

Population dynamics of ovine coccidia in lambs reared under different management conditions in Greece



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Coccidiosis, a major disease affecting many intensively-reared livestock, such as poultry, cattle, sheep and goats.

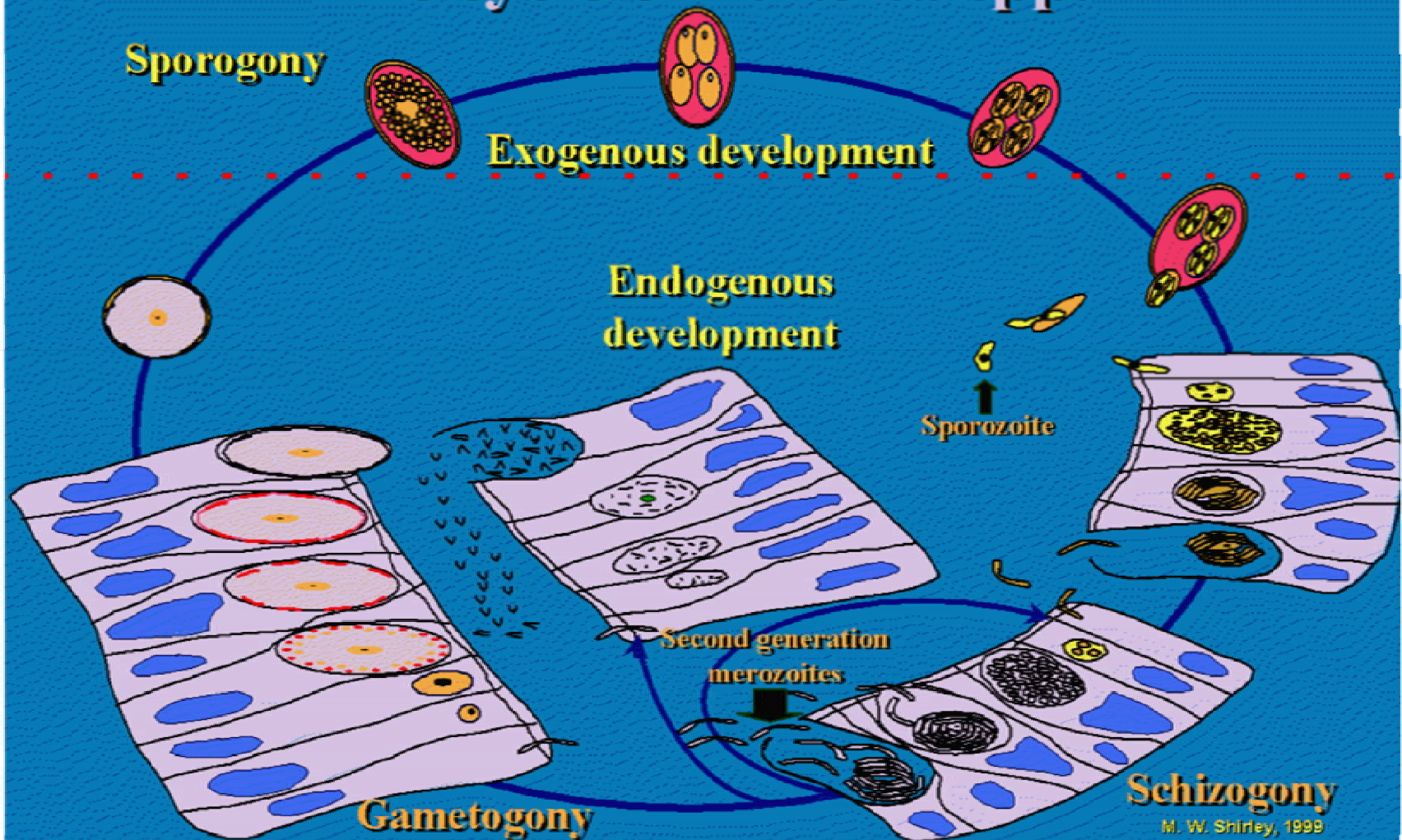
Coccidial infections in sheep are highly prevalent and frequently occur after heavy infection of susceptible animals, mostly lambs



Coccidiosis in sheep

- ✓ Affecting lambs (age: 4–8 weeks) ➡ genus *Eimeria*
- ✓ Mostly found in the intestine causing diarrhoea
- ✓ 15 *Eimeria* spp. have been described
- ✓ *E. ovinoidalis* and *E. crandallis* * most pathogenic
- ✓ Clinical signs / Pathology: diarrhoea, dehydration, epithelial hyperplasia, inflammation, villus atrophy, mucosal collapse

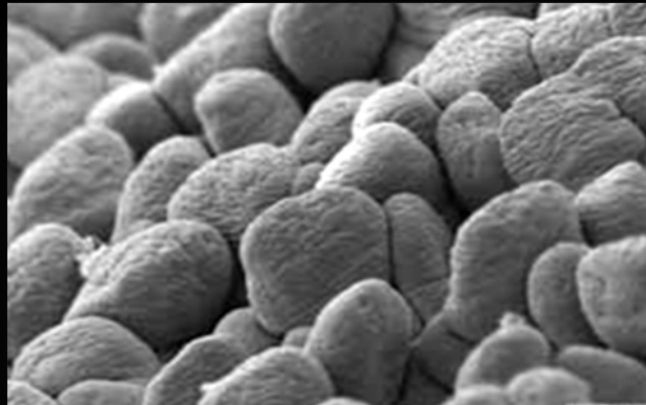
Life cycle of *Eimeria* spp.



