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***Helicobacter suis* in UK farmed pigs and retail meat products: implications for zoonotic transmission**

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SMART

POST DOCTORAL RESEARCH FELLOWS



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MTIF

Medical Technologies
Innovation Facility

Antimicrobial Resistance
Omics & Microbiota



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Biotechnology and
Biological Sciences
Research Council



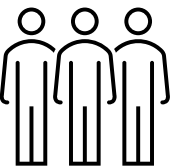
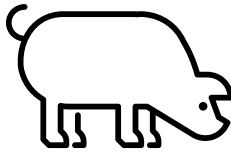
don whitley
scientific
culturing innovation



MICROBIOLOGY
SOCIETY

Helicobacter suis – A One Health concern

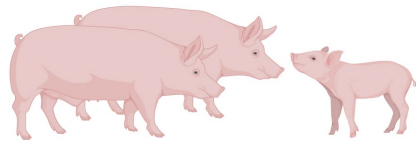
- Primarily colonises stomach of pigs (20-90%)
- Associated with gastritis, ulceration, hyperkeratosis
- Linked with sudden death and low daily weight gain
- Compensatory farming - 448.3 kg CO₂e ²
- Most common NHPH isolated from non-*H. pylori* gastric biopsies (29%¹)
- Increases the risk of MALT lymphoma



What we don't know



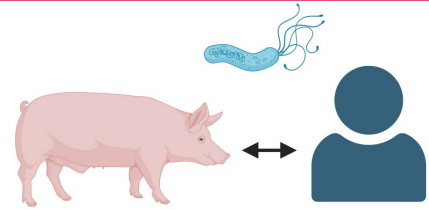
Growth requirements



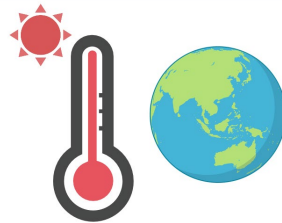
Animal welfare



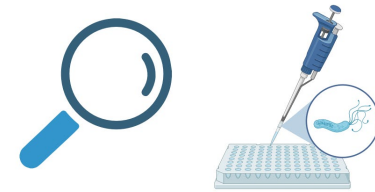
Treatment



Pig - human transmission



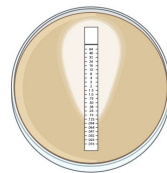
Environmental impact



Surveillance + diagnostics



Disease



AMR

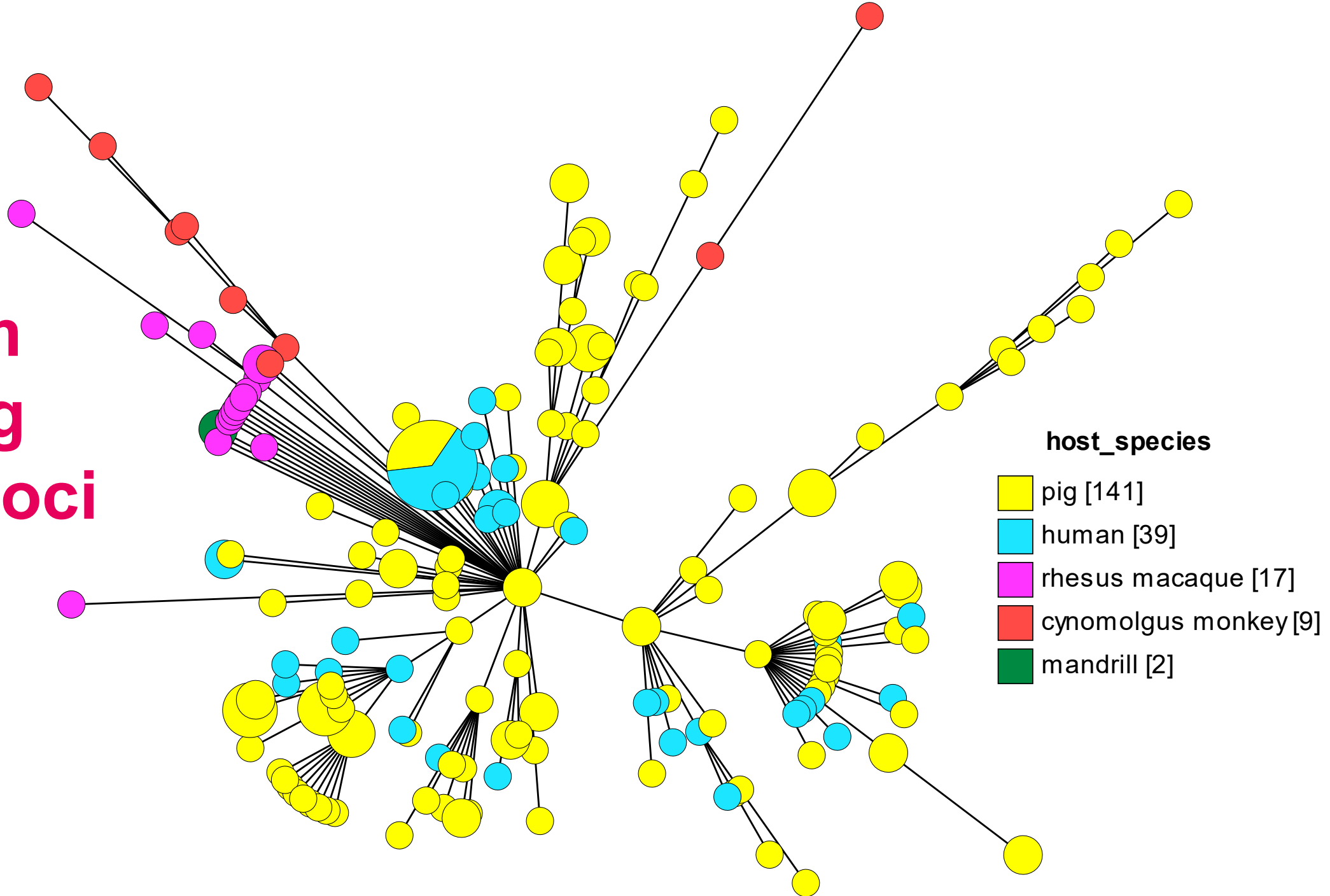


UK data



Submissions to PubMLST

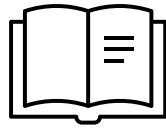
Minimum spanning tree – 7 loci MLST



The project

■ Background

- Viable *H. suis* on pig carcasses³ - Belgium
- *H. suis* in retail meat products⁴ - Belgium
- Hyperkeratosis of the *pars oesophagea* linked to infection⁵

