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Sustainable prevention and eradication of footrot in sheep (MORes)

A. Wirth, D. Vasiliadis, J. Storms, A.K. Struck and Ottmar Distl

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Background – Sustainable prevention and eradication of footrot

Footrot (interdigital dermatitis, under-running footrot)

- Most frequent foot disease in sheep
- Causative agent: anaerobe bacterium
- highly contagious agent
- debilitating disease
- endemic in flocks
- present in many flocks
- eradication long lasting and difficult
- poor welfare
- high economic losses



Background – Sustainable prevention and eradication of footrot

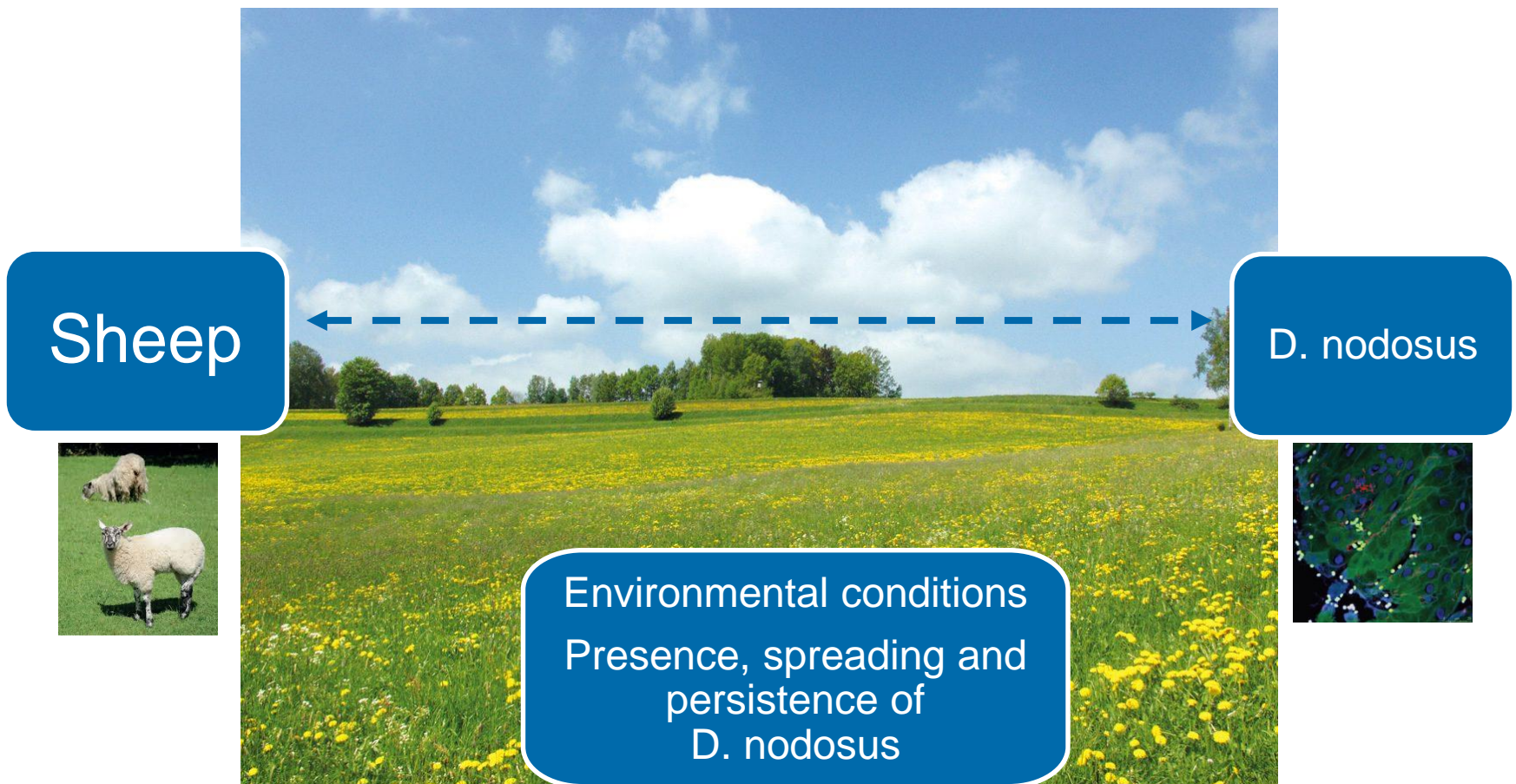
Footrot (interdigital dermatitis, under-running footrot)

