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# Dietary electrolytes affect slurry composition and volume from dairy cows



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# Slurry volume and composition

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## Estimates of slurry volume

- Danish standards: 20 ton cow<sup>-1</sup> year<sup>-1</sup> ~ 55 kg day<sup>-1</sup>
- USA trials: 39-75 kg day<sup>-1</sup>

## Volume might vary greatly due to water

- feces DM vary from 10% to 20% - volume varies little
- urine DM < 5% - volume varies much

## Composition from a nutritionist point of view

- indigestible feed components
- metabolic waste products
- surplus electrolytes and water - narrow physiological regulation

# Hypothesis

Dietary potassium (K) and sodium (Na) affect slurry volume and composition in dairy cows through water and electrolyte homeostatic mechanisms





# Treatments

	Low Na Low K	Low Na High K	High Na High K	High Na High K + Lucerne
Na g/kg DM	1	1	10	10
K g/kg DM	12	35	35	35

# Feed rations



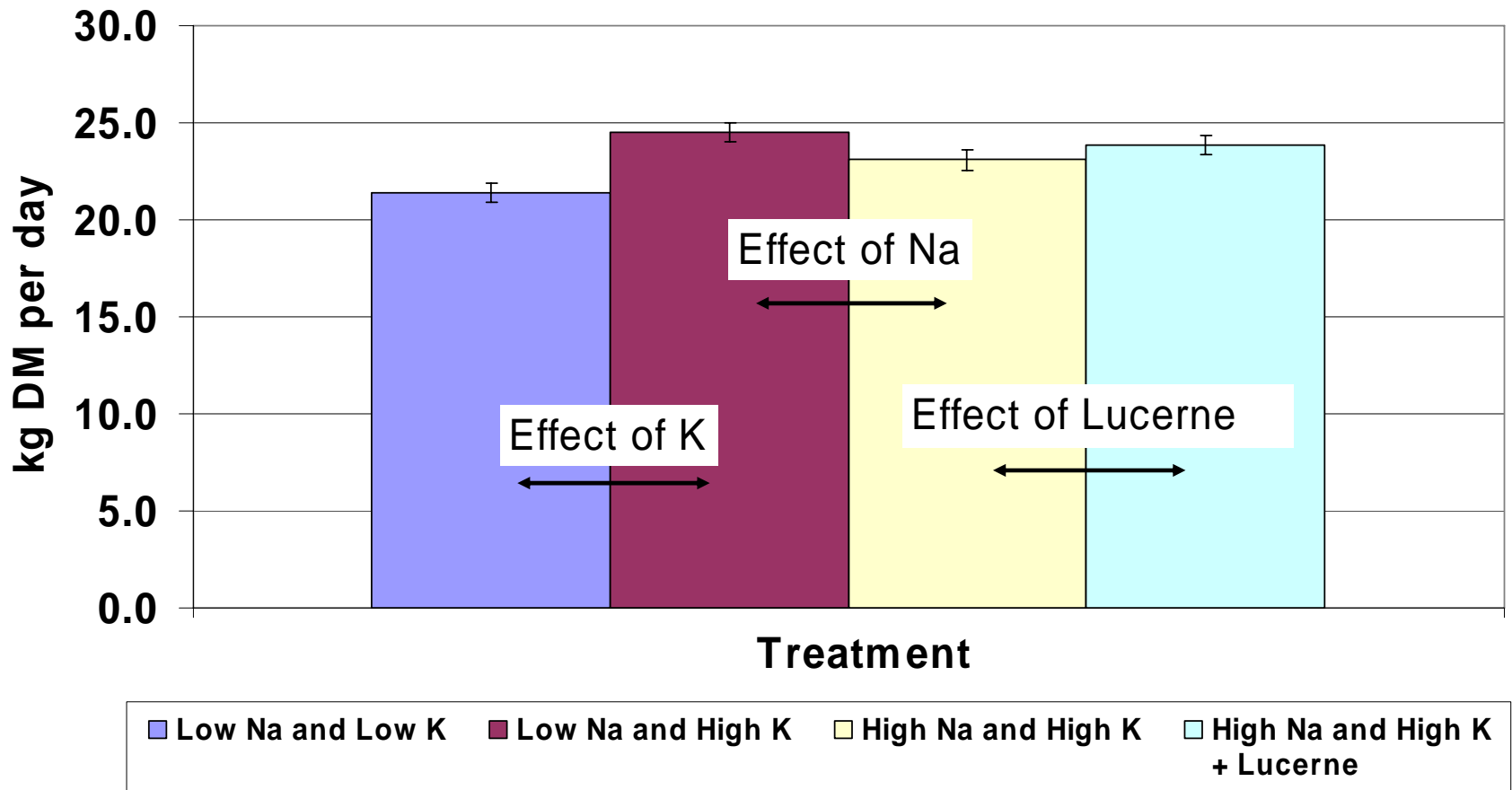
Dry matter per cow per day	Ration
Maize silage, kg	11.6
Rapeseed meal, kg	4.1
Perennial ryegrass straw, kg	1.3
Rolled oats, kg	2.3 or 0
Lucerne pellets, kg	0 or 3.6
NaCl, g	8 to 497
KCl, g	0 to 885
Minerals and vitamins	+

