Effects of saline water on food and water intake, blood and urine electrolytes and biochemical and hematological parameters in male goats

Session 13.9

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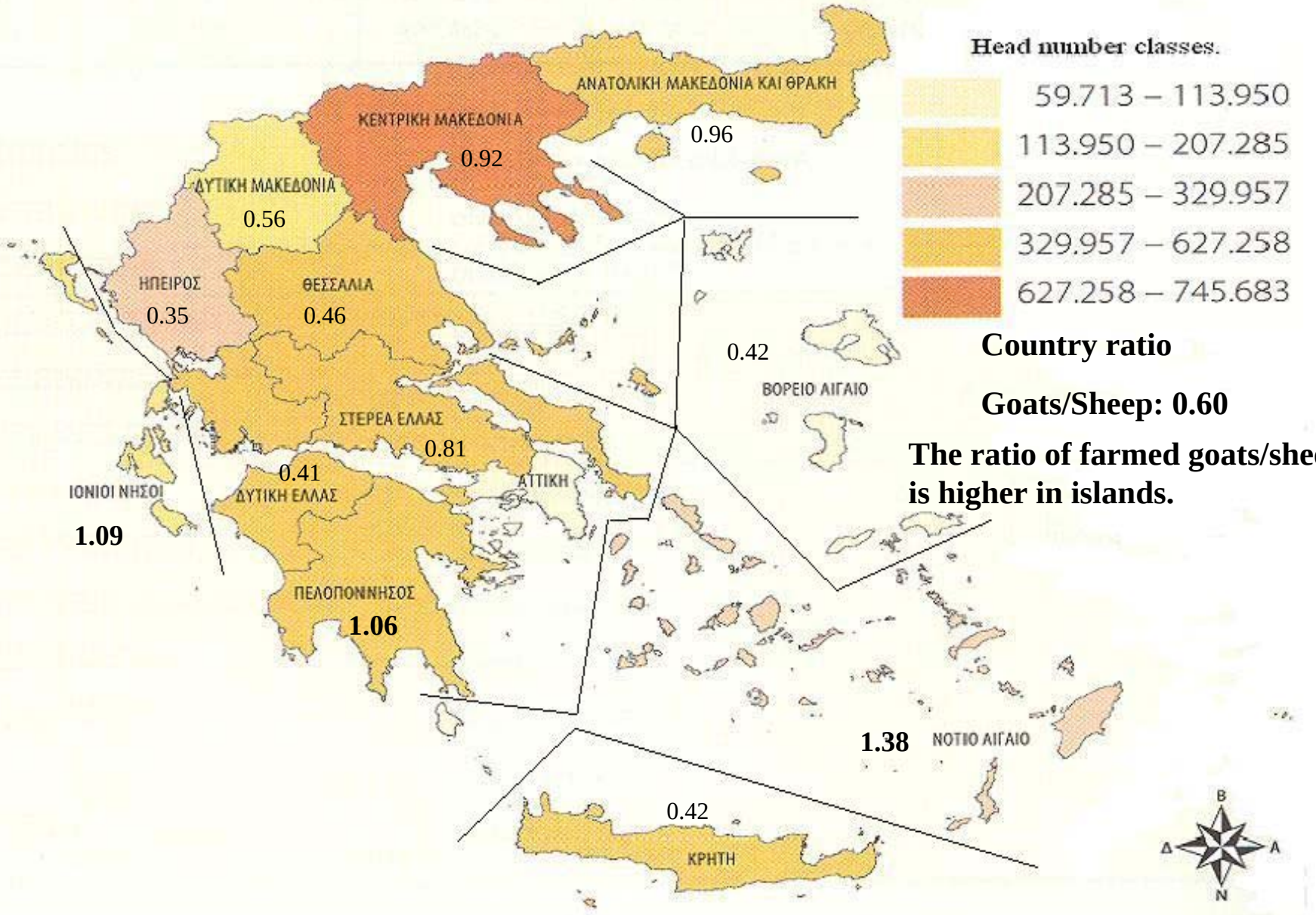

Distibution of goats by region and head number classes (Source: NSSG, 2004)


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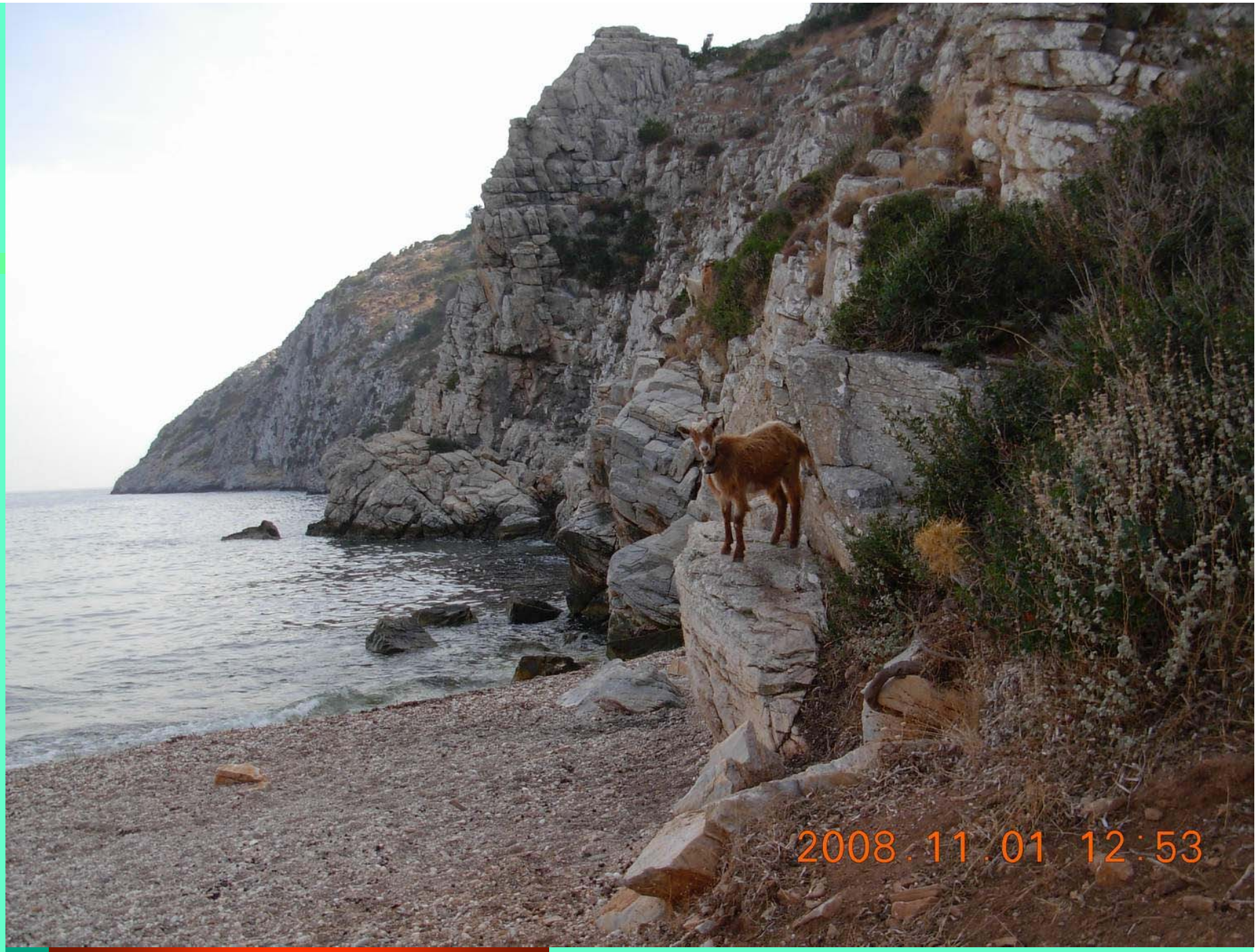
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Background

