Introduction & Objective

- Dairy Farmers experience a heavy burden of bioaerosol-related ailments.
- Bioaerosols are known to contain inflammagens (i.e., endotoxins), as well as a diverse bacterial community that is associated with upper respiratory inflammation and pulmonary decrement.
- Industrialization and modernization of the dairy industry has led to dramatic changes to production, work organization and tasks. Consequently, exposure patterns have been altered.
- Recently, we demonstrated the particle size range of dairy bioaerosols is predominately present between 10-100 μm in aerodynamic diameter. These particle sizes are known to deposit in the upper respiratory system.

Methods

Nasal Lavage:
- Nasal lavages were administered to workers before and after their shift over five consecutive days (8-hour shifts). Dairies were located in the high plains and intermountain region of Colorado.
- Dairy workers volunteered to have air monitoring, pulmonary function testing and nasal lavages performed before and after their shift.
- Nasal lavage was performed by administering 5 mL of saline into each nostril (total 10 mL). Volunteers were made to hold their breath for 10 seconds and to not swallow any of the liquid. After the saline was administered, volunteers were instructed to lean forward and allow the saline to drain from their nose into a sterile sample cup.
- After the collection of the nasal lavage, investigators measured the return with a serological pipette for an accurate quantification. The collected lavage sample was then transferred into a sterile 15 mL falcon tube.
- Protease Cocktail inhibitor was added in the field to the lavage for the purpose of preserving cellular information for a study investigating inflammatory response. Samples were stored on ice until they returned to Colorado State University and stored at 6°C in the laboratory.
- A 1 mL aliquot was taken from the lavage sample 12 hours post collection for MRSA carriage testing. Samples were mixed in a 1:1 ration with 40% glycol stock for preservation.

Chemical & biological composition of inhulable dust made several Colorado dairy parlors aerosolized. Figure 2: SEM image of dust sample. Figure 3: Beaurouel particle size distribution.

To date:
- Five dairies have been sampled in the high plains of Northern Colorado and northern Texas
- Volunteer sample size = 31
- 119 nasal lavage pre-shift samples
- 119 nasal lavage post-shift samples
- Average nasal lavage sample = 6.6 mLs

Identification of carriage agents remains an essential need that warrants further research.

Results

Table 1. Methods used for determining presence and carriage of MSSA and MRSA.

<table>
<thead>
<tr>
<th>Methods</th>
<th>Materials</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolation</td>
<td>Chromagar Staph</td>
<td>Resistance indicates LA-MRSA</td>
</tr>
<tr>
<td></td>
<td>Chromagar MRSA II</td>
<td>Resistance provides evidence of further public health concern</td>
</tr>
<tr>
<td></td>
<td>Triple dye Agar</td>
<td>Methicillin-resistant MRSA</td>
</tr>
</tbody>
</table>

Methods continued

To date, a total of 31 dairy workers have participated in our study. Exposure data were available for 119 work shifts based on number of consecutive days of monitoring. As such, 238 nasal lavage samples (pre and post-shift) were collected.
- A total of 50 samples tested positive for MSSA (34%), 23 samples tested positive for MRSA (9.7%).
- To date, 3 samples out of 23 that were MRSA positive have undergone AST. Results for vancomycin susceptibility indicated 3 out of 3 were susceptible to vancomycin (resistance indicates potential public health concerns).
- Additionally, results for tetracycline indicated resistance in two samples (n=2), and susceptibility observed in one sample (n=1). AST results for cefoxitin indicated one sample was resistant (n=1; mecA +), and two samples were susceptible to cefoxitin and therefore mecA – (n=2).

Future Recommendations

- Perform AST on remaining 20 MRSA + samples
- Confirm isolates as LA-MRSA using PCR and MALDI - TOF