

Subclinical mastitis in small ruminants: prevalence, comparative aspects and prevention





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Is subclinical mastitis of concern to the small ruminant industry?



Zoonosis agents

- * brucellosis
- * tuberculosis

Welfare



Economic question

Milk quantity?

Yield of milk, fat, total proteins,
casein and curd

Milk quality?

Internal bacterial contamination,
somatic cell count,
secreted enzymes

**Subclinical mammary infection
is an economical question**

**In most herds most of the time
the proportion of infected animals
is unknown**

Cost benefit

- * Cost of identification**
- * Loss of yield, quality**
- * Cost of treatment**

Cost benefit

* Cost of identification

Herd

Bulk SCC

individual

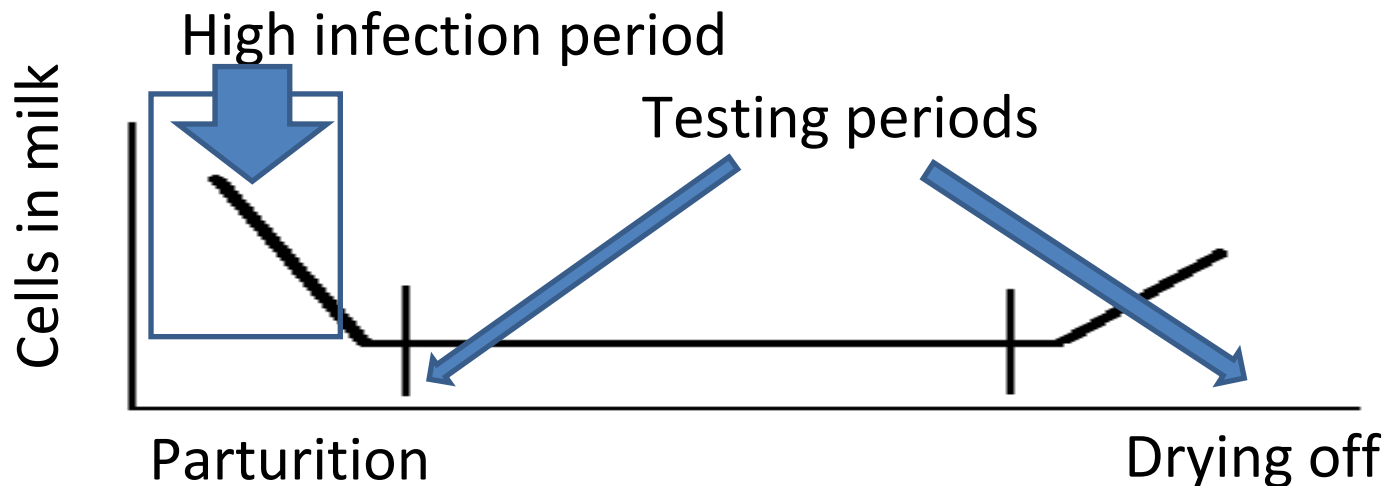
**Bacteriology
SCC, CMT**



Bacteriology - Laboratory cost

SCC – No routine measurement
CMT – Low cost; animal place

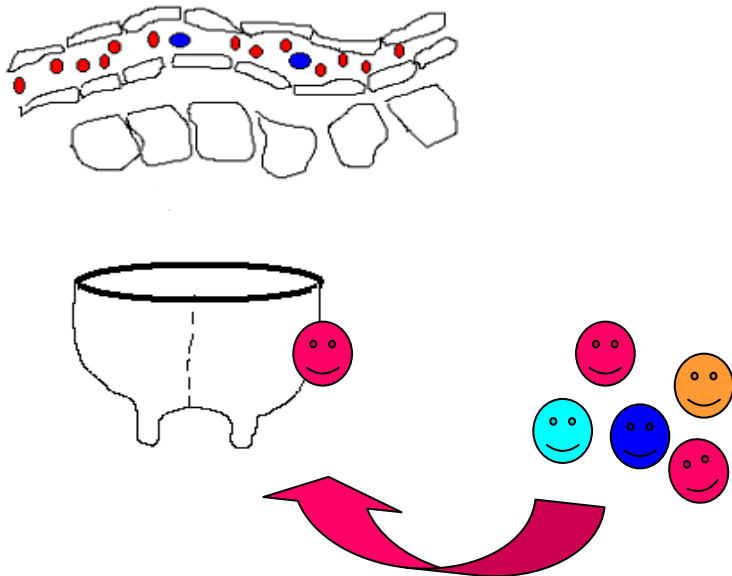
Bacterial status	SCC (x 1000)	CMT
Uninfected	50- 300	0-1
Infected	> 500	2-4



* Loss of yield, quality

Aim: to calculate the loss of milk and cheese as related to the level of subclinical udder infection in a herd.

To clarify the major factors that influence milk yield and, consequently, curd yield in **Assaf sheep** and **Saanen and Shami × Anglo-Nubian goats**.