- Body fluid balance in mammals is constantly kept within narrow margins.
- A change in the volume or content of extracellular fluid is rapidly balanced by the neuroendocrine control systems.
- Water and sodium are the primary variables in maintaining fluid balance, through adjustments in their ingestion and excretion.
- Intake of saline water presents a challenge in maintaining body fluid balance.

Materials and Methods

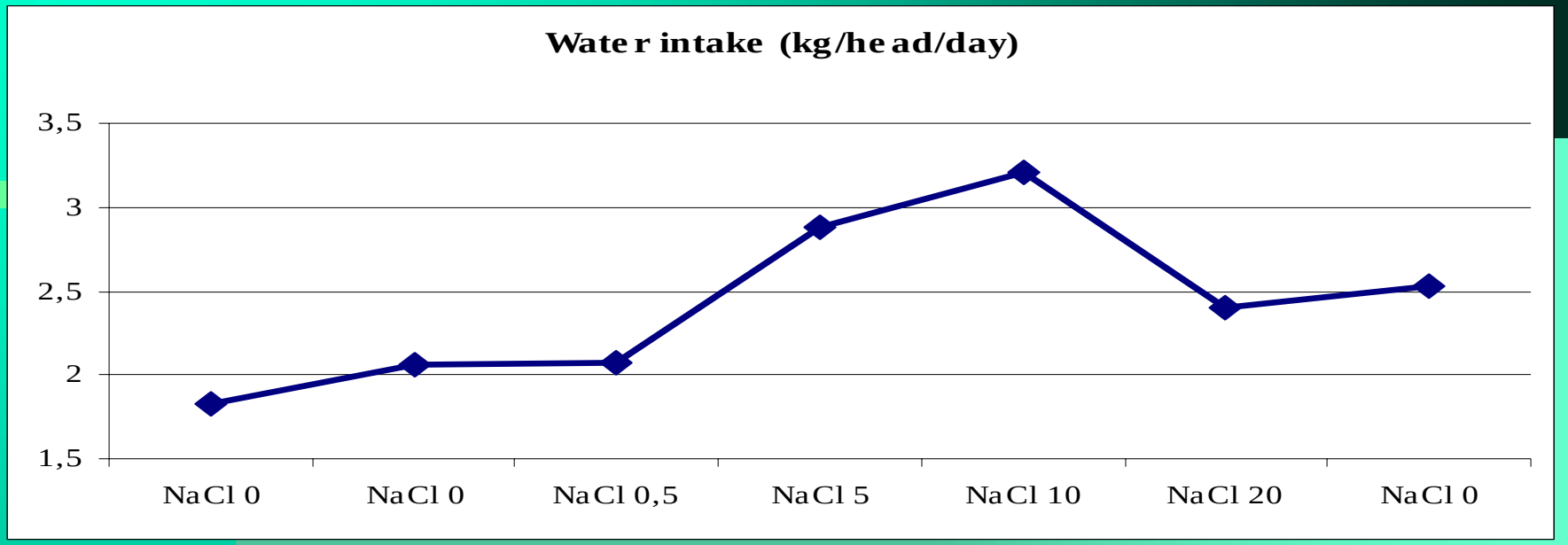
- Animals: four castrated male goats (indigenous crossed) fitted with harnesses
- Feeds: alfalfa hay and pelleted concentrates at maintainance level
- Water: free access, consequtively to five levels of salinity 0, 0.5, 5, 10 and 20‰
- Duration: five weeks in 5 days intervals

