Impact of improved hygiene: Farrowing accommodation and liquid feeding systems

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Introduction

- ↑ internal biosecurity: ↑ pig growth and ↓ mortality & antibiotic usage
- But, many factors are associated with internal biosecurity
- Impact of measures such as cleaning & disinfection routines not always clear
  - Implementing correctly takes time, and
  - Temptation to take short cuts or, worse, avoid altogether, particularly where labour & space limiting
- Two very different but critically important areas on the unit regarding hygiene
  - Farrowing accommodation
  - Liquid feeding systems

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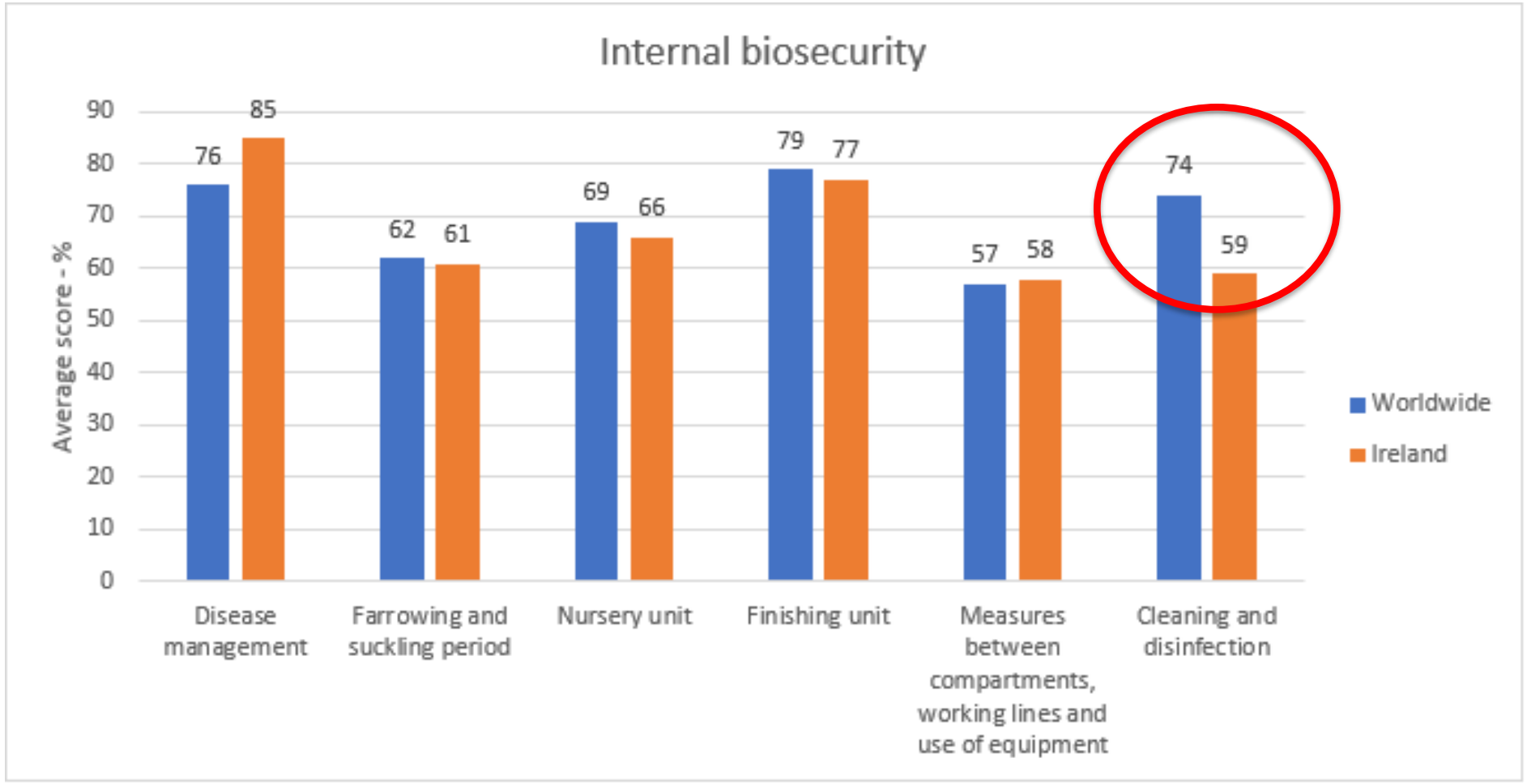
1. Farrowing Accommodation Hygiene

Internal Biosecurity- Pig Health Check



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Introduction

- High use of antibiotics linked to spread of AMR from animals to humans
  - Increased restrictions on antibiotic use in EU January 2022
  - Therapeutic levels of in-feed zinc oxide banned in EU June 2022

All happening when litter size ↑- piglet weight and health to weaning

- Internal biosecurity measures shown to ↑ pig growth, ↓ mortality (Laanen, et al. 2013) and ↓ antibiotic usage (Postma, et al. 2017)
- We believe farrowing accommodation hygiene to be particularly important
- **Objective:** ↓ the need to medicate suckling piglets & ↑ piglet growth by implementing an optimised sanitisation routine in farrowing accommodation

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Farrowing Accommodation Hygiene

Sub-optimal *vs.* improved/optimal cleaning and disinfection protocol

- ~22 litters/pens on each protocol
- Average born alive – 14.9
- 2 batches of pigs

Parameters measured:

- Microbiology: Total bacterial and *Enterobacteriaceae* counts in farrowing pens
- Growth: Individual piglet weight
- Health: Clinical cases, no. injections, antibiotic & anti-inflammatory usage per litter

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Study

Optimal sanitisation routine for farrowing accommodation

Pre–soak pens with water overnight (≤18hr)

Chlorocresol-based disinfectant (Interkokask®)

Dry 6 days, blow heater 1st 24 hr

Detergent (Blast Off - Carboxylic acid) - 20 min

Power wash

Dry overnight with blow heater

Sows: washed & disinfected (Virkon® S – potassium sulfate) pre-entry to farrowing crates

Sub-optimal sanitisation routine for farrowing accommodation

Washing pens with water

Dry overnight (≤18 hr)