M. W. Shirley, 1999



EIMERIA





Unsporulated oocyst (40x)



Sporulated *E. faurei*
oocyst (20x)



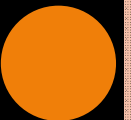
Sporulated *E. bakuensis* oocysts (40x)



COCCIDIOSIS IN LAMBS ??

Coccidiosis major issue poultry and calves

Not enough information available for lambs!





QUESTIONS TO BE ANSWERED:

- infections dynamics/ onset, common *Eimeria* species in dairy husbandry systems?
- effect of climate conditions, seasonal effects (early vs. late lambing)
- influence of husbandry practices (*semi-intensive vs. intensive management*)
- ...when to apply treatment/ how to control ?



STUDY DESIGN

7 sheep flocks were selected

Crete

1. Asomatoi (NAGREF station/ semi-intensive)
2. Karines (semi-intensive)
3. Bali (intensive)

„sfakia“ breed

Northern Greece

1. Ag. Mamas (NAGREF station/ semi-intensive)
2. Kozani (semi-intensive)
3. Eleochoia (semi-intensive)
4. Volos (intensive)

„chios“ breed

The same flocks were used for both rounds of the experiment, as they include both early as well as late lambing ewes



Chios breed



Sfakia breed





Semi-intensive





intensive





STUDY DESIGN

- 20 lambs (7–9 days old) were randomly selected from each flock
- Sampling 5x every 6 days
- Start date for Crete: Oktober 2008 (early) / March 2009 (late)
- Start date for northern Greece: November 2008 (early) / middle of February 2009 (late)