- Causative agent: *Dichelobacter nodosus*
- Bimodal population with
 - benign and virulent strains
 - differ in activity of extracellular proteases
 - due to *aprB2* and *aprV2* genes
- Survival outside dermis (aerobic): 10-30 days
- Most infectious stages in sheep
 - before onset of signs and sheep with mild signs of ID
- Sheep infected with *D. nodosus* but no signs of disease



Background – Sustainable prevention and eradication of footrot

Transmission of *D. nodosus* via contact with soil and moisture ground



Sustainable prevention and eradication of footrot

Elimination and control strategies

- Environment
 - avoid wet floors and maceration of interdigital skin, use dry bedding material, reduce stocking density, optimize pasture/yard management
- Elimination and reduced transmission of *D. nodosus*
 - antibiotics, foot-baths, quarantine, isolation
 - separation of flock into unaffected and infected animals
- Resilience and resistance of sheep
 - biannual vaccination program (footvax or farm-specific)
 - culling of highly susceptible sheep and/or sheep with mishappen or overgrown horn
 - breeding program

Sustainable prevention and eradication of footrot

Project

- Coordination
 - University of VetMed Hannover
- Project partners
 - sheep breeding organizations
 - sheep health services
 - private sheep practitioners
 - sheep industry
- Funding
 - Federal Ministry of Food and Agriculture (MORes)

Sustainable prevention and eradication of footrot

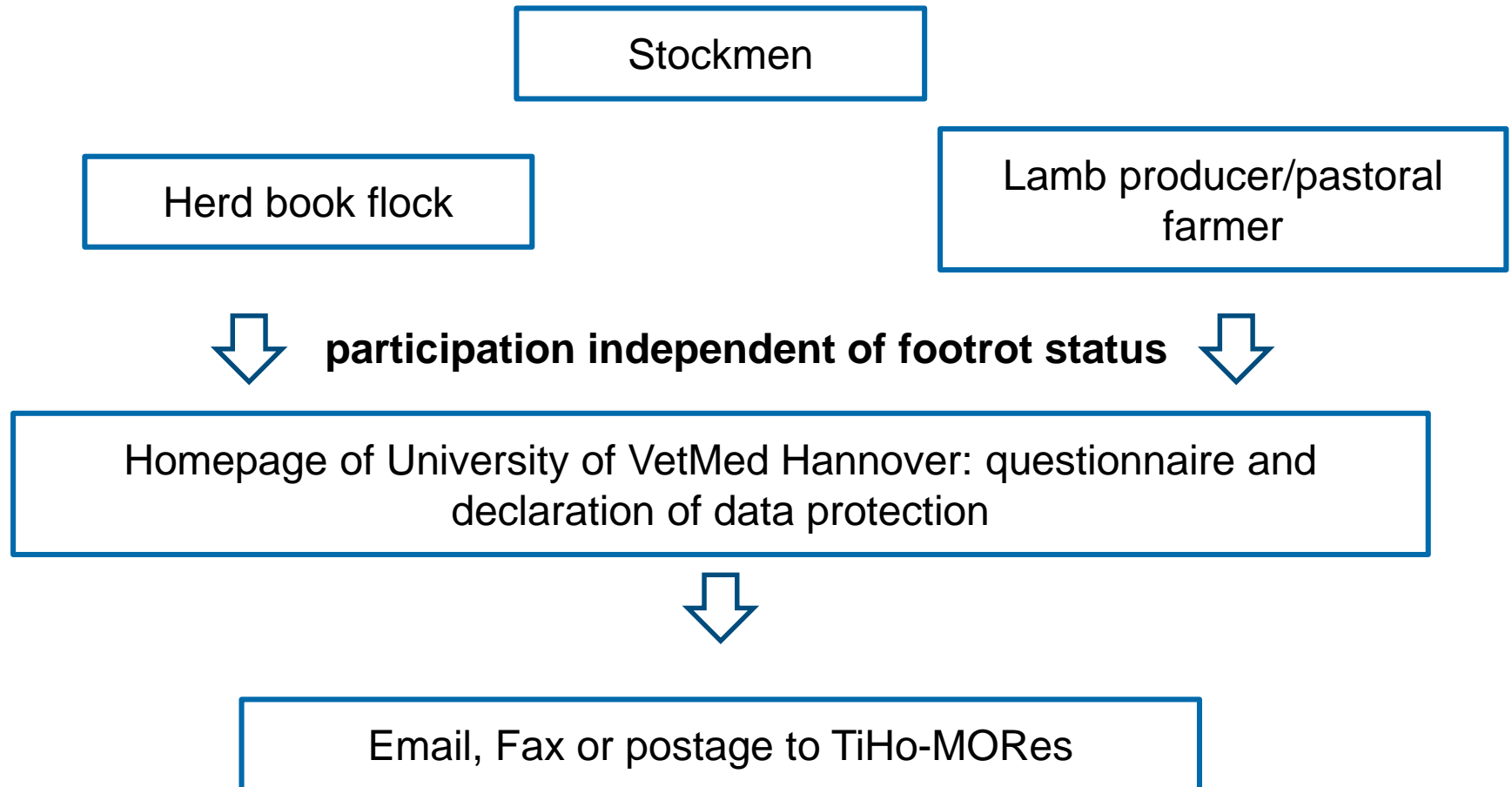
Objectives (main issues for breeding)