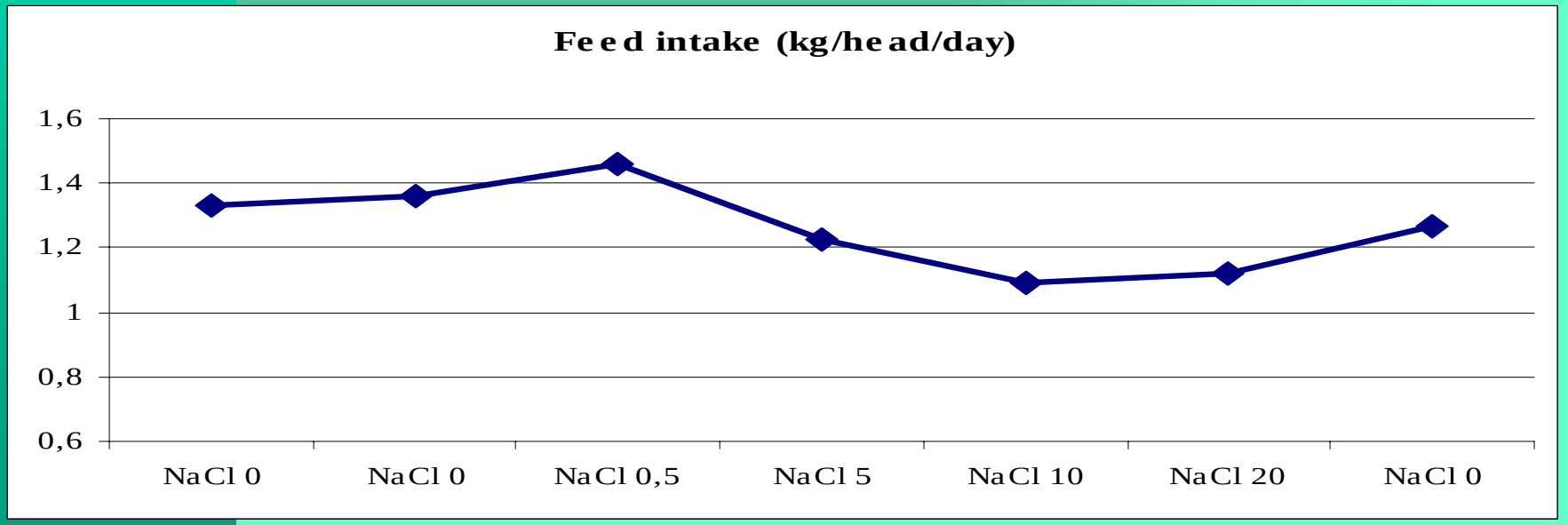
Materials and Methods

Measurements:

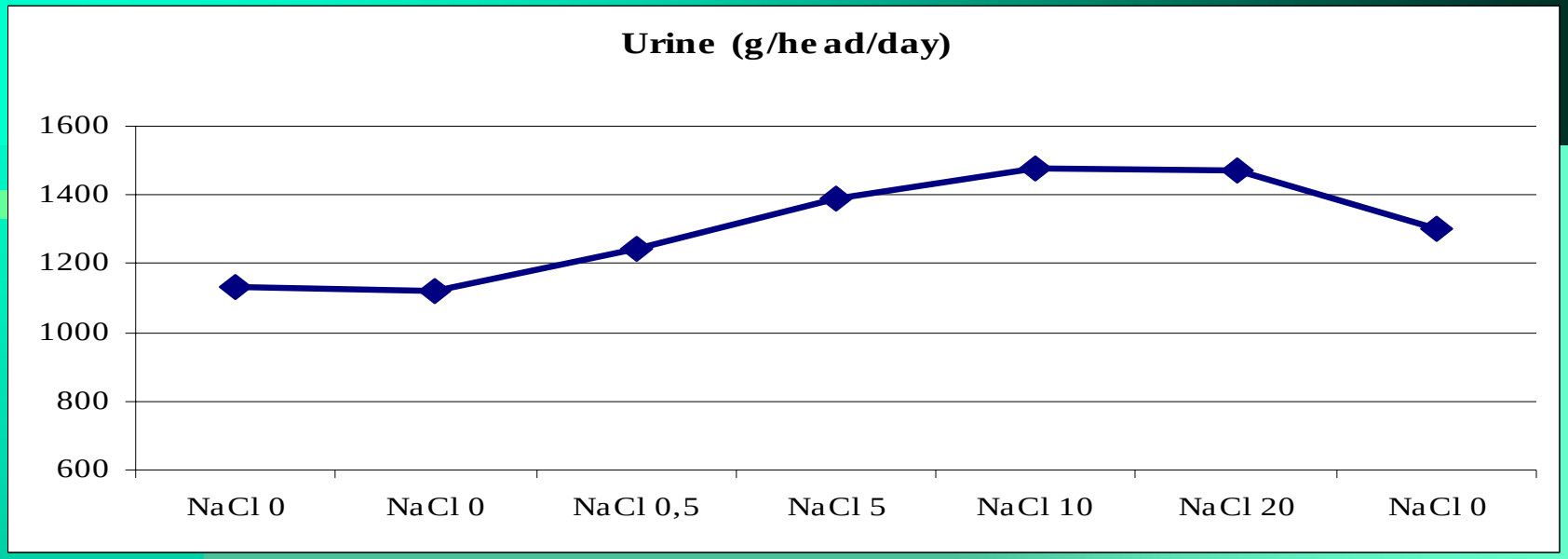
- Food and water consumption, urine excretion
- Plasma concentrations of: Na, K, glucose, creatinine, urea, proteins, osmolality and hematological parameters (HCT, RBC, HGB, WBC, PLT)
- Urine: pH, specific weight, Na, K, creatinine, osmolality

Results


Water intake (kg/head/day)
3,5
3
2,5
2
1,5
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0


Feed intake (kg/head/day)
1,6
1,4
1,2
1
0,8
0,6
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