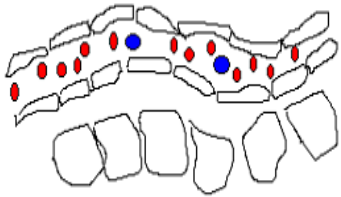


Infection rate	Projected SCC	Milk loss (%)		Total curd loss (%)	
		Half-udder model	Herd	Half-udder model	Herd
Sheep					
25	760,000	12	8	17	12
50	1,300,000	25	15	34	24
75	2,100,000	38	23	51	36
Goat					
25	640,000	8	3	21	16
50	920,000	15	6	41	32
75	1,300,000	23	8	62	48

Leitner G. et al. (2008). Estimate of milk and curd yield loss of sheep and goats with intramammary infection and its relation to somatic cell count. Small Ruminant Res., 74:221-225

Animal model built on glandular level

One udder-half infected with CNS species and the contra-lateral being free of bacteria



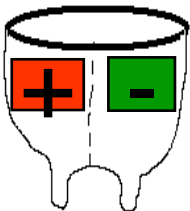
S. caprae

S. chromogenes

S. epidermidis

S. simulans

S. xylosos

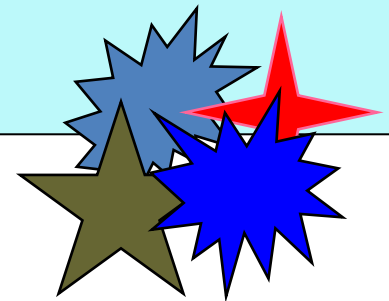


Sheep and goats were considered infected only if the same bacteria was isolated and SCC was high ($> 10^6$) in three consecutive samples

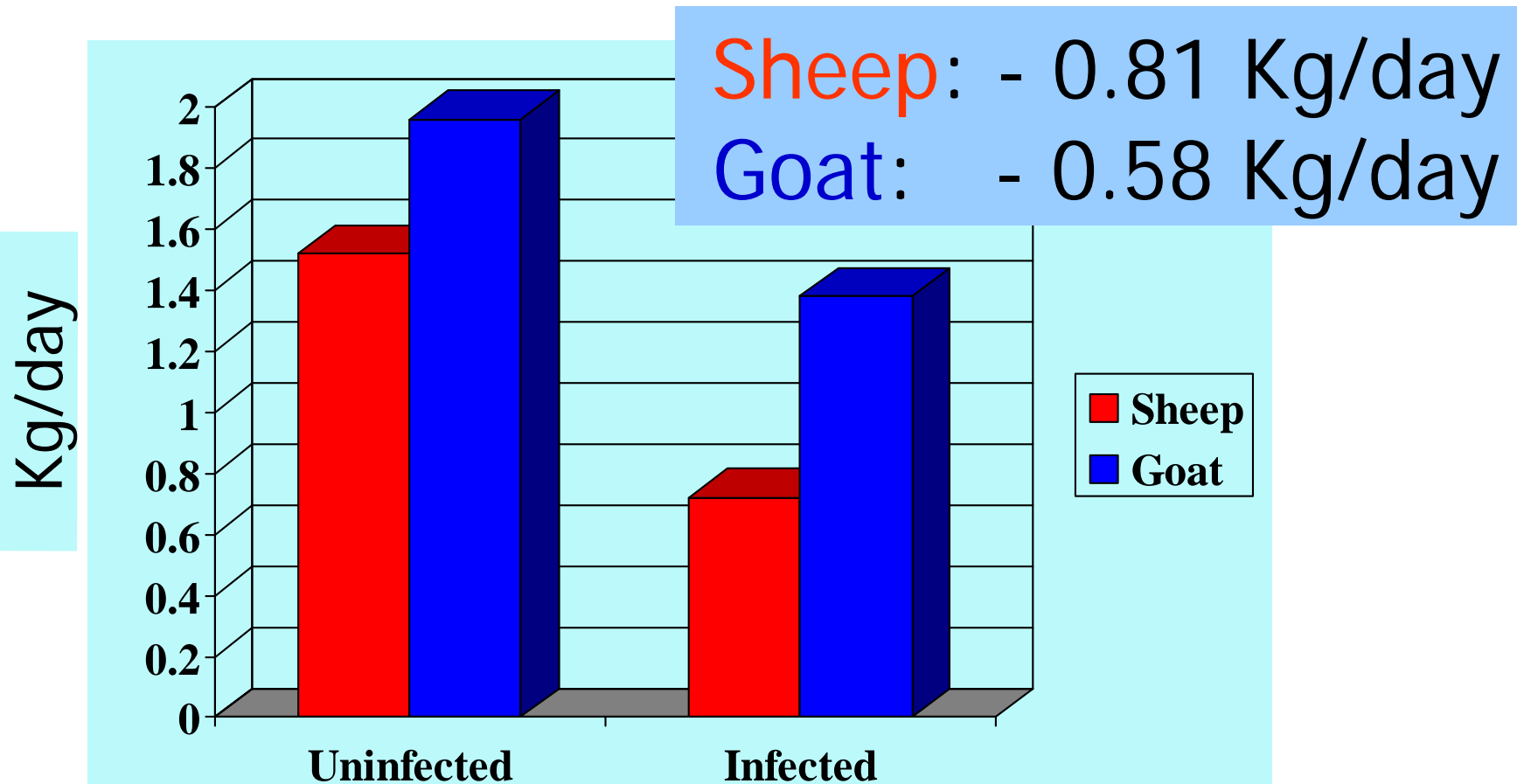
Most udder-halves infected with CNS had a normal morphology, similar to the contra-lateral uninfected gland