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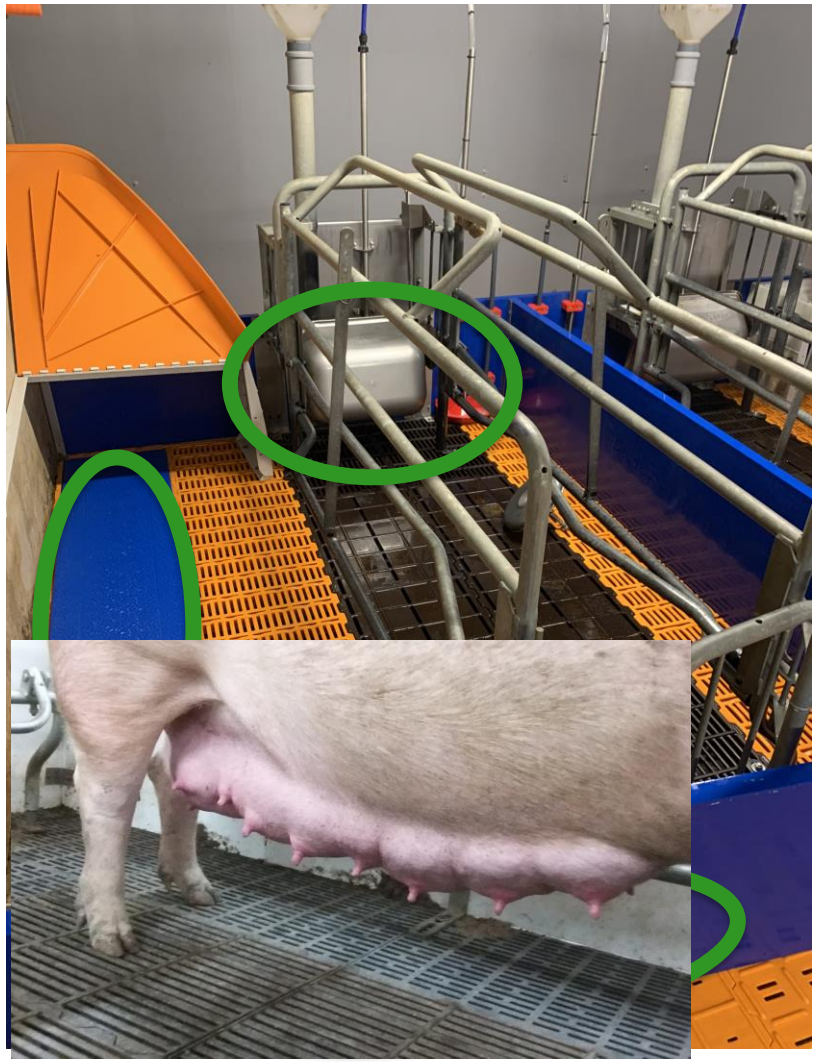
Swabbing of farrowing pens

Areas swabbed



Sow feeder

Piglet lying area

Floor area behind the sow

Wall behind the sow

Piglet drinker

Sow's udder

Swabbing of pens

- 1) Before washing (pens containing organic matter)
- 2) After disinfectant application (2 hrs)
- 3) 24 h after disinfectant application
- 4) 72 h after disinfectant application
- 5) After drying / as sows enter farrowing crates

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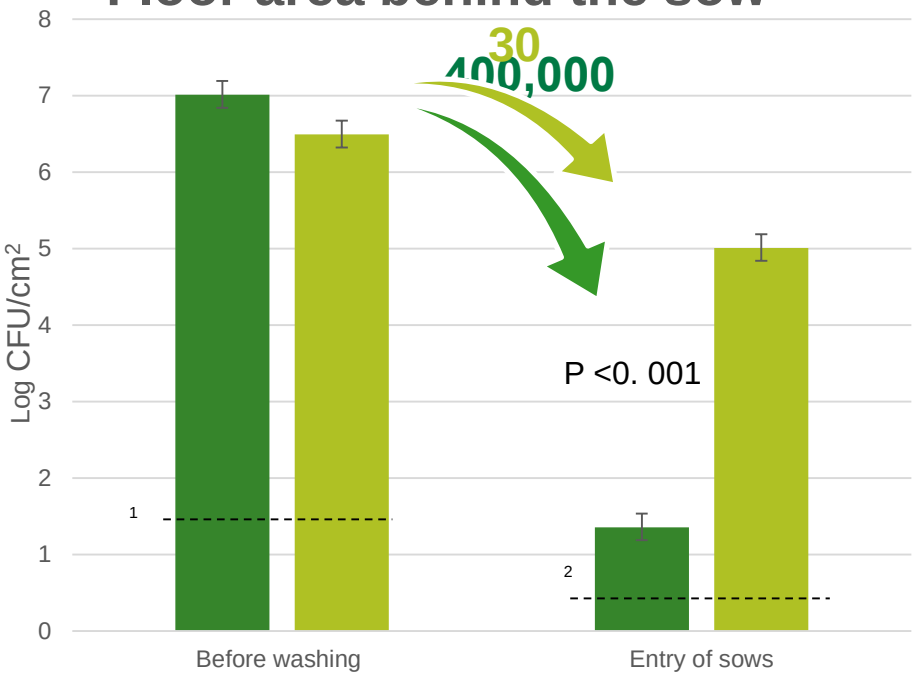
Results - Total Bacterial Counts