Results


Urine (g/head/day)
1600
1400
1200
1000
800
600
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0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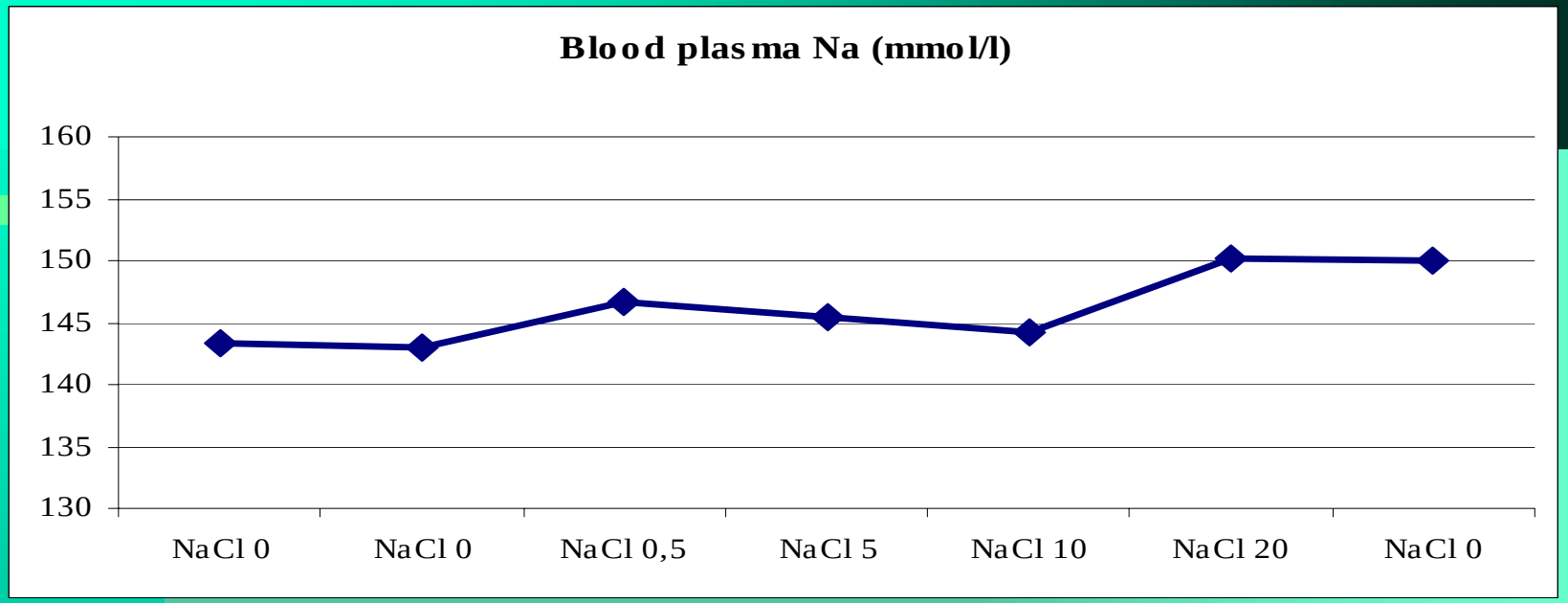
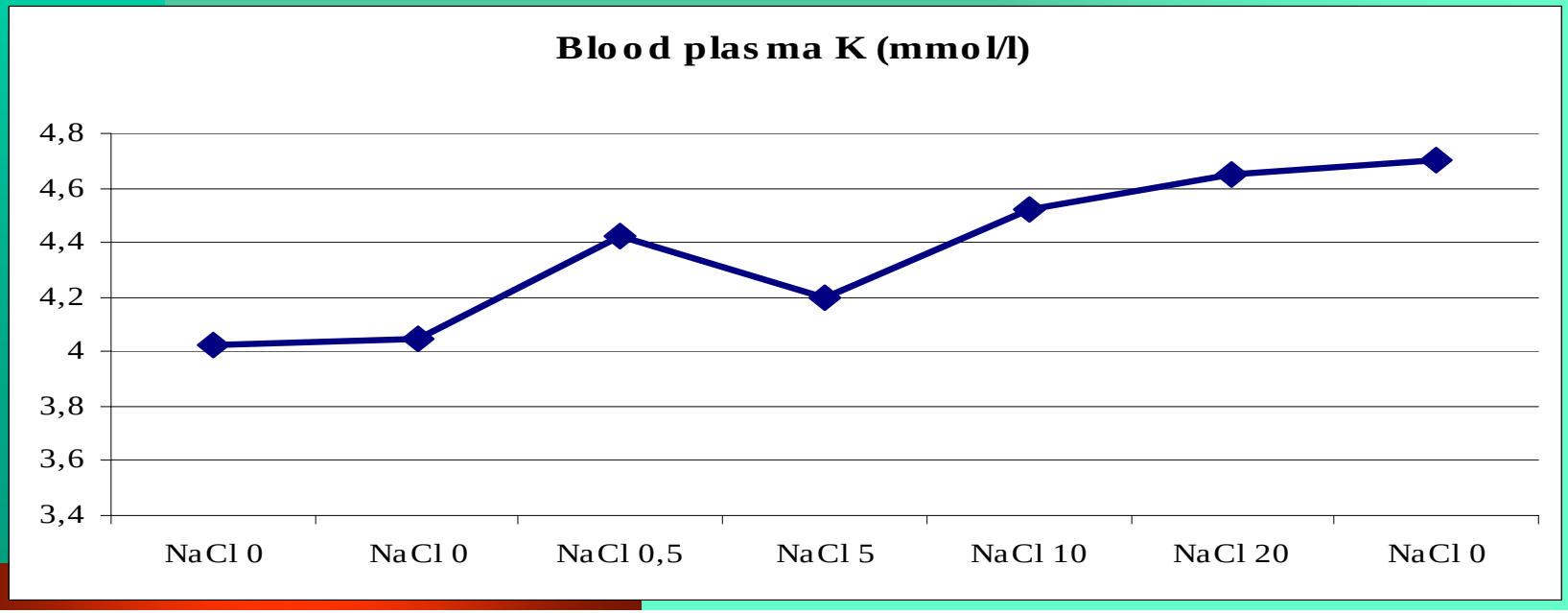
Results

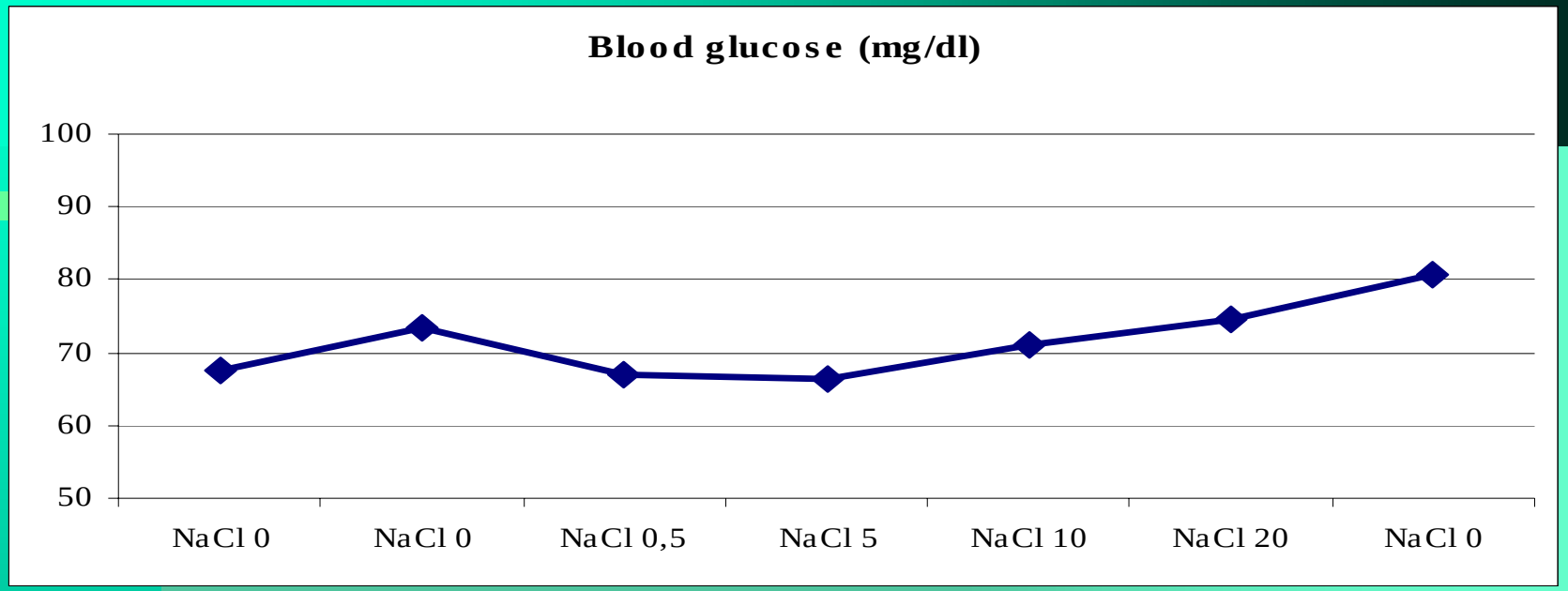
- Hematological parameters: increased levels of hematocrit (20.2 to 24.6 %) and red blood cells (8.0 to 10.6 $x10^6/\mu l$) ⟹ mild dehydration
- All other parameters were not affected and within physiological ranges