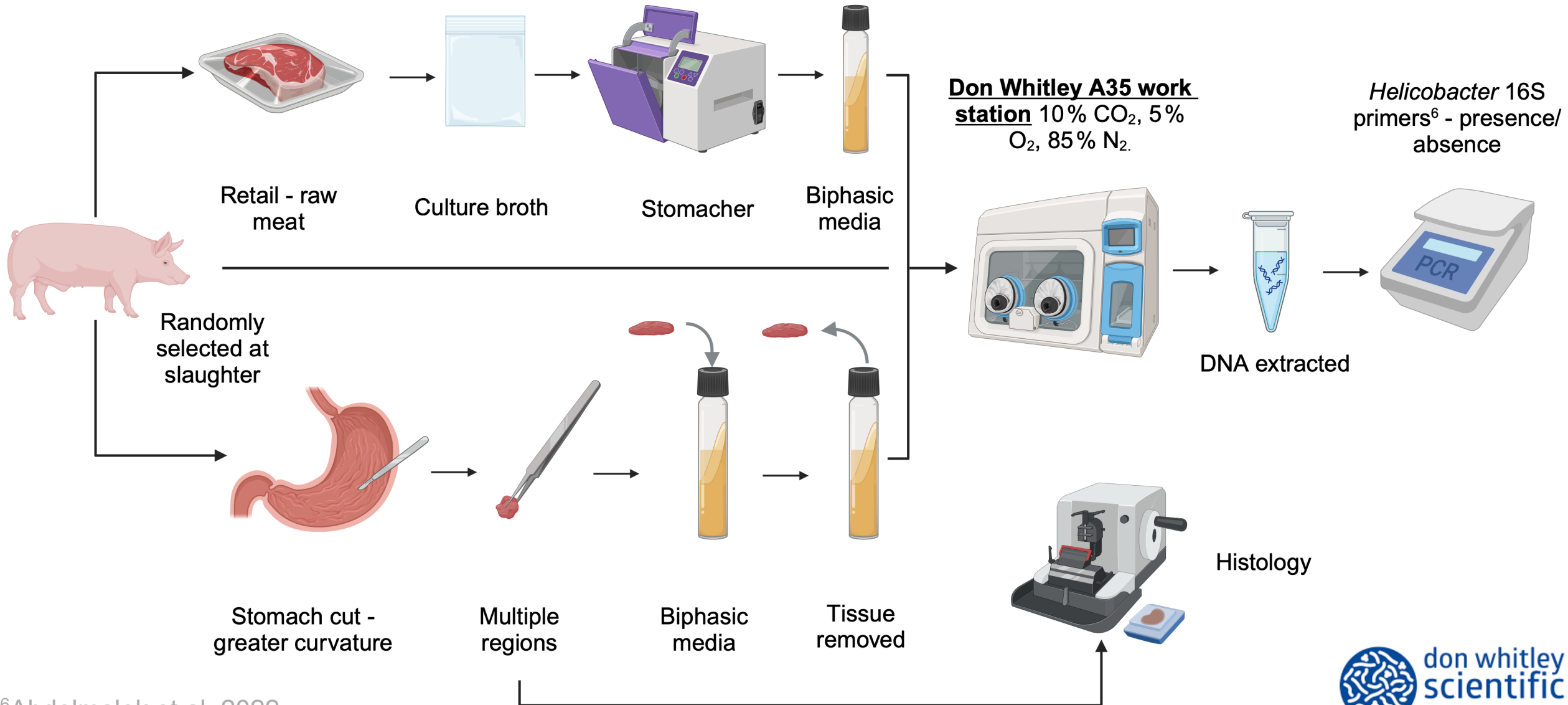


■ Aims

- Determine the prevalence of *H. suis* infection in UK farmed pigs
- Determine if *H. suis* is present in raw pork products for sale in the UK
- Determine if there is a link between *H. suis* infection and gastric disease



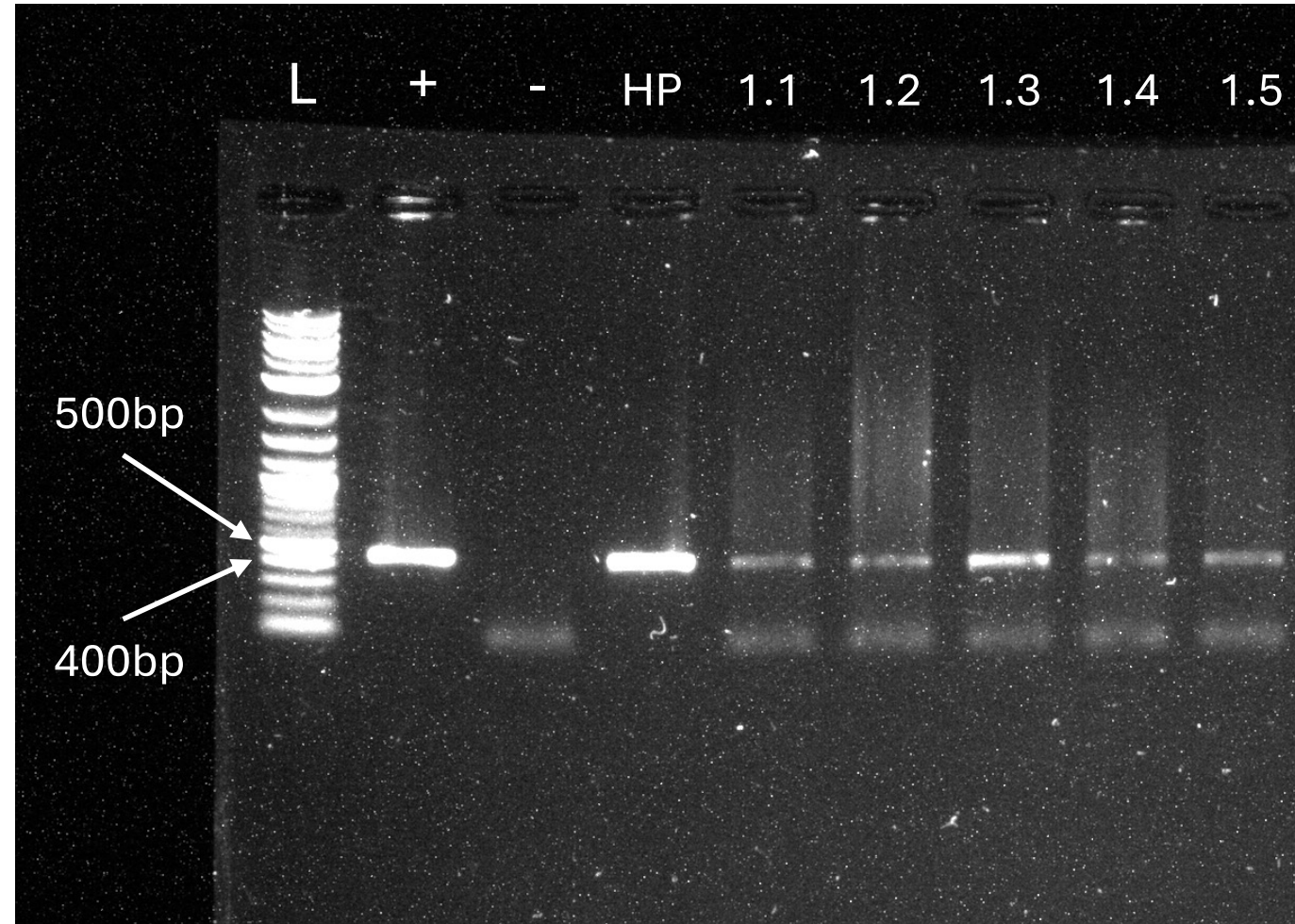
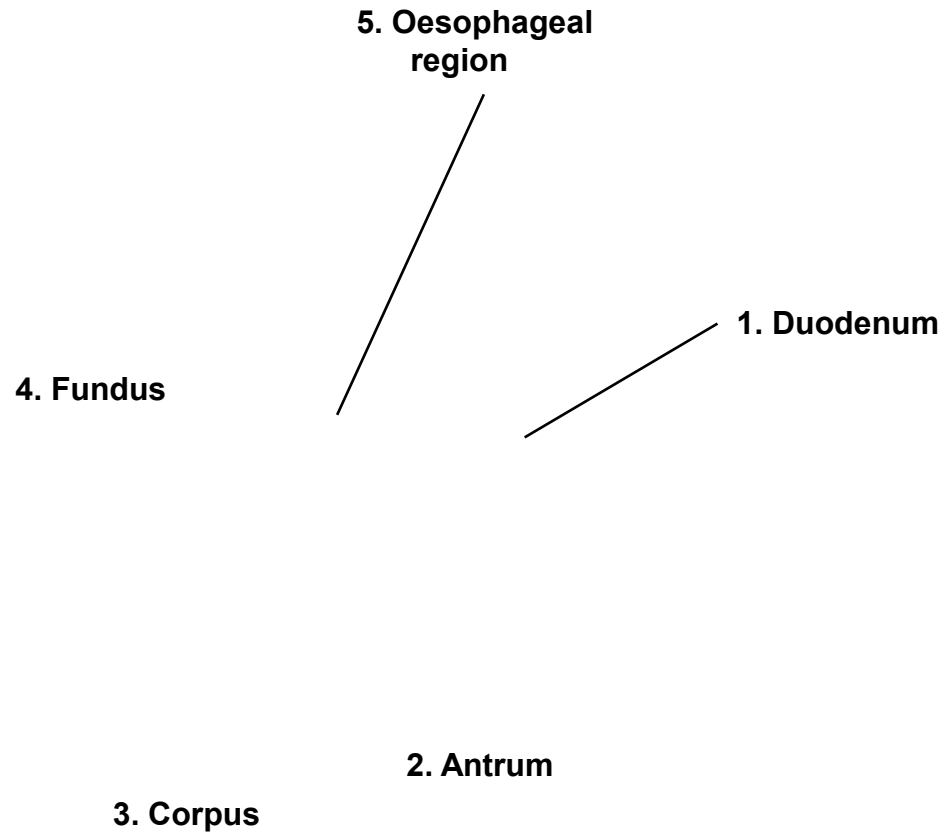
Isolation of *H. suis* and PCR confirmation