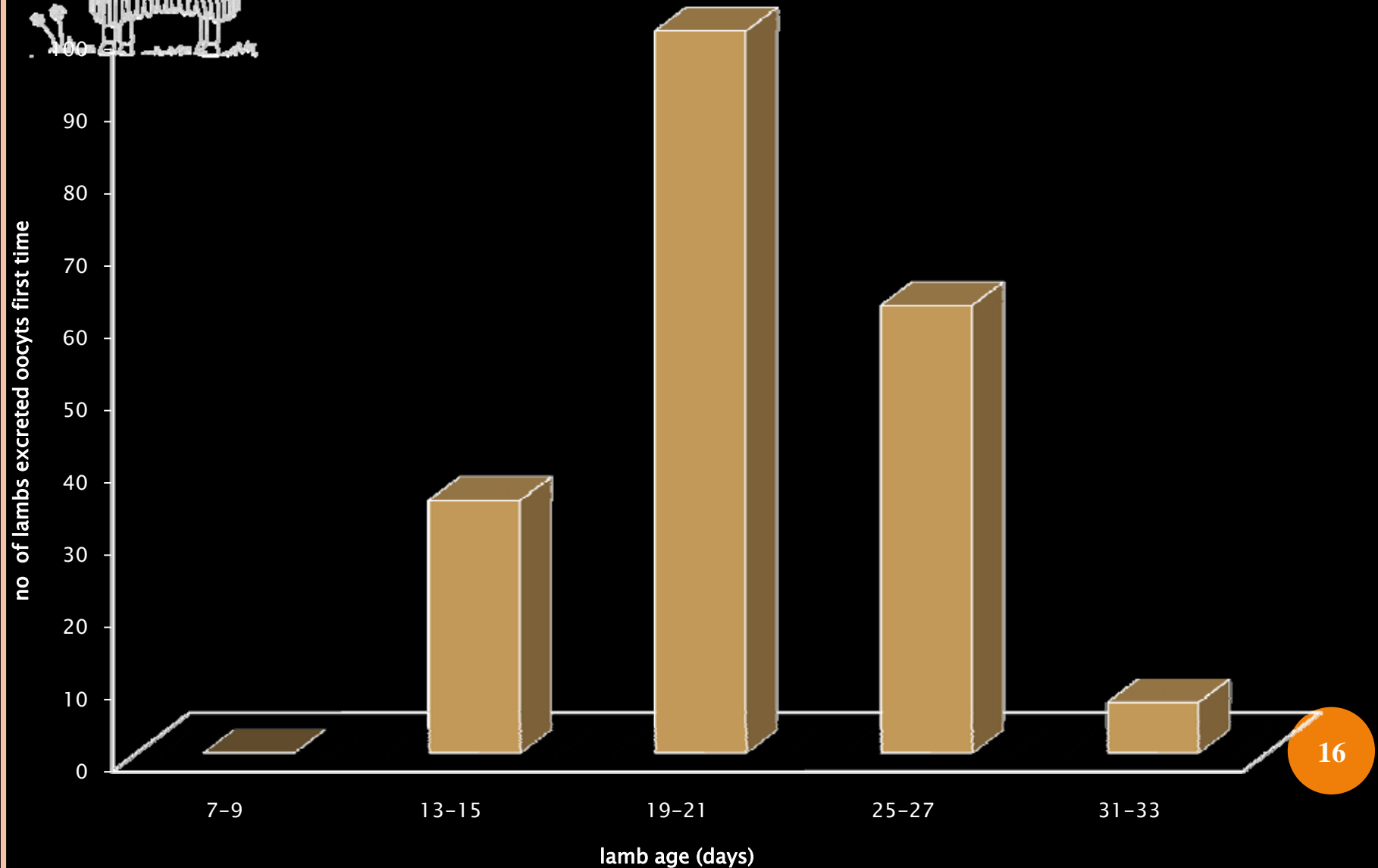


FAECAL EXAMINATION

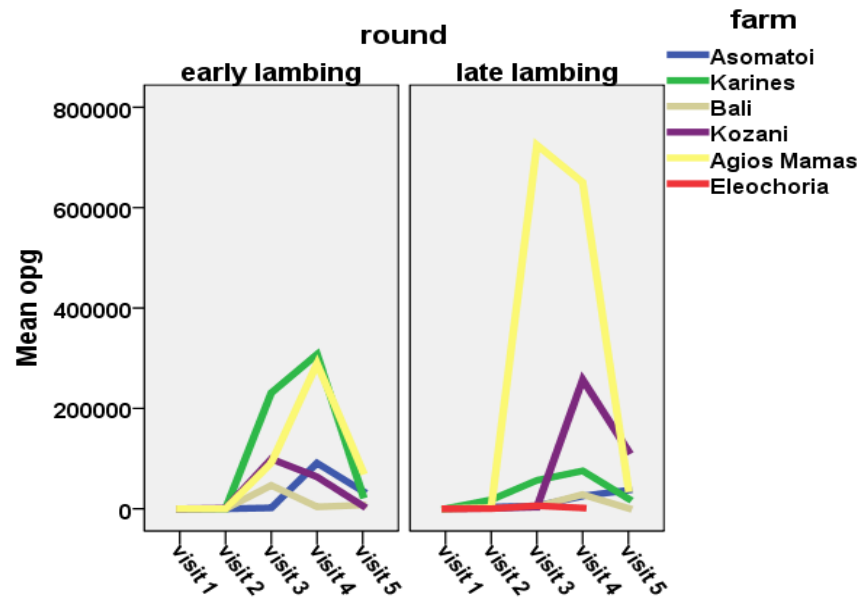
- Faecal weight and consistency (pellet, pasty, liquid, haemorrhagic) were recorded
- Intensity of infection (oocyst per gram of faeces – OPGs)
 - modified Mc Master method (for samples $\geq 0,5$ gram)
 - Faust method (for samples weighing $< 0,5$ gram)
- Oocysts in samples with more than 300 opg were sporulated in order to differentiate species



all flocks infected
92.7% prevalence

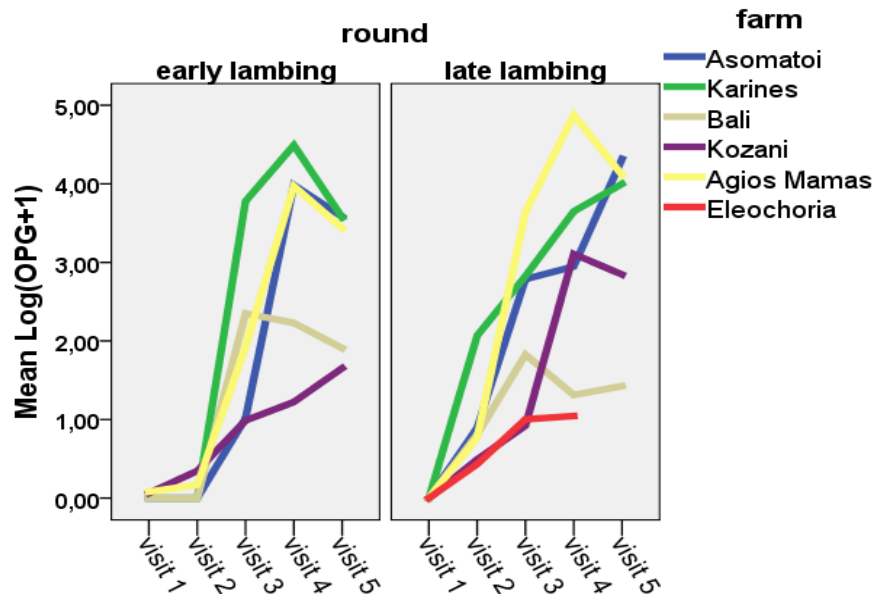


Infection dynamics/ patterns



Crete

Northern Greece

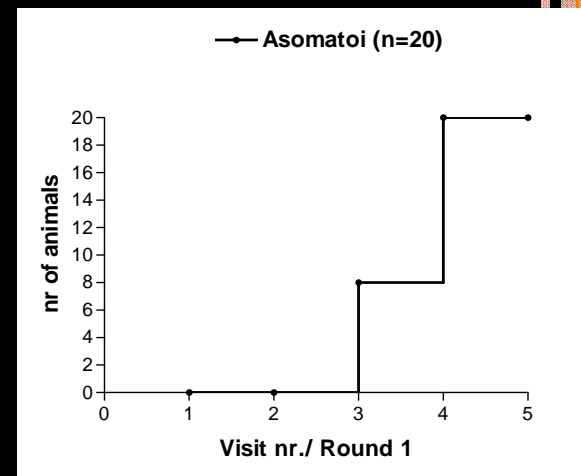
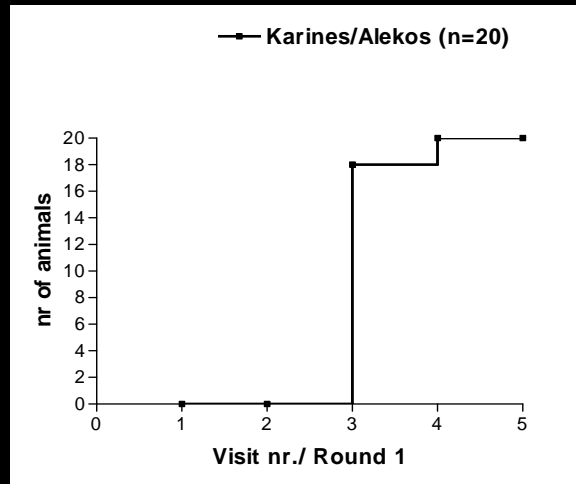
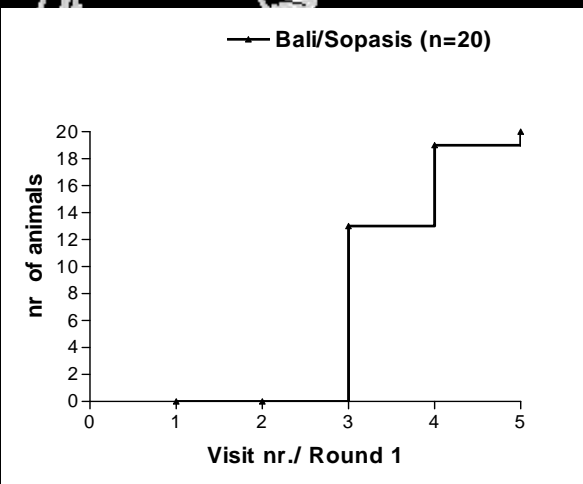


