Multi Drug Resistant *Escherichia coli* on an Irish Suckler Farm (2015-2017)

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Limerick RVL

One Health Seminar
Dublin Convention Centre
20th November 2018
Background..

• Numbers of Cattle submissions to LRVL in 2015-2018*

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Carcass</th>
<th>Foetus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avian</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Meline</td>
<td>52</td>
<td>0</td>
<td>52</td>
</tr>
<tr>
<td>Bovine</td>
<td>3120</td>
<td>1409</td>
<td>4529</td>
</tr>
<tr>
<td>Canine</td>
<td>27</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Caprine</td>
<td>38</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>Cervine</td>
<td>45</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td>Equine</td>
<td>22</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Ovine</td>
<td>483</td>
<td>212</td>
<td>695</td>
</tr>
<tr>
<td>Porcine</td>
<td>28</td>
<td>13</td>
<td>41</td>
</tr>
<tr>
<td>Vulpine</td>
<td>196</td>
<td>0</td>
<td>196</td>
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<tr>
<td>TOTAL</td>
<td>4111</td>
<td>1645</td>
<td>5756</td>
</tr>
</tbody>
</table>

• Many 000’s more diagnostic samples
Herd Introduction

- Suckler Herd
- Catchment area of Limerick RVL
- 50-60 Suckler cows with calves at foot; reared to slaughter

- 1st Jan 2015 – 199 animals (15th May 2018 – 145) AHCS
- 17 calves (incl. stillborn calf) & 1 cow – LRVL

- Typical Case
  - Sick at a couple of days of age
  - Rapid deterioration, depression, sepsis and death. Some develop neurological signs.

- Intensive treatment has failed in almost all cases

- 1 cow - post Caesarean peritonitis (1 of 4/5)
Herd Introduction

- **Review of farm data 1/1/2015**
  - 51 animals born on farm in 2014
  - Mortality:
    - 15 calves in 2014
    - 1 cow in 2014

- **Review of farm data 1/1/2016**
  - 32 animals born on farm in 2015
  - Mortality:
    - 17 calves in 2015
    - 6 cows in 2015

- **Review of farm data 1/1/2017**
  - 47 animals born on farm in 2016
  - Mortality:
    - 5 calves in 2016
    - 2 cows in 2016

- **Review of farm data 1/1/2018**
  - 27 animals born on farm in 2017
  - Mortality:
    - 9 calves in 2017
    - 3 cows in 2017

- **Review of farm data 12/11/2018**
  - No animals born on farm in 2017 to date
  - Mortality:
    - 0 calves to date
    - 2 cows to date
<table>
<thead>
<tr>
<th>Date of sub</th>
<th>Carcase/Samples</th>
<th>Age of animal</th>
<th>Diagnosis</th>
<th>E coli isolated</th>
<th>MDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/01/2015</td>
<td>Carcase</td>
<td>2 weeks</td>
<td>Bacteraemia/Septicaemia</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>05/01/2015</td>
<td>Carcase</td>
<td>2 weeks</td>
<td>Enteritis. Rotavirus.</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>05/01/2015</td>
<td>Serum X</td>
<td>Adult X 2</td>
<td>None</td>
<td>No</td>
<td>No</td>
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<tr>
<td>10/06/2015</td>
<td>Carcase</td>
<td>2 weeks</td>
<td>Enteritis/Septicaemia</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>10/07/2015</td>
<td>Carcase</td>
<td>2 weeks</td>
<td>Bacteraemia/Septicaemia</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>07/04/2016</td>
<td>Carcase</td>
<td>3 days</td>
<td>Enteritis/Septicaemia</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>08/04/2016</td>
<td>Carcase</td>
<td>5 days</td>
<td>Enteritis. Cryptosporidium</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Enteritis/Hypogammaglobulinaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18/04/2016</td>
<td>Carcase</td>
<td>3 years</td>
<td>Peritonitis</td>
<td>Yes</td>
<td>Unknown</td>
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<tr>
<td>25/04/2016</td>
<td>Swabs X 5</td>
<td>Adults</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>25/04/2016</td>
<td>Carcase</td>
<td>0 days</td>
<td>Atrial septal defect</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>12/05/2016</td>
<td>Carcase</td>
<td>0 days</td>
<td>Dystocia related death</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>21/11/2016</td>
<td>Blood and Faeces</td>
<td>18 months</td>
<td>None</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>14/03/2017</td>
<td>Carcase</td>
<td>2 months</td>
<td>Septicaemia/Meningitis</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>30/03/2017</td>
<td>Carcase</td>
<td>4 months</td>
<td>Pneumonia</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>30/03/2017</td>
<td>Carcase</td>
<td>4 months</td>
<td>Pneumonia</td>
<td>No</td>
<td>No</td>
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<tr>
<td>06/04/2017</td>
<td>Carcase</td>
<td>1 week</td>
<td>Septicaemia</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>06/04/2017</td>
<td>Carcase</td>
<td>1 week</td>
<td>Septicaemia</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>21/04/2017</td>
<td>Carcase</td>
<td>3 weeks</td>
<td>Ventricular septal defect</td>
<td>No</td>
<td>No</td>
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<tr>
<td>02/05/2017</td>
<td>Carcase</td>
<td>2 weeks</td>
<td>Unknown</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>09/11/2017</td>
<td>Carcase</td>
<td>1.5 days</td>
<td>Septicaemia</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>15/12/2017</td>
<td>Carcase</td>
<td>2 days</td>
<td>Enteritis</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Patterns of Resistance 2015 - 2018