Sub optimal

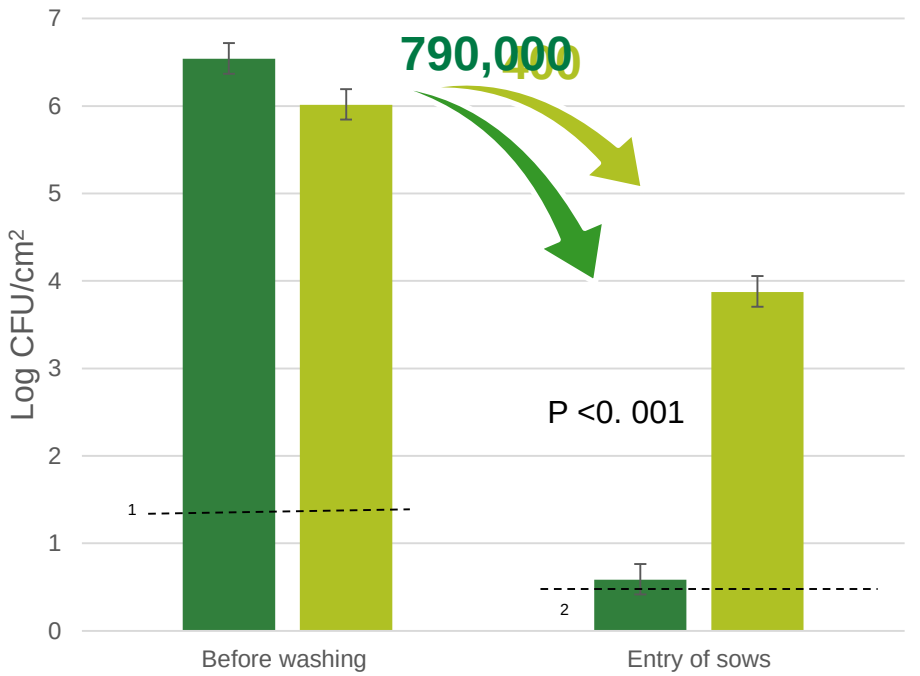
Optimal

Floor area behind the sow



[1] Detection limit for floor area behind sow before washing (1.4 Log CFU/cm^2)
[2] Detection limit for floor area behind sow after washing (0.4 Log CFU/cm^2)

Wall behind the sow



[1] Detection limit for wall behind the sow before washing (1.4 Log CFU/cm^2)
[2] Detection limit for wall behind the sow after washing (0.4 Log CFU/cm^2)

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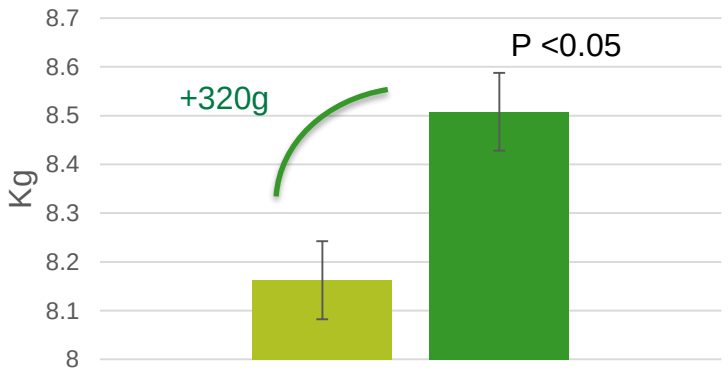
Results

