

# Digital Dermatitis

## and the manageable state of disease

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# introduction

- papillomatous digital dermatitis – (P)DD
  - elimination vs. modulation
    - “the manageable state of disease”
  - 5 stages of (P)DD: M1 to M4 plus M0
  - the transitions between the M-stages
    - new infections
    - healing
    - other transitions
  - what can a mathematical model do to define the manageable state of disease for (P)DD?
    - population dynamic model: SEIS

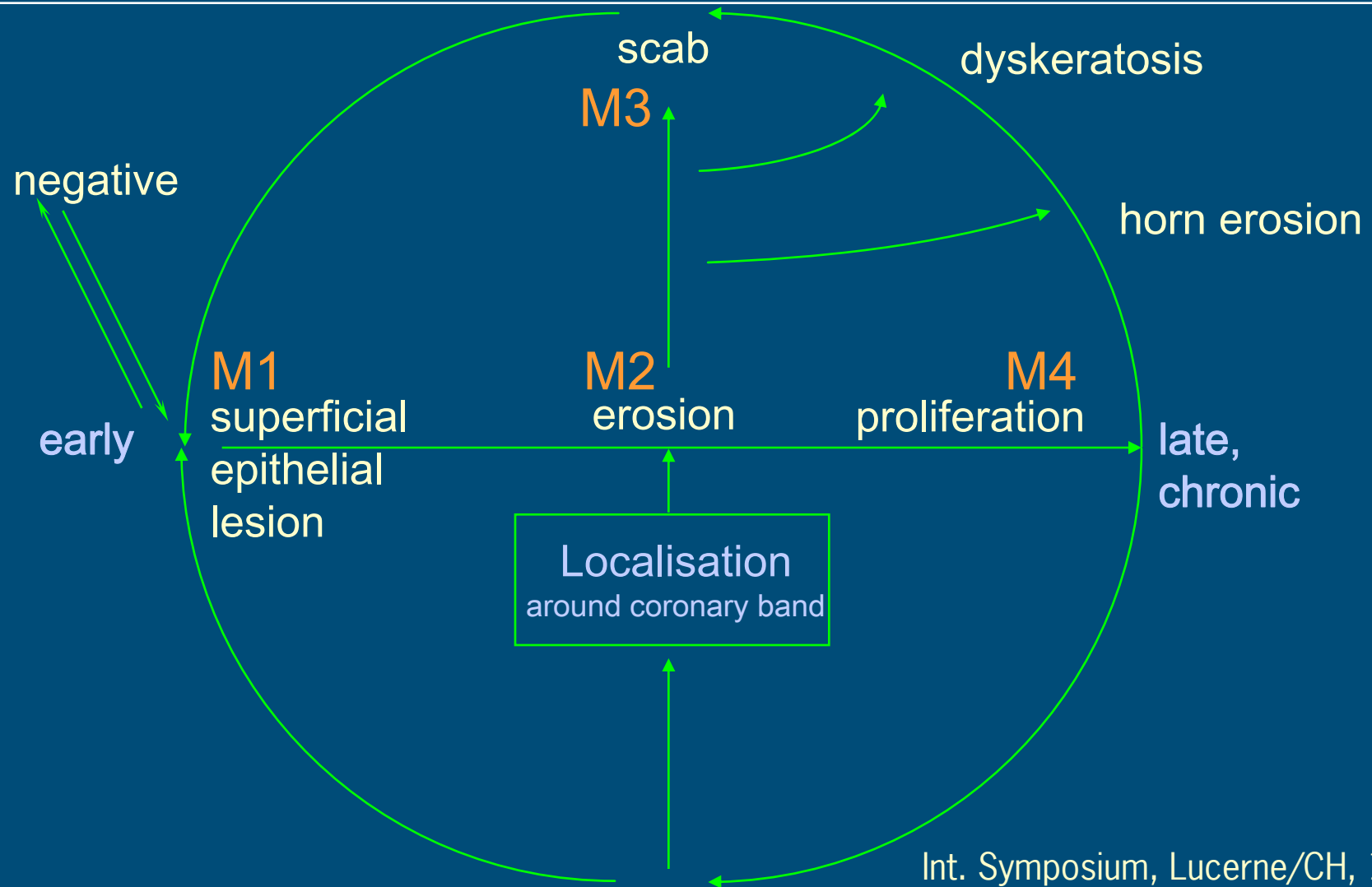


# starting point

- papillomatous digital dermatitis – (P)DD
  - an infectious claw disease
  - showing stages during its course
  - (P)DD seems not to be eliminated
  - but can be influenced (modulated)
  - need a manageable state of disease defined by:
    - animal welfare constraints
    - economic constraints
    - public opinion



# (P)DD population dynamics – stages of (P)DD lesions



# 5 stages during the course of (P)DD lesions



**M1**  
early lesions