Bacteria	Number of udder infection	
	Sheep	Goat
<i>S. aureus</i>	8	45
<i>S. chromogenes</i>	78	28
<i>S. epidermidis</i>	277	171
<i>S. simulans</i>	68	97
<i>S. xylosus</i>	21	36
<i>S. caprae</i>	-	77
<i>Streptococci</i>	31	8
<i>Coliforms</i>	10	15
<i>Corynebacteria spp.</i>	29	12
Total infected	522 (33%)	489 (35.9%)
Total uninfected	29	12

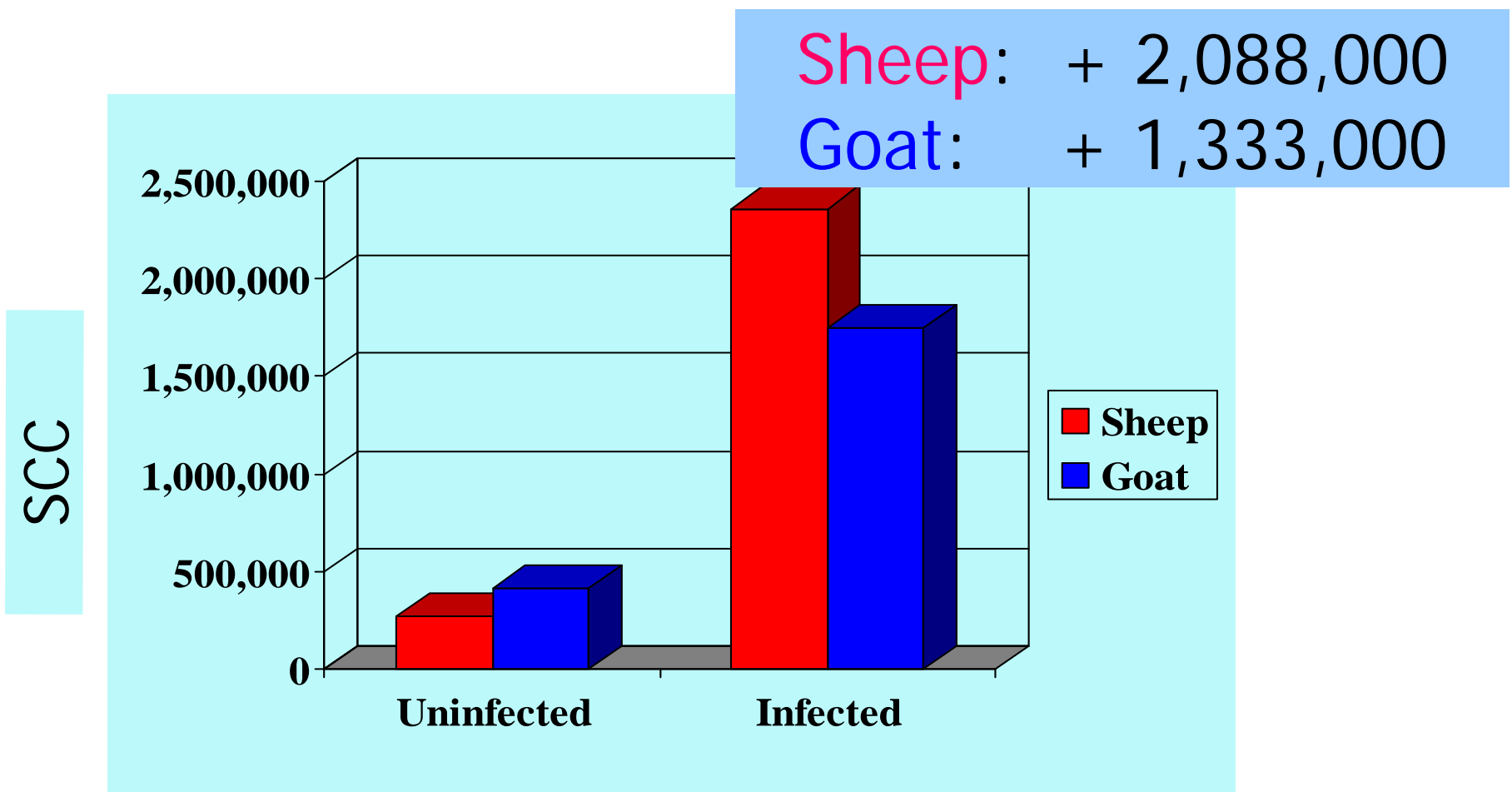
- * **Milk yield was measured separately for each udder-half**
- * **Milk tested for: bacteriology, SCC, protein, fat, lactose**
- * **Skim milk was analyzed for: casein, whey protein, albumin, proteose-peptone, and activities of Plasmin, Plasminogen activator and Plasminogen, ionized calcium (Ca^{2+}) and calcium activity (aCa^{2+})**
- * **Curd yield and Rennet clotting time**



Milk yield (half) of sheep or goat infected with CNS species in one gland and the contra-lateral being free



SCC (half) of sheep or goat infected with CNS species in one gland and the contra-lateral being free