Pre-weaning pig growth performance and therapeutic treatments

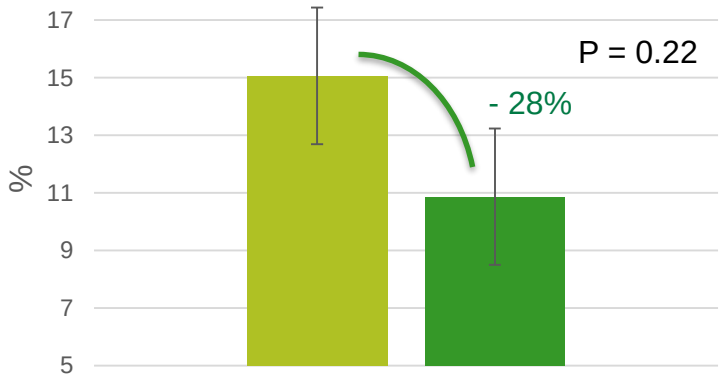
Sub optimal

Optimal

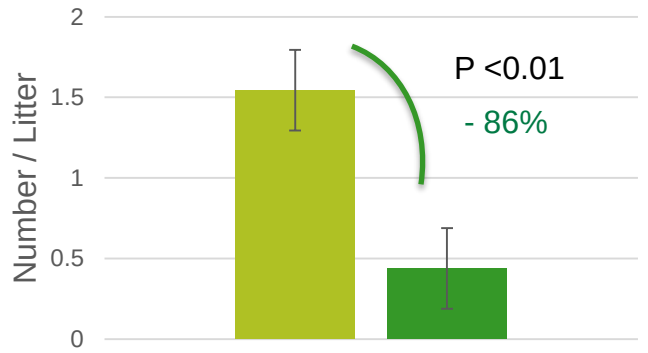
Average litter weaning weight



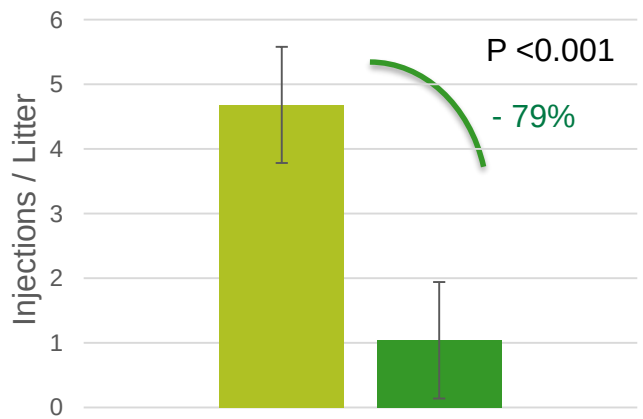
Mortality



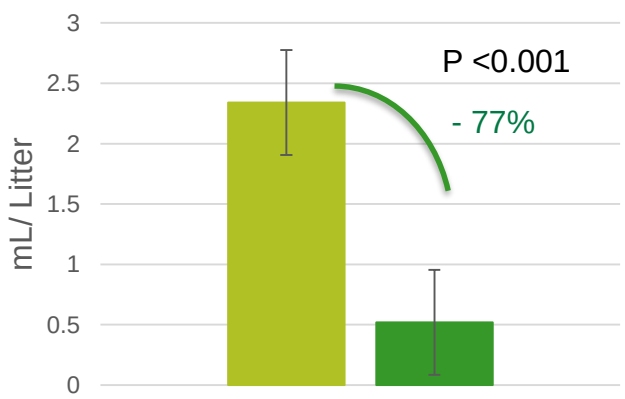
No. of clinical cases / litter



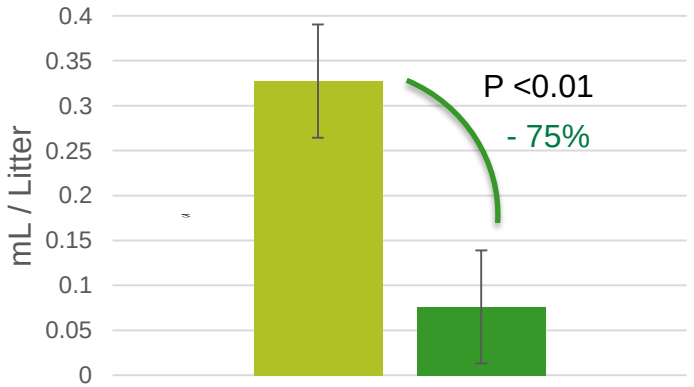
No. injections / litter



Antibiotic usage / litter



Anti -inflammatory usage / litter



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Implications

- Requires ↑ labour and ↑ time
  - Optimal; 32 min per pen, 4 steps, 6 days drying (3 days drying is sufficient)
  - Sub-optimal; 23.5 min per pen, 2 steps, overnight drying.
- Requires sufficient farrowing accommodation to implement properly
- Sub-optimal may seem basic
  - Compared to sanitisation regime in Moorepark at the time, yielded similar results
  - Representative of commercial sanitisation regimes

- **A little more time and effort yields dramatic benefits in terms of reducing medication usage and increasing piglet growth**

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2. Liquid Feeding System Hygiene

Introduction

- No *standard* protocol to optimise liquid feeding system hygiene

- Poor hygiene: proliferation of undesirable bacteria and fungi
  - Loss of energy and amino acids from the feed
  - Poorer Feed Efficiency and potentially reduced growth

- **Objective:** Test a practical & easy to apply feeding system sanitisation protocol
  - ✓ Remove/disrupt biofilms in the pipes and mixing tank
  - ✓ Suppress *Enterobacteriaceae* and yeast & mould growth in liquid feed

- Combination of an alkali wash followed by an acid rinse

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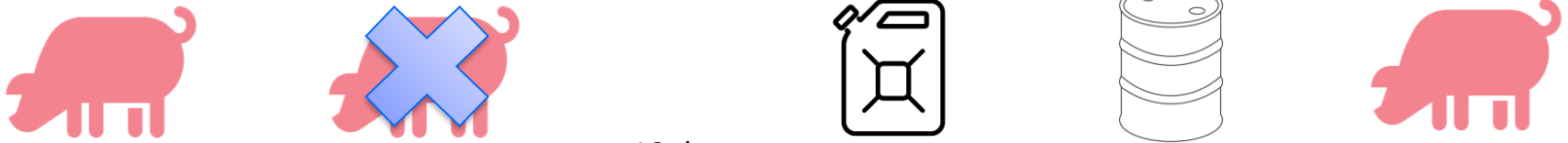
Liquid Feeding System Hygiene Protocol



10 days

Usual unit cleaning

Trial duration - nightly acid rinse as maintenance cleaning

System never cleaned

Baseline collection

(Day -1)

Initial Wash & Scrub

Alkali wash
0.9 % inclusion of Avalksan Gold Standard CF Chlorine Free

Recirculation in main line for 10 mins every 2 hours -16 hours

(Day 0)

Acid Wash
6L acid blend per tonne of water

Recirculation in main line for 10 mins every hour - 4 hours

(Day 1)

Maint. Acid Rinse
3L acid blend per tonne of water

Recirculation in main line for 10 mins every hour - 6 hours

Weekly sampling for 10 weeks

Acid Blend
Interpronutri Plus BE: Formic (60%),Propionic (15%), Benzoic (2.5%)

Pigs introduced on Day 1

10 week finishing period
(~ 35 kg to 130 kg)

Sampled weekly and more in first week

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Liquid Feeding System Hygiene Protocol

Day -1

Physical cleaning (wash & scrub)