Crete

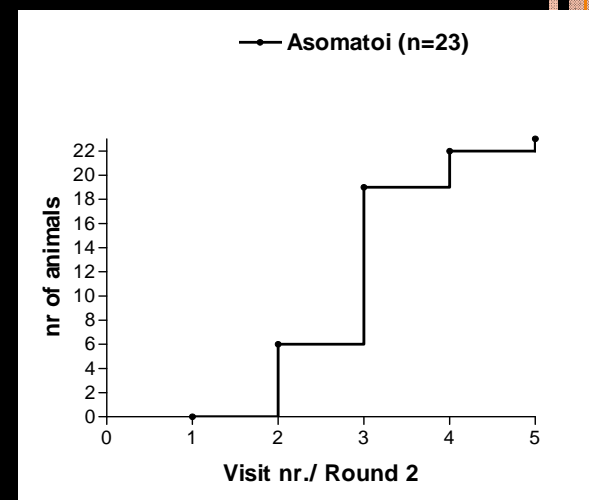
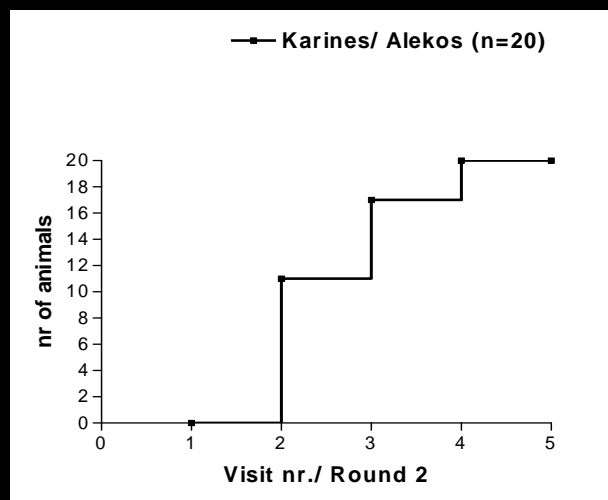
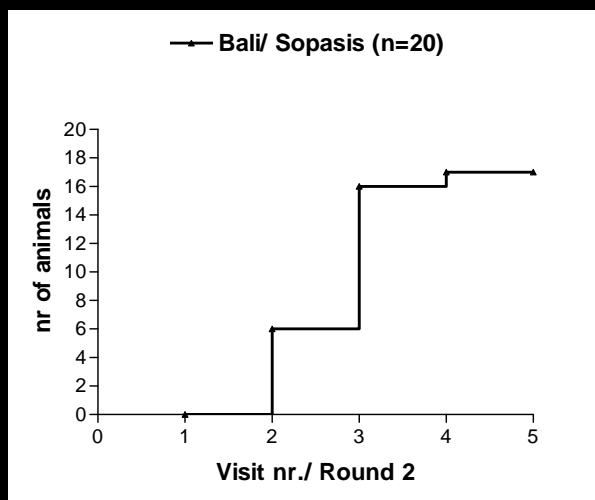
Northern Greece