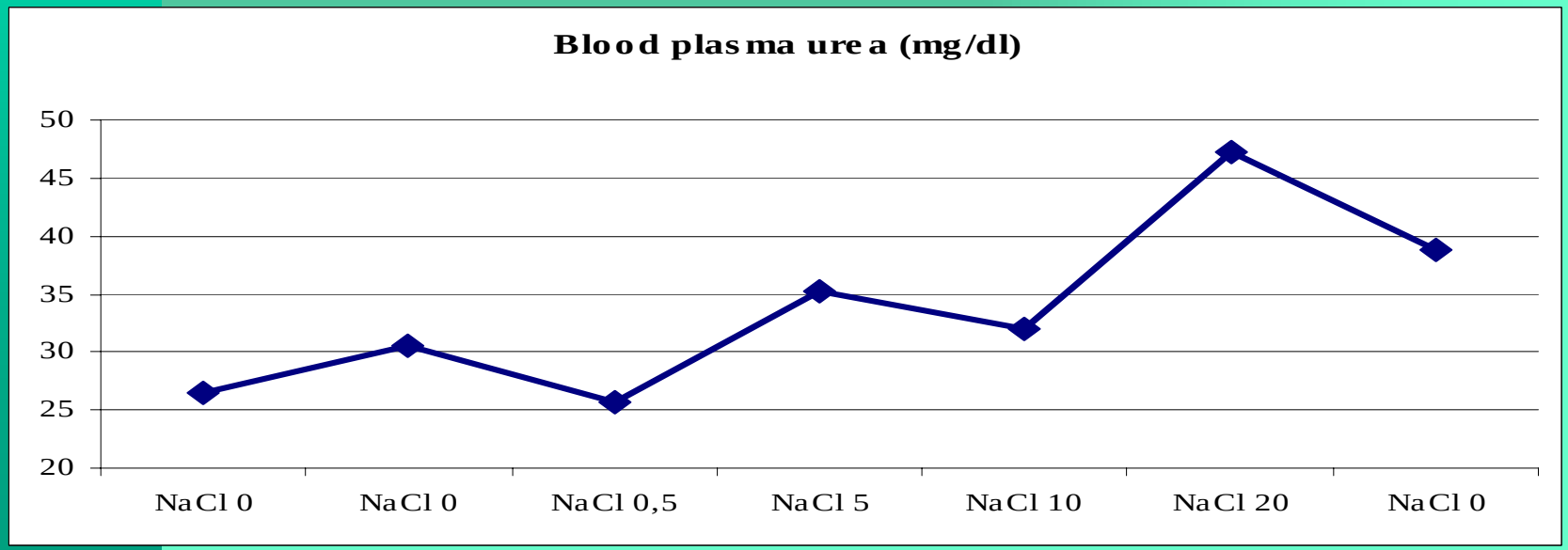
Results


Blood plasma Na (mmol/l)
160
155
150
145
140
135
130
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

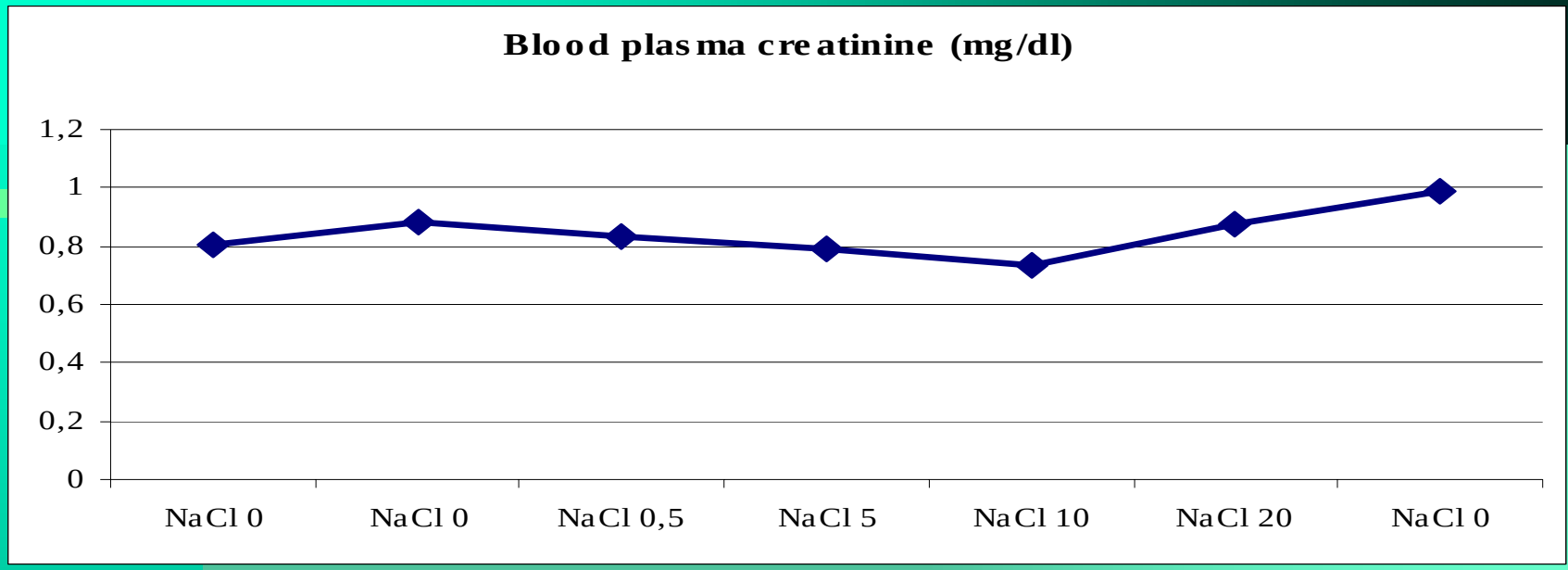

Blood plasma K (mmol/l)
4,8
4,6
4,4
4,2
4
3,8
3,6
3,4
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