**M2**

classical ulcer

**M3**

scab formation  
after  
topical treatment

**M4**  
**M4**

dyskeratosis and  
proliferation

## elimination vs. modulation

- papillomatous digital dermatitis – (P)DD
  - that seems **not** to be **eliminated**
  - but **can** be influenced (modulated)
    - risk factor management
    - preventive vs. curative footbaths
    - individual therapy





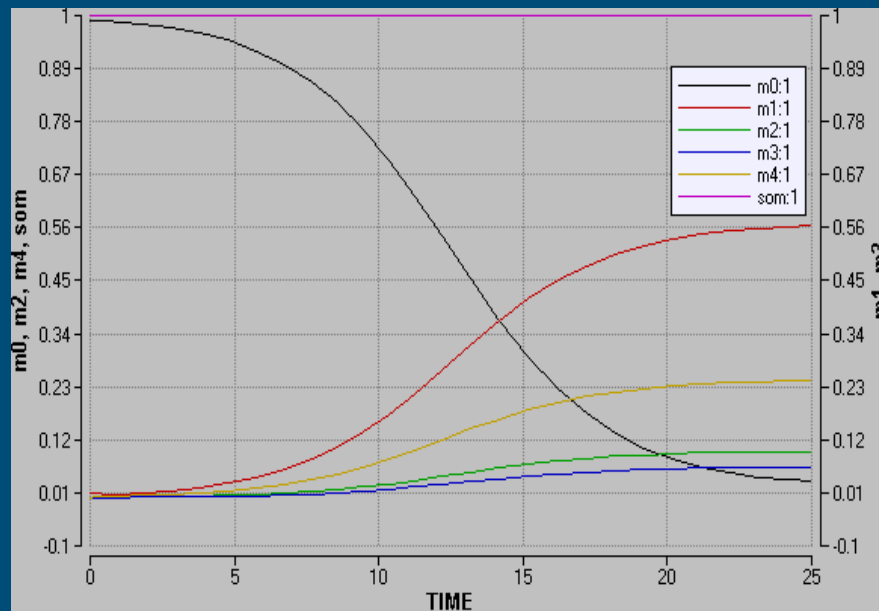
# what can a model do?

## ■ papillomatous digital dermatitis – (P)DD

- need a “manageable state of disease” defined by:
  - animal welfare constraints (lameness is a welfare and alertness problem)
  - economic constraints (costs for therapy and prevention, production losses, labour, culling due to lameness)
  - public opinion (farmers feel abandoned by claw health advisors, criticism by society about animal husbandry, different levels of problem awareness)
- not intuitively defined – need a tool, f.e. a mathematical model