- *Escherichia coli* isolates taken from these animals display multidrug resistance.
- Disc Diffusion
- Resistance to:-
  - Ampicillin & Amoxycillin-Clavulanate
  - Ceftiofur (CIA)
  - Tetracycline
  - Trimethoprim-Sulphonamides
  - Cefpodoxime, (CIA)
  - Enrofloxacin (CIA),
  - Neomycin and Streptomycin
Patterns of Resistance 2015 - 2018

- Follow on ESBL analysis in BW (n= 3)
- 3 isolates CVRL
- Broth microdilution (CLSI guidelines) using EUVSEC 1 and 2 plates
- Minimum Inhibitory concentrations (MICs) were interpreted using epidemiological breakpoints (ECOFFs) recommended by the European Reference Laboratory for antimicrobial resistance
- Whole-genome 3 isolates using the Miseq platform
Patterns of Resistance 2015 - 2018

• Follow on ESBL analysis in BW (n= 3)

• Three (2/3) resistant to:
  - Ampicillin
  - Cefotaxime (CIA)
  - Ceftazidime (CIA)
  - Chloramphenicol
  - Ciprofloxacin
  - Nalidixic acid
  - Gentamicin
  - Sulphamethoxazole
  - Tetracycline/

• Resistance to beta lactams (including ESBLs) was mediated by
• Mutations in the AmpC promoter region of the bacterial chromosome (Amp-C phenotype).
What would you advise next?
Management Changes Made So Far

- Improved Colostral Management
- Changed Disinfectants - Iodophor (FAM)/ Hydrated Lime
- Calves left in calving pens for 7 days – Cows left in to be suckled 3 times a day
- Calving Pens cleaned out every 7 days
- Majority of herd calved outside at grass
- Changing Point – Clothes/Boots for yard work are left in the Yard
- Autogenous Vaccination
Management Changes Made So Far

• Improved Colostral Management

• Changed Disinfectants - Iodophor (FAM)/ Hydrated Lime

• Calves left in calving pens for 7 days – Cows left in to be suckled 3 times a day

• Calving Pens cleaned out every 7 days

• Majority of herd calved outside at grass

• Changing Point – Clothes/Boots for yard work are left in the Yard

• Autogenous Vaccination
Management Changes Made So Far

- Improved Colostral Management
- Changed Disinfectants - Iodophor (FAM)/ Hydrated Lime
- Calves left in calf pens for 7 days - Cows left in to be suckled 3 times a day
- Calving Pens cleaned out every 7 days
- Majority of herd calved outside at grass
- Changing Point - Clothes/Boots for yard work are left in the Yard
- Autogenous Vaccination

No calf losses this year
Antibiotic Usage History – Anecdotal

• Lameness not traditionally a problem – paring not common – Antimicrobials not routinely used

• Weanlings @ Housing – Not as routine

• Post Dehorning – Not as routine

• Neonatal calves: prevention of navel infection – Not as routine – Omphalophlebitis

• Cases of Scour – treated aggressively
OneHealth Risks with this Herd

- Entire family likely to be colonised at this point?
- Three members of farm family work in healthcare
- Commercial Beef Herd – Trading
- Farm to Farm
- Farm to Market
- Farm to Abattoir

- Slurry Spreading
  > own land – No contractor

<table>
<thead>
<tr>
<th>Year</th>
<th>Moves Out (K/S)</th>
<th>Moves Out (M)</th>
<th>Moves out (F)</th>
<th>Moves In (M)</th>
<th>Moves In (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>54 (23/31)</td>
<td>0</td>
<td>86*</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>2016</td>
<td>27 (8/19)</td>
<td>24</td>
<td>40*</td>
<td>0</td>
<td>11 (7*)</td>
</tr>
<tr>
<td>2017</td>
<td>19 (16/3)</td>
<td>34</td>
<td>7*</td>
<td>23</td>
<td>10 (5*)</td>
</tr>
<tr>
<td>2018</td>
<td>4</td>
<td>16</td>
<td>1</td>
<td>4</td>
<td>25*</td>
</tr>
</tbody>
</table>

* Denotes all cattle moved to/from same herd
Points of Concern

• Trading Herd – many movements
• Pigs/Poultry are largely terminal producers
• Biosecurity

• One health risks

• One change seemed to have major effect!

• Next time?
Thank You