Understanding sheep milk composition in the NZ environment

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Research Objective 1.1; Understanding product characteristics

**Question:** What are the effects of seasonality, ewe lactation status, farm of origin, and breed on the composition, physico-chemical properties, and nutritional value of NZ sheep milk and the consequent effects of processing, storage, and desired product qualities?

**Outcomes:**
Information on nutritional characteristics of sheep milk produced at all stages of the year;
- animal management
- product development
- marketing
- regulatory/compliance purposes.
Mobile sampling

Full milking volume from each animal at each collection time
Composition Study;

400 Individual milk samples; 300 random samples

   Age selected animals

   Lactation cycle selected animals

Mixed genetics / selected genetics

Variability of major milk components; lactation cycle (DIM),
   animal age (lactation No)
   calendar month
Composition results:

Fat % distribution over Days In Milk:
- Range: 1.6-16.8

Protein % distribution over Days In Milk:
- Range: 4.1-11.2

Lactose % distribution over Days In Milk:
- Range: 3.3-5.8

Total solids % distribution over Days In Milk:
- Range: 12.1-32.5
Composition results:

No significance of age of animal

DIM significant

Calendar month significant
Composition results;

Effect of lambing month on season volume and total solids concentration

![Graph of seasonal volume (L)](image1)
![Graph of Collection day Total Solids (%m/v)](image2)
# Sheep study and cow milk comparison

<table>
<thead>
<tr>
<th>Component</th>
<th>NZ Sheep milk</th>
<th>Cow milk*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Average</td>
</tr>
<tr>
<td><strong>Total protein (%)</strong></td>
<td>4.1 – 11.2</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Casein</strong></td>
<td>4.1 – 5.0</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Whey</strong></td>
<td>0.78 – 1.40</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Non-protein nitrogen</strong></td>
<td>0.04 – 0.05</td>
<td>0.046</td>
</tr>
<tr>
<td><strong>Fat (%)</strong></td>
<td>1.6 – 16.3</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Phospholipids (%)</strong></td>
<td>0.03 – 0.12</td>
<td>0.053</td>
</tr>
<tr>
<td><strong>Cholesterol (mg/100mL)</strong></td>
<td>10 – 23</td>
<td>15</td>
</tr>
<tr>
<td><strong>Lactose</strong></td>
<td>3.4 – 5.5</td>
<td>4.9</td>
</tr>
<tr>
<td><strong>Ash</strong></td>
<td>0.89 – 0.93</td>
<td>0.91</td>
</tr>
<tr>
<td><strong>Total solids</strong></td>
<td>12.1 – 32.5</td>
<td>17.4</td>
</tr>
<tr>
<td><strong>Water (by diff)</strong></td>
<td>78.3 – 84.7</td>
<td>81.9</td>
</tr>
</tbody>
</table>


**adapted from Braun M et al. Quantification of phospholipids in infant formula and growing up milk by high-performance liquid chromatography with evaporative light scattering detector. Journal of AOAC International. 2010;93(3):948-55. Epub 2010/07/16
Summary

- Component composition;
  variability driven by fat and protein content = high total solids
  effect Lactation cycle (DIM) and calendar month -processing impacts

- Averaged composition consistent across NZ producers, across years and
  with reported levels

- Studies to address the impact of processing on composition underway
  input into optimisation of storage and processing conditions.