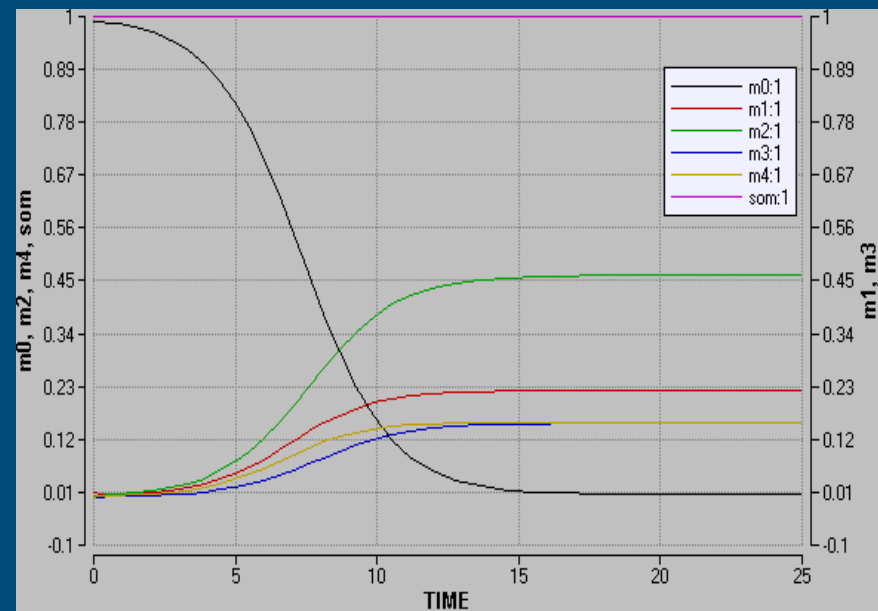


# (P)DD population dynamics – time plot SEIS model



can find  
different levels of disease prevalence  
depending on  
dynamics of infection and farm

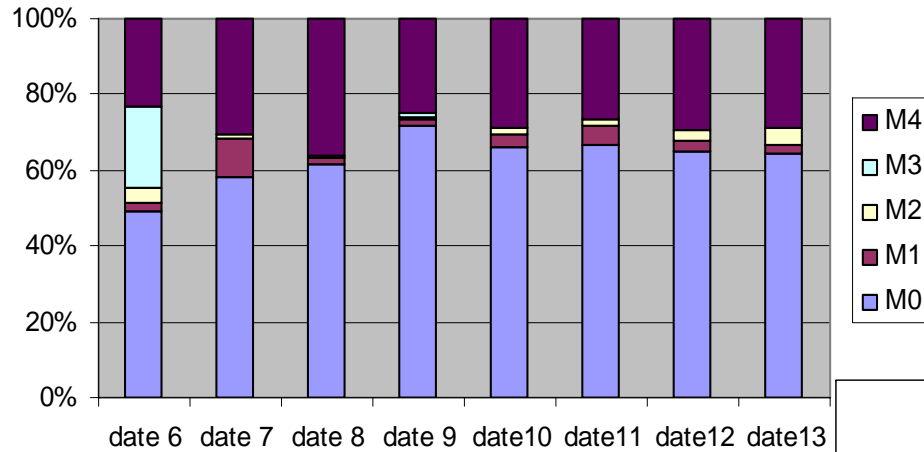
need to modulate the dynamics towards a  
manageable equilibrium



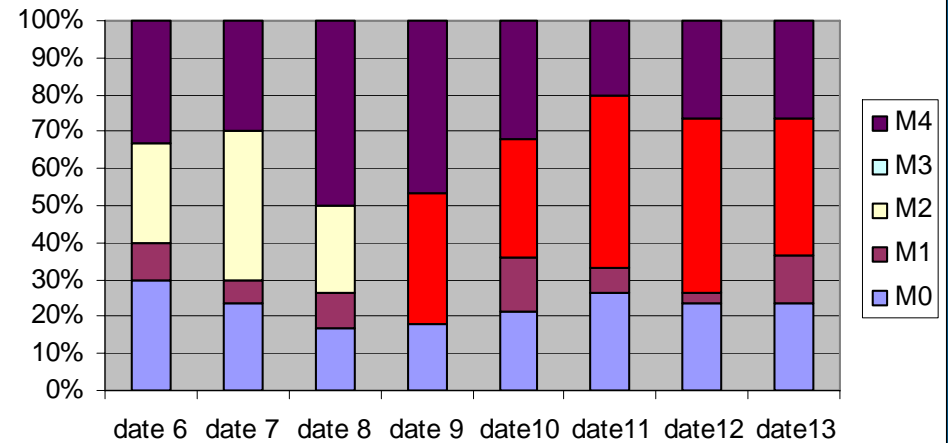


# (P)DD population dynamics – dynamics of individual lesions

% M stadia group 5 ('control', 1/w formalin)