- breeding approaches
 - resilience (D. nod. present) and resistance (D. nod. absent)
- prevention, control and eradication programs
 - through reducing D. nodosus challenge
 - establishing immunity in sheep
 - breeding with resilient and resistant animals
- concept based on breeding, prevention and control
- reduce more efficiently susceptible sheep
- stable schools for farmers

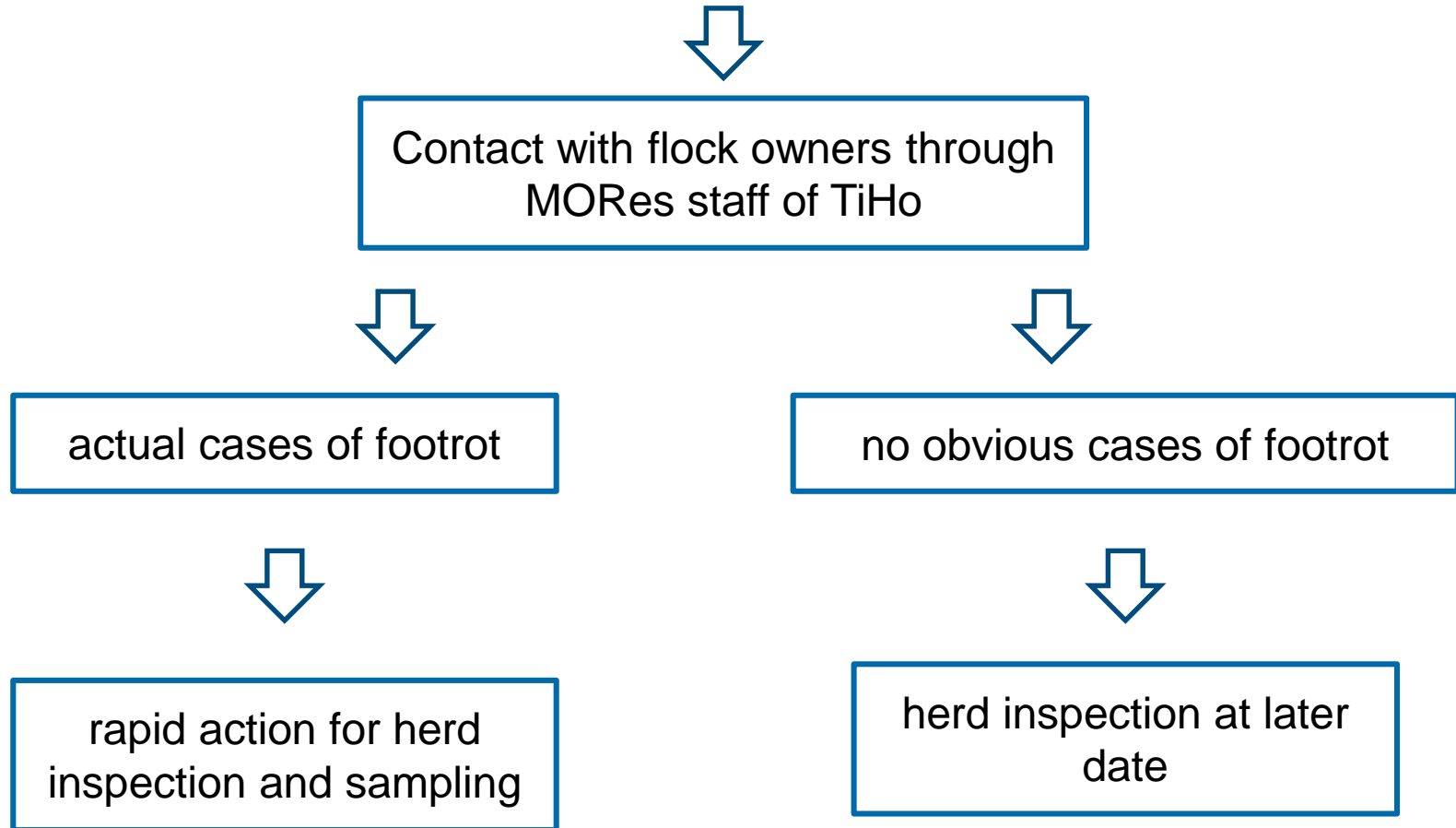
Who can participate

- sheep breeders and sheep stockmen
 - an obvious outbreak or present severe cases of footrot in the flock are not mandatory
- veterinarians, sheep health services, claw trimmer, sheep breeding associations
 - support and publicity for the project

Sustainable prevention and eradication of footrot



Sustainable prevention and eradication of footrot



Sustainable prevention and eradication of footrot

Data recording of individual animals using an electronic reader with programming functions

- scanning of electronic ear tag or manual recording
- age
- sex
- breed or mix
- locomotion score
- footrot score
- foot and claw conformation
- other foot disease
- other conditions
- sample IDs



Sustainable prevention and eradication of footrot

Sampling

- Collecting swabs of interdigital skin
 - restraining individual animals (conveyor)
- Taking blood samples
 - Fixation of the standing animal
- Recording flock-specific and management data