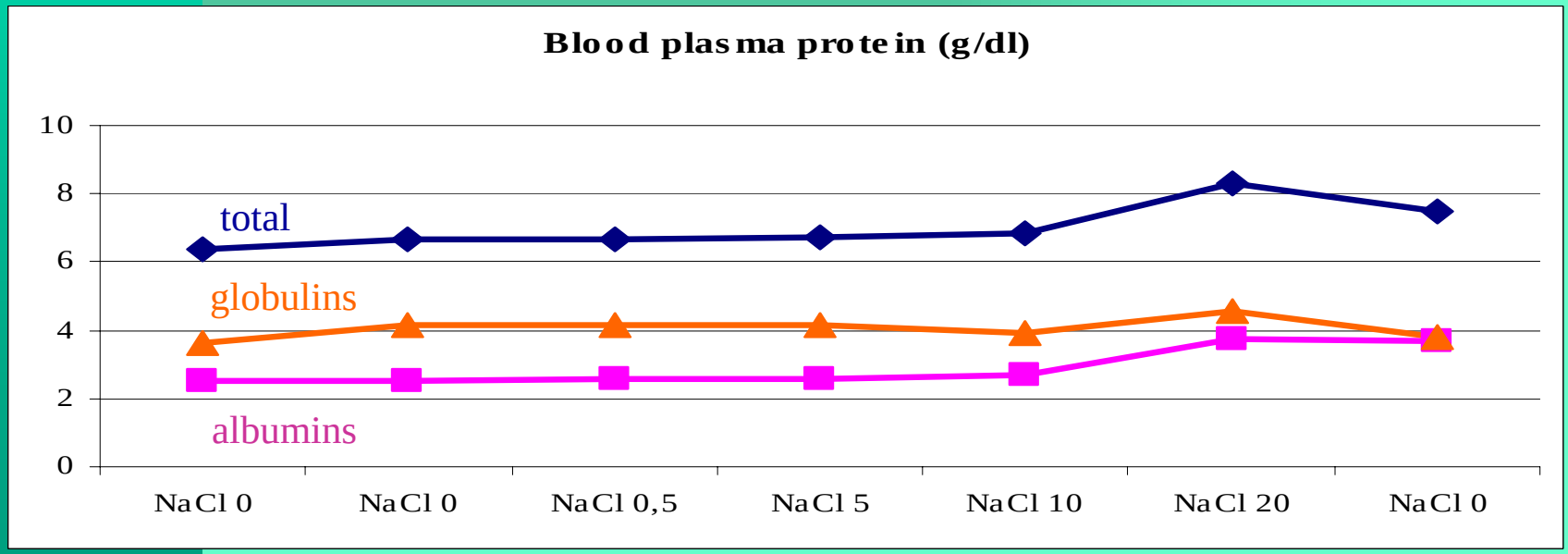
Results


Blood glucose (mg/dl)
100
90
80
70
60
50
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

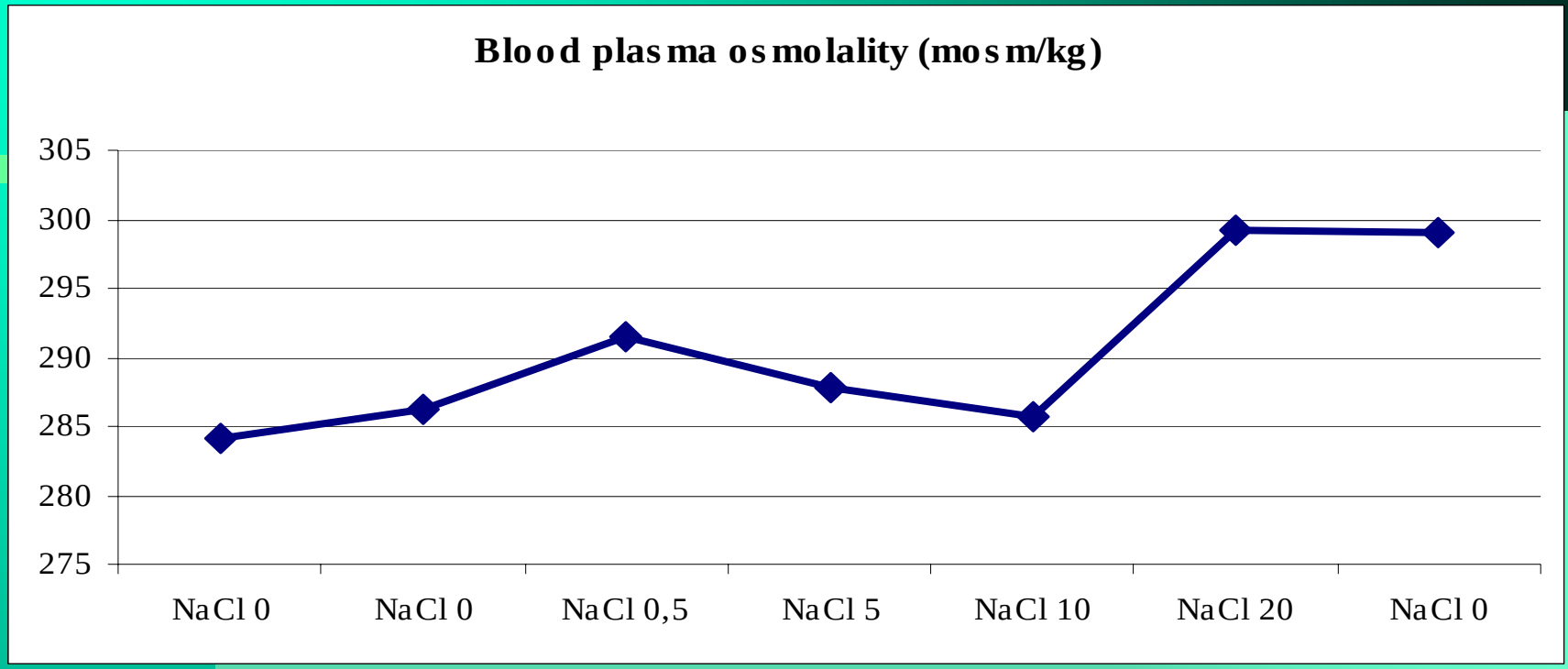

Blood plasma urea (mg/dl)
50
45
40
35
30
25
20
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

