Attempts to eradicate some respiratory and enteric pathogens in Danish pig farms

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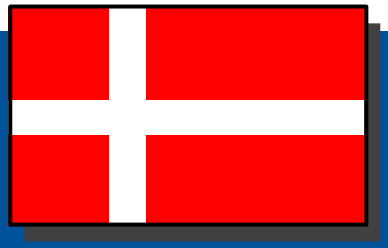

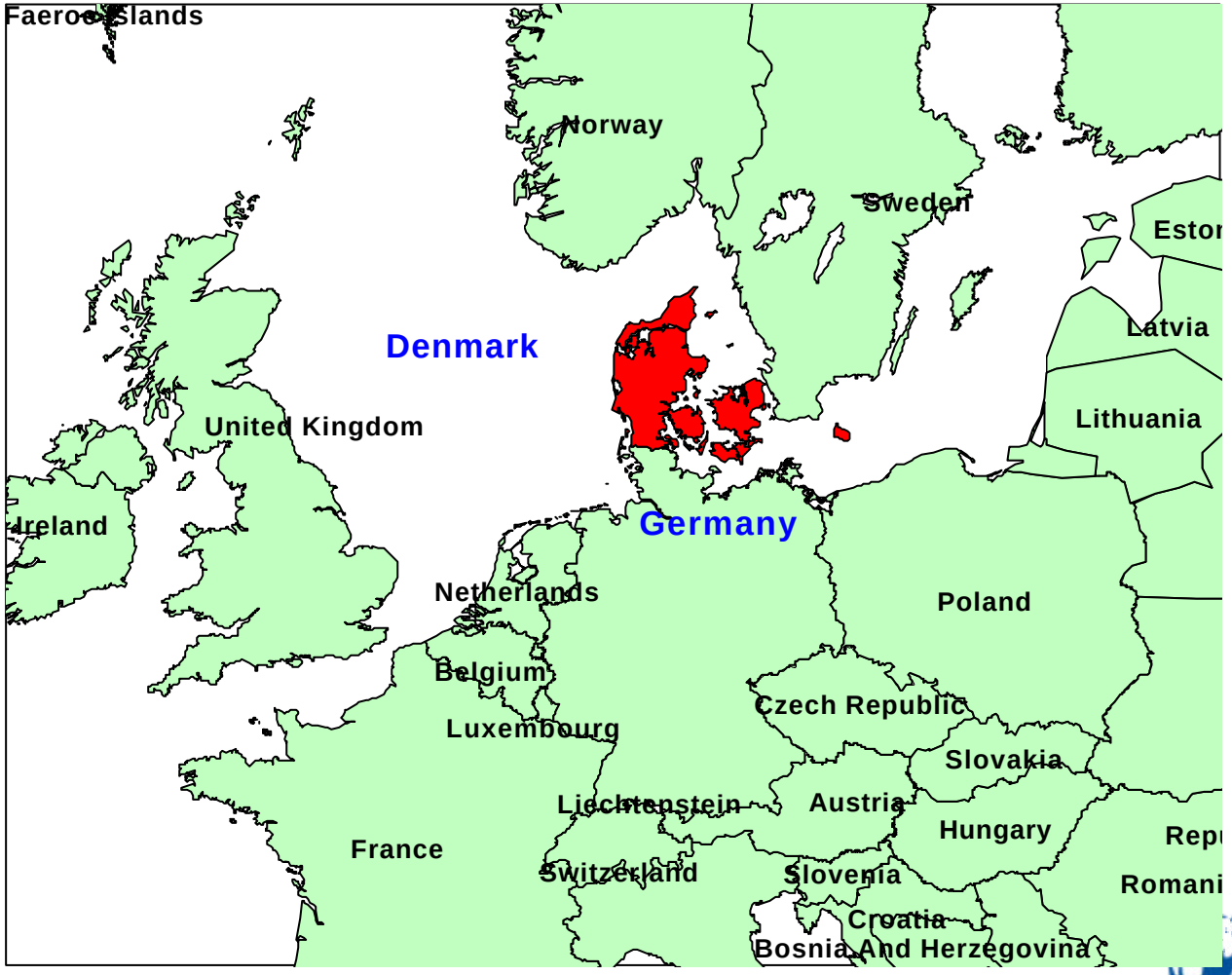

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Agenda

- General matters about elimination of disease
- Attempts to eradicate some respiratory and enteric pathogens in Danish pig farms