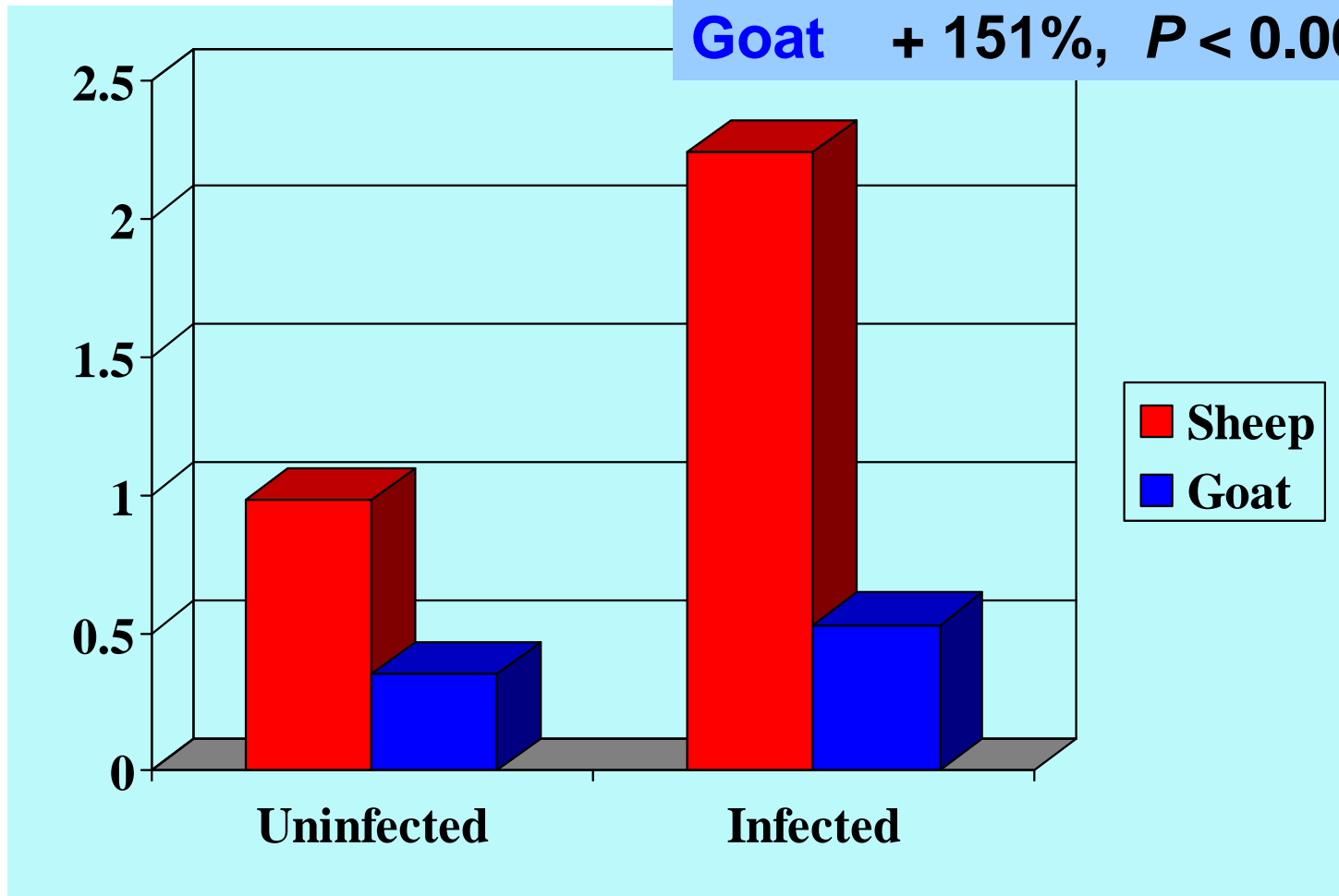
Mean and SE of fat, protein, lactose, whey, casein and albumin in uninfected vs. infected glands of sheep and goats.

Parameter	Sheep		Goats	
	Uninfected	Infected	Uninfected	Infected
Fat (g/L)	64.9±0.26	61.7±0.21	38.9±1.1	38.8±1.2
Protein (g/L)	58.5±0.07	53.5±0.10	34.2±0.5	35.0±0.5
Casein (g/L)	45.9±1.36	40.5±1.59	28.1±0.7	28.2±0.8
Lactose (g/L)	44.7±0.08	33.5±0.16	47.0±1.0	41.7±1.3
Whey (g/L)	11.9±0.38	12.8±0.16	6.1±0.3	6.8±0.4
Albumin (µg/mL)	517±31	759±59	280±22	472±50

