

Urine Output, Renal Excretion, and Clearances of Urea and Creatinine in Diarrheic Calves Upon admission, Following Intensive Fluid Therapy, and After Recovery

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Introduction

In diarrheal disease of young calves azotemia is a common event, and is sometimes interpreted as an indication of impaired renal function. Urea clearance is said to correlate with urinary flow, whereas creatinine clearance is taken to be influenced mainly by glomerular filtration rate (GFR). Objective of the study was to quantify urine flow rates, as well as the renal excretion of urea and creatinine, in young, diarrheic calves. The ultimate objective is to create a model that simulates fluid dynamics in diarrheic calves.

Materials and Methods

Male calves up to age 16 days that were admitted to the clinic because of diarrheal disease were weighed and fitted with a device for total urine collection. Urine was collected in 12-hour periods during the first 48 hours after admission (periods 1- 4), during which time the calves received fluid therapy as indicated by clinical and

laboratory parameters, and for another 24 hours following normalization of fecal consistency (periods 5 – 6).

Results and Conclusions

Relevant results are listed in the table. Values with different superscripts in the same column differ significantly ($p < 0.05$; two-sided t-test for paired samples.)

Absolute urine output per 24 h varied from 520 mL to 6210 mL (periods 1 + 2), 460 mL to 6910 mL (periods 3 + 4), and 1520 mL to 6740 mL (periods 5 + 6). There was a significant ($p < 0.05$) positive correlation between UFR and Cl_{urea} in all periods, as well as between UFR and Cl_{creat} in periods 1, 3, 5, and 6.

Even values obtained in period 1 do not reflect a standardized disease state, but may be influenced by fluid therapy which was initiated immediately.

Both urea and creatinine clearance values are comparable to those measured by various methods in healthy calves and older cattle. Azotemia in diarrheic calves apparently is all but completely prerenal.

Period	UFR ¹ μL/min/kg	Ex _{urea} ² μmol/min/kg	Cl _{urea} ³ mL/min/kg	Ex _{creat} ⁴ μmol/min/kg	Cl _{creat} ⁵ mL/min/kg
1	38.0±25.5 ^a	6.42±3.42 ^a	.94±.49	.187±.068 ^a	1.58±.71
2	51.7±28.7 ^b	5.18±2.38 ^b	1.12±.59 ^a	.160±.047	1.62±.58
3	51.2±29.1 ^b	3.85±1.58 ^c	1.09±.52 ^a	.151±.039 ^b	1.65±.54
4	59.8±30.5 ^b	3.45±1.45 ^c	1.09±.51 ^a	.149±.035 ^b	1.85±.73 ^a
5	48.9±22.6 ^b	2.40±1.10 ^d	.90±.40	.147±.047 ^b	1.58±.49
6	53.5±23.9 ^b	2.45±0.92 ^d	.82±.25 ^b	.149±.041 ^b	1.59±.35 ^b

1 urine flow rate 2 renal excretion of urea 3 renal clearance of urea

4 renal excretion of creatinine 5 renal clearance of creatinine