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General matters about elimination of disease

- Denmark has a long history of eradication of diseases on country level and farm level.
- Denmark was free from some of the infections of importance before the Specific Pathogen Free (SPF) system was established in 1971.
- Establishment of SPF system has made it possible to control further some important diseases in Danish pig farms.

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List A Infections
Serious and very rapidly communicable

- Foot and mouth disease: Last outbreak in 1983
- Swine vesicular disease: Never recorded
- Classical swine fever: Last outbreak in 1933
- African swine fever: Never recorded
- Teschen disease: Never recorded

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List B Diseases

Communicable infections of some importance

- Aujeszky's disease: Eradicated in 1986
- Leptospirosis: (Last outbreak in 1991)
- Brucella suis: No clinical outbreaks recorded
- TGE: One outbreak since 1969
- Trichinella spiralis: Never recorded
- S. cholerasuis: Last reported in pigs in 1930

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SPF - Diseases

- Enzootic pneumonia: Mycoplasma hyopneumoniae
- Pleuropneumonia: A. pleuropneumoniae
- Atrophic rhinitis: Toxigenic Pasteurella multocida
- Swine dysentery: Brachyspira hyodysenteriae
- Mange: Sarcoptes scabie
- Lice: Haematopinus suis

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Control of diseases

- Changes in management
- Changes in production system
- Vaccination
- Antibiotic medication
- ELIMINATION OF PATHOGENS
  - Eradication on country level
  - Eradication on herd level

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Why elimination on herd level ?

- Higher productivity
- Higher price on pigs
- Less variation in production costs
- Less work
- Less use of antibiotic
- Lower risk of resistance
- Higher animal welfare

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Elimination of diseases

Three different principles

1. **Total depopulation/repopulation (SPF)**
2. Test and removal
3. **Partial depopulation and medication**

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Partial depopulation and medication

- Introduction of multiple-site production systems and all-in-all-out has significantly improved the possibility for elimination of some pathogens from the farms.
  - More attractive because stop of production due to depopulation is much shorter.
  - This procedure can preserve genetic material of breeding stock.