Results – prevalence

Sample	<i>Helicobacter</i> negative	<i>Helicobacter</i> positive	Percentage positive
Raw meat products	91	4	4.2%
Pig stomach	1	6	85.7%

H. suis was found across the stomach



Graphic warning – pig stomach

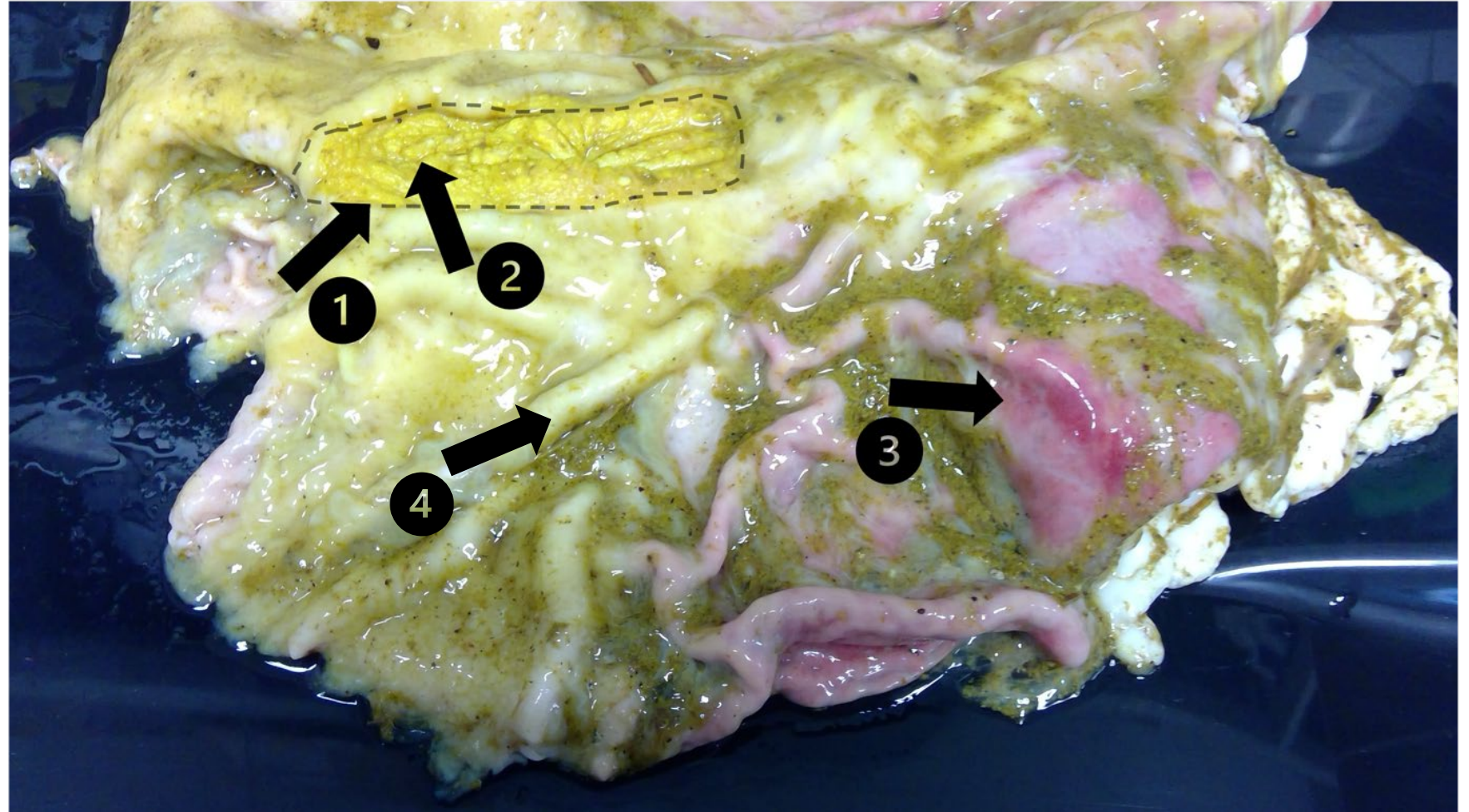
Hyperkeratosis, ulceration and inflammation