# Experimental design and protocol

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- 20 cows, 23 weeks in lactation, yield 34 kg
- 4 groups, 4 treatments and 4 periods in latin square
- 1 week periods, sampling day 6 and 7
- sampling and analysis of feces, urine, milk, saliva, blood, feeds, weight, health
- registration of feed and water intake, milk yield

# Feed intake - corrected for salt

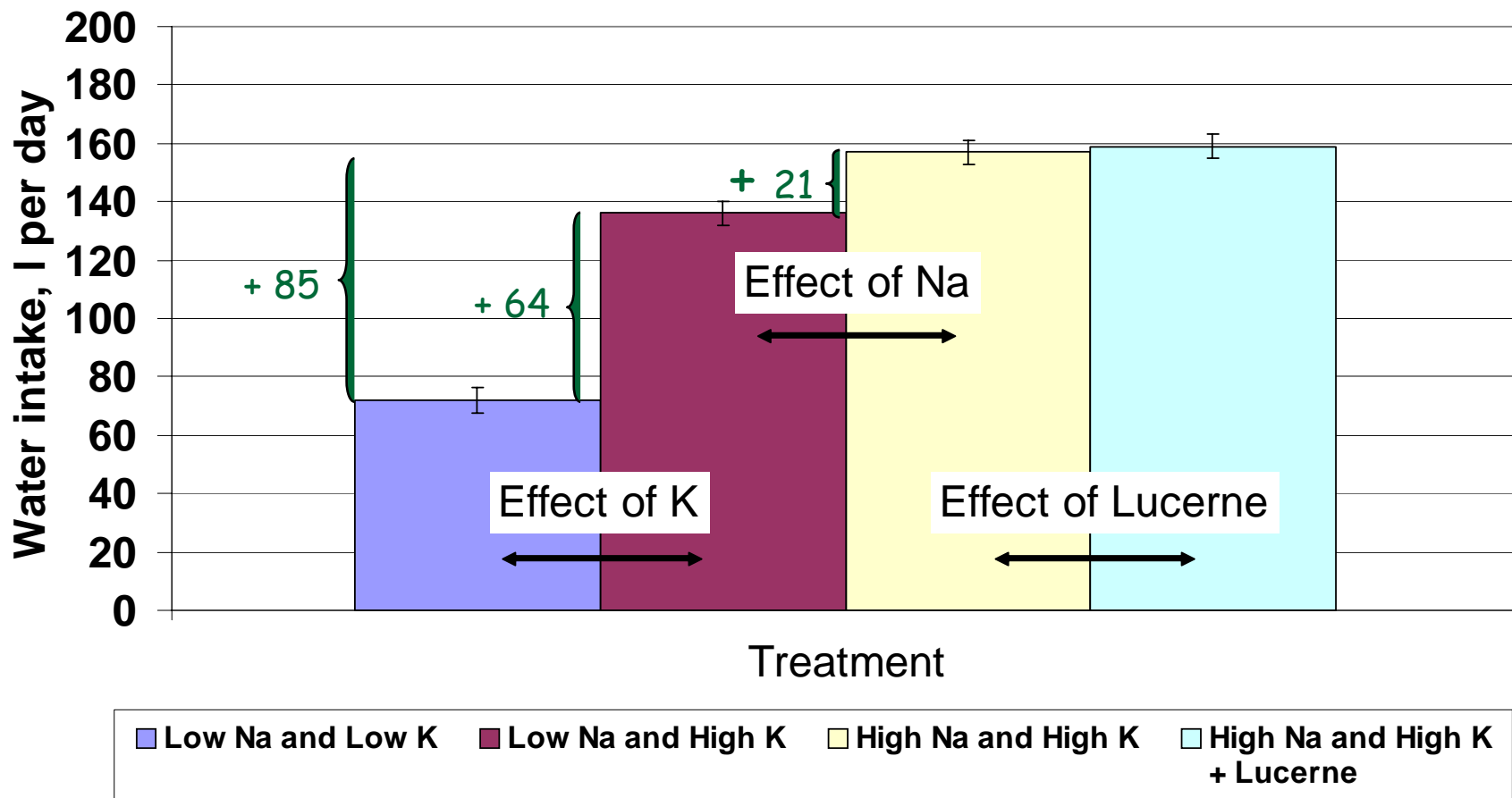


■ Low Na and Low K   ■ Low Na and High K   ■ High Na and High K   ■ High Na and High K + Lucerne