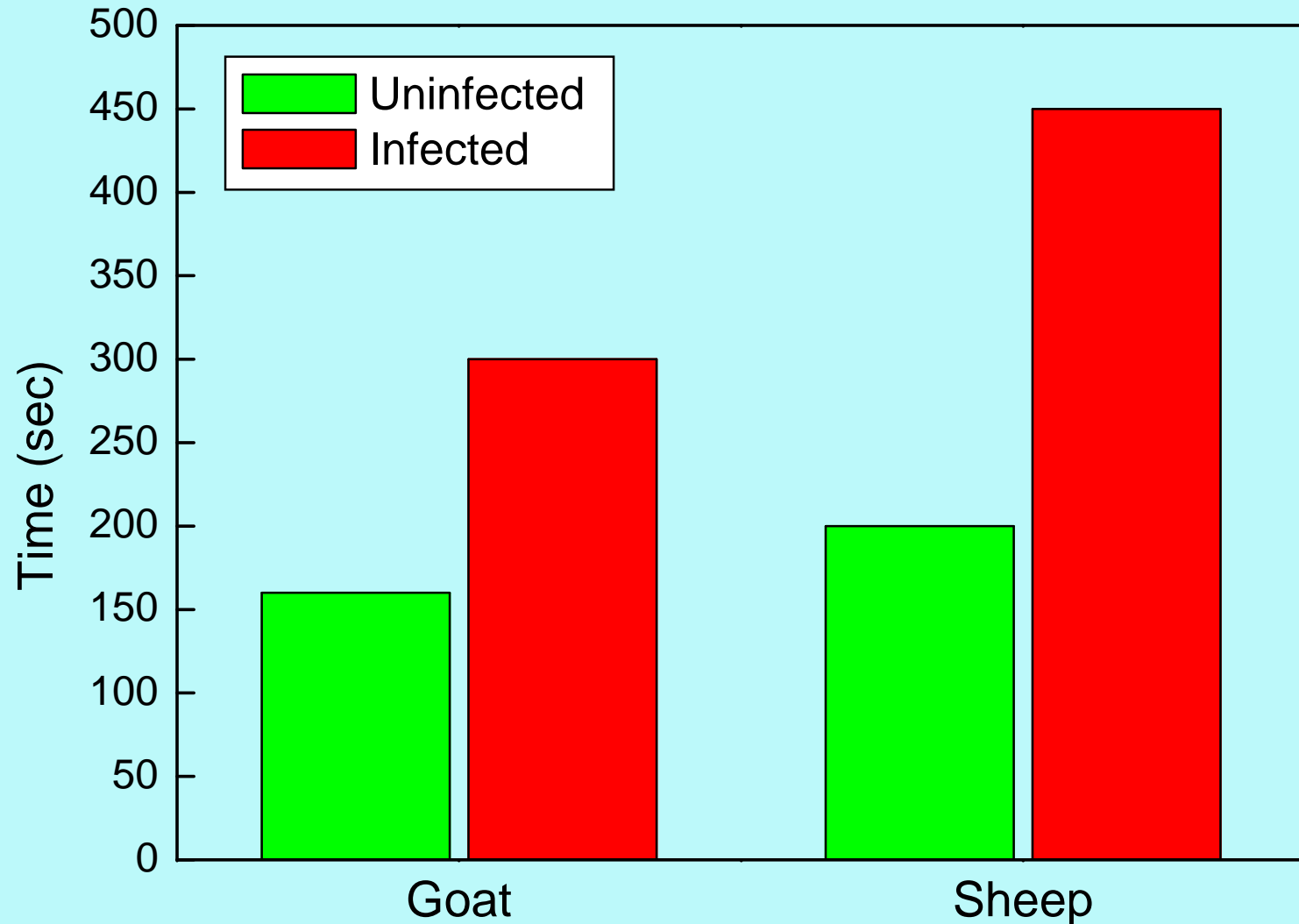
Proteose-peptone concentration

Sheep + 247%, $P < 0.0001$
Goat + 151%, $P < 0.0001$

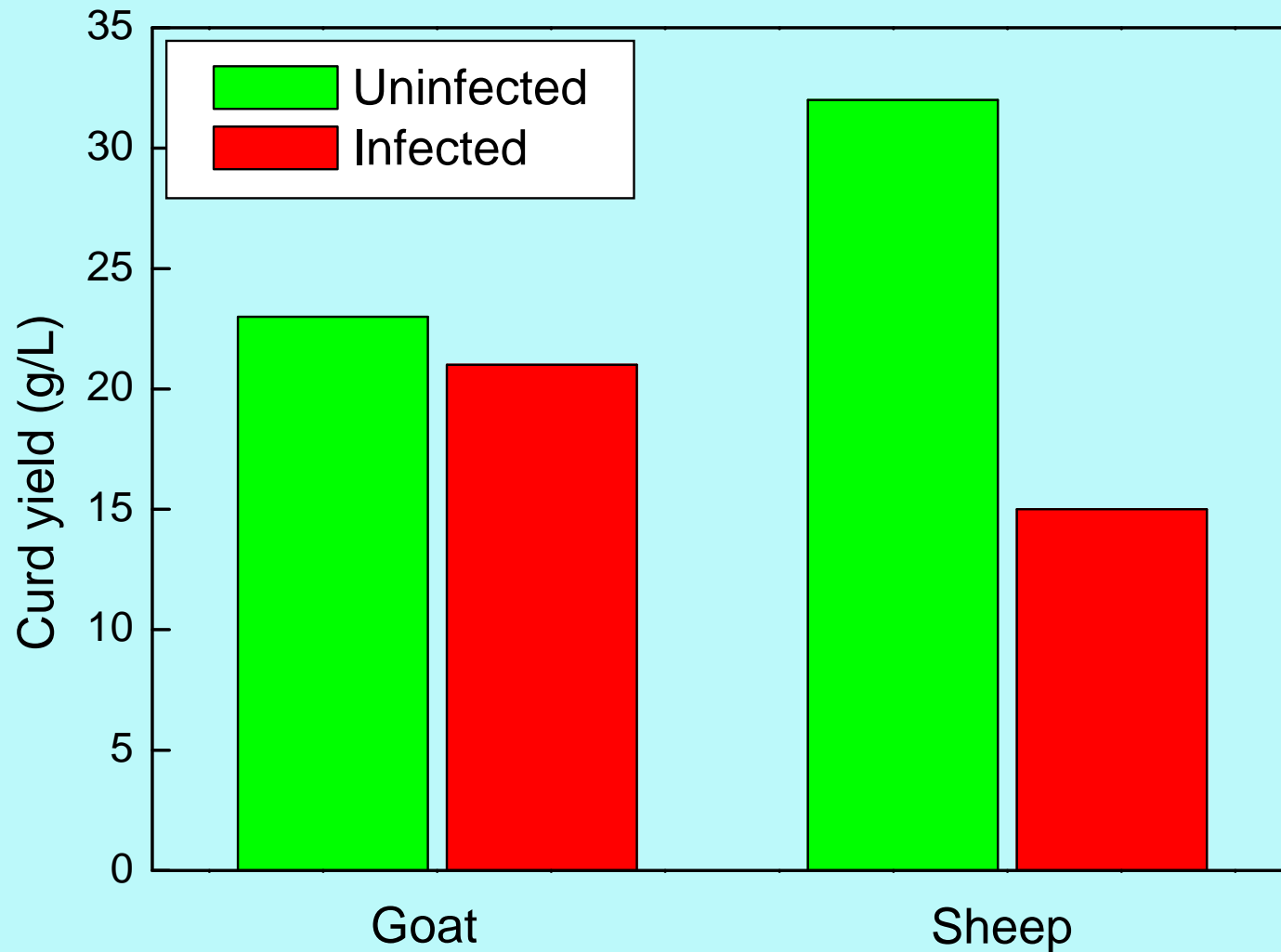
p-p, g/L



Rennet clotting time of goat and sheep milk from uninfected vs. infected udder-halves