Results


Blood plasma creatinine (mg/dl)
1,2
1
0,8
0,6
0,4
0,2
0
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

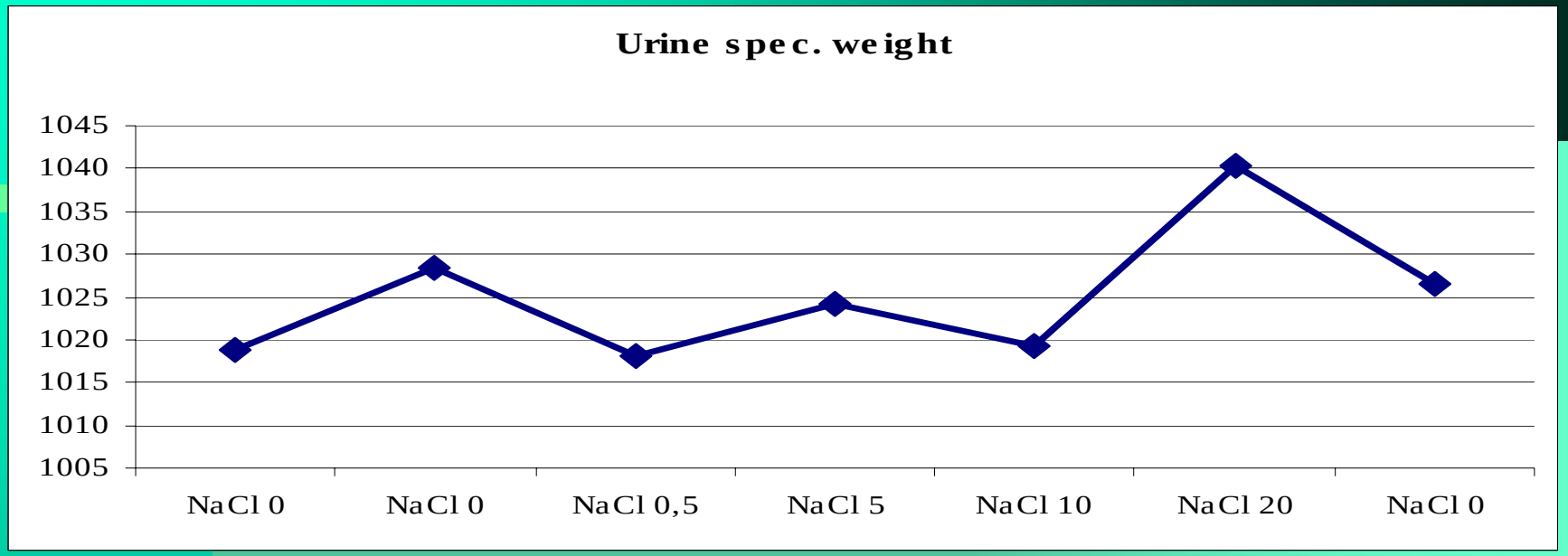

Blood plasma protein (g/dl)
10
8
6
4
2
0
total
globulins
albumins
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