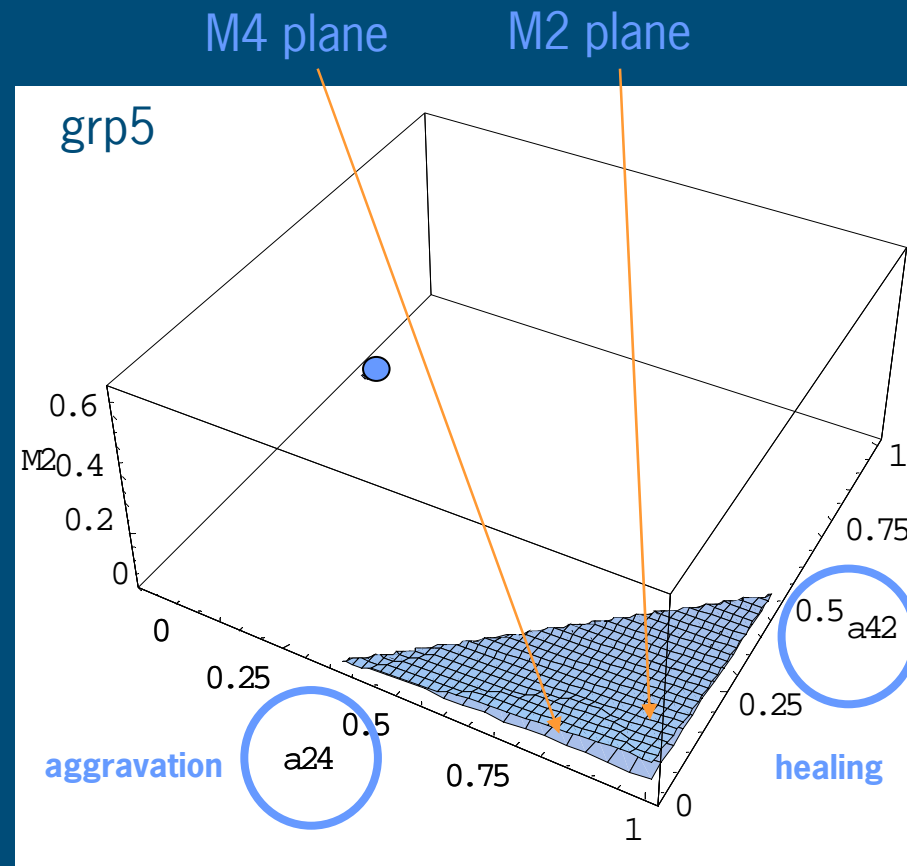


% M stadia group 4, 1/w 3% Soda



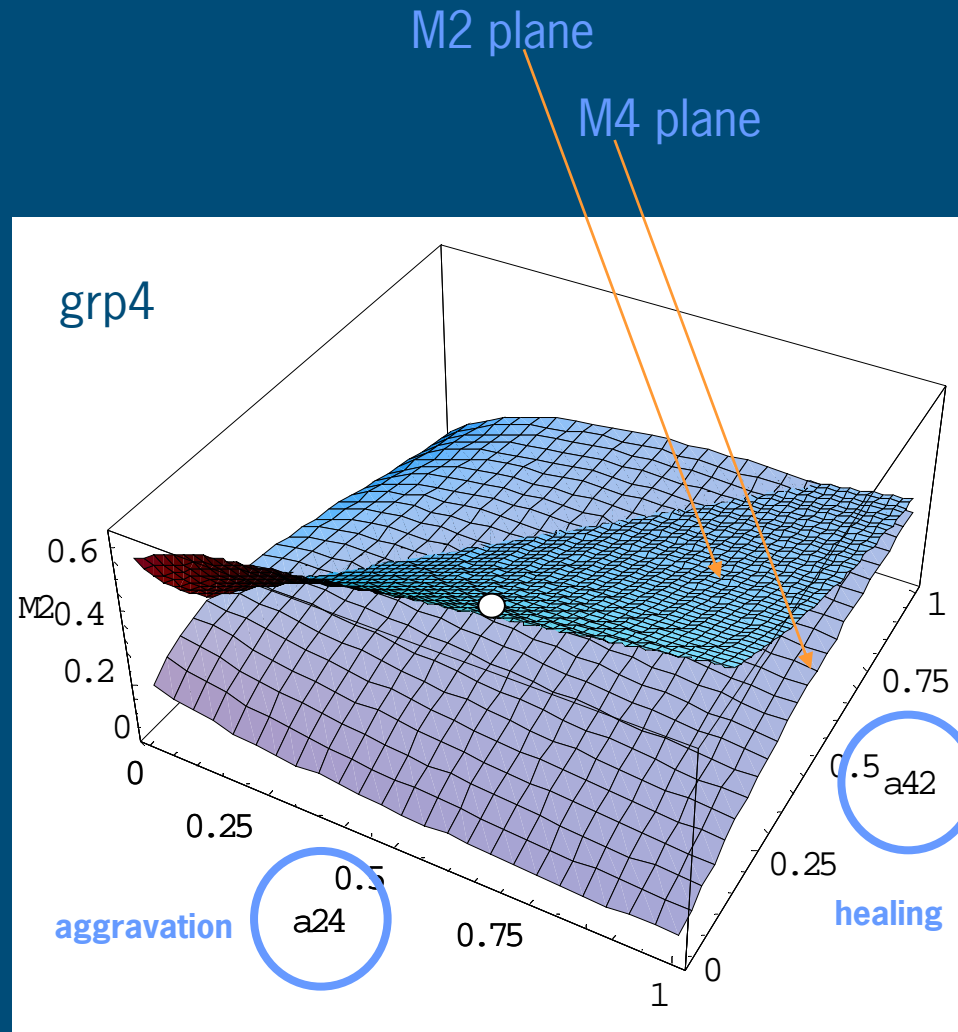
# (P)DD population dynamics – ‘aggravation (a24) by healing (a42)’ parameter planes