1 – Hyperkeratosis of the *pars oesophagea*

2 – Erosion/ ulceration

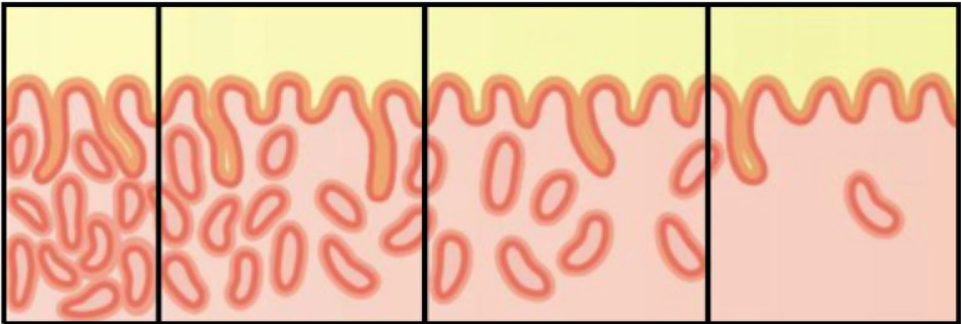
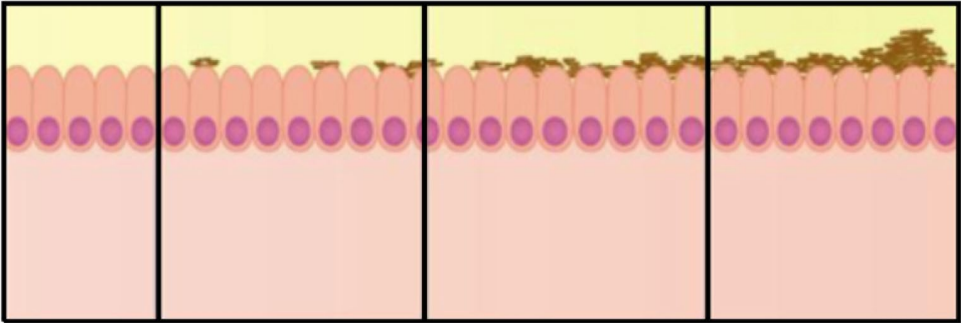
3 – Inflammation

4 – Healthy tissue



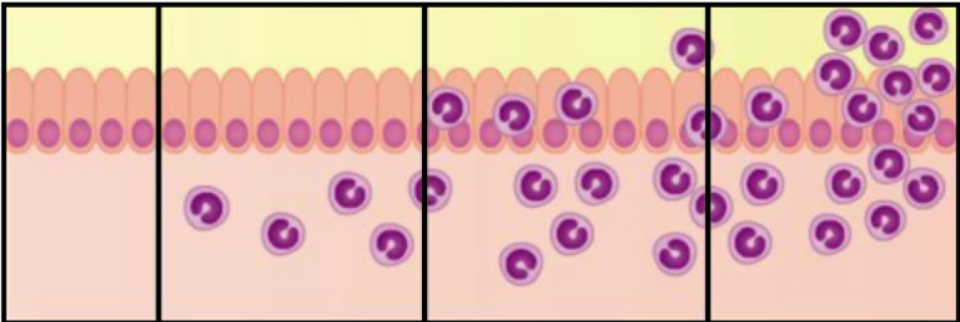
Histology⁷

Normal Mild(1) Moderate(2) Severe(3)

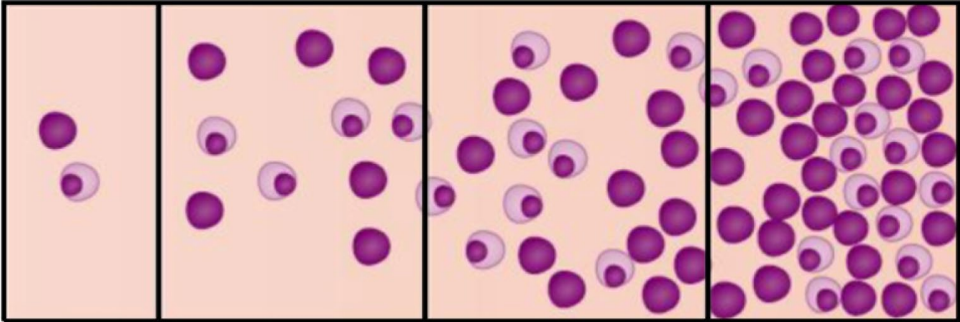


Atrophy

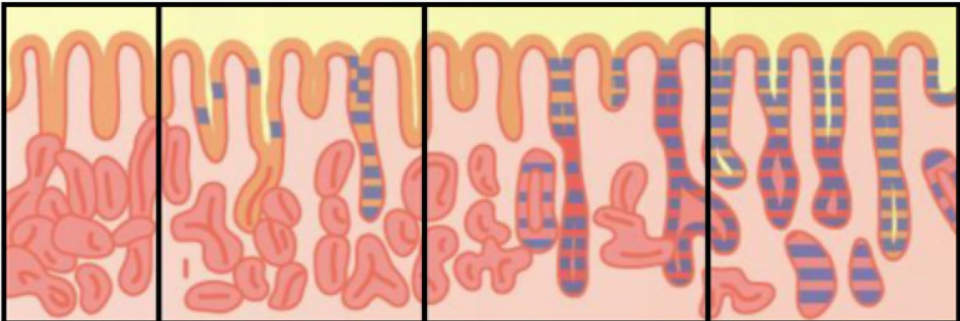
Normal Mild(1) Moderate(2) Severe(3)