Cumulative incidence per farm/visit/round

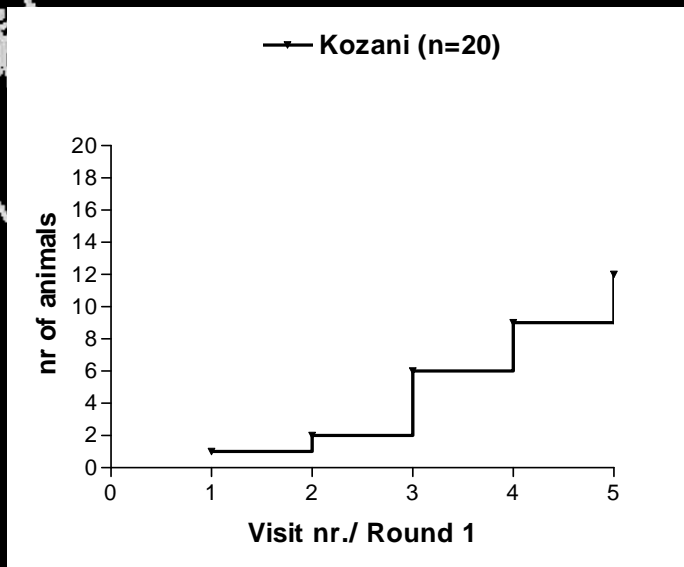


round 1= early lambing

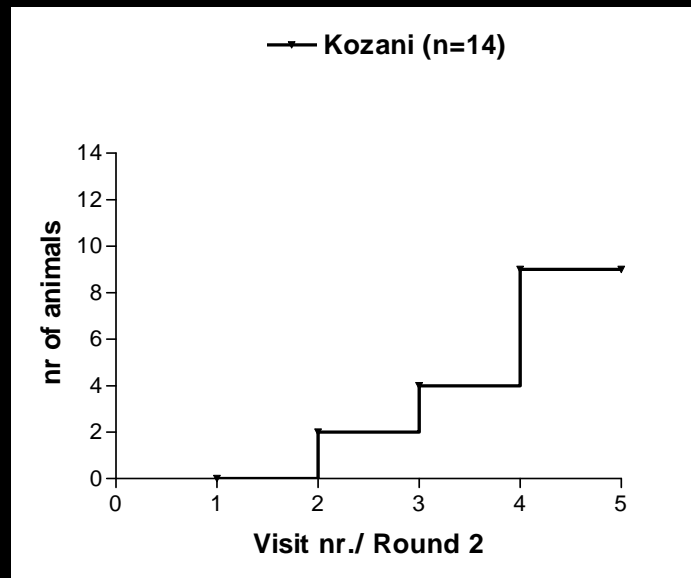
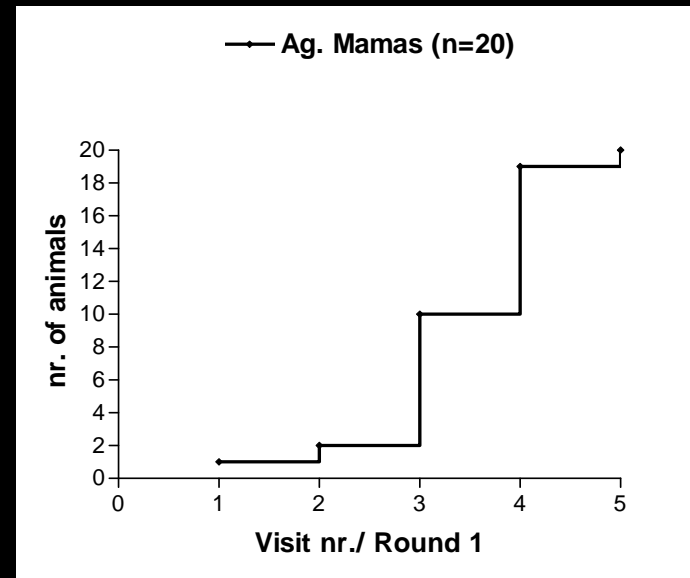


round 2= late lambing

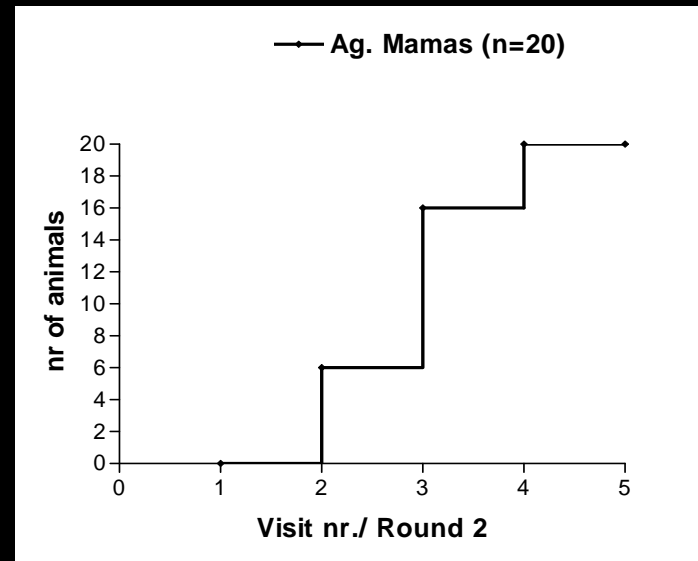
Cumulative incidence per farm/visit/round