no outbreak

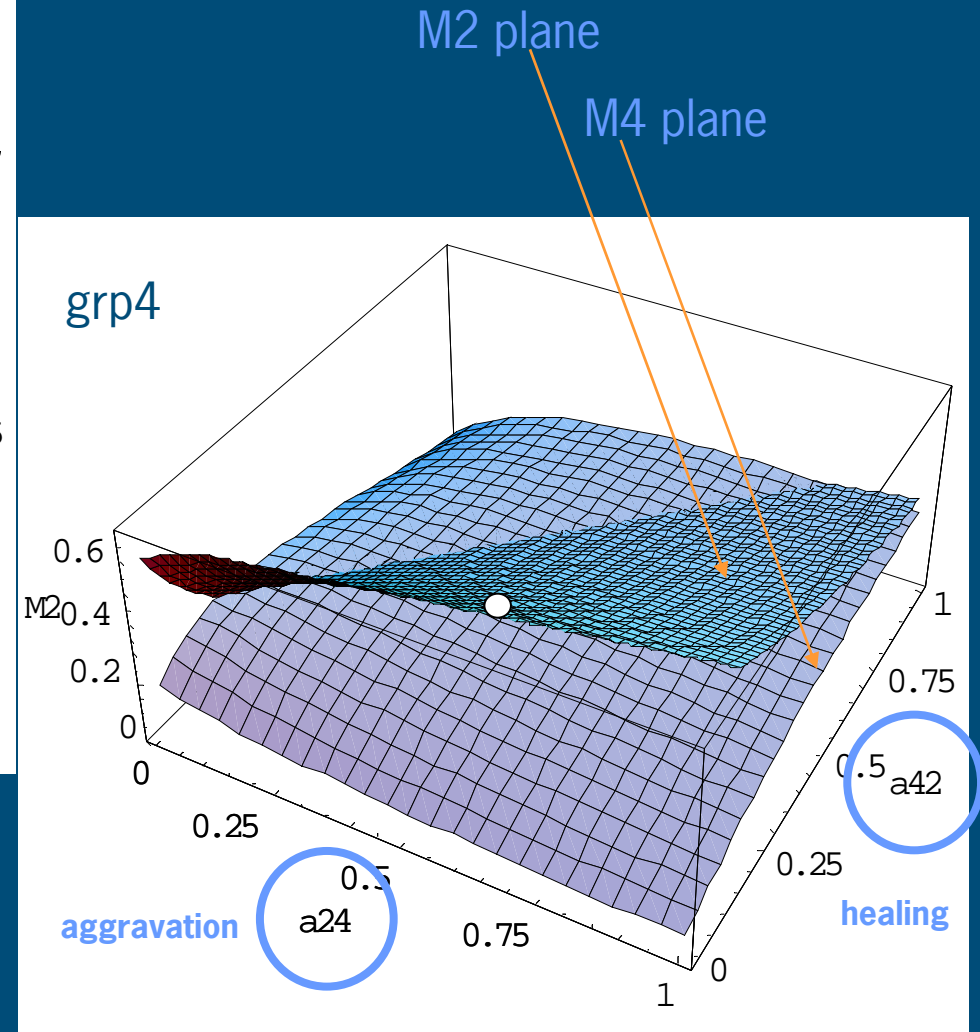
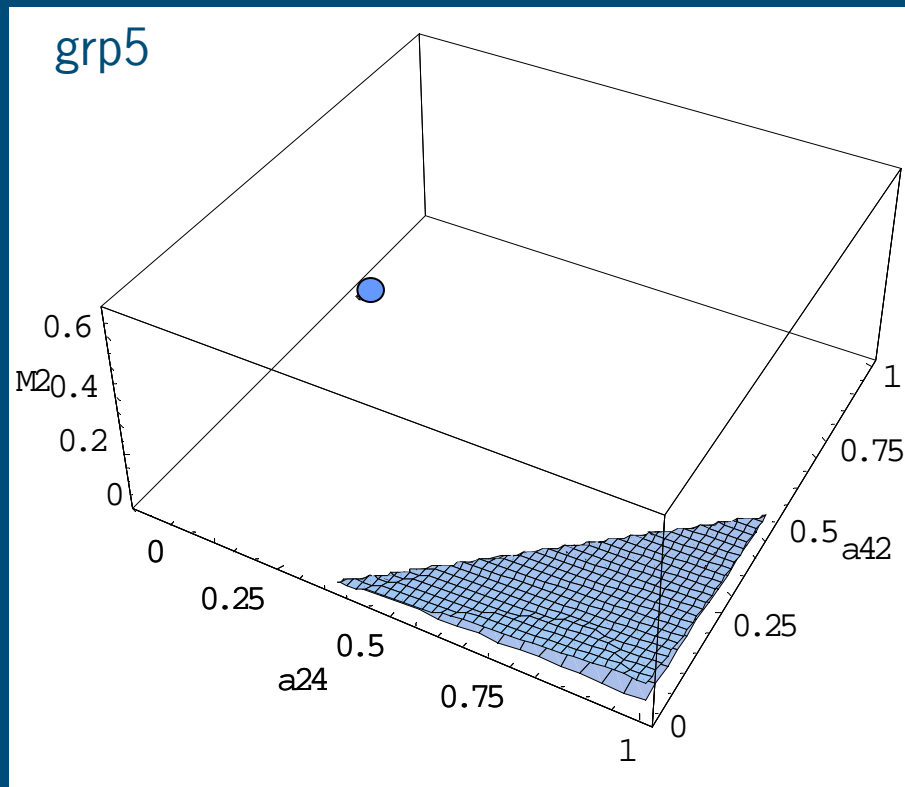