Before | **After**

Wash balls and exhaust pipe

Before cleaning

Before cleaning

After cleaning

Mixing tank lid

After cleaning

Mixing tank scrubbed and power washed

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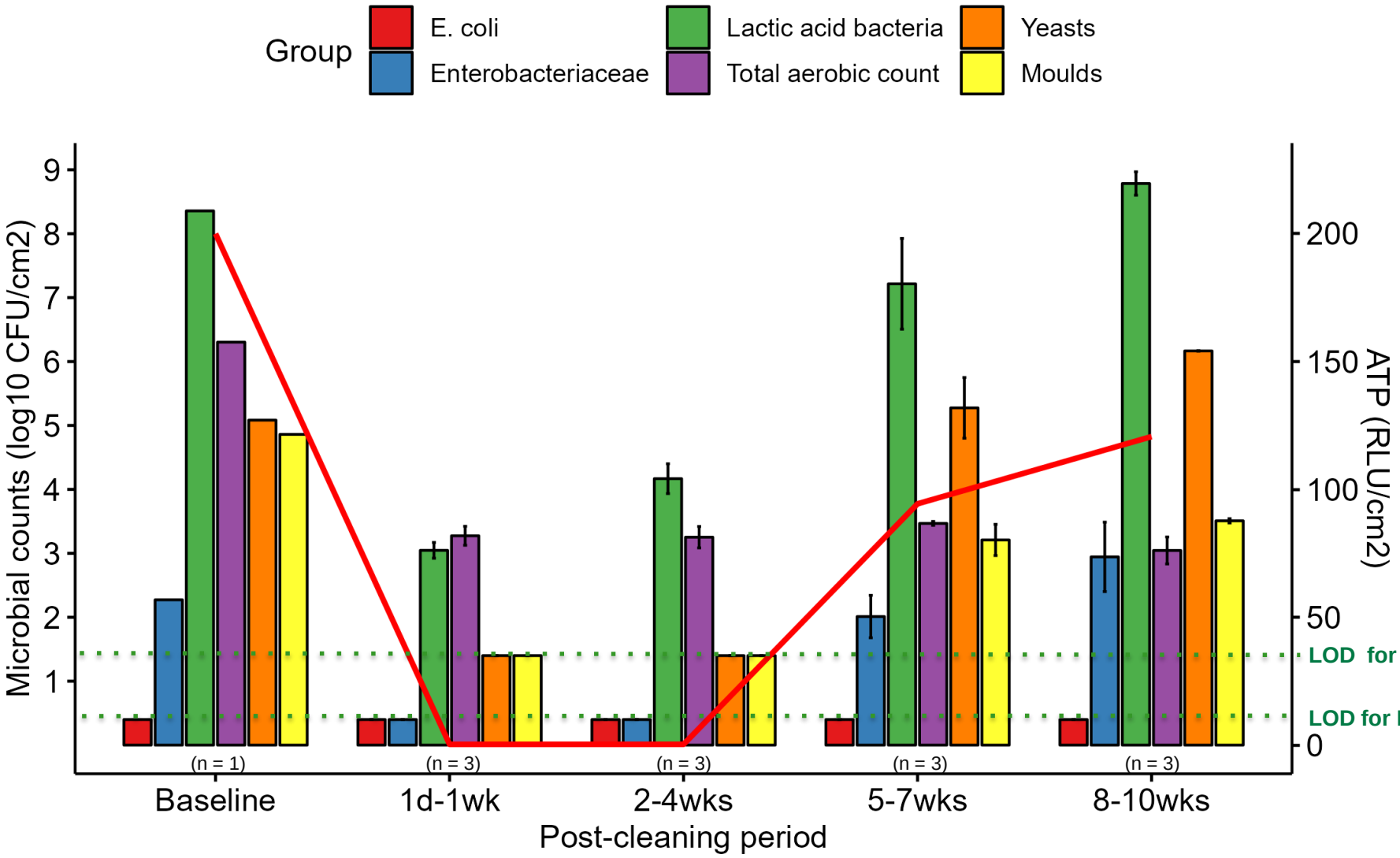
Results: Mix tank swab



- *Enterobacteriaceae*, yeast & moulds undetectable for 4 wks
- General reversion towards baseline levels after 5wks

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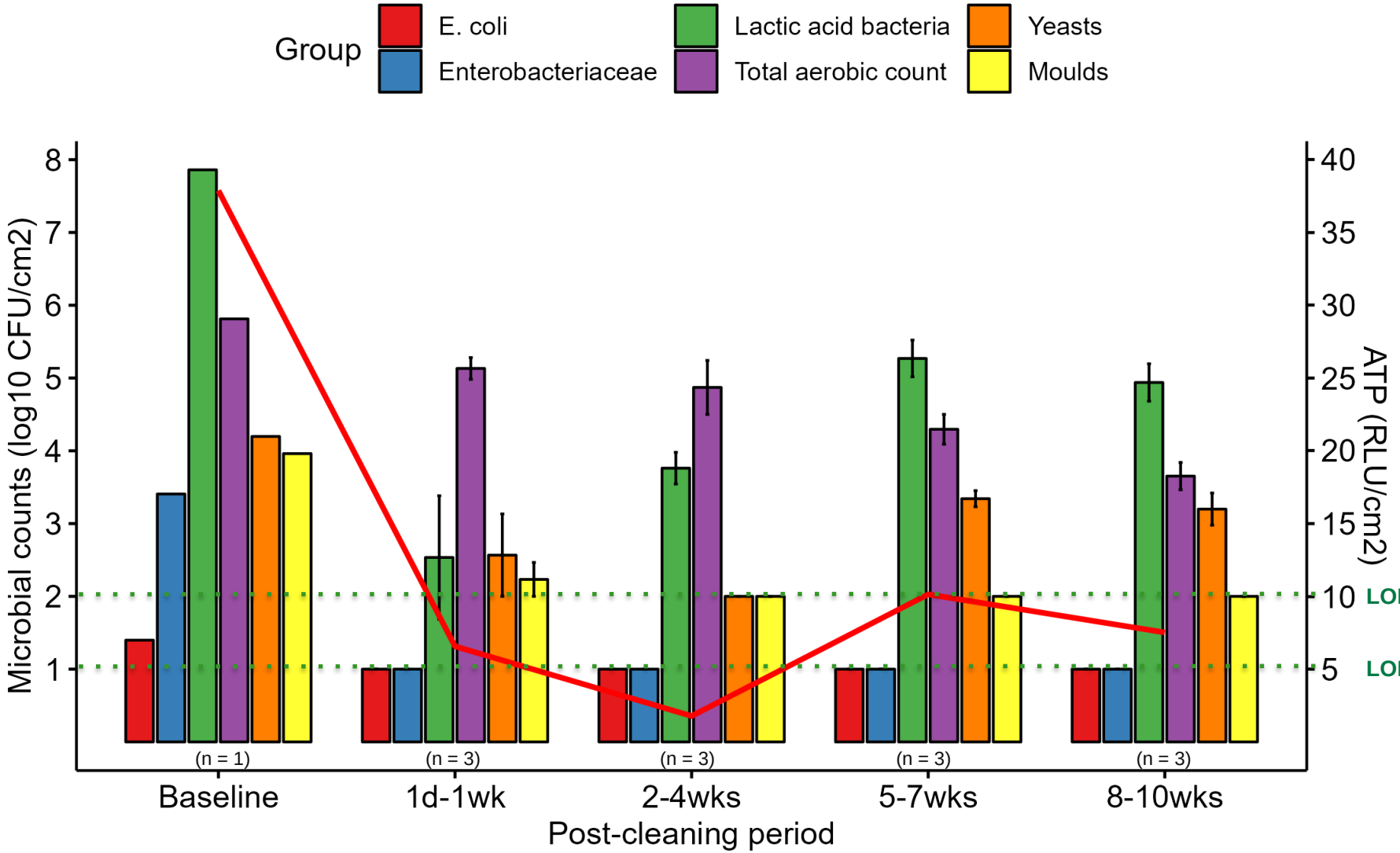
Results: Pipe swab



