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Introduction

The salinisation of soils and ground water due to climate change is a worldwide increasing phenomenon. Although salt (NaCl) is essential for regulating body water content, muscle functions, nutrient absorption etc., excessive and long term intake of saline drinking water may cause severe health problems.

➔ We explored whether sheep differentiate fresh and slightly salinated water and related their taste preferences with ambient temperature.



Fig. 1: Two choice preference test: the animals choose between fresh or salinated water *ad libitum*

Material and Methods

Experimental animals: 12 female sheep (Deutsche Schwarzkopf), aged between 1 to 8 years with an average body mass of 74.3 ± 10.1 kg.

Housing and feeding: individual experimental pens (3.0 m²), straw bedding and crushed hay *ad libitum*, average ambient temperature (T_a) was $19.4 \pm 1.6^\circ\text{C}$ and average relative humidity was $52.4 \pm 8.2\%$, lighting schedule was kept at 14 h light : 10 h dark.

Treatment:

- Control phase: two buckets with fresh water (unsalinated)
- Treatment phase 1: choice between fresh water and water with 0.25% NaCl
- Treatment phase 2: choice between fresh water and water with 1.0% NaCl
- Treatment phase 3: choice between fresh water and water with 0.25% NaCl

Two choice preference test (Fig. 1): one bucket with fresh water and another bucket with salted (0.25% or 1.0% NaCl) water *ad libitum*.

Traits measured: Rumen temperature was continuously recorded using miniature data loggers at 30 min intervals. Daily water and feed intake, respiratory rate, body mass and T_a were recorded.

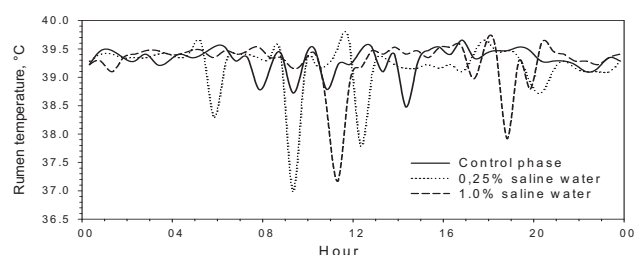


Fig. 2: Examples of diurnal rumen temperature rhythm for control and treatment (water with 0.25% or 1.0% NaCl) phases in one sheep during one day each.

Results

- Sheep exhibited a tendency for sidedness during the control phase and consumed 4.58% more water from the left than from the right side.
- Sheep preferred saline water and their preference increased significantly ($P < 0.001$) with 1.0% concentration of saline water (Tab. 1).

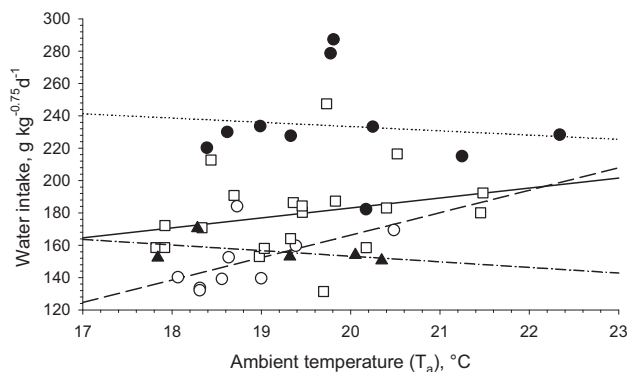


Fig. 3: Relationship between ambient temperature ($^\circ\text{C}$) and mean daily water intake ($\text{g kg}^{0.75} \text{d}^{-1}$) for control (\circ , dashed line), treatment phase 1 (\square , solid line), treatment phase 2 (\bullet , dotted line) and treatment phase 3 (\blacktriangle , dash-dotted line) in sheep.

- Respiratory rate increased significantly ($P < 0.001$) with preference for higher concentrations of saline water (Tab. 1).
- Rumen temperature changed with different concentrations of salted water (Fig. 2).

Tab. 1: Body mass, total water intake, fresh and salt water intake, dry matter intake and respiratory rate for control and treatment (0.25%, 1.0% and 0.25% salted water in choice with fresh water) phases in sheep corrected for T_a (mean \pm SD).

Traits	Experimental phase			
	Control N=12	Treatment 1 0.25% NaCl N=12	Treatment 2 1.0% NaCl N=12	Treatment 3 0.25% NaCl N=12
Body mass (kg)	$74.5 \pm 10.3^{\text{ab}}$	$74.7 \pm 10.1^{\text{a}}$	$76.5 \pm 10.5^{\text{b}}$	$76.5 \pm 10.6^{\text{ab}}$
Total water intake (kg/d)	$3.8 \pm 1.0^{\text{a}}$	$4.5 \pm 1.3^{\text{b}}$	$6.0 \pm 1.8^{\text{c}}$	$4.0 \pm 1.1^{\text{a}}$
Water intake ($\text{g/kg BM}^{0.75}/\text{d}$)	$151.6 \pm 35.8^{\text{a}}$	$179.3 \pm 44.3^{\text{b}}$	$232.3 \pm 67.0^{\text{c}}$	$156.6 \pm 37.8^{\text{a}}$
Fresh water intake (kg/d)	$3.8 \pm 1.0^{\text{a}}$	$1.7 \pm 1.4^{\text{aA}}$	$1.9 \pm 1.4^{\text{aA}}$	$1.3 \pm 0.9^{\text{aA}}$
Salt water intake (kg/d)	-	$2.8 \pm 1.7^{\text{aB}}$	$4.0 \pm 2.2^{\text{bB}}$	$2.8 \pm 1.3^{\text{aB}}$
Water intake by hay (kg/d)	$0.15 \pm 0.03^{\text{ab}}$	$0.14 \pm 0.04^{\text{bc}}$	$0.15 \pm 0.04^{\text{a}}$	$0.13 \pm 0.03^{\text{c}}$
Dry matter intake (kg/d)	$1.4 \pm 0.3^{\text{a}}$	$1.3 \pm 0.3^{\text{a}}$	$1.4 \pm 0.4^{\text{a}}$	$1.2 \pm 0.3^{\text{b}}$
Dry matter intake ($\text{g/kg BM}^{0.75}/\text{d}$)	$53.2 \pm 9.4^{\text{a}}$	$52.6 \pm 11.5^{\text{a}}$	$52.9 \pm 11.8^{\text{a}}$	$47.9 \pm 10.7^{\text{b}}$
Respiratory rate (breath/min)	$33.8 \pm 10.4^{\text{a}}$	$41.0 \pm 14.6^{\text{b}}$	$41.5 \pm 13.2^{\text{b}}$	$39.2 \pm 11.9^{\text{b}}$

^{a,b,c} Means within the same row with different superscripts differ significantly by $P < 0.05$

^{A,B} Means within the same column with different superscripts differ significantly by $P < 0.05$.

Conclusions

- In a two choice test, sheep differentiated fresh and salted water, and exhibited increasing preferences for saline water, which was most expressed with 1.0% salted water.
- Rumen temperature showed fluctuations according to water intake

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