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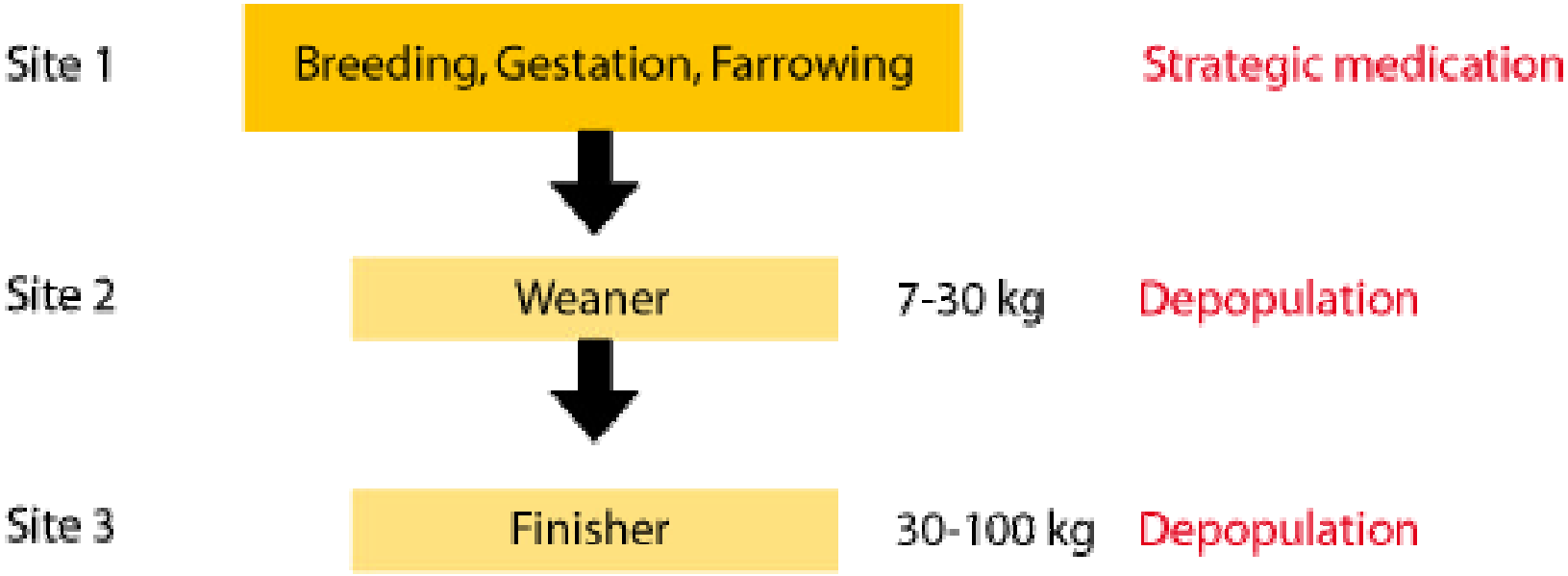
Multiple-site production system and all-in-all-out



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Partial depopulation and medication

The procedure for elimination of M. hyopneumoniae, A. pleuropneumoniae, B. hyodysenteriae, S. scabiei var. suis

- For a minimum period of 14 days on site one (breeding, gestation, farrowing) only breeding animals older than 10 months may be present in the herd.
  - This means that all young animals are moved out from the herd area while farrowing is stopped for 14 days.
- All remaining breeding animals are medicated orally daily with suitable antimicrobial/s for a minimum of 14 days.

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Partial depopulation and medication

The procedure for elimination of M. hyopneumoniae, A. pleuropneumoniae, B. hyodysenteriae, S. scabiei var. suis

- Thorough cleaning and disinfection once or twice daily in the area where the animals are. All depopulated pens are cleaned and disinfected.
- Depopulation of weaners and finishers on site two and three. Cleaning and disinfection, and the units must be empty for 21 days.
  - All-in-all-out on site two and three after repopulation.

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Attempts to eradicate Lawsonia intracellularis by medication in Danish swine herds

- Eradication programme at the farm was carried out with two strategies:

  1. Partial depopulation and medication

  2. Depopulation and medication of repopulated young gilts infected with Lawsonia

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The procedure for elimination of *L. intracellularis* and strategic medication

- The total depopulation on the farm followed by cleaning and disinfection of the empty units, which must be empty for at least 21 days. Rodent control should be carried out.

- All new gilts entering the farm are medicated orally with suitable antimicrobial/s in therapeutic doses for 14 days.

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The procedure for elimination of *L. intracellularis* and strategic medication

- After 14 days treatment move to the other cleaned and disinfected pens/units in the farm area.
  - Clean and disinfect the hoofs and skin of the pigs.
  - Clean and disinfect pens that the animals come from.
  - Medication of gilts continues with antimicrobials for the next 14 days.

The procedure for elimination of *L. intracellularis* and strategic medication

- After the eradication has been carried out:
  - All new purchased gilts are kept in quarantine facilities until they are allowed into the farm.
  - During the quarantine period they will go through the same medication procedure as above.

Partial depopulation and medication

- In general more emphasis on cleaning and disinfection and eradication of rodents in case of enteric pathogens.

- Treatment duration for enteric pathogens can also fluctuate depending on specific farm conditions, such as the possibility of effective cleaning and disinfection and whether breeding animals are in small or large groups etc.

