Assessing the efficacy of improved animal welfare to control Campylobacter contamination in poultry

• **Faecal shedding** of pathogens can increase after transport and feed withdrawal in poultry

• The existing literature about the impact of farming and slaughtering management on *Salmonella* and *Campylobacter* shedding is still scarce and results are contradictory

• To date, no evaluation of the effects of **different management systems** on carcass contamination, nor measurement of the level of stress, have been investigated

• No data is available on *Listeria monocytogenes* contamination
• Could poultry welfare influence *Salmonella*, *Campylobacter* and *Listeria* shedding?

• Are there specific factors (either on-farm and pre-slaughtering) that significantly affect stress in poultry and have impact on faecal shedding of pathogens or carcass contamination?

**Aim:**

Identify and evaluate on-farm and pre-slaughtering stress factors that could influence shedding of food-borne pathogens in broilers

• Young researchers project funded by the Italian Ministry of Health
• Duration: 3 years (December 2014 - December 2017)
Main phases

- **Phase1** (farm): Screening and selection of farms with different AW levels

- **Phase2** (farm and slaughterhouse): AW assessment and evaluation of prevalence and carcass contamination by *Campylobacter*, *Salmonella* and *Listeria monocytogenes* at slaughterhouse.

- **Phase3**: Data analysis and identification of possible solutions to control contamination while improving animal welfare.
Phase 1:
Farm screening and selection

Animal welfare assessment on farm

Identification of farm having different welfare status
Welfare Quality® protocol

Good feeding

Good housing

Good health

Appropriate behaviour
<table>
<thead>
<tr>
<th>Principle</th>
<th>Criteria</th>
<th>Measures</th>
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<tbody>
<tr>
<td>Good feeding</td>
<td>Absence of prolonged thirst</td>
<td>Drinker space</td>
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<tr>
<td>Good housing</td>
<td>Comfort around resting</td>
<td>Plumage cleanliness, litter quality, dust sheet test</td>
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<td></td>
<td>Thermal comfort</td>
<td>Panting, huddling</td>
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<td></td>
<td>Ease of movements</td>
<td>Stocking density</td>
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<td>Good health</td>
<td>Absence of injuries</td>
<td>Lameness, hock burn, food pat dermatitis</td>
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<td></td>
<td>Absence of diseases</td>
<td>On farm mortality, culls on farm</td>
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<tr>
<td>Appropriate behaviour</td>
<td>Good human-animal relationship</td>
<td>Avoidance distance test</td>
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<td></td>
<td>Positive emotional state</td>
<td>QBA</td>
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</tbody>
</table>
Preliminary data: welfare assessment

10 farms (Ross 308 and 708)

Average number of birds: 15,600.

Farm visits: 1-2 days prior to slaughtering (average age=49 days), average weight 2.9kg

Average mortality: 2.7% (1.6-5.5); average culling rate: 2.8% (1.7-3.9).

High variations of space allowance, with values ranging from 26.8 to 41 kg/m².

Human-animal relationship was evaluated through touch tests: the mean prevalence of touched birds on the number of those being at arm reach was 53.4% (33-70).
Preliminary data: welfare assessment

Lameness

- Score 1: 85%
- Score 2: 12%
- Score 3: 3%

Hock burns

- 36%
- 35%
- 29%
- 67%
Preliminary data: On farm welfare assessments

- 6 'Improved welfare'
- 2 'Acceptable'
- 2 'Non classified'

Bar chart showing evaluations of different farms on aspects of welfare:
- Good feeding
- Good housing
- Good health
- Appropriate behaviour

Key:
- Farm 1
- Farm 2
- Farm 3
- Farm 4
- Farm 5
- Farm 6
- Farm 7
- Farm 8
- Farm 9
- Farm 10
Three level of assessment:

On farm
- screening at 30d to confirm *Campylobacter* presence
- WQ (as in phase 1, day before slaughtering)

Pre-slaughter
- WQ (DOA, panting, pre-stun shock, etc.)
- Faecal sampling (pre-transportation)
- Faecal sampling (post-transportation)
- Blood sampling (eterophils / lymphocytes ratio)

Post-slaughter (carcasses)
- WQ (lesions, bruises, broken wings, ascites)
- Sampling of caeca
- Sampling of skin