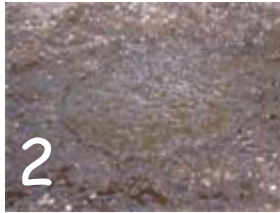




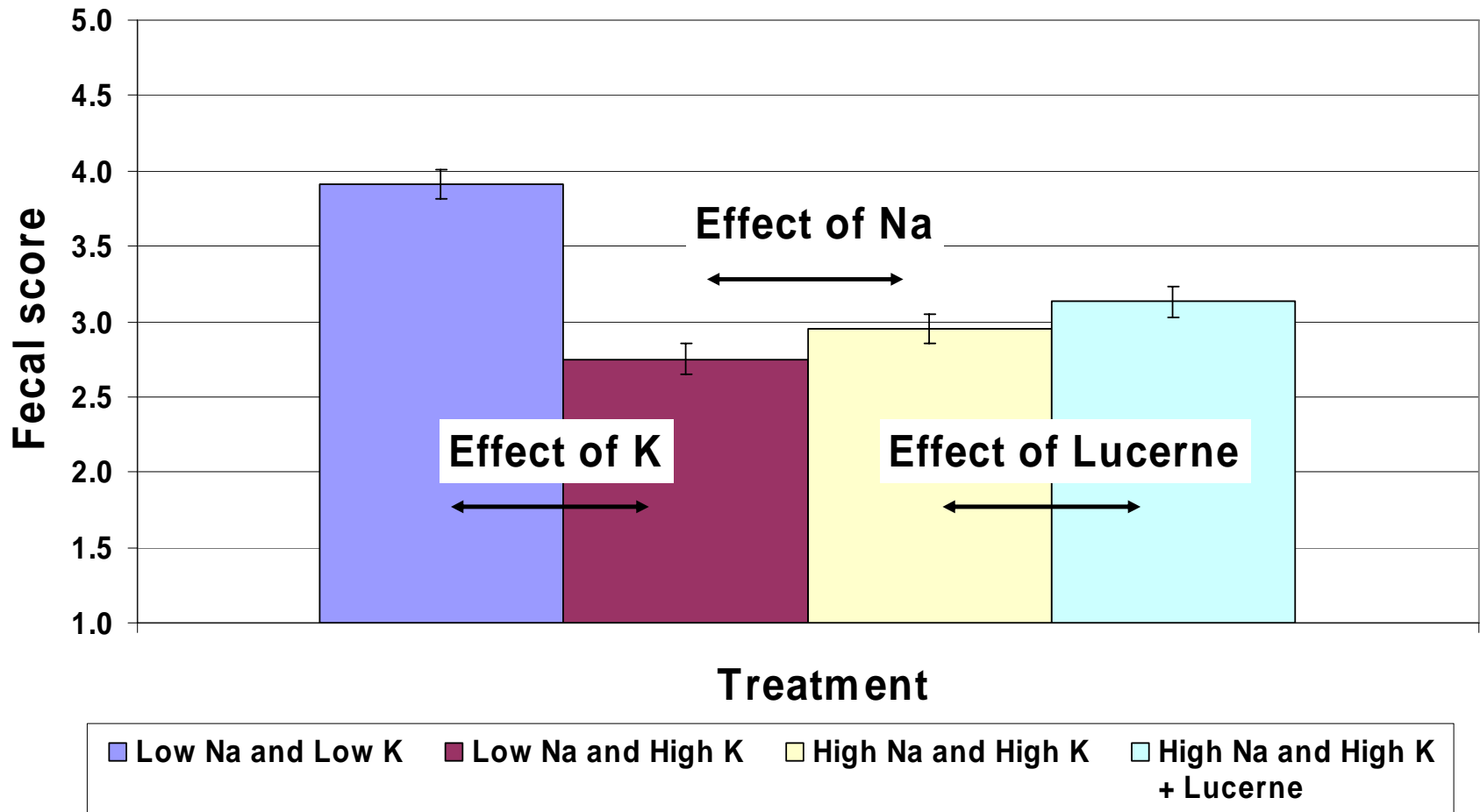
# Water intake



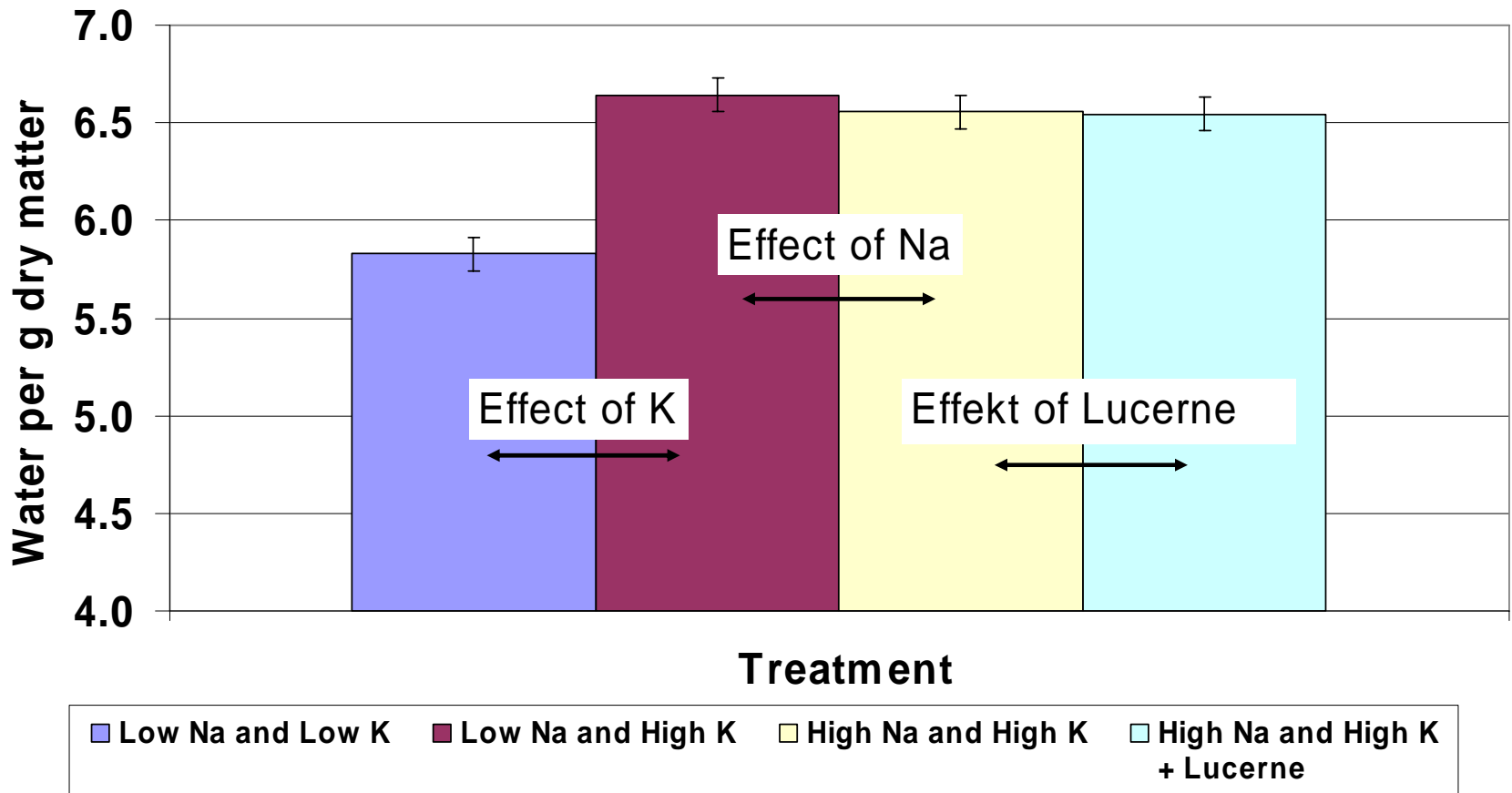




# Fecal consistency



# Fecal water binding capacity



# Where did the water go ?

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85 liter increase in daily water intake:

