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MEETING HOST:



Poster #37

The Mineral Status of Sheep and Goats with Reference to Swayback in Central Trinidad

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ABSTRACT.

There have been many occurrences in Trinidad of lambs and kids that have died within 6 months of birth of suspected Cu deficiency resulting in clinical signs resembling swayback. Animals displayed an inability to stand at birth or hind limb ataxia progressing to an inability to stand in the delayed forms. The condition continues to be of economic importance because of poor growth rates and high mortality of lambs and kids of affected farms.

OBJECTIVES.

This study investigates the mineral status of

- 1) Swayback (n=50) and apparently normal lambs (n=39) and adult sheep (n=42) and
- 2) Swayback (n=24) and apparently normal kids (n=21) and adult goats (n=41) of affected farms of Central Trinidad

MATERIALS AND METHODS.

Calcium, Mg, Na, K, Cu and Zn concentrations were evaluated by atomic Absorption spectroscopy and colorimetrically for P, on blood serum of swayback and apparently normal sheep and goats. The identical minerals including Fe and Mn were evaluated on grasses of swayback affected farms or locations (Table I).

RESULTS.

Significantly lower ($p < 0.001$) serum Ca, Cu, and Zn levels were found in swayback than in apparently normal lambs and adult sheep. Serum Cu was also lower ($p < 0.001$) in swayback than in apparently normal kids and adult goats. Several swayback lambs had low concentrations of Ca (< 2.0 mmol/L), P (< 1.3 mmol/L) and Zn (< 9.2 μ mol/L), while most swayback lambs and kids had critically low Cu (< 7.9 μ mol/L). Several adult sheep and goats were also deficient in Cu and P, while about half of the grasses analysed had low Cu (< 5 ppm) (Tables II, III, & IV).

CONCLUSIONS.

Critically low serum Cu in swayback lambs and kids was probably caused by the low Cu concentrations found in the grasses. Twenty four, 47 and 16% of grasses also had levels of Ca, Mg, and P below minimum requirements ($< 0.20\%$ DM). The study provides

a basis for the inclusion of Cu and P supplementation to enhance productivity of sheep and goats of Central Trinidad.

REFERENCES.

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- Smith, M.C. and Sherman, D.M., 1994. Musculoepithelium System In Goat Medicine,(Lea and Febiger, Philadelphia, U.S.A.)
- Underwood, E.J.and Suttle N.F., 1999. The Mineral Nutrition of Livestock. 3rd edn., (Commonwealth Agricultural Bureaux, London.)

TABLE 1
Blood samples collected from Swayback and Apparently normal sheep and goats

<i>Sheep</i>	swayback			apparently normal			total
	Newborn	1 - 6 mth	Newborn	1 - 6 mth	1 - 4 yr		
Petrotrin Sheep Farm	0	6	0	9	3	18	
Chaguanas Location	1	10	2	12	12	37	
Mon Jaloux Livestock Farm	24	2	2	9	19	56	
Sugarcane Feeds Centre	0	7	1	4	8	20	
Total Sheep	25	25	5	34	42	131	

Goats	swayback		apparently normal		total
	1 - 6 mth	1 - 4 yr	1 - 6 mth	1 - 4 yr	
Couva Location	13	8	22	43	
Chaguanas Location	11	5	15	31	
Sugarcane Feeds Centre	0	8	4	12	
Total Goats	24	21	41	86	

TABLE II
Serum macro (mmol/l) and micro ($\mu\text{mol/l}$) mineral levels in swayback and apparently normal sheep of Central Trinidad

Mineral (n)	Swayback			Apparently Normal			V	42 ^c	± SE	Sig. ¹	
	I	II	25 ^a	± SE	III	5 ^b					± SE
Ca	2.60	0.10	2.39	0.07	2.91	0.16	0.06	2.72	2.53	0.06	***
Mg	1.03	0.06	0.99	0.04	1.07	0.09	0.04	1.09	1.02	0.04	NS
P	1.32	0.12	1.42	0.09	1.91	0.19	0.07	1.59	1.39	0.07	*
Na	138.17	2.52	137.70	1.90	139.70	4.11	1.59	141.83	137.04	1.51	*
k	5.26	0.16	5.46	0.12	5.77	0.26	0.10	5.86	5.26	0.10	***
Cu	4.41	0.47	4.88	0.38	9.44	0.83	0.31	8.50	8.03	0.30	***
Zn	10.25	0.69	10.55	0.55	16.98	1.22	0.47	14.68	13.46	0.44	***

Serum mineral concentrations found in sheep and goats are compared with the following critical levels: Ca 2.0, Mg 0.6 and P 1.3 mmol/L; Cu 7.9 $\mu\text{mol/L}$ and Zn 9.2 $\mu\text{mol/L}$ (Underwood and Suttle, 1999)

a,b,c I, Newborn lambs affected with congenital swayback; II, 1 to 6 month old lambs affected with delayed ataxia; III, newborn lambs, apparently normal; IV, 1 to 6 month old lambs, apparently normal; V, 1 to 4 year old adult sheep, apparently normal.

¹ * P < 0.05; *** P < 0.001; NS Not Significant

TABLE III
Serum macro (mmol/l) and micro ($\mu\text{mol/l}$) mineral levels of swayback and apparently normal goats of Central Trinidad

Mineral ¹	Swayback		Apparently Normal			Sig. ²
	II	\pm SE	IV	\pm SE	V	
n	24 ^a		21 ^b		41 ^b	
Ca	2.47	0.07	2.56	0.07	2.47	NS
Mg	1.11	0.04	1.14	0.04	1.19	NS
P	1.63	0.07	1.56	0.06	1.48	NS
Na	132.70	2.39	137.96	2.25	136.39	NS
K	5.51	0.11	5.69	0.10	5.54	NS
Cu	6.14	0.55	8.97	0.52	7.87	***
Zn	13.31	0.92	15.75	0.86	13.77	NS

^{a,b}

II, 1 to 6 month old kids affected with delayed ataxia; IV and V, 1 to 6 month old kids and 1 to 4 year old adult goats, apparently normal

¹ Normal expected Levels : Ca 2.3-2.9, Mg 1.1-1.5 and P, 1.5-5.3 mmol/L; Cu 9.4-23.6 and Zn 12.7-16.8 $\mu\text{mol/L}$ (Smith and Sherman, 1994)

² * $P < 0.05$; *** $P < 0.001$; NS Not Significant

TABLE IV
Forage macro (% dm) and micro (ppm) mineral levels of swayback affected farms

Mineral	Mean ¹ and range	± SD	Minimum requirement ²	% Below requirements
Ca	0.36 (0.07 - 0.86)	0.20	0.20	24
Mg	0.26 (0.10 - 0.86)	0.13	0.12(0.20)	0(47)
P	0.26 (0.07 - 0.79)	0.09	0.16(0.20)	0(16)
Na	0.16 (0.03 - 0.18)	0.14	0.09	40
K	1.80 (1.03 - 3.66)	0.72	0.50	0
SO ₄	0.14 (0.12 - 0.16)	0.01	----	0
Cu	5.3 (1.2 - 10.7)	2.18	7(5) ³	85(49)
Zn	58 (26 - 175)	28.8	20	0
Fe	133 (74 - 356)	56.9	20	0
Mn	186 (16 - 797)	150.2	20	0

¹ Based on 45 grass samples

² Lower Limit or Minimum Requirements for Sheep (NRC, 1985)

³ Deficient level associated with swayback in lambs (Underwood and Suttle, 1999))