracts during extreme hot ambience. M.V.Sc. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal Science, Bikaner, RAJUVAS, Bikaner, Rajasthan, 2018.
18. Singh A. Relationship of antioxidant status and water deficit markers in non-descript goat from arid tracts during extreme hot environmental temperature period. M.V.Sc. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal Science, Bikaner, RAJUVAS, Bikaner, Rajasthan, 2018.
19. Singla B. Kidney function of *Marwari* sheep during water depletion. M.V.Sc. thesis submitted to Department of Veterinary Physiology, College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner, Rajasthan, 2005.
20. Varley H. In: Practical Clinical Biochemistry. 4th edn. CBS publishers and distributors, New Delhi, 1988, 158-637.