round 1= early lambing



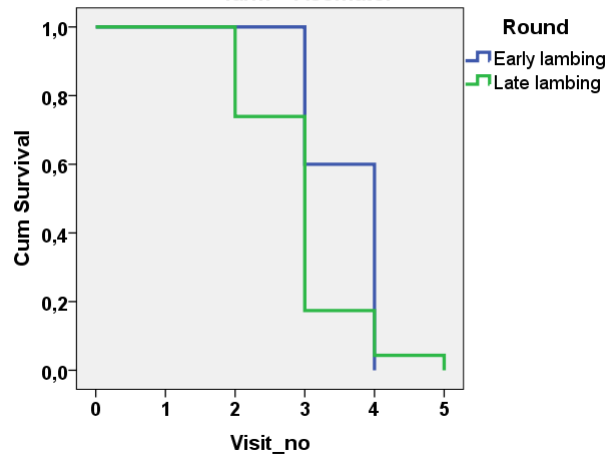
round 2= late lambing



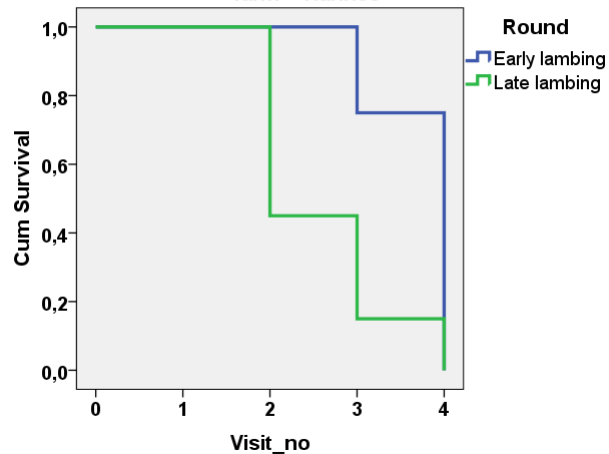


CUMULATIVE SURVIVAL FUNCTION/ KAPLAN MEIER ANALYSIS

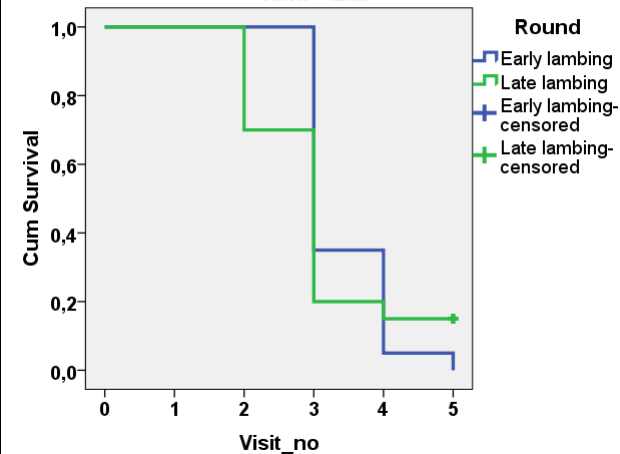
farm = Asomatoi



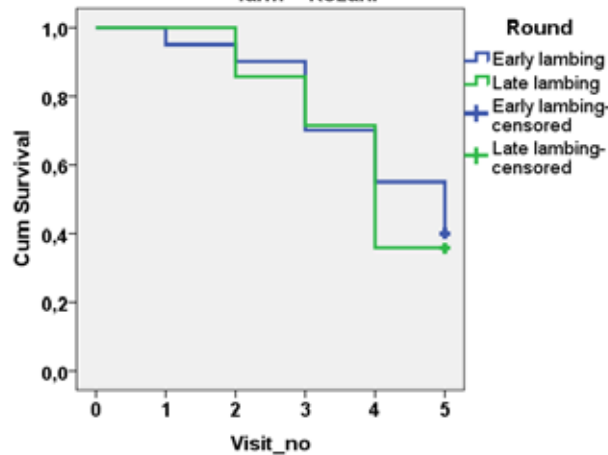
farm = Karines



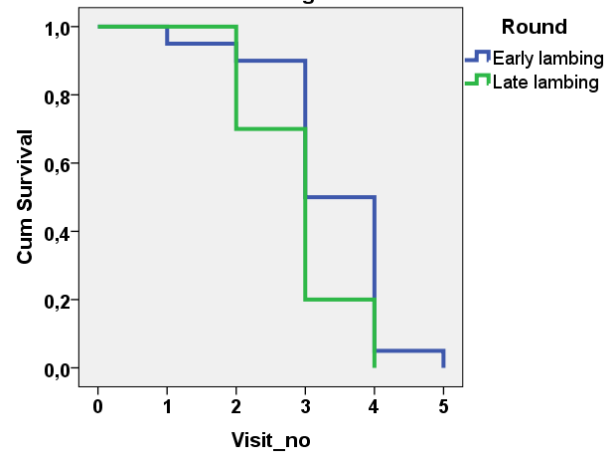
farm = Bali



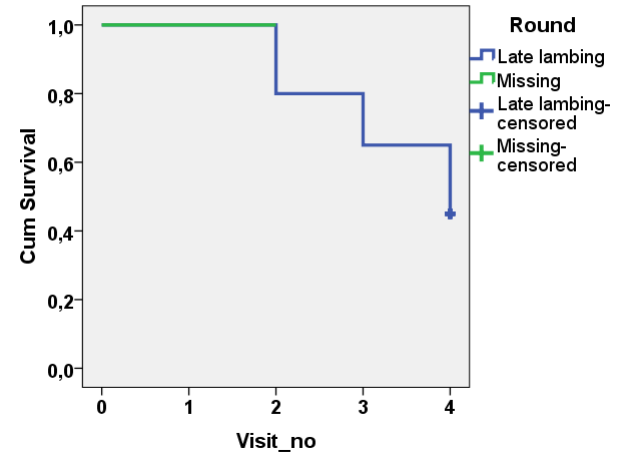
farm = Kozani



farm = Ag. Mamas



farm = Eleochoria



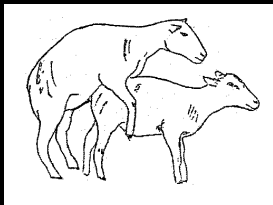


Survival analyses indicated that there was a greater risk for lambs to get infected earlier in life during round II (spring lambing).