Activity

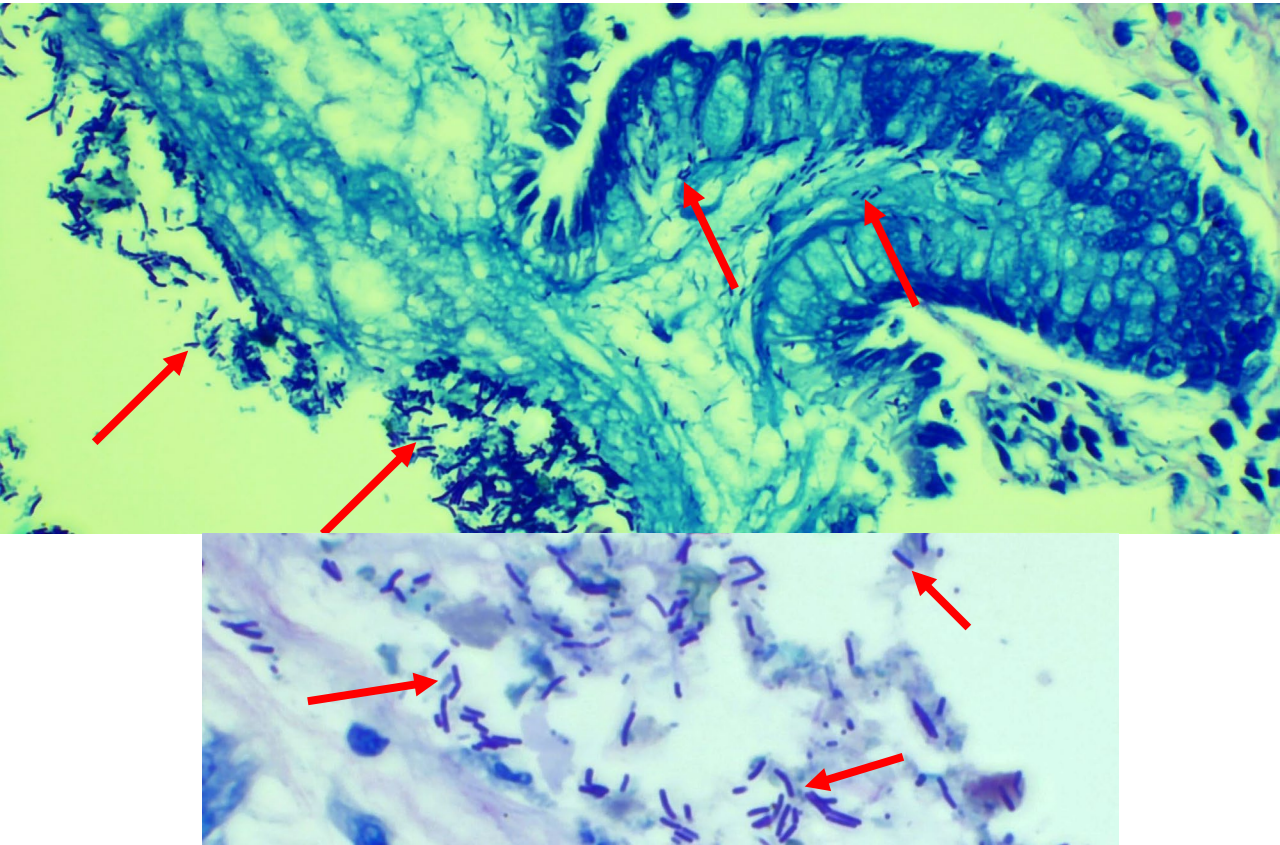


Chronic inflammation

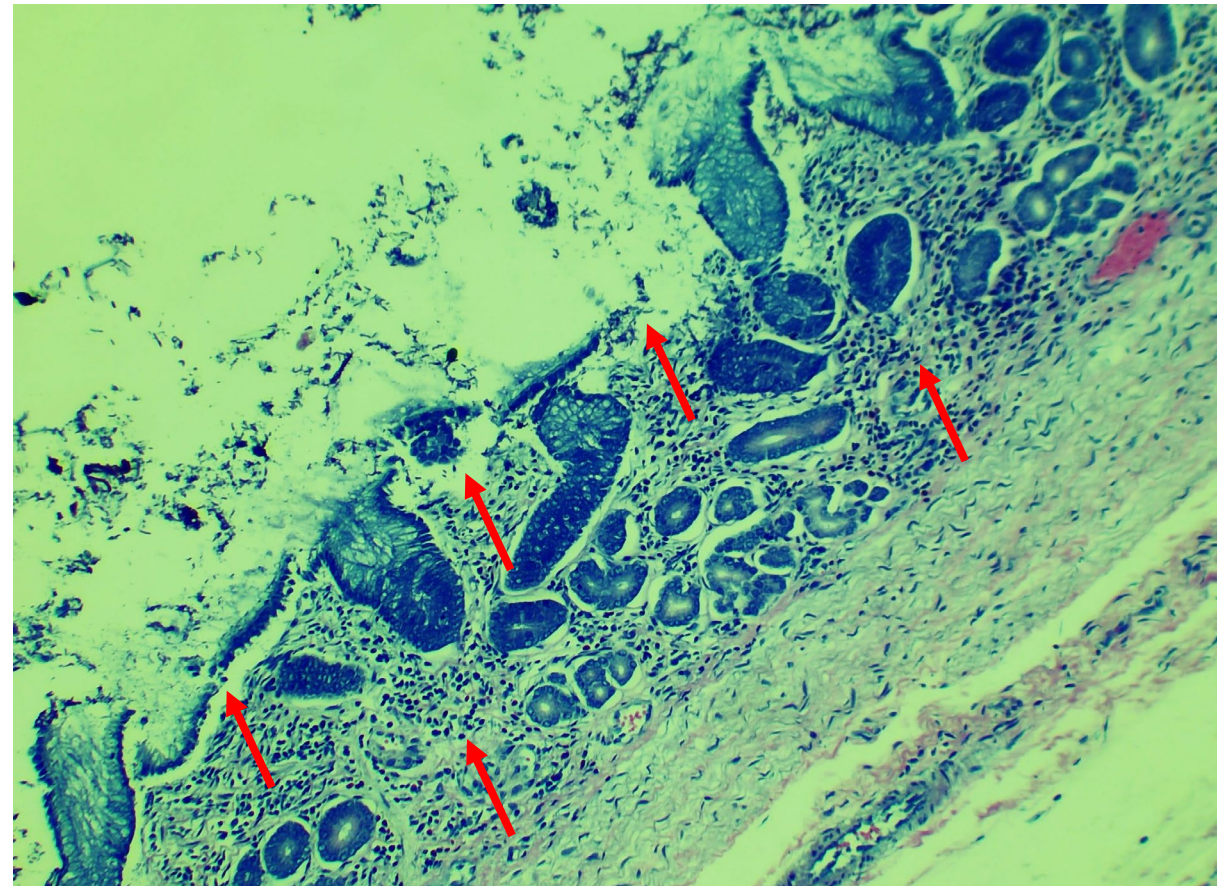


Intestinal metaplasia

Histology

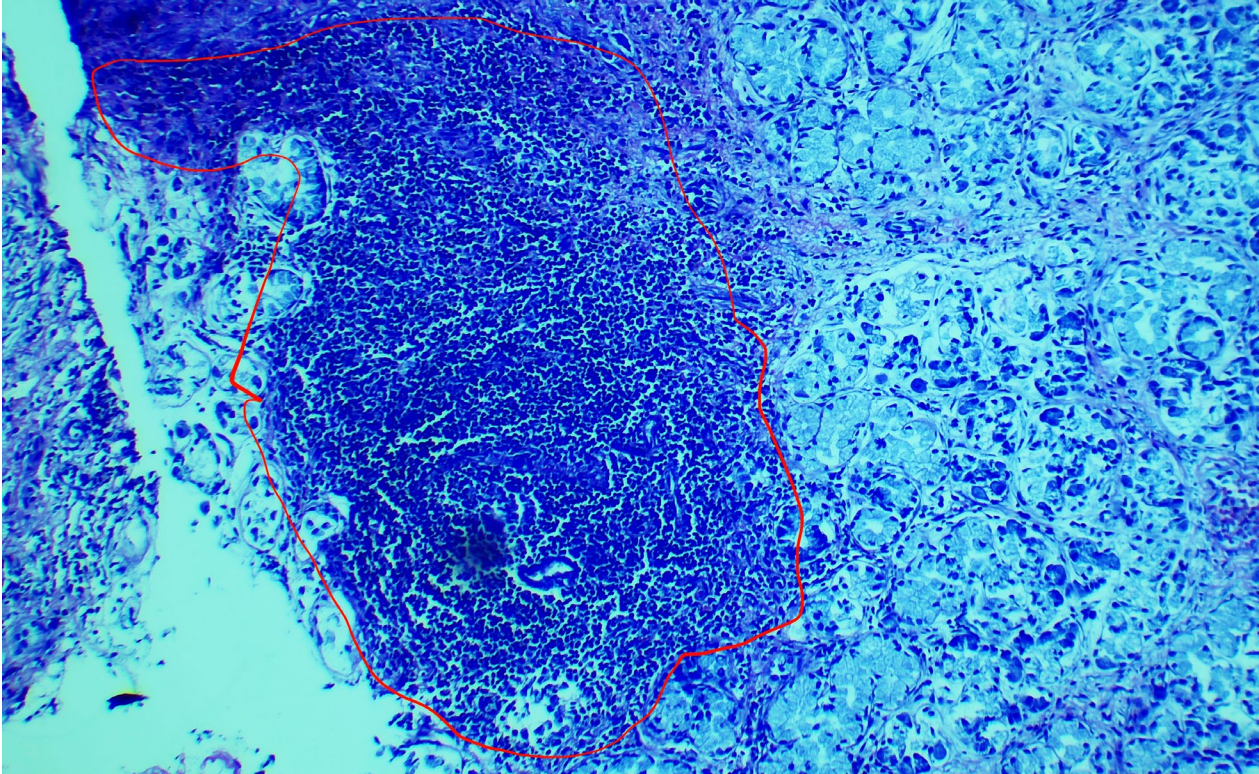