Sustainable prevention and eradication of footrot

Study design

- Number of flocks envisaged to be enrolled: ~ 300
- Flocks: purebred, crossbred, mixed breeds
- Number of sheep to be inspected: ~ 12,000
 - Tools
 - » electronic reader and questionnaires
 - » herd management programs
 - » qRT-PCR, multiplex PCR for *D. nodosus*
 - » whole genome sequencing of *D. nodosus*
 - » interrogation of whole genome (ovine beadchips 50k, 600k, 15k)
 - » Whole genome sequencing of animals

Study design

- Characterize exposure of flocks to footrot and *D. nodosus*
- Identify flocks highly exposed to *D. nodosus*
- Differentiate animals according to footrot scores, locomotion scores and presence of *D. nodosus* strains
- Follow-up controls in selected flocks
 - flocks with repeated infections
 - flocks with bimodal/multimodal distributions of sheep
 - high *D. nodosus* load and infections
 - high *D. nodosus* load and healthy
 - lack of *D. nodosus* load and healthy

Expected study outcomes

- Dynamics of *D. nodosus* to minimise propagation of infection
- Triggers for mutational events of *D. nodosus*
- Association among virulence variants and severity of footrot
- Transmission pathways of *D. nodosus* strains

- Prevention and eradication with integrated breeding programs
- Increasing number of flocks with resilient and resistant animals

- Protection of susceptible herds against infection

Thank you for your attention!

