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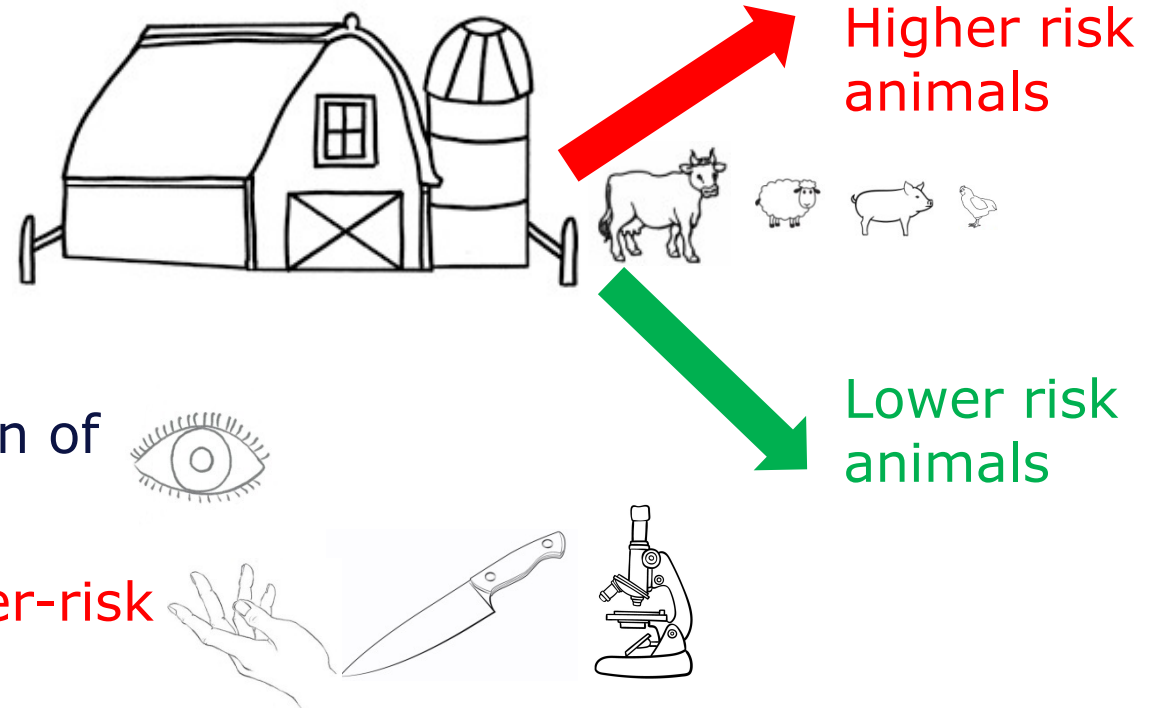
**RIBMINS**

# New application possibilities in the diagnostic methods: Acute phase proteins

Bojan Blagojevic | 16-June-2023 | online

# Introduction

- Risk categorisation of farms
- Risk-based meat inspection
  - simplified post-mortem examination of **lower-risk groups**
  - more detailed examination of **higher-risk groups**
- Can Acute Phase Proteins help with this?



# What are Acute Phase Proteins (APPs)?

- **Group of blood proteins that reach different concentrations in animals suffering from infection, inflammation, surgical trauma and/or stress**

- Haptoglobin

- Serum amyloid A

- C-reactive protein

- Pig major acute phase protein

- Alpha-1-acid glycoprotein

- Ceruloplasmin

- Fibrinogen

- Transferrin

- Albumin

positive APPs (*the levels are **increased** in diseased animals*)

negative APPs (*the levels are **decreased** in diseased animals*)

# Haptoglobin (Hp)

- One of APPs, synthesised in liver and released into circulation

## Increased Hp in cattle

- ✓ Metritis or mastitis
- ✓ Endocarditis or pericarditis
- ✓ Lameness
- ✓ Bovine respiratory syncytial virus
- ✓ Foot and mouth disease infection
- ✓ *P. multocida* or *Mycoplasma* infection
- ✓ Tuberculosis (*M. bovis*)
- ✓ Fatty liver
- ✓ Transport stress
- ✓ Traumatic reticuloperitonitis

## Increased Hp in pigs

- ✓ Pneumonia (*Mycoplasma hyopneumoniae*)
- ✓ Lameness
- ✓ Pleuritis
- ✓ Clinical signs of respiratory disease
- ✓ Diarrhoea
- ✓ Porcine circovirus infection
- ✓ Stress due to long transport
- ✓ Castration
- ✓ Tail biting