SEMI-INTENSIVE

Mating



Lambing



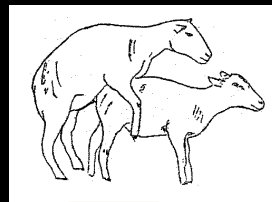
Milking

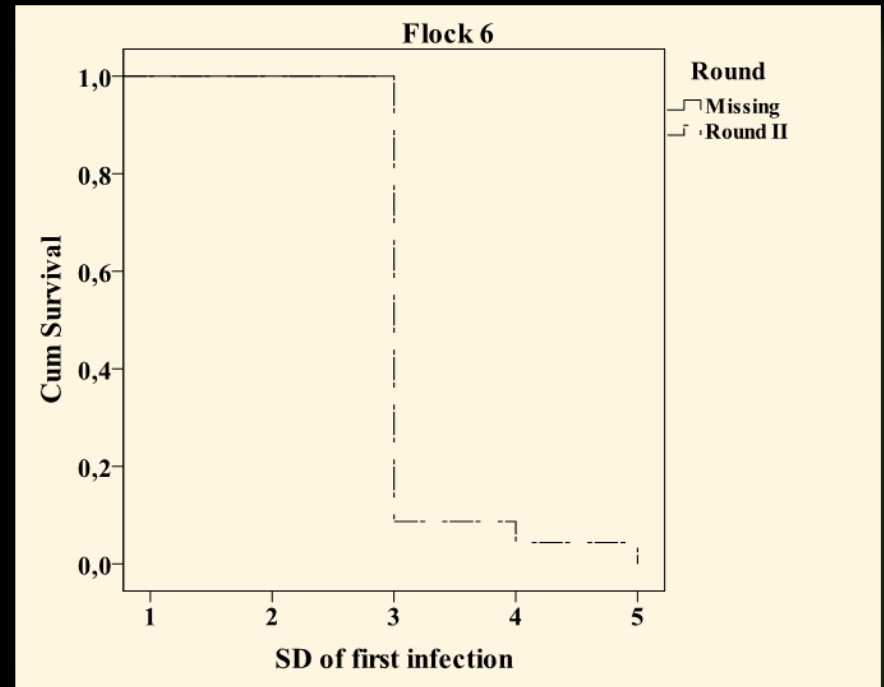
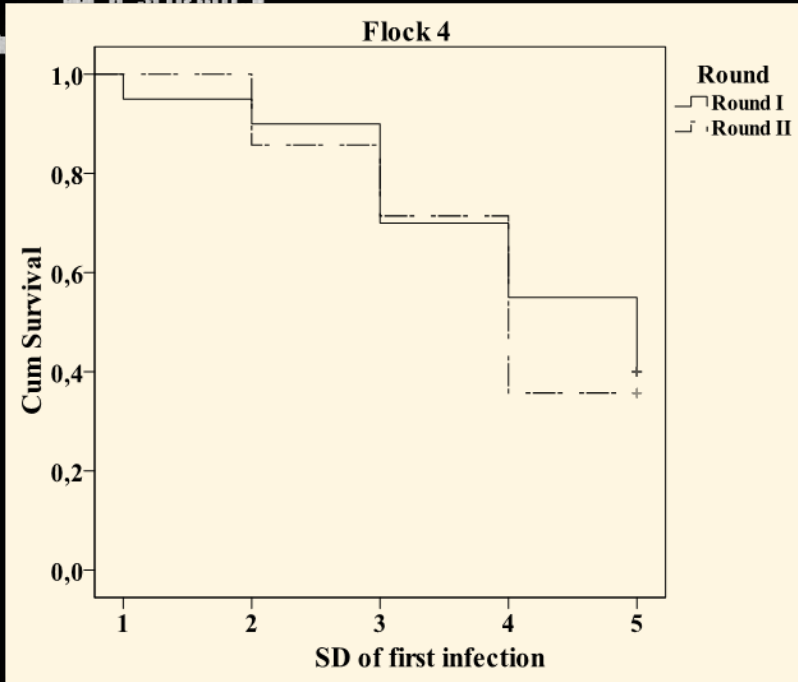


EARLY LAMBING

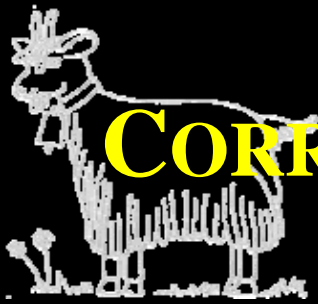


LATE LAMBING





Hygiene?



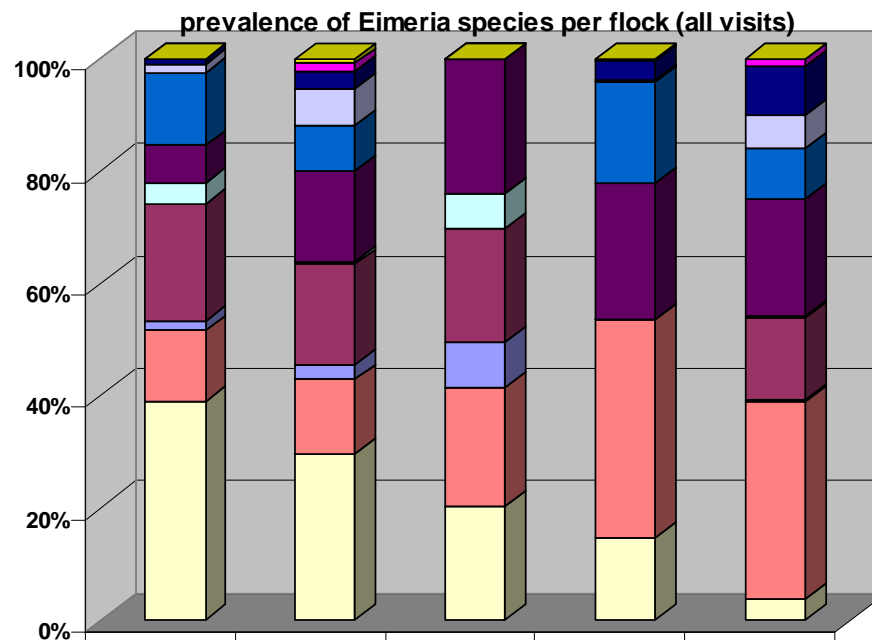
CORRELATIONS/ SPEARMAN'S RHO

- between faecal score and OPG (all farms/ both rounds)
=> $P = -0,183$, $p = 0,001$
- between faecal score and the presence of pathogen species (all farms/ both rounds)
=> $P = -0,249$, $p = 0,000$