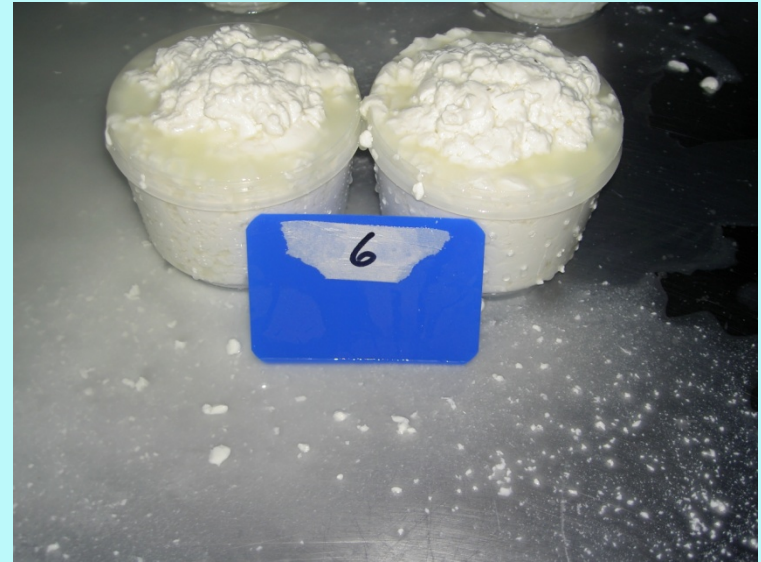
Curd yield of **goat** and **sheep** milk from uninfected vs. infected udder-halves



NO Infection



Infection

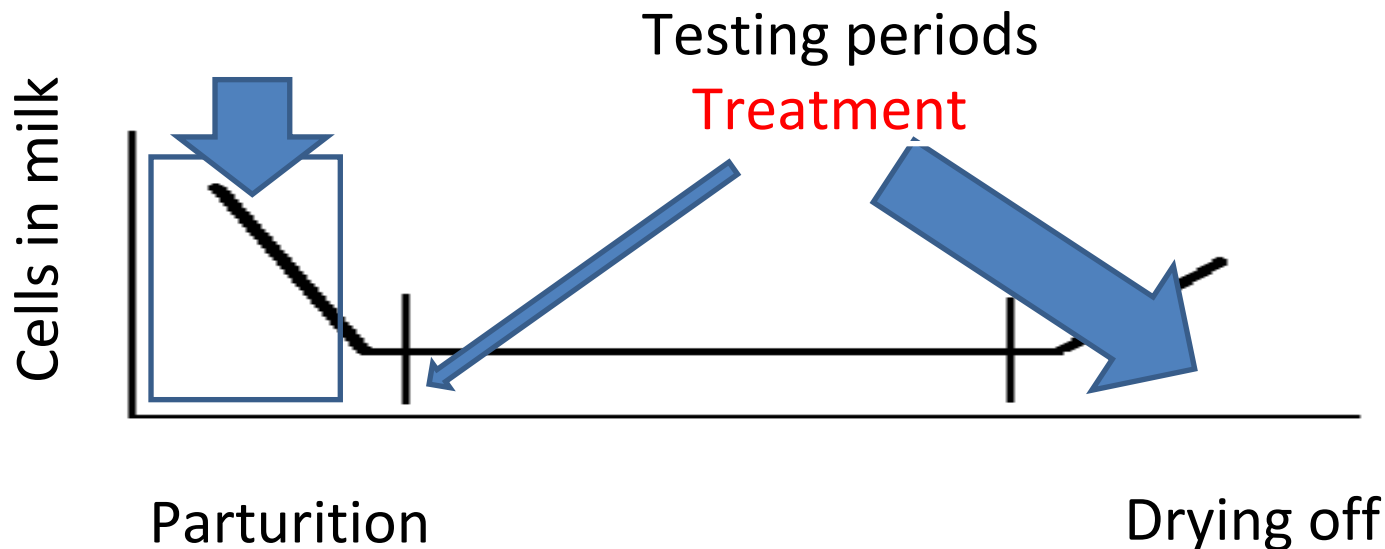


Cost benefit

* Cost of treatment

Treatment is a choice:

