Practical considerations to reduce carry-over in design of recording and sampling devices

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Practical Considerations to Reduce Carry-Over in Design of Recording & Sampling Devices

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What Carryover?

- Colostrum
- Milk
- Water and/or cleaning agents
- External contamination
Opportunities for Residue?
Does Backflush Help??
Milk - Physical Properties

- Physically, milk is a rather dilute emulsion combined with a colloidal dispersion in which the continuous phase is a solution. Its physical properties are similar to those of water but are modified by the concentration of solutes and by the state of dispersion of the other components.

- It is “Sticky”
# Surface Tension of Milk, Water and a Plastic

(dyn/cm at 20°C)

<table>
<thead>
<tr>
<th>Material</th>
<th>Surface Tension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Milk</td>
<td>49-51</td>
</tr>
<tr>
<td>Cream</td>
<td>42-45</td>
</tr>
<tr>
<td>Water</td>
<td>72.8</td>
</tr>
<tr>
<td>Polysulphone</td>
<td>42.1</td>
</tr>
</tbody>
</table>
How Much Carryover per Milking Unit?

Claw + Long Milk Tube  80 – 160ml
Plus Milk Meter  0 – 20 ml
Sticky Milk Residues
## Significance of Carryover - Fat

<table>
<thead>
<tr>
<th>Carryover</th>
<th>Fat</th>
<th>Carryover</th>
</tr>
</thead>
<tbody>
<tr>
<td>gm milk</td>
<td>%</td>
<td>gm fat</td>
</tr>
<tr>
<td>50</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>100</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>160</td>
<td>8</td>
<td>12.8</td>
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</table>
### Significance of Carryover - Fat

<table>
<thead>
<tr>
<th>Yield</th>
<th>Fat</th>
<th>Fat 50 gm</th>
<th>Fat 160 gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
<td>%</td>
<td>gm</td>
<td>%</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>200</td>
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<td>15</td>
<td>4</td>
<td>600</td>
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</tr>
<tr>
<td>20</td>
<td>4</td>
<td>800</td>
<td>804</td>
</tr>
</tbody>
</table>

Colostrum?  
Antibiotic Residue?  
Micro-organisms??
Internal Surface Area (to point of sample extraction)

Conventional Milking Unit

0.33 - 0.45 m²

Automatic Milking Unit

1.27 m² (not including sampler)
Milking equipment and connection to milk storage facilities on the farm should be designed and maintained to minimize turbulence, frothing, foaming or agitation of the milk, thereby reducing physical damage to the milk fat and the development of free fatty acids.

All milk contact surfaces shall be free from engraving or embossing. All metal milk contact surfaces, except for welded seams, shall have a surface roughness, $R_a$, less than or equal to 2.5 $\mu$m when tested in accordance with ISO 4288. Surface roughness, $R_a$, on welded seams shall not exceed 16 $\mu$m.

Materials that come into contact with cleaning and disinfecting fluids at concentrations of normal use shall be suitable for such contact. Materials that also come into contact with milk shall be resistant to both milk fat and cleaning and disinfecting solutions.
Practical Steps to Reduce Carryover

• End of Milking - Valve Dump
• Milk Sweep
• Eliminating Non-Draining Milk Tubes
• Material Choice??
Conclusions

• Carryover is unavoidable

• Effect on Fat Content may or may not be significant

• Traditional Sampling Model driven by need for fat accuracy

• What about Disease Surveillance and Pathogen Recognition?

• Need to review Sampling Model for Disease Surveillance, e.g. mid stream sampling?
Thank You