Prevalence of Eimeria spp per flock/ early lambing



| | Asomatoi | Karines | Bali | Kozani | Ag.Mamas |
|------------------|----------|---------|-------|--------|----------|
| E. intricata | 0,20 | 0,92 | 0,00 | 0,00 | 0,00 |
| E. granulosa | 0,00 | 1,35 | 0,00 | 0,56 | 1,48 |
| E. ahsata | 0,91 | 3,08 | 0,00 | 3,34 | 8,72 |
| E. bakuensis | 1,53 | 6,60 | 0,24 | 0,22 | 5,73 |
| E. faurei | 12,87 | 7,99 | 0,00 | 18,04 | 8,99 |
| E. weybridgensis | 6,79 | 16,14 | 23,91 | 24,25 | 20,86 |
| E. marsica | 3,58 | 0,54 | 6,10 | 0,11 | 0,32 |
| E. parva | 20,74 | 17,90 | 20,23 | 0,00 | 14,61 |
| E. pallida | 1,81 | 2,63 | 8,03 | 0,00 | 0,36 |
| E. crandallis | 12,54 | 13,20 | 21,17 | 38,79 | 35,03 |
| E. ovinoidalis | 39,02 | 29,64 | 20,31 | 14,68 | 3,91 |

pathogen →

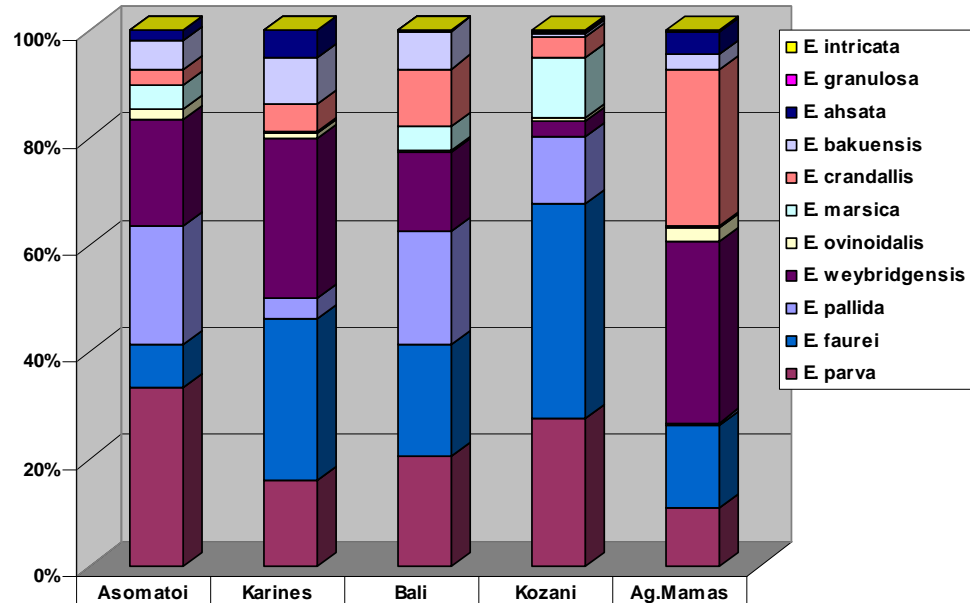
pathogen →

pathogen →



Prevalence of Eimeria spp per flock/ late lambing

prevalence of Eimeria spp per flock (all visits)



pathogen →

pathogen →

pathogen →





CONCLUSIONS

- During the first two weeks oocyst excretion is very rare
- Peak in OPGs after the 3rd (day 19–21 post birth) or 4th (day 25–27 post birth) visit (during both lambing periods)
- All lambs were infected until visit 5 except for the flock in kozani (during both rounds)
- Greater risk to get infected earlier during late lambing



CONCLUSIONS

- All *Eimeria* species were present ($N_{\text{total}} = 16539$)

predominant species:

→ early lambing:

E. ovinoidalis (!), *E. crandallis* (!), *E. weybridgensis*

→ late lambing:

E. weybridgensis, *E. parva*, *E. pallida*, *E. faurei*

- Faecal scores were negatively correlated to the presence of pathogen species



CONCLUSIONS

Eimeria spp occurred frequently and regardless of the management practices applied, the farm environment appeared favourable for transmission of the parasite.

Even subclinical eimeriosis was reported to affect performance of the lambs. The status of immunity of the lambs was probably good enough to suppress clinical disease, probably caused by an early age of infection.



PROBLEMS EMERGING ...

- production losses (140 million \$/year worldwide)
- welfare
- extensive use of chemicals
 - ➡ parasites develop drug resistance
 - ➡ drug residues in animals and food products

Necessity

for the development of sustainable control strategies!



Thank you

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