- * Bacteria sensitivity
- * Medicine exist
- * Cost benefit



**Aim: determine dry-off treatment in
Assaf sheep:
efficacy and a management tool for
improving milk quantity and quality.**



Results

Sheep

Distribution of intramammary bacterial findings in 159 dairy sheep (318 halves) at drying-off.

Bacteria	Isolations	
	Number	%
Total infected halves	151/318	47.5%
Total CNS	134	88.7
<i>S. chromogenes</i>	23	17.2
<i>S. epidermidis</i>	67	50.0
<i>S. haemolyticus</i>	4	3.0
<i>S. simulans</i>	24	17.9
<i>S. xylosus</i>	4	3.0
Unidentified CNS	12	8.9

Results

Distribution and [χ^2] results of 159 dairy sheep udders (318 halves) before draying-off and 21-28 days post-partum, according to udder bacterial infection.

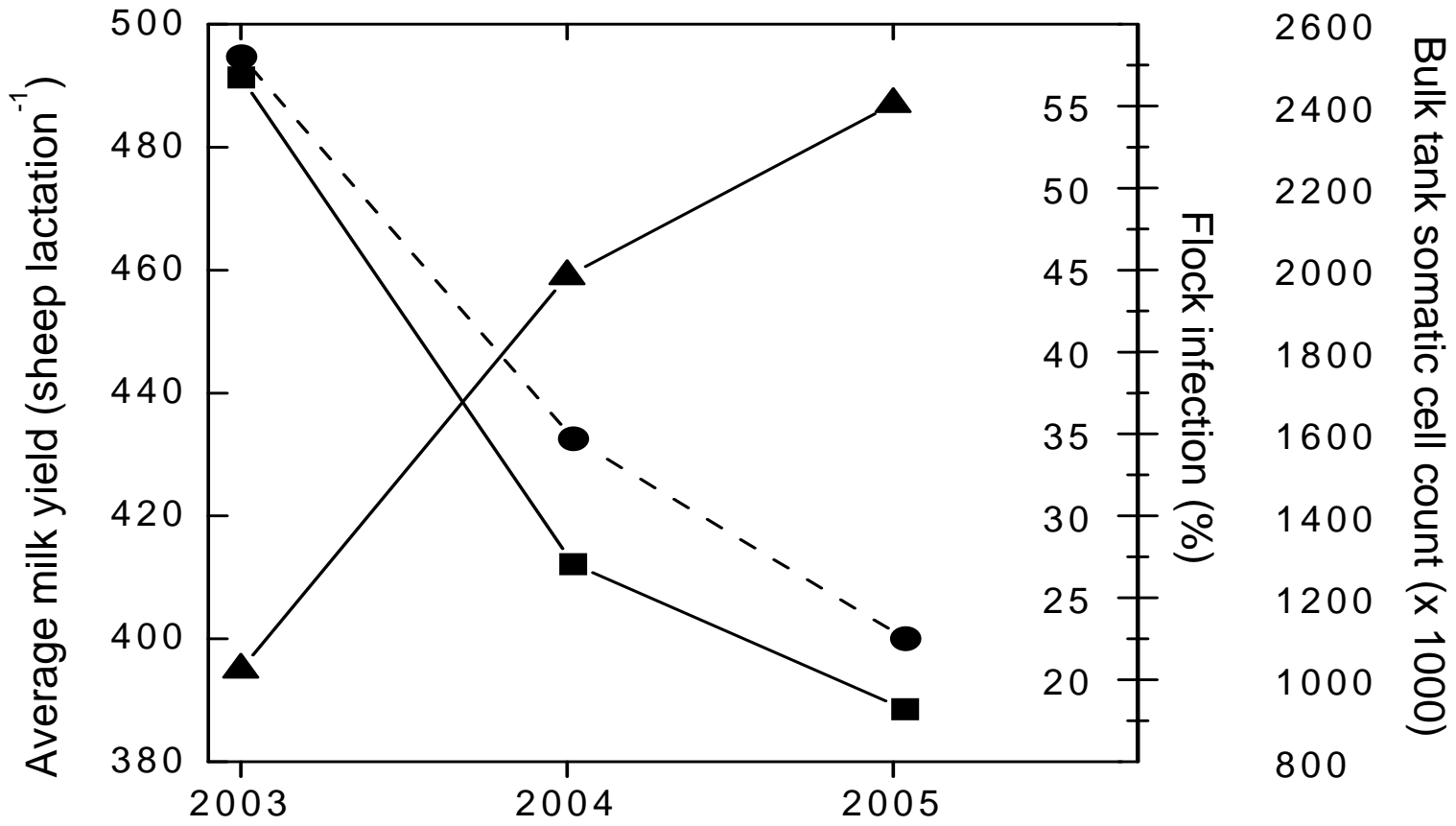
Sheep

Group	Before treatment		After treatment		
	Bacteria		Bacteria		
			Yes	No	P (χ^2)
Treatment	Yes	92	27 (29%)	65 (71%)	
Control	Yes	59	54 (92%)	8 (8%)	< 0.0001
Treatment	No	70	13 (19%)	57 (81%)	
Control	No	97	27 (28%)	70 (72%)	NS

Results

Sheep

Average milk yield, bulk-milk somatic cell count and percentage infection in the sheep flock in the course of the 2-yr study.