Pig – Bacterial load 3

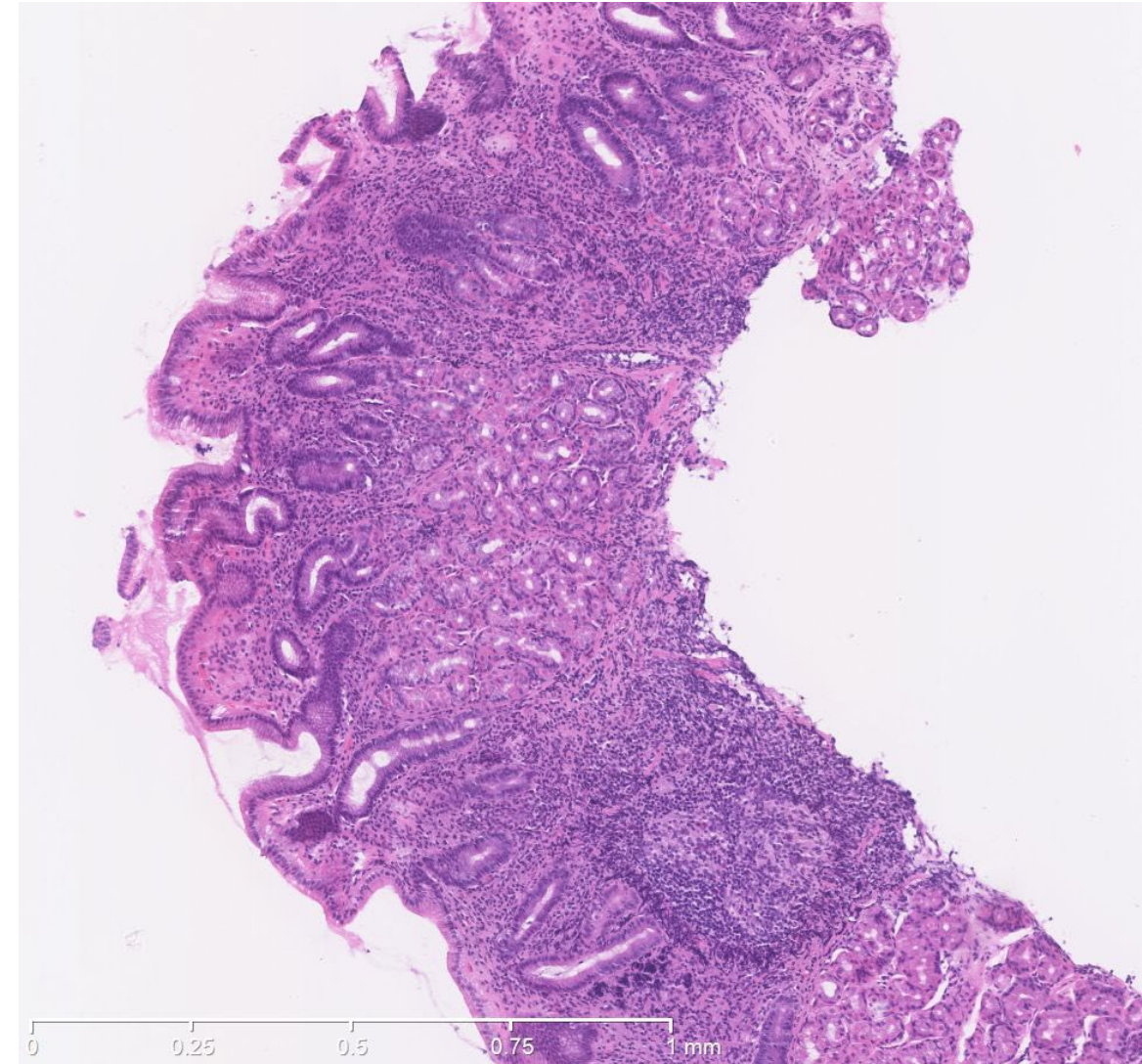


Pig – atrophy 2

Histology



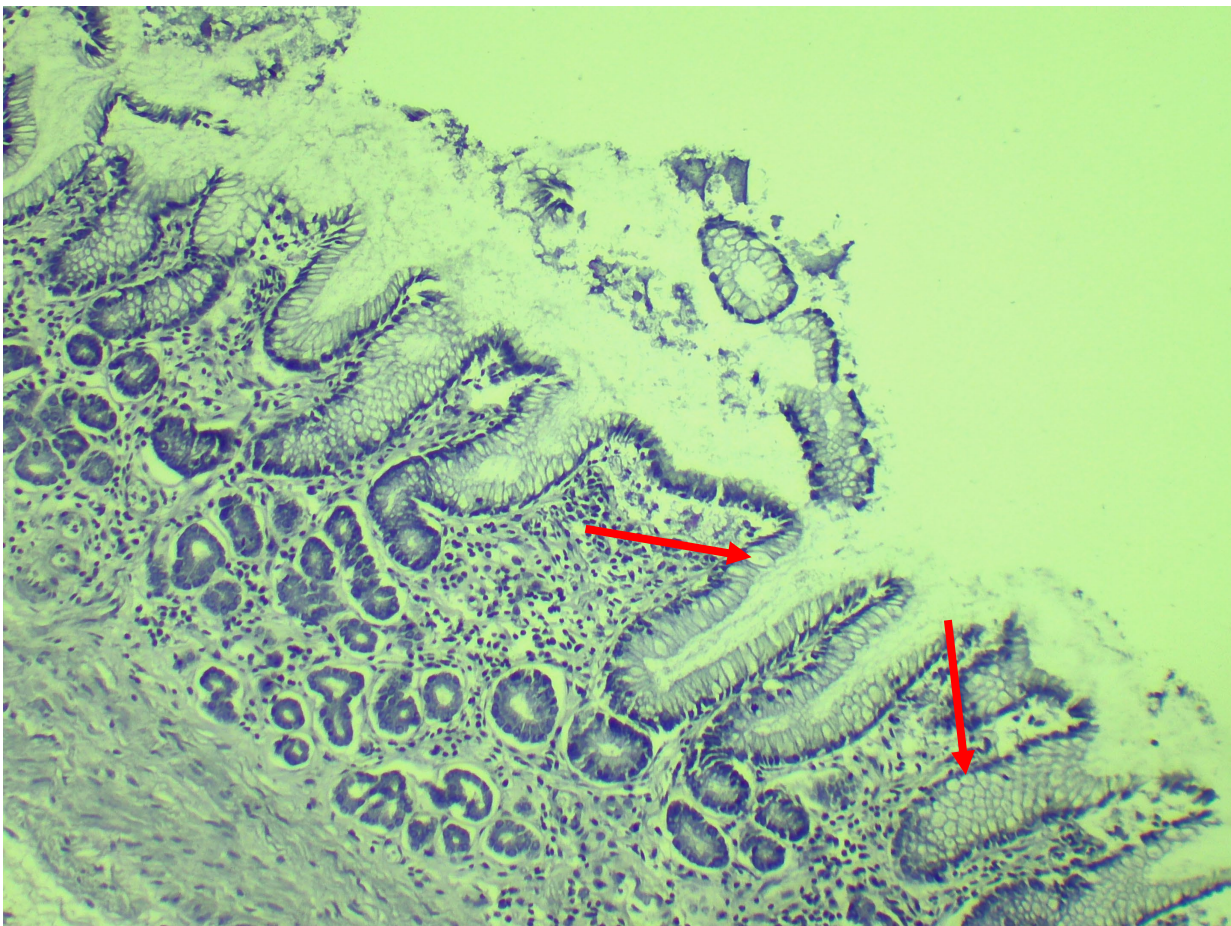
Pig – inflammation 3 with very large follicles