- max 4% (3 liter) excreted in milk
- approx. 82 liter extra in urine and feces
- 300 days \* 82 liter ~ 25 ton slurry/cow/year
- of which 93%-100% is excreted as urine

# Slurry volume and composition

	Low Na Low K	Low Na High K	High Na High K	High Na High K +Lucerne
Feces, kg <sup>1</sup>	36	50	47	50
Urine, kg <sup>2</sup>	45	98	121	119
Feces + urine	81	148	168	169
Feces : urine	0.8	0.5	0.4	0.4
Slurry DM% <sup>3</sup>	10	7	6	6

1: assumed feed DM digestibility of 71%

2: calculated as water in: drinking + feed - milk - feces

3: assumed constant 5% dry matter content in urine

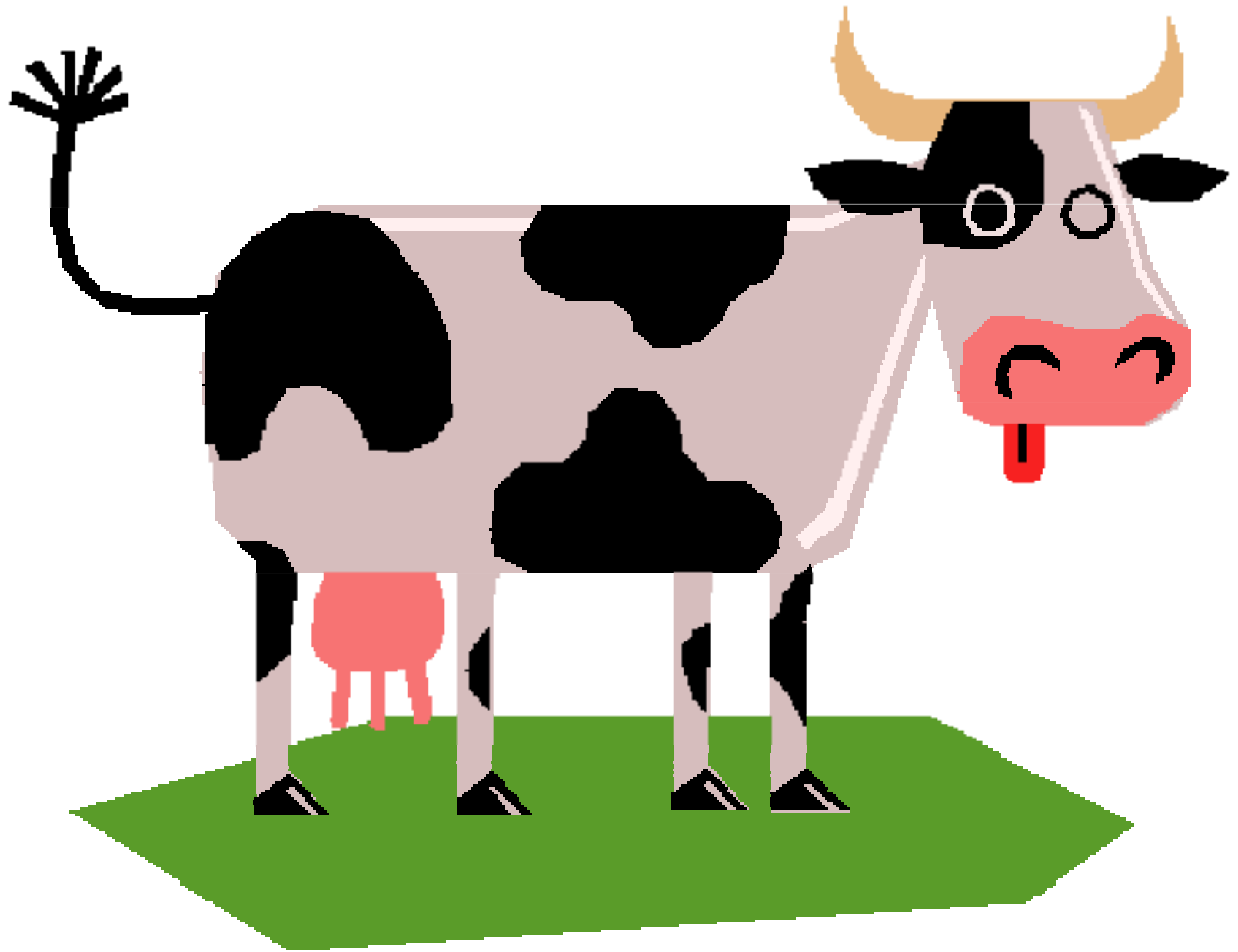
# Conclusion

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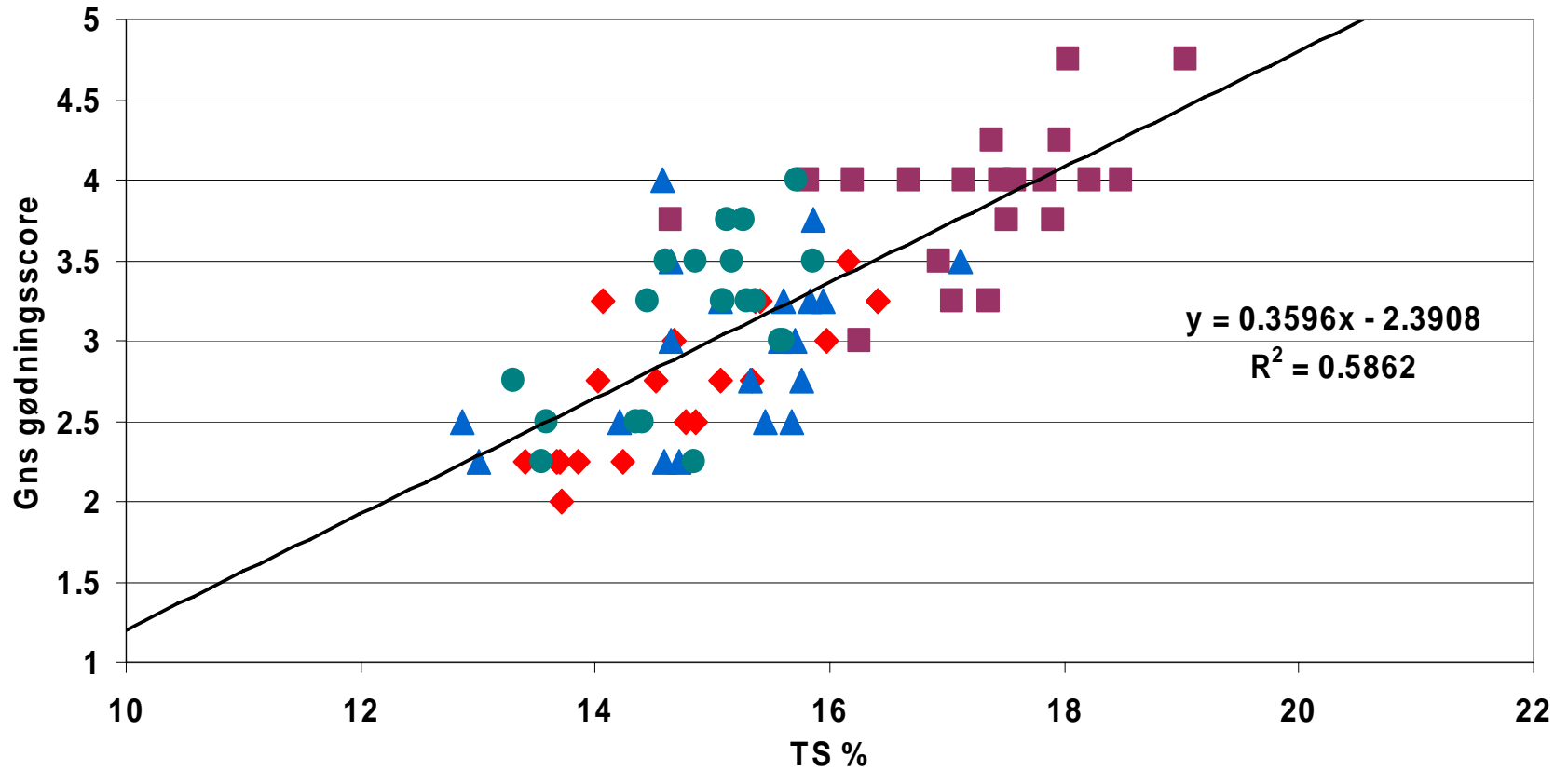
Dietary potassium (K) and sodium (Na) affect:

- slurry volume and composition
- fecal water content and dry matter composition
- urine volume and water excretion
- ratio between feces and urine

Standards for dairy cow slurry volume do not account for huge variation



# Correlation DM% and score



■ Lav Na og lav K    ◆ Lav Na og høj K    ▲ Høj Na og høj K    ● Høj Na og høj K    — Lineær reg på alle + lucerne