



Individual risk factors for *Staphylococcus aureus* mastitis in transhumant dairy herds in western Alps

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Bovine mastitis in mountain dairy farming

Mastitis is the most prevalent and costly disease in dairy cattle,

→ 21-35% prevalence of subclinical mastitis

→ >30% of herds affected

Pathogen profile dominated by **contagious organisms** (23-35%),

Mountain dairy herds are exposed to different environmental and management conditions than lowland herds

[Bellato et al., 2024; Busato et al., 2000; Walkenhorst et al., 2005]



Evidence of the role of transhumance is limited

Epidemiological evidence comes mainly from intensive indoor systems

Only a few studies investigated mastitis in mountain transhumant herds

Pre-transhumance infections may play an essential role



Mastitis risk is higher during upland grazing than in lowlands due to exacerbation of pre-existing infection

[Walkenhorst et al., 2005]



Known risk factors and knowledge gap

Indoor systems – known risk factors:

- increasing days in milk (DIM)
- higher lactation rank
- previous udder infection

Transhumant systems – unknown risk factors:

- ? DIM
- ? Parity
- ? BCS
- ? Breed
- ? Cow, Udder and Begging cleanliness



Aim of the study

To evaluate which individual-level risk factors for *S. aureus* intramammary infection (IMI) established in indoor dairy systems remain relevant in transhumant dairy herds