Partial depopulation and medication

- In some cases in order to reduce production stop piglets in the farrowing units were included in the elimination procedure and were treated parenterally by suitable antimicrobial/s on day two, seven and 14.
  - After weaning piglets were removed from the herd area.
  - Only piglets born after 14 days oral medication of breeding animals can repopulate the depopulated area at the farm on site 2.

Partial depopulation and medication

- For eradication of mange ivermectin was used parenterally twice at an interval of 14 days. Often eradication of mange was carried out simultaneously with eradication of the other above pathogens.

- A specific protocol designed for the particular farm should always be prepared by the farm responsible veterinarian, sometimes after consultation with other specialists in the area.

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Bio-security

Before eradication

- Consider the level of bio-security
- Re-introduction of pathogen
  - Visitors and trucks
  - Infected replacement stock
  - Airborne transmission

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Airborne transmission

Risk increases by

1. Size and number of neighbour farms
2. Size of own farm

Safe distance

- Enzootic pneumonia (*M hyo*): 2-3 km
- Pleuropneumonia : ½-1 km

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Airborne transmission

- In Denmark a geographical information system (GIS) is implemented which gives information about all swine farms, including size of the farm.
- The probability of staying non-infected can be calculated.

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Before the start of the eradication procedure

- Laboratory confirmation by isolation of pathogens, like *B. hyodysenteriae* or *A. pleuropneumoniae*, and testing for susceptibility to antimicrobials is necessary.
- For other microorganisms confirmation of the presence of pathogens by suitable laboratory methods should be carried out.
- There must not be any clinical symptoms, only healthy carriers, at the farm just before the eradication procedure is initiated.

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Selection of antimicrobials for eradication of the individual pathogen

- Very low MIC value
- Very efficient for treatment of infection
- Show under experimental conditions that they can eliminate pathogens from the pig

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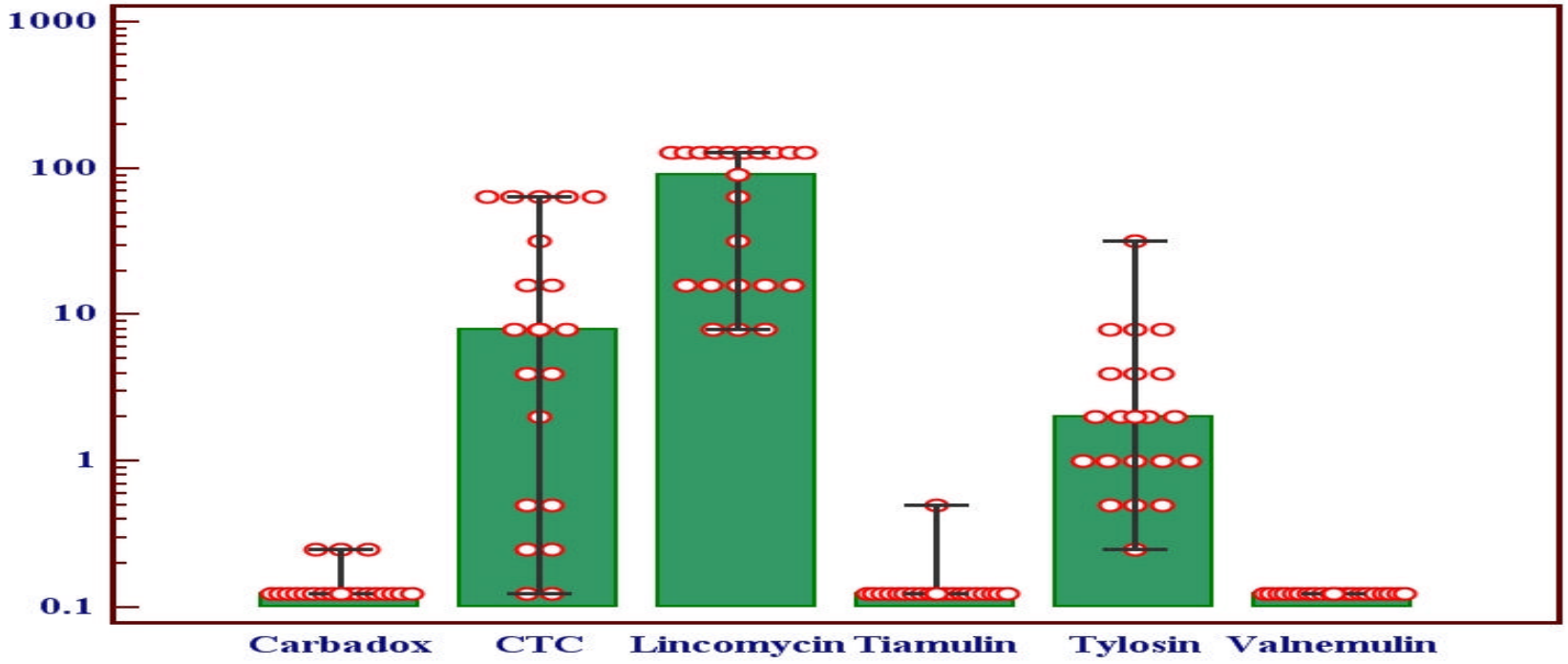
In vitro testing of antimicrobial agents for *Lawsonia intracellularis*