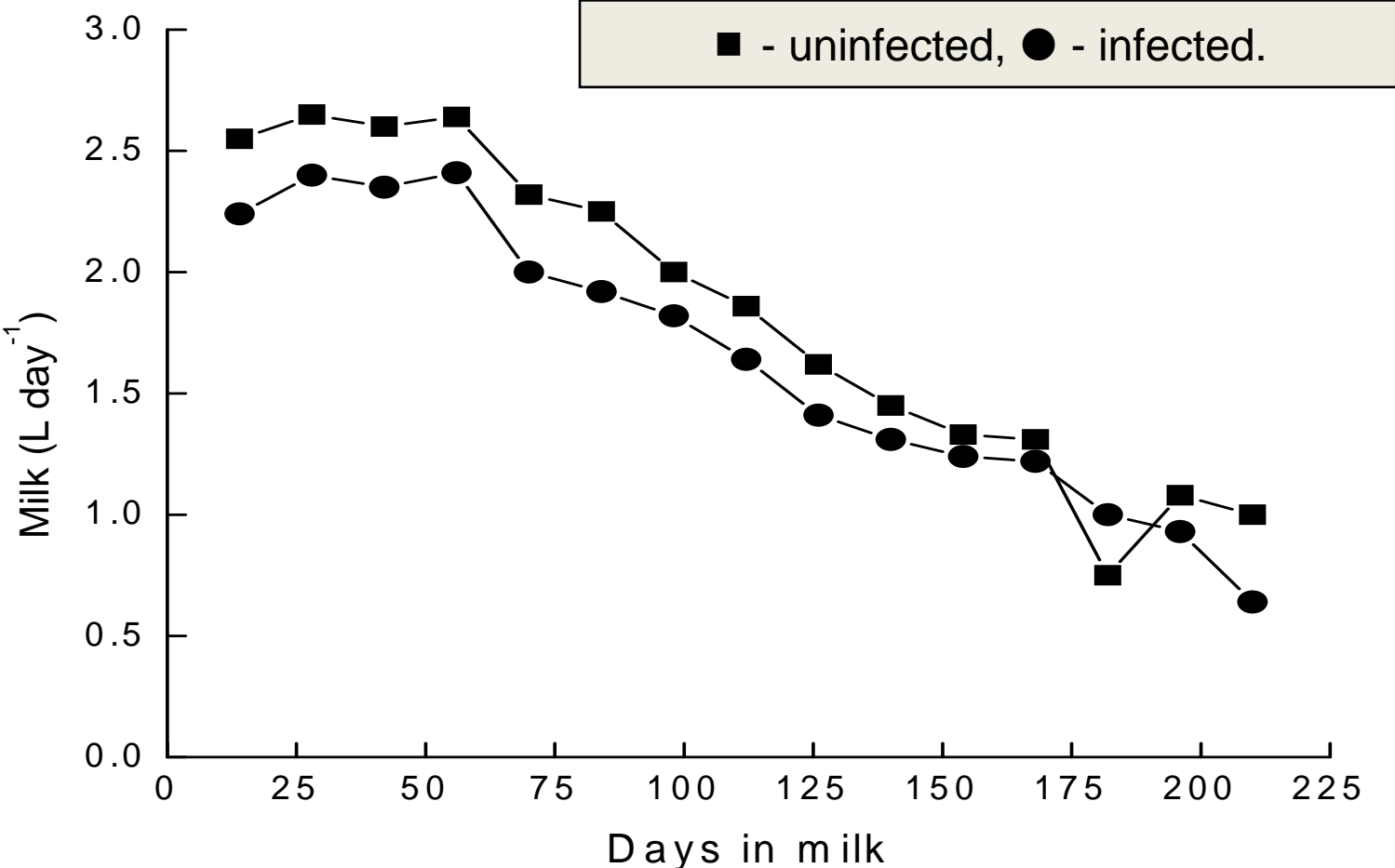


▲ - Average milk yield, ■ - somatic cell count, ● - percentage intramammary infection.

Results

Milk yields of uninfected and infected ewes.

Sheep



Cost benefit

Cost of identification

Time of sampling - second week in lactation and/or before drying off.

Test - CMT and/or SCC and bacteriology

**Improved milk yield
quantity and quality of products**

Cost benefit

Loss of yield, quality

Milk Yield – reduction of 5-30%

Product quantity and quality - reduction of 5-30%

**Reduction dependent on bacteria
species and animal's breed**

Cost benefit

Cost of treatment

Recovery – 50-85%

Existing Medicine – availability and price

Recovery depends on bacteria
species and length of the infection

Subclinical mastitis

Prevention

Identification

Existing medicine, availability and price

Calculate cost benefit



Thanks