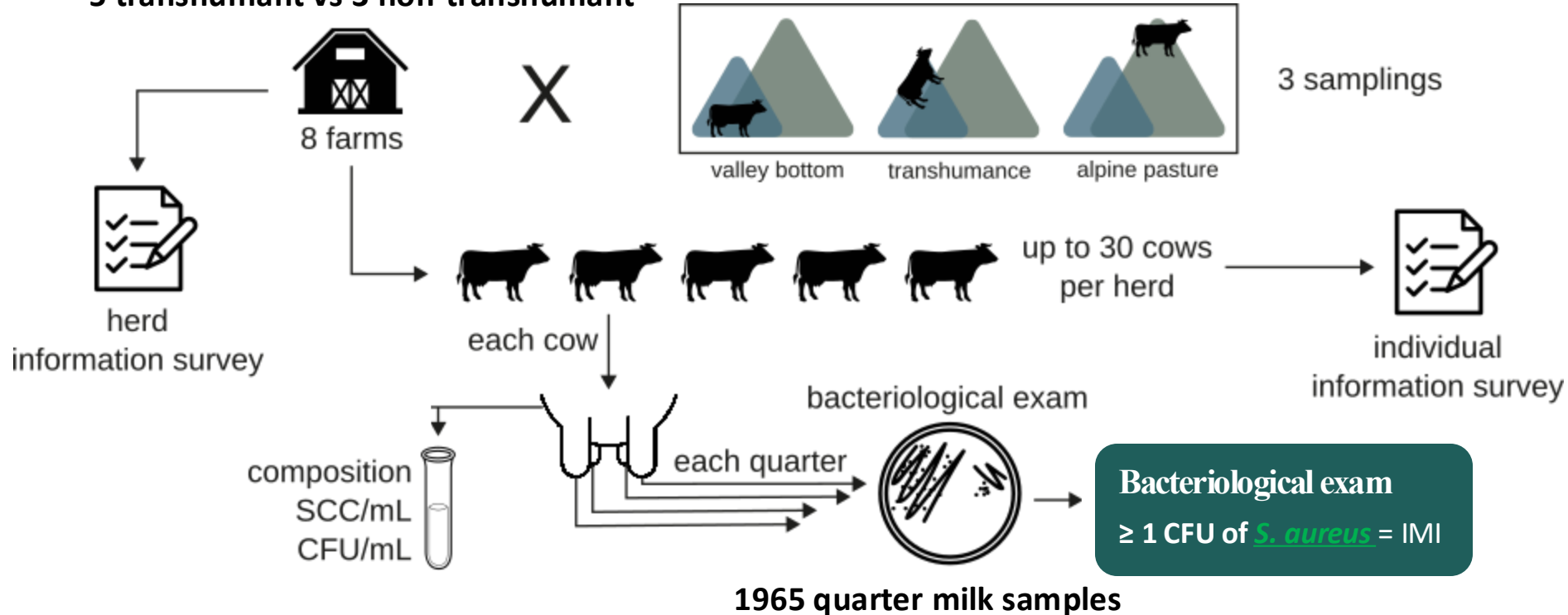
Lanzo Valleys

representative of internal areas



Study design

5 transhumant vs 3 non-transhumant



Epidemiological model follows data structure

Data structure

Quarter is the epidemiological unit nested within cows

Cows are aggregated by herd



Model structure

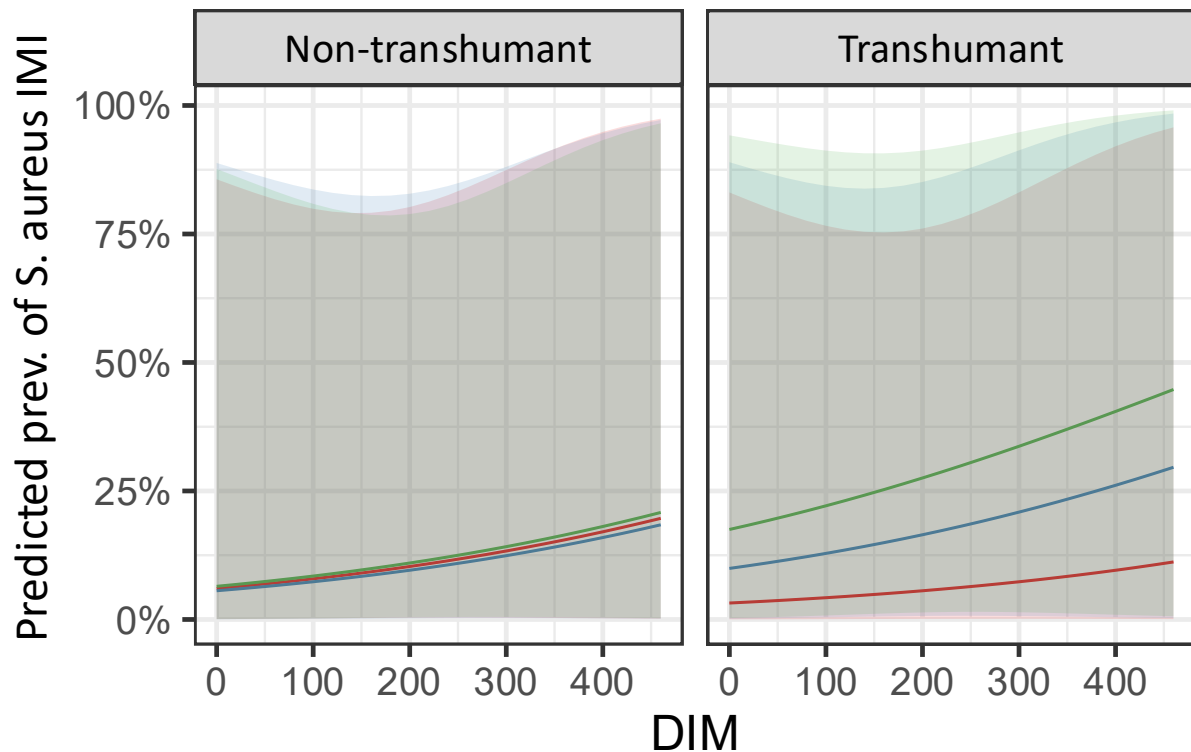
A generalized estimating equation (**GEE**) logistic regression model was fitted to estimate the **association between individual-level risk factors and *S. aureus* IMI** while accounting for **repeated observation** of the same quarter over time

Which risk factors remained relevant?

Risk factor	Odds Ratio (95% CI)	Significance
DIM (per month)	1.09 (1.03-1.16)	**
Lactation rank	1.06 (0.99-1.14)	ns
BCS	1.01 (0.80-1.28)	ns
Italian local breeds	0.87 (0.53-1.43)	ns
French local breeds	0.88 (0.44-1.75)	ns
Cleanliness score	0.91 (0.62-1.32)	ns
T1 × Transhumance	3.62 (1.62-8.06)	**
T2 × Transhumance	5.98 (2.79-12.83)	***

No association was observed for lactation rank, BCS, breed or cleanliness indicators