Wattanaphansak, S., Gebhart, C., Singer, R., Dau., D.
American Association of Swine Veterinarians, 2007, p. 255-256

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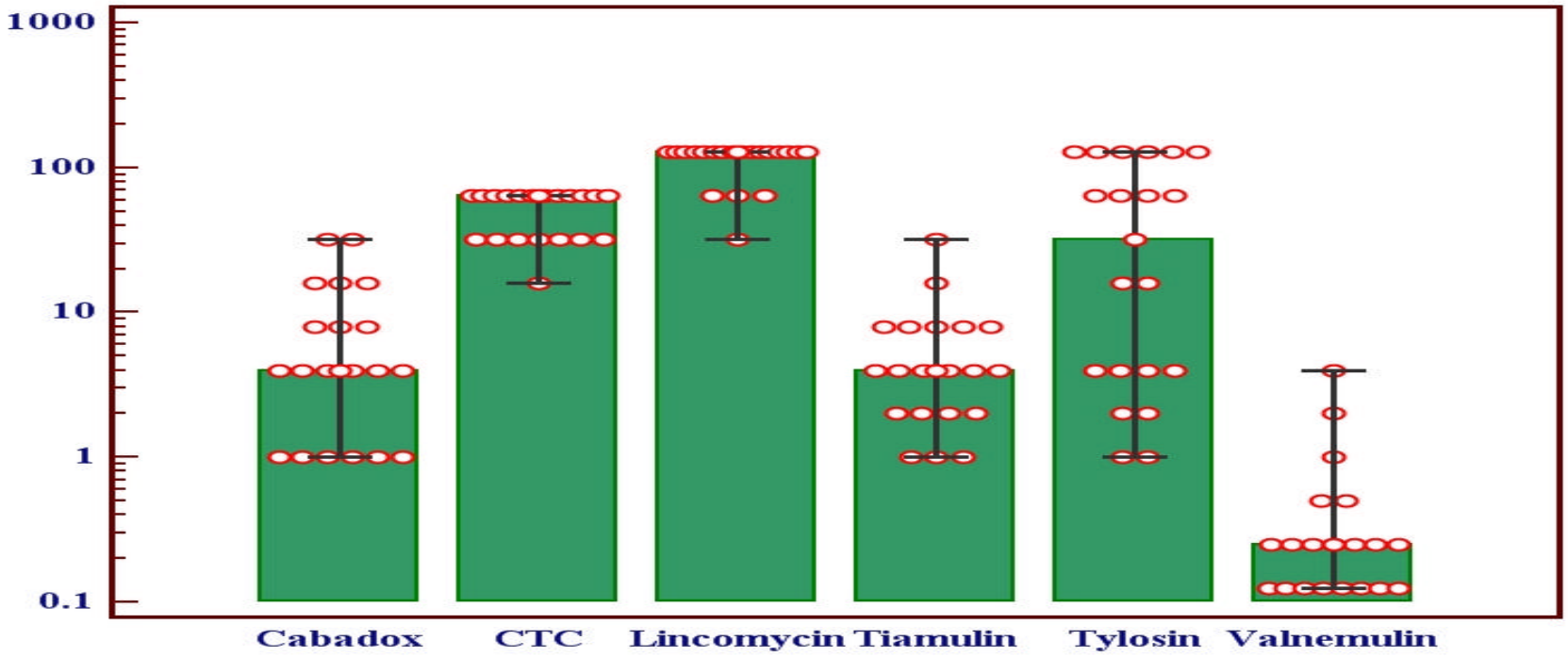