Phase 2: Evaluation at slaughterhouse
**First sampling (FARM 8) in farm and slaughterhouse on May 2016:**

- Farm at 3 km from slaughterhouse (short transport)
- ‘Improved welfare’ WQ score
- Slaughtering on day 48
- Preliminary screening (day 30) at the farm to choose a Campylobacter positive batch

**Second sampling (FARM 10) in farm and slaughterhouse on July 2016:**

- Farm at 331 km from slaughterhouse (long transport)
- ‘Improved welfare’ WQ score
- Slaughtering on day 42
- Preliminary screening (day 30) at the farm to choose a Campylobacter positive batch
Preliminary data: pathogens in cloacal swabs (shedding)

First sampling (FARM 8)

- *Campylobacter* spp. prevalence in cloacal swabs 60% before transport and 75% after transport
- Cloacal swabs negative to *Salmonella* and *Listeria monocytogenes*

Second sampling (FARM 10)

- *Campylobacter* spp. prevalence in cloacal swabs 25% before transport and 55% after transport
- Cloacal swabs negative to *Salmonella* and *Listeria monocytogenes*
Preliminary data: pathogens in caeca

First sampling (FARM 8)
- Prevalence of *Campylobacter spp.* in caecal contents: **52.5%** (21/40)
- *Campylobacter coli* sharply prevalent on *Campylobacter jejuni*
- Levels of contamination between 6.6 and 9.2 log10 UFC/g, mean 8.72 log10 CFU/g
- Absence of *Salmonella* and *Listeria monocytogenes*

Second sampling (FARM 10)
- Prevalence of *Campylobacter spp.* in caecal contents: **97.5%** (39/40)
- Info about *Campylobacter* species identification not yet available
- Levels of contamination between 5.6 and 9 log10 CFU/g, mean 8.63 log10 CFU/g
- Absence of *Salmonella* and *Listeria monocytogenes*
Preliminary data:
pathogens on carcass skin (final product)

First sampling (FARM 8)

- Prevalence of *Campylobacter spp.* on carcass skin after cooling: 85% (34/40)

- *Campylobacter coli* slightly prevalent on *Campylobacter jejuni*

- Levels of contamination between 40 UFC/g and 25*10^3 CFU/g (mean 2226 CFU/g)

- Absence of *Salmonella*

- *Listeria monocytogenes* detected in 3 samples out of 40 (7.5%). Environmental contamination or from other batches? Low levels of contamination
Preliminary data: pathogens on carcass skin (final product)

Second sampling (FARM 10)

- Prevalence of *Campylobacter spp.* on carcass skin after cooling: **100%** (40/40)

- Info about *Campylobacter* species identification not yet available

- Levels of contamination between 82 UFC/g and 15*10^3 CFU/g (mean **1833 CFU/g**)

- *Salmonella* detected in 1 sample (**2.5%**, *Salmonella* typhimurium)

- *Listeria monocytogenes* just like in farm 8 detected in 3 samples out of 40 (**7.5%**). Environmental contamination or from other batches? Low levels of contamination
Campylobacter spp. in carcass: comparison with national monitoring program

• Compared to the mean of samples analysed in the same slaughterhouse by the Campylobacter national monitoring programme in 2015, the mean level of contamination of *Campylobacter* on carcass skin was about 45% lower for farm 8 (2226 vs 3965 CFU/g) and about 53% lower for farm 10 (1833 vs 3965 CFU/g)

• More sampling sessions are scheduled by the end of 2017, in order to accurately compare the effect of different management systems:
  - High WQ score vs low WQ score
  - Farm far from the slaughterhouse vs farm close to the slaughterhouse
  - Climatic conditions
Some preliminary observations

- **Long transport could influence prevalence** of *Campylobacter* contamination of the final product.

- Levels of **carcass contamination** seem to be mostly related to the caecal **content levels** (similar results in both batches).

- **Caecal (and therefore carcass) contamination levels could be mostly related to «long-term» stress in farm, while changes in prevalence seem to be more sensible to «short-term» stress like long transport.**

- More sampling sessions are necessary to confirm these preliminary observations in order to perform statistical analyses.

- The final results would help in supporting poultry farms with new tools for controlling food safety.
Thank you for your attention!

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