- *Enterobacteriaceae* & *E. coli* undetectable for 10wks
- Yeast & moulds undetectable at 3d
- Moulds undetectable for 10wks
- Yeast returned after 5wks
- ATP = good hygiene indicator

LOD for Y&M = 2 CFU/cm²

LOD for bacteria = 1 CFU/cm²

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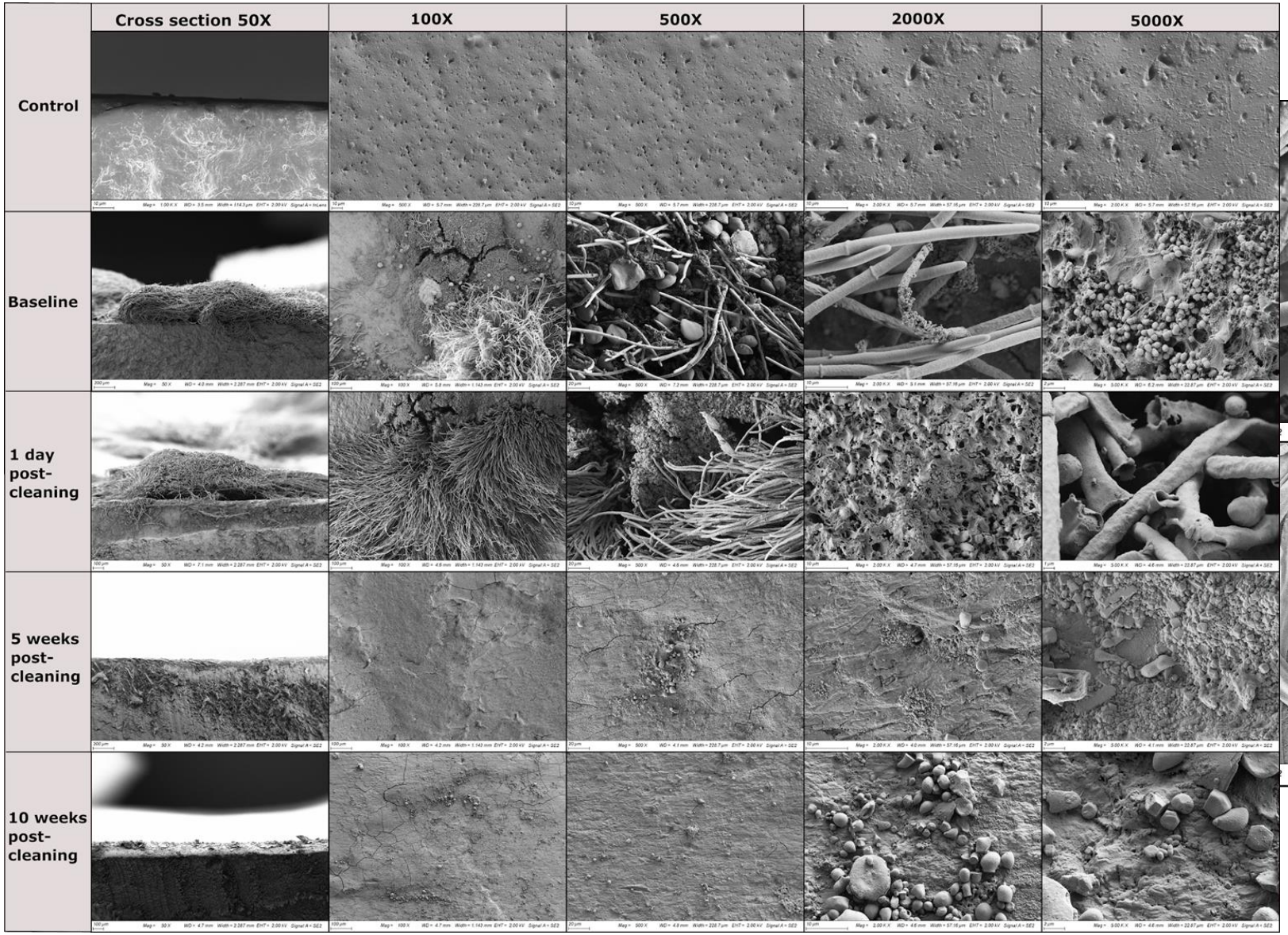
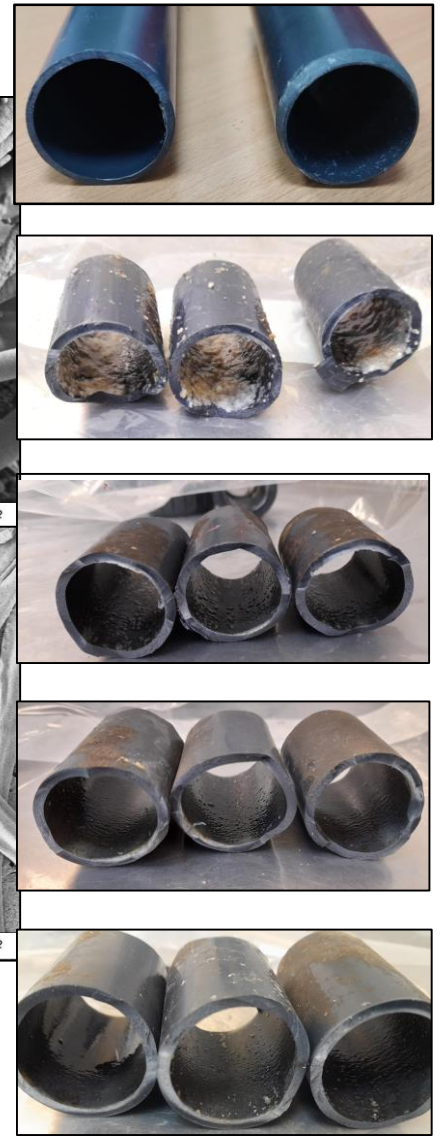
Results: Scanning electron microscopy