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After the elimination procedure has been carried out

- The farm should be monitored for clinical symptoms and specific pathogens by using suitable laboratory tests.
- In general under Danish conditions a farm should be tested once a month with at least 20 animals until it is declared free according to the Danish SPF guidelines for:
  - Six months — *B. hyodysenteriae*
  - 10 months — *M. hyopneumoniae*
  - 24-36 months — *A. pleuropneumoniae*

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Partial depopulation and medication

- The most frequently used antibiotic for elimination of *M. hyopneumoniae, B. hyodysenteriae* and *L. intracellularis* from the pig units is tiamulin (Tiamutin).

- For elimination of *A. pleuropneumoniae* several different antibiotics have been used, alone or in combination
  - Fluoroquinolones: enrofloxacin (Baytril), marbofloxacin (Marbocyl)
  - Tilmicosin (Pulmotil)
  - Tiamulin (Tiamutin).
  - Combinations of antimicrobials:
    - Fluroquinolones in combination with tilmicosin
    - Tiamulin in combination with chlortetracycline and fluoroquinolones.

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Partial depopulation and medication

- For elimination of *S. scabiei var. suis* ivermectin (Ivomec).
- In general, doses of antimicrobials which were used for eradication procedure were in accordance with legislation.
- Treatment duration was sometimes longer than stated in the data sheets.

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Partial depopulation and medication

- This strategy was used in Denmark for eradication of several infections, important in Danish SPF system, like:
  - *Brachyspira hyodysenteriae*
  - *Sarcoptes scabiei var. suis* (Mange)
  - *Mycoplasma hyopneumoniae*
  - *Actinobacillus pleuropneumoniae*
  - *Lawsonia intracellularis*

  - *Mycoplasma hyosynoviae*
  - Toxigenic *Pasteurella multocida*

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Attempts to eradicate some respiratory and enteric pathogens in Danish pig farms

- Results
  - The depopulation/repopulation method is safe with a success rate close to 100 per cent.
  - Partial depopulation and strategic medication success rate:
    - With a consistent success rate of approx. 90 per cent for elimination of *B. hyodysenteriae* and *M. hyopneumoniae.*
    - With a consistent success rate of approx. 100 per cent for elimination of *Sarcoptes scabiei var. suis.*
    - Success rate after two years for elimination of *A. pleuropneumoniae* is less than 10 per cent.
    - Freedom from *L. intracellularis* infection was on average two years.

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Partial depopulation and medication
Elimination of A. pleuropneumoniae

- This method is not reliable for *A. pleuropneumoniae* with a success rate of less than 10 per cent.
- *A. pleuropneumoniae* survive on the tonsils.
  - Can be introduced to the herd by carrier breeding animals which do not always show seroconversion.
- It is probably difficult to eliminate the microorganism from the tonsils by medication.

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Cost benefit analysis

- Depends on how substantial production losses have been incurred.
- How long was production stop in connection with eradication procedure?
- Some cost benefit analyses were carried out:
  - Showing that cost of eradication of swine dysentery and *M. hyopneumoniae* infection was regained within 12 months.
  - Sometimes in spite of recurrent infection improvement in the production result leads to regaining of the costs within two-three years.

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- THANK YOU FOR YOUR ATTENTION

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