Effect of DIM on *S. aureus* infection

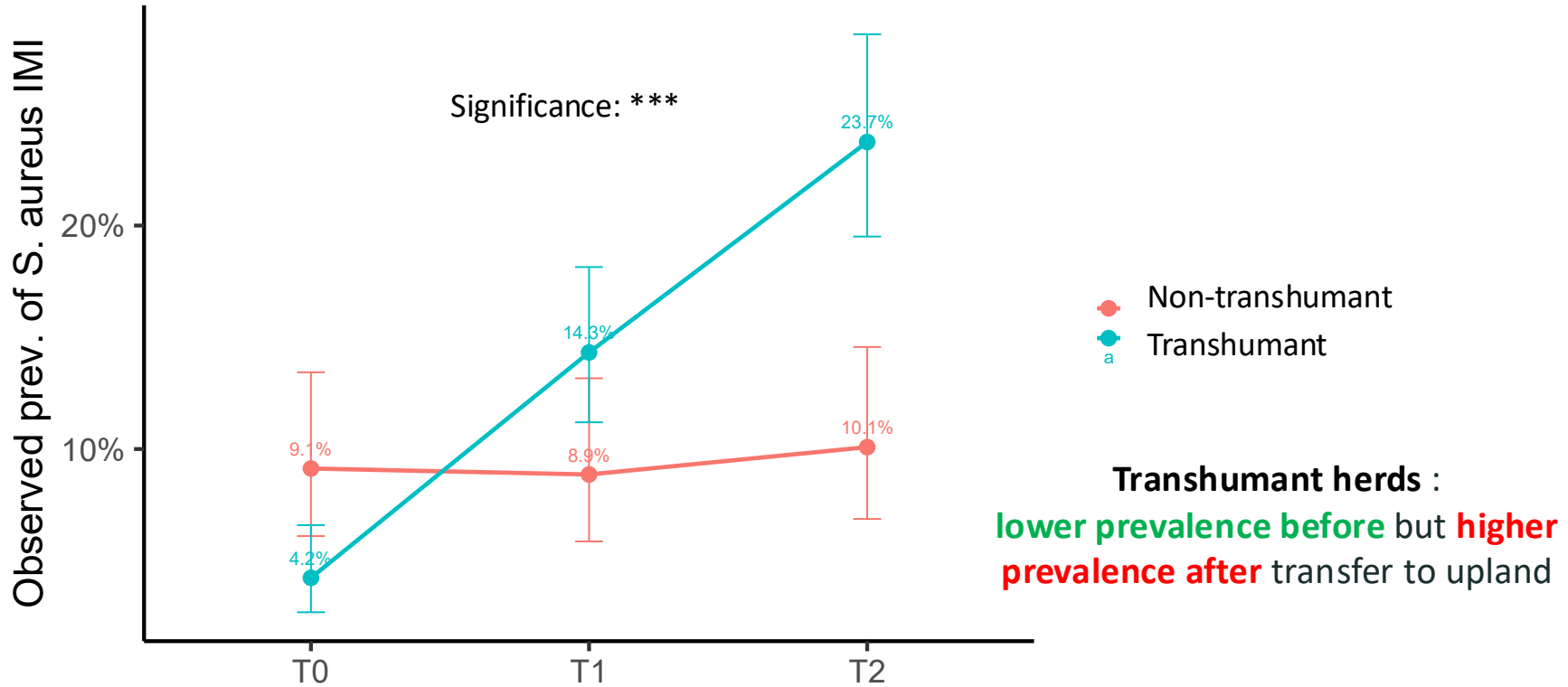


S. aureus IMI risk increased with **9.3% every month of lactation**

Sampling



IMI prevalence increased after transhumance

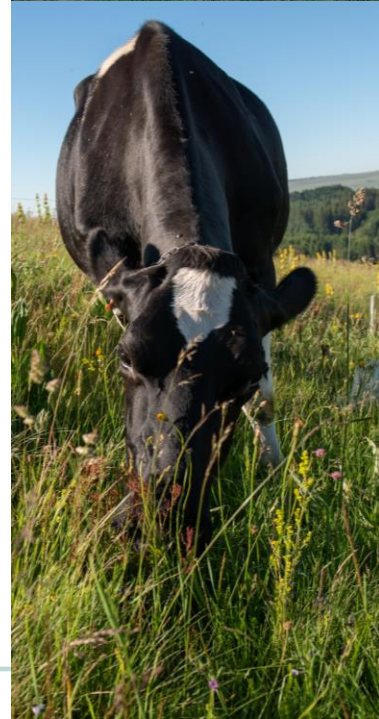


Main findings

- Transhumance was associated with a marked increase in *S. aureus* IMI risk
- DIM remained an important risk factor
- Lactation rank, breed, BCS and cleanliness indicators were not associated with infection risk

Management changes during transhumance may outweigh several individual-level risk factors commonly described in intensive dairy systems

The **increased risk** observed immediately **after transhumance persisted and further increased** after one month of upland grazing



Practical implications

Transhumance is a **critical epidemiological window for *S. aureus* transmission** in mountain dairy herds

Transhumance create conditions that **sustained increasing IMI risk throughout the grazing period**

- **Increased surveillance** around transhumance
- **Early identification** of infected cows before movement
- **Targeted prevention** during adaptation to upland grazing



Thank you

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