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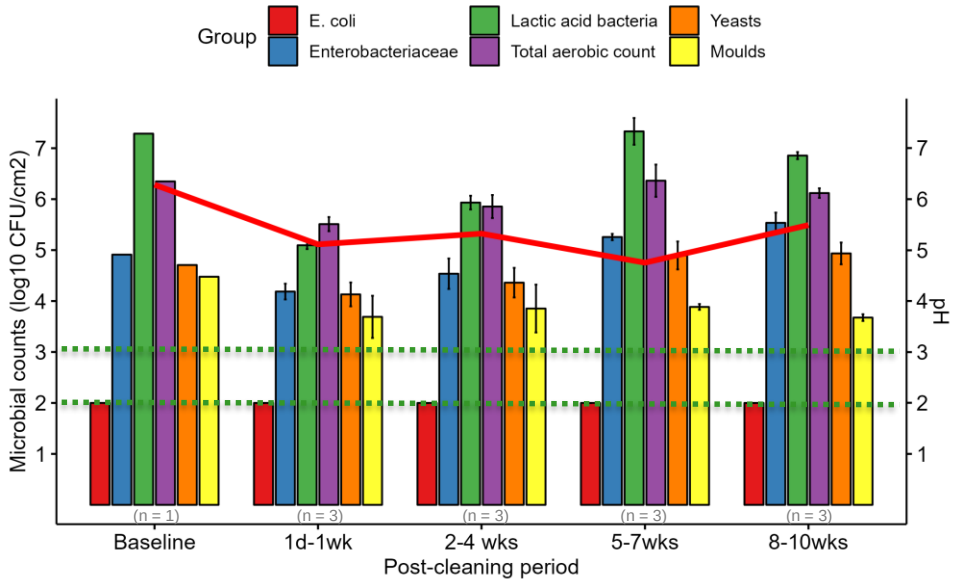
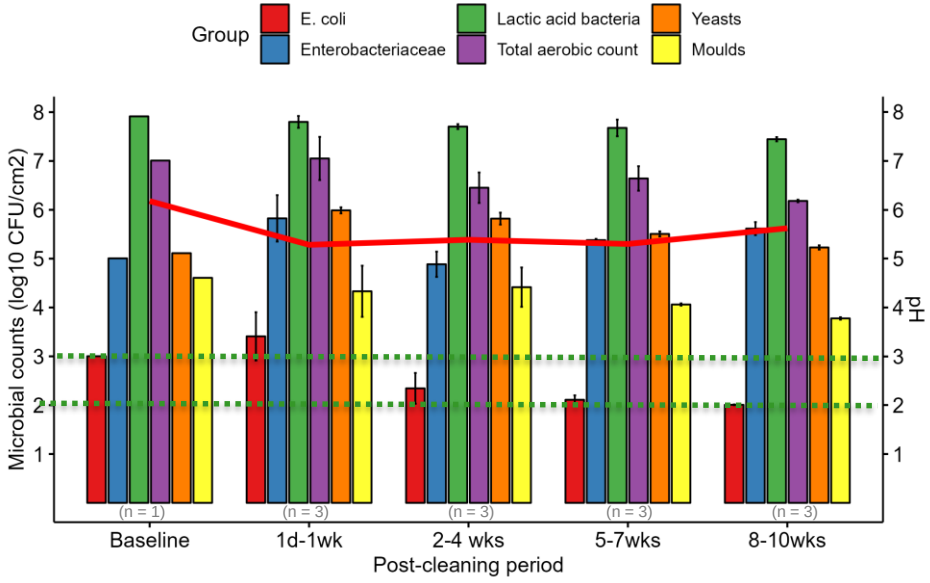
Results

Mix tank feed



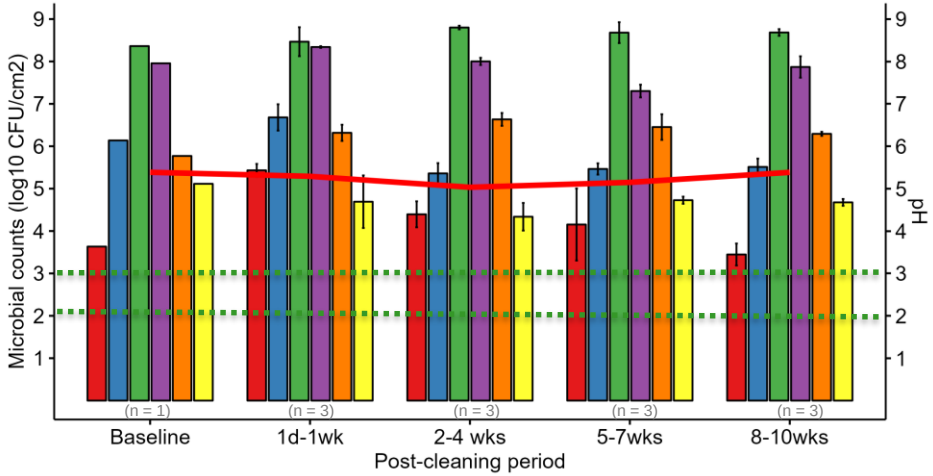
Fresh trough feed



LOD for Y&M= 3 CFU/g

LOD for Bacteria= 2 CFU/cm2

Residual trough feed



LOD for Y&M= 3 CFU/g

LOD for Bacteria= 2 CFU/cm2

- Feed-associated microbes proliferate in feed despite improved system hygiene
- Should we be surprised?
- ADFI: 2,854 g/d; ADG: 1,216 g/d; FCE: 2.35

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Conclusions & Implications

- Improved hygiene of mixing tank and pipes
  - Opportunity to control/reduce re-colonisation of system
- Pipe biofilm not completely removed but ↓ *E. coli, Enterobacteriaceae* & moulds
  - Implications for pathogen presence & mycotoxin production
- Little impact of cleaning on feed microbial composition
  - Focus on feed! Acidify feed / use of homofermentative inoculants
  - Control/reduce microbial load of feed + good water quality
  - Good system hygiene will prevent recolonization of feed mix

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Acknowledgements - PigNutriStrat

Funding

The PigNutriStrat project is funded by the Irish Department of Agriculture, Food and the Marine's Competitive Research Funding Programmes (Grant no: 2019R518).