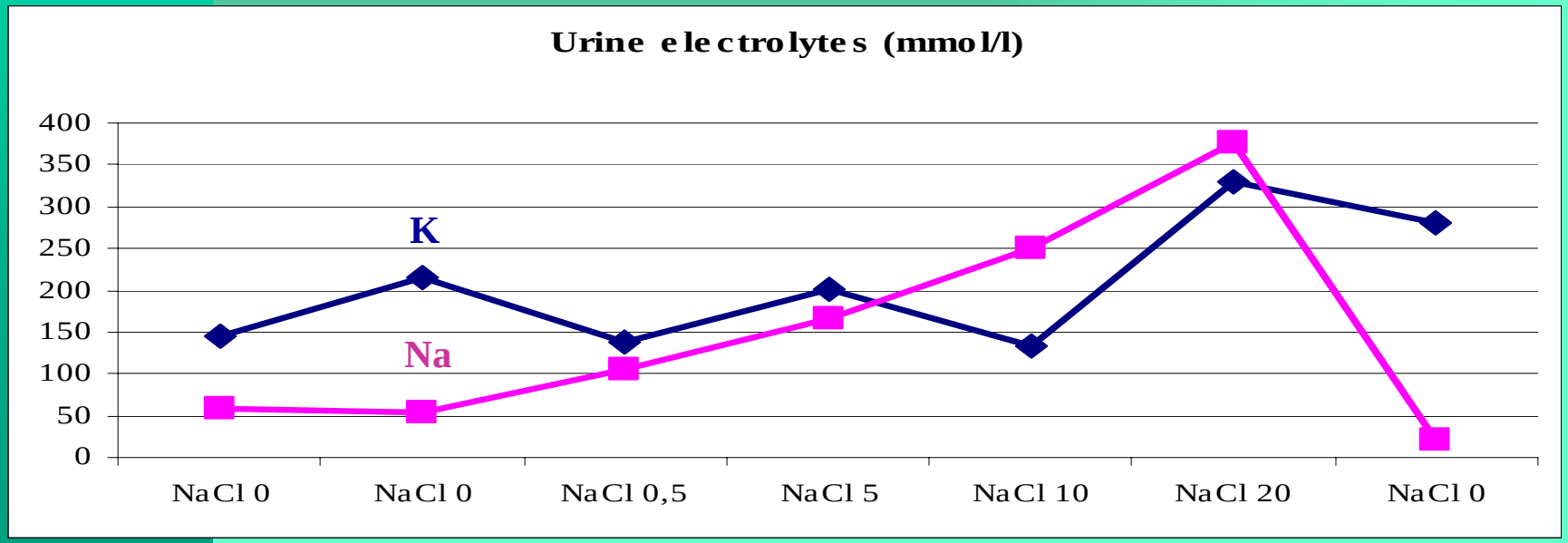
Results



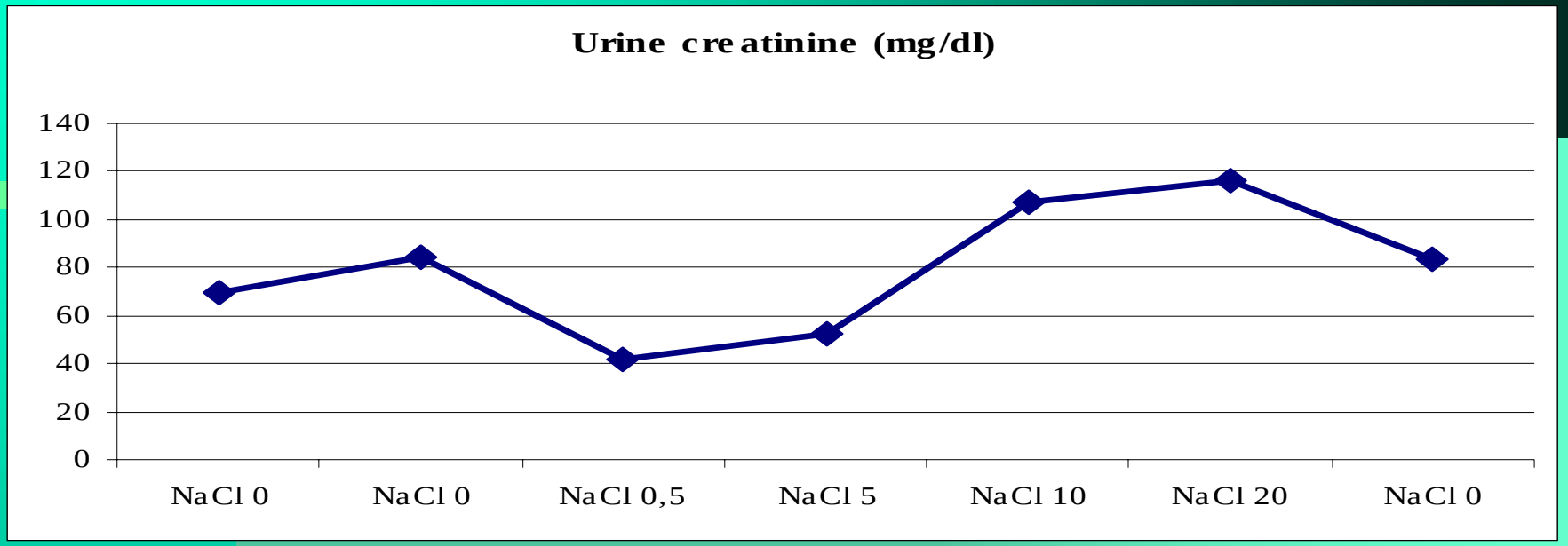
Osmolality of extracellular fluid is dictated primarily by sodium, followed by glucose and urea contents. In mammals is metriculusly maintained near 290 mosmol/kg.

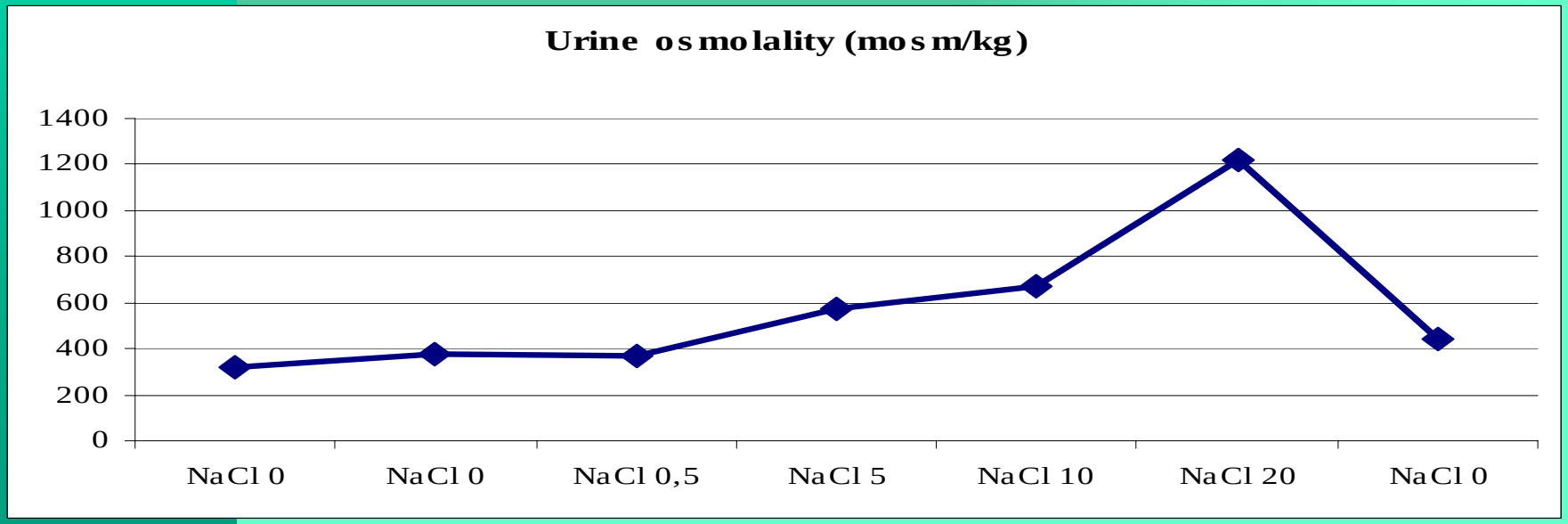
Results


Urine spec. weight
1045
1040
1035
1030
1025
1020
1015
1010
1005
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0


Urine electrolytes (mmol/l)
400
350
300
250
200
150
100
50
0
K
Na
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

Results


Urine creatinine (mg/dl)
140
120
100
80
60
40
20
0
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0


Urine osmolality (mosm/kg)
1400
1200
1000
800
600
400
200
0
NaCl 0
NaCl 0
NaCl 0,5
NaCl 5
NaCl 10
NaCl 20
NaCl 0

Results

- Urine pH: 8,0-9,0 within physiological range
- Determination of Na levels in faeces in progress by ICP-MS (Inductively coupled plasma-mass spectroscopy)

Conclusions

- Goats can subsist on high salinity water, at least on the short term, as indicated by no negative clinical-physiological symptoms on:
  - Animal behaviour and appetite
  - Haematological analyses
  - Biochemical analyses assesing kidney function

Thanks for your attention !!!