Genome Analysis of a Bacterium that Causes Lameness

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Lameness Incidence
- Sporadic outbreaks
- Variation between houses
  - Incidence: 1-10%
- Primarily only in broilers
- Primarily femoral or tibial heads

Femoral Head Necrosis

Wideman and Prisby. 2013. Frontiers in Endocrinology 3: article 183

Wire Flooring Model
- Grow on Litter
- Transfer to wire flooring
- Lameness about 1 week later

Bacterial Distribution Based on Broiler Line

<table>
<thead>
<tr>
<th>Bacterial Species</th>
<th>Y</th>
<th>Z</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus agnetis</td>
<td>43</td>
<td>36</td>
<td>81</td>
</tr>
<tr>
<td>Staphylococcus hominis</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Staphylococcus zymogenes</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Enterococcus faecalis</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Staphylococcus saprophyticus</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Total number of infections diagnosed: 53
Total number of collected from 3 broiler samples: 53

S. agnetis predominates
- By Line
- By Gender
- By Hatchery
- By Site of Infection (Tibial or Femoral; Left or Right)
**S. agnetis in Water Induces Lameness**
- 7 and 14 days
- Minimum $10^4$ cfu/ml

**Assembling the S. agnetis Genome**
- MiSeq PE 2x251: 6.6 M reads (1000x)
- PacBio: 40,000 reads N50=7000 (10x)
- Assembled PacBio with CeleraCA
- Corrected with MiSeq
- 2 Contigs
  - 2.4 Mbp (5 rDNA operons)
  - 34 kbp plasmid
- 2-3 small plasmids current focus

**Terminal Repeat/Overlap**
- 1-17223 vs 2474478-2491670 ts: 10 tv: 6
- Read Depth and Pair Consistency?

**Genetic Diversity**
- Aligned to MiSeq data from other Staphylococcus species isolates

**Genome Comparisons**
- BLAST Ring Image Generator
  - Black: GC content
  - BlastN-
    - Blue: S.pseudintermedius
    - Green: S.saprophyticus
    - Red: six S.aureus

**Staph Phylogeny**
- Dogs
- Chickens
- Flies
- Humans
Gene Annotation

- Gene annotation is ‘in process’