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

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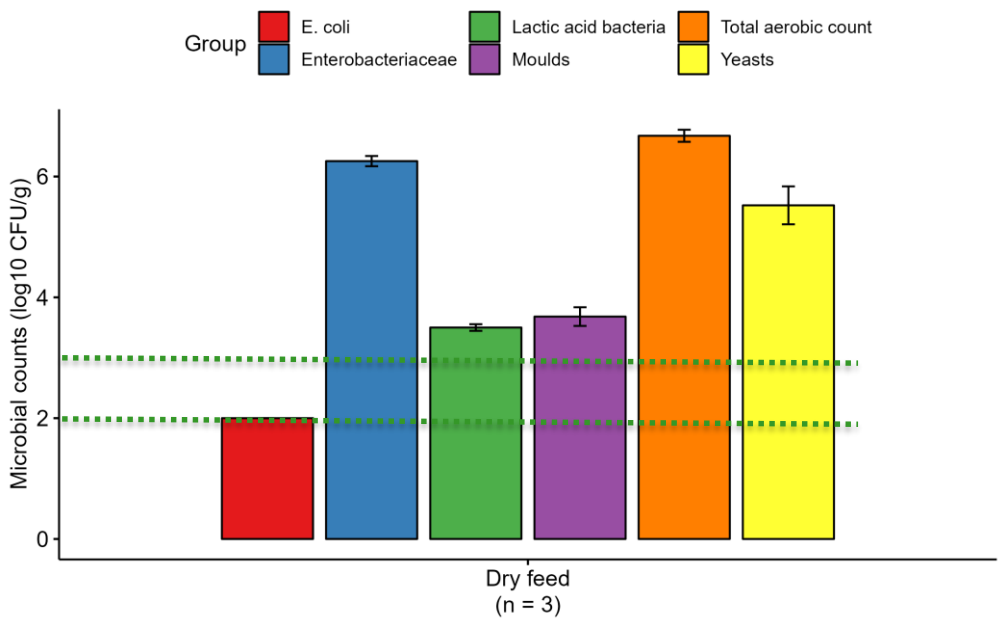
Acknowledgments –WetFeed-2

- **Partners**

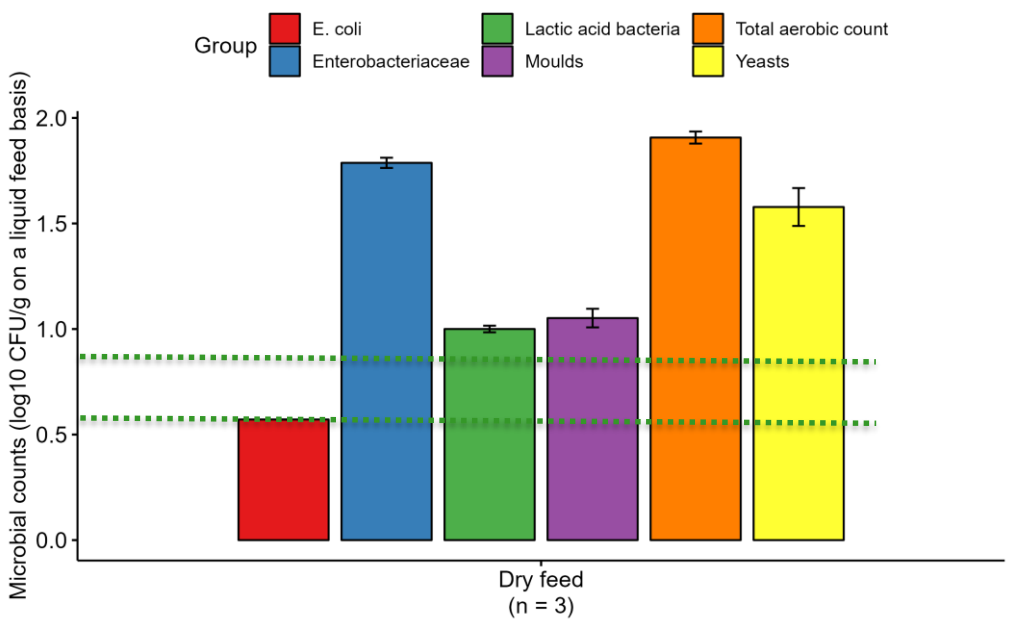
- **Funders**

Results

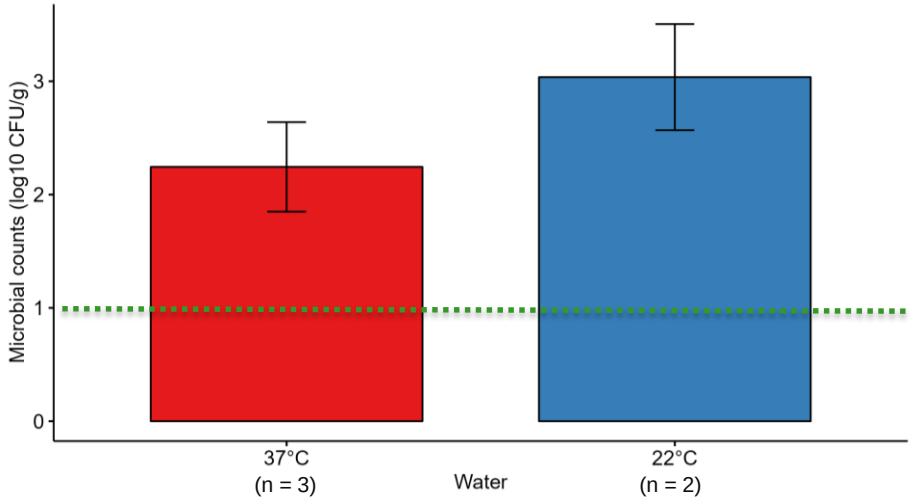
Dry feed



Dry feed on a liquid feed basis



Aerobic colony count of water



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