# (P)DD population dynamics – ‘aggravation (a24) by healing (a42)’ parameter planes

outbreak is  
to be expected

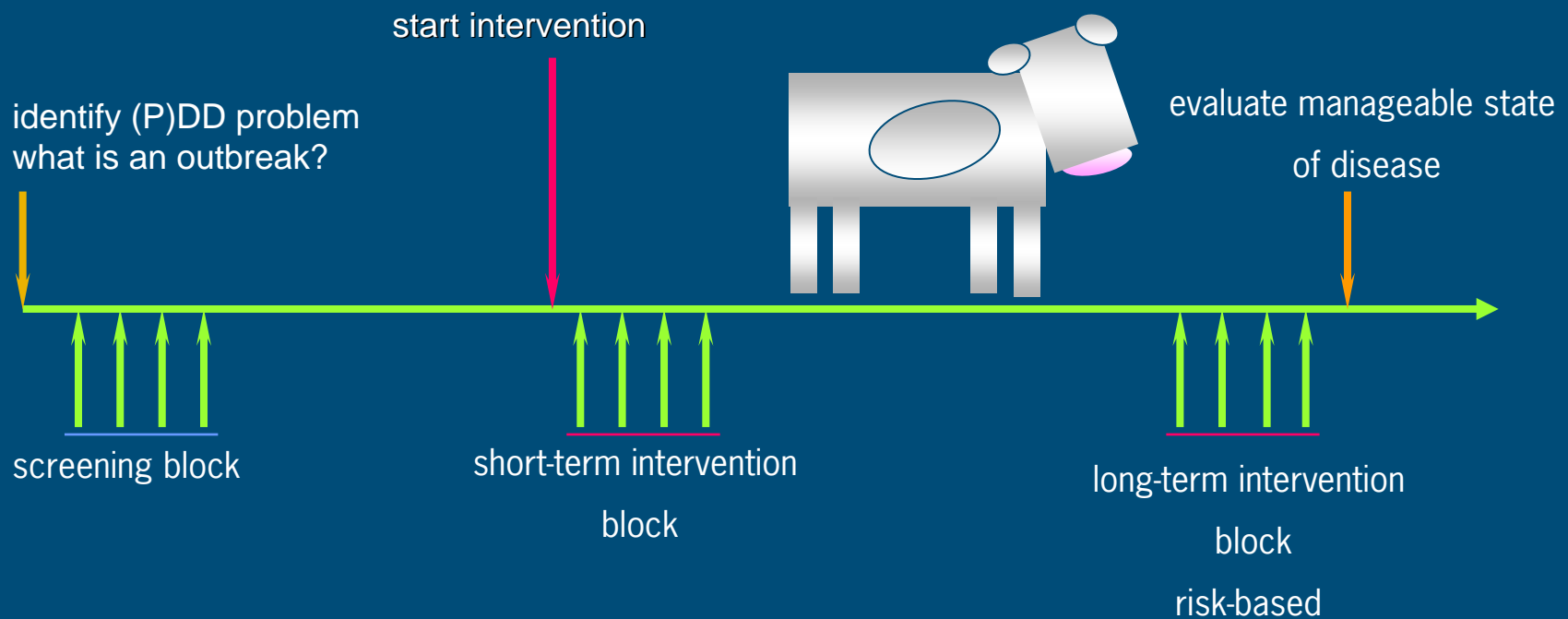


# (P)DD population dynamics – ‘aggravation (a24) by healing (a42)’ parameter planes



# what can be done?

- **time line for group management and transition monitoring** blocks of four clinical evaluations using a recording protocol



# what can be done?

- some animals need special attention!
- identify:  
problem animals
- use:  
sentinel animals  
during risk periods





## (P)DD population dynamics – conclusions

need to define the manageable state of disease

using a tool,

f.e. a dynamic model for

transitions between stages of (P)DD

population dynamic modeling for (P)DD)

is feasible and adds value to optimization strategies



■ Thank you for your attention!!!!