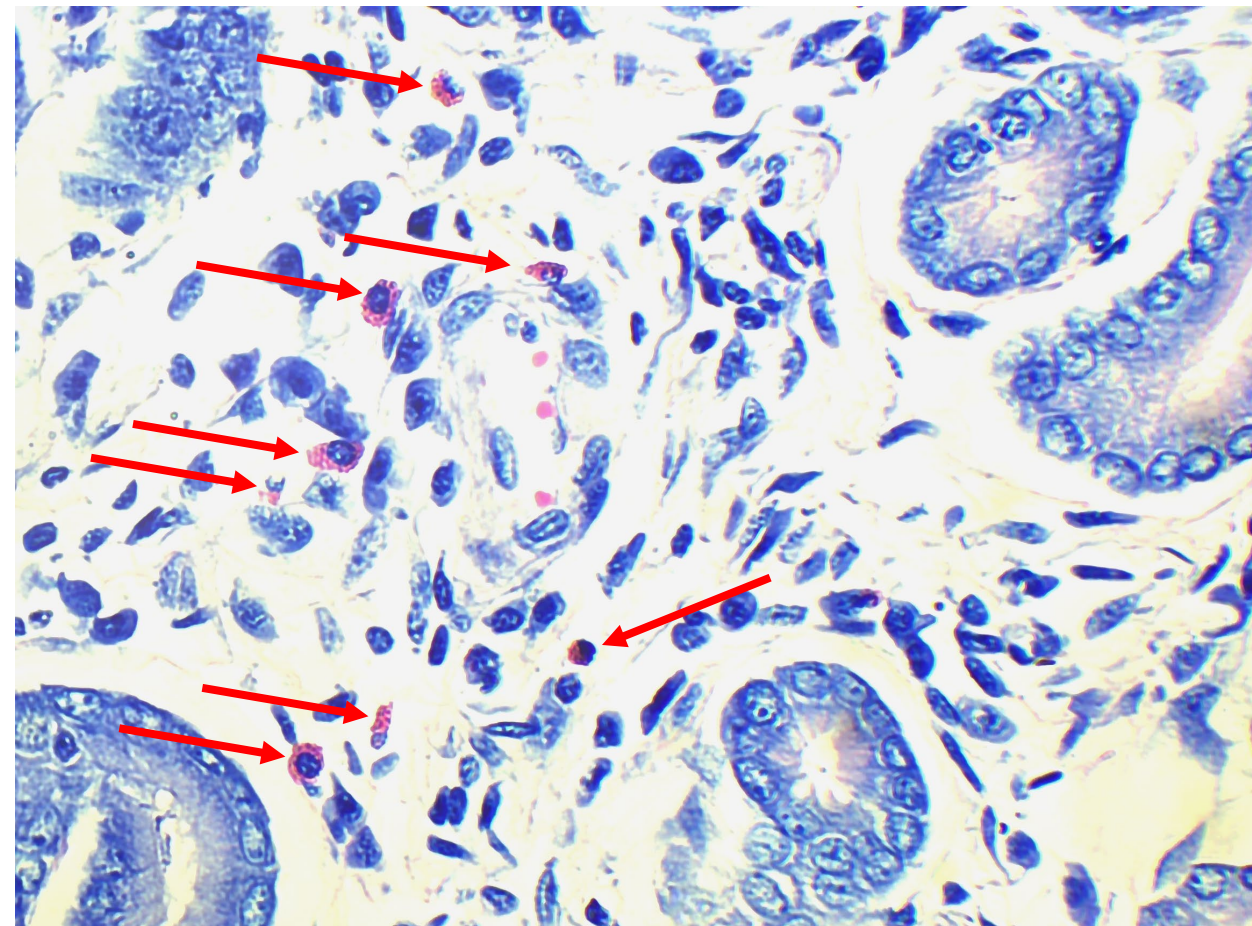
Human – inflammation 3 with large follicles