# Serum amyloid A (SAA)

- APP mainly synthesised in liver (extrahepatic production possible too) and released into circulation

## Increased SAA in cattle

- ✓ Sub-clinical inflammation
- ✓ Lameness
- ✓ Metritis
- ✓ Mastitis
- ✓ Foot and mouth disease infection
- ✓ BVD
- ✓ *Manheimia haemolytica*
- ✓ Transport stress
- ✓ 3 day starvation

## Increased SAA in pigs

- ✓ *Actinobacillus pleuropneumoniae*
- ✓ PRRS virus
- ✓ Swine influenza

# C-reactive protein (CRP) and pig major APP (pig-MAP)

- CRP – very well studied and used in human medicine

## Increased CRP in cattle

- ✓ Mastitis
- ✓ Endometritis
- ✓ Pneumonia
- ✓ Food root

- Pig-MAP – pigs' specific

## Increased CRP in pigs

- ✓ *Actinobacillus pleuropneumoniae* infection
- ✓ *Pasteurella multocida* infection
- ✓ Prolonged transportation

## Increased pig-MAP

- ✓ PRRS
- ✓ Influenza
- ✓ *Pasteurella multocida* infection
- ✓ Prolonged transportation

# How can APPs contribute to risk-based meat inspection?

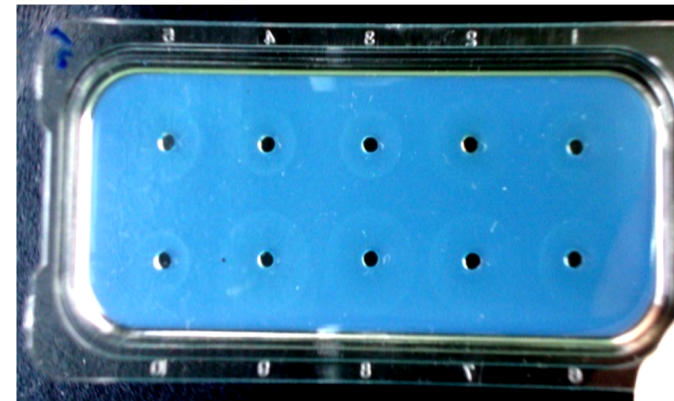
- May provide **alternative means of monitoring animals' health** including in the context of meat inspection
- Might be relevant in **risk categorisation of farms/animals** in a context of risk based meat inspection
- Could be particularly important in **decision about condemnation:**
  - to **distinguish between acute** (i.e. when a hazards could still be present in blood/meat) **and chronic processes** (i.e. when a hazard is usually absent)

# Example – Hp study

## A Study of Haptoglobin Levels in Groups of Cattle and Pigs With and Without Abnormalities at Meat Inspection

Bojan Blagojevic, Dragan Antic, Miroslav Ducic, and Sava Buncic

- 96 cattle and 97 pigs
- AM and PM performed
- Hp levels determined
- Aim:
  - to evaluate differences in Hp levels between animals with and without abnormalities found at meat inspection
  - to evaluate Hp usefulness in risk categorisation of cattle/pig batches





# Results - cattle

According to farm type	Mean Hp value (µg/mL)
Group I: 3 cattle-only farms (n=13)	52.3
Group II: 6 small "general" farms (n=23)	96.9
Group III: 27 small "general" farms, but held and delivered to abattoirs by resellers (n=60)	172.5

According to meat inspection findings	Mean Hp value (µg/mL)
Cattle (n=48) without abnormalities	49.8 (a)
Cattle (n=48) with abnormalities	226.5 (b)
b>a (p=0.00001)	

**Important notes:**  
- huge SD  
- many animals with no lesions had high Hp and *vice versa*

# Results - pigs

According to farm	Mean Hp value (µg/mL)
A (n=28)	1,065.4
B (n=20)	1,166.0
C (n=9)	1,015.6
D (n=20)	1,415.0
E (n=20)	1,088.5

According to meat inspection findings	Mean Hp value (µg/mL)
Pigs (n=41) without abnormalities	842.9 (a)
Pigs (n=56) with abnormalities	1,389.3 (b)
b>a (p=0.0000000000000001)	

**Important notes:**  
- huge SD  
- many animals with no lesions had high Hp and *vice versa*

## Concluding remarks

- APPs are promising tool that could be used in **risk-based meat inspection** and overall RB-MSAS aiming to improve meat safety
- APP levels could be used in as part of FCI in **risk categorisation of farms** – in combination with other serological analyses, prevalence of health problems, performance indicators, etc.
- Before practical implementation, **methods have to standardised and thresholds determined** (further research)

# QUESTIONS?