Histology

Pig – intestinal metaplasia 3

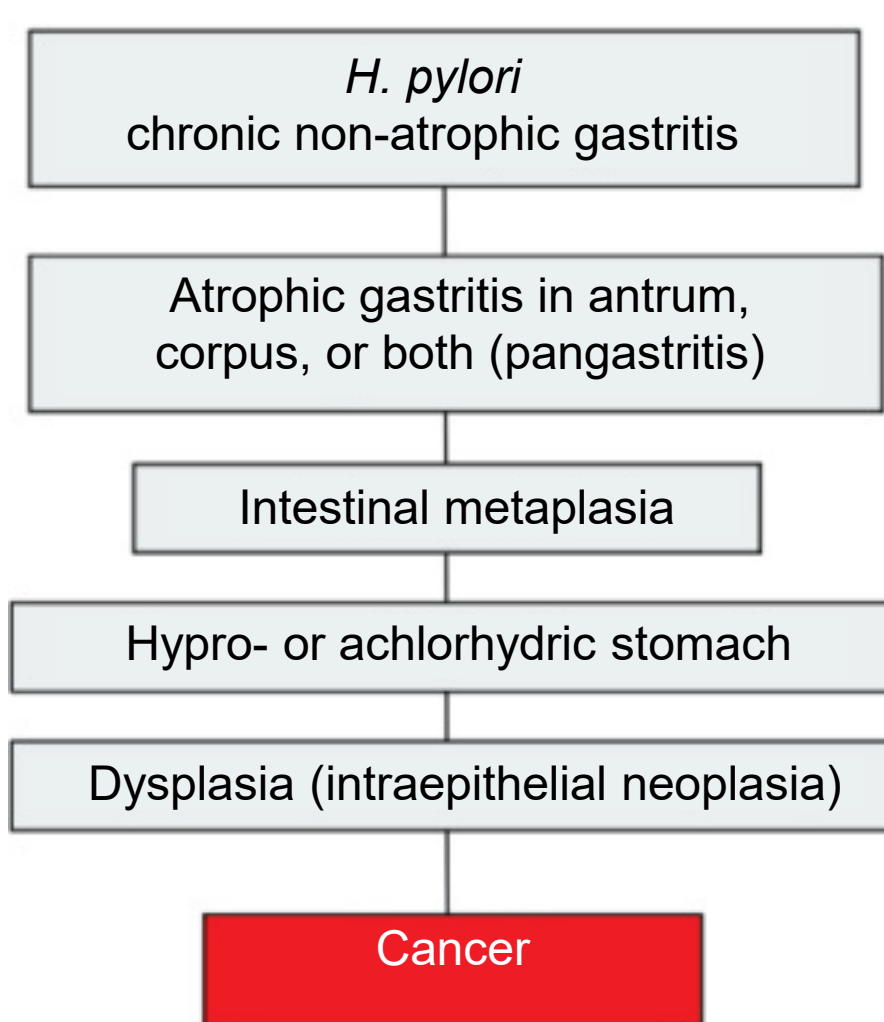


Pig – moderate (2) eosinophils



Why is this important?

Stomach mucosa



Potential factors triggered on

- *cagA* positive
- *vacA* s1/i1
- *H. pylori* overgrowth
- Oxidative stress
- N=O mutagens
- Acetaldehyde
- Low vitamin B₁₂
- High homocysteine
- Impaired methylation cycle
- Smoking, diet; etc.

**Gene errors
accumulate**

Why is
this
important?

Stomach mucosa

H. suis
chronic non-atrophic gastritis

Atrophic gastritis in antrum,
corpus, or both (pangastritis)

Intestinal metaplasia

?
Hypro- or achlorhydric stomach

Dysplasia (intraepithelial neoplasia)

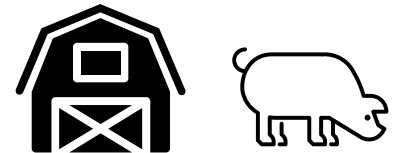
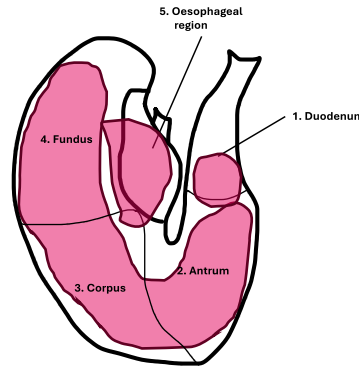
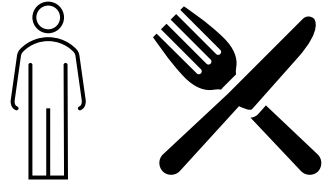
?
Cancer

Potential factors
triggered on

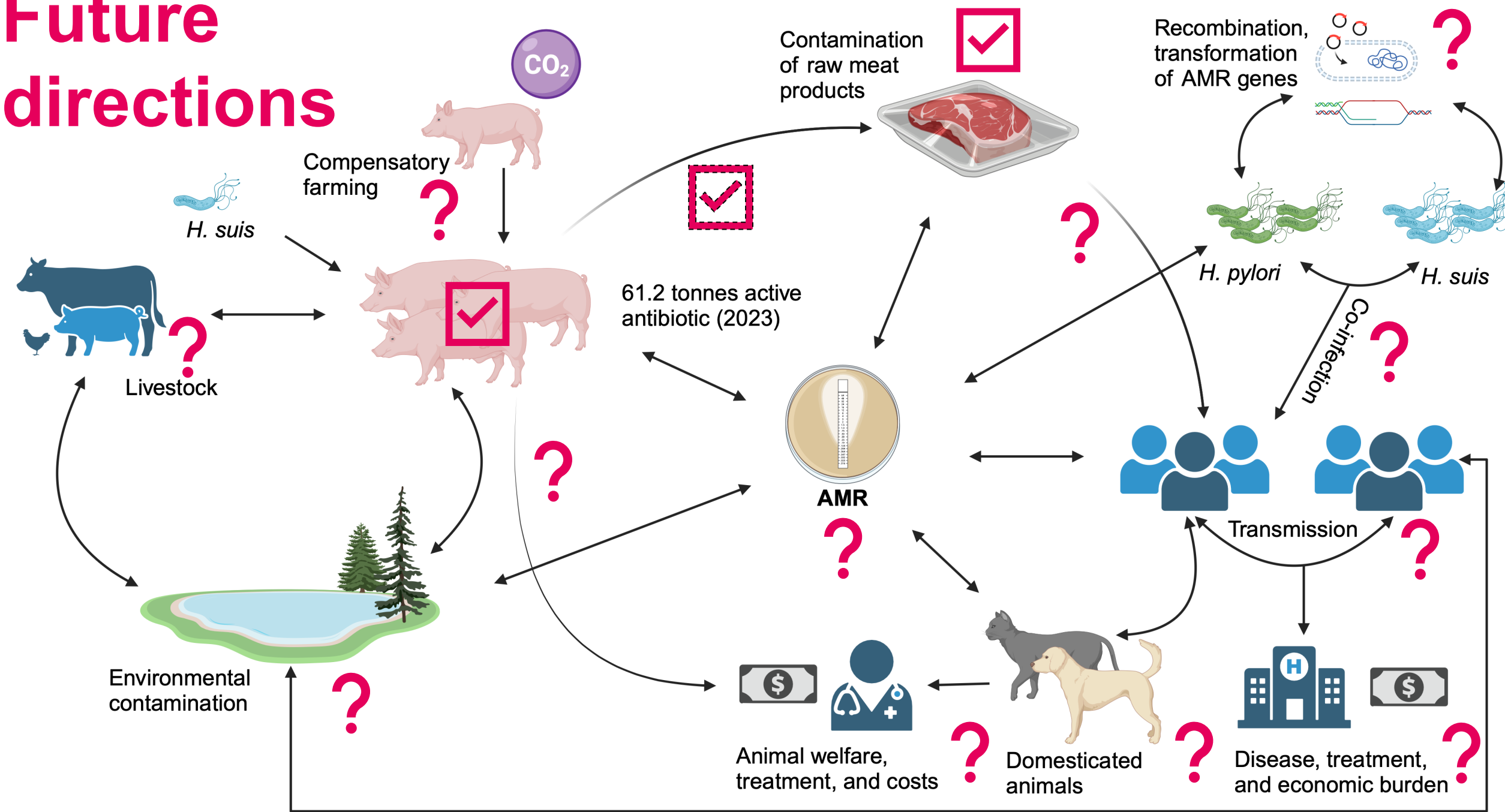


Conclusions

- ~85% of UK farmed pigs are infected with *H. suis*
- ~4% of raw pork products were contaminated with *H. suis* – highlighting a potential transmission link between pigs and humans
- Infected pigs show pan-gastritis
- Our study raises significant animal welfare concerns that are not presently recognised



Future directions





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Thank you



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I will also be at poster A56