Global Headquarters

Matthews, NC

CEM Europe

- United Kingdom
- Ireland
- Germany
- France
- Italy
- Switzerland
- Austria
CEM Testing Divisions

- **Analytical (40%)**
  - Sample Digestion for Chemical Analysis
  - Prep for ICP, Heavy Metals, etc

- **Process (40%)**
  - Food Compositional Testing
  - Process/Quality Control

- **Molecular (10%)**
  - Extraction for pesticides, vitamins, contaminants, etc
  - Prep for GC, HPLC, and more
## Compositional testing limitations

### Reference methodology (Kjeldahl, Rose Gottlieb, Mojonnier, Soxhlet etc)
- Long analysis times (hours)
- Skilled chemists
- Hazardous chemicals (volume, safety & waste)
- Repeatability issues

### Rapid techniques (NMR, NIR, FT-IR, DUMAS etc.)
- Method development required and often matrix dependent
- DUMAS - High Maintenance Costs/Running Costs. Additional Utilities eg, gas supplies
- FTIR - mechanical – pumps/ valves/ heaters – limited sample tested
- NIR – requires a chemometrician to build/ maintain calibration. Fingerprint affected by changes in colour, consistency, texture and recipe.
CEM Philosophy

Disruptive Technology

• SPRINT for PROTEIN

• ORACLE for SOLIDS/ FAT

Accuracy

Speed

Simple

Cost Effective
Protein

- Automates Udy Dye-Binding method
- Patented iTag Technology
- Under 4 minute analysis
- No toxic waste
- SPRINT auto-cleans between runs
- Low cost v Kjeldahl/ DUMAS
- AOAC Approved – 967.2 for milk/ dairy products
Measure Protein not Nitrogen

- Tags only the amino acids commonly found in proteins
- Histidine, Lysine and Arginine
- All have ‘basic’ side chains
- Ignores all sources of NPN (non-protein Nitrogen)
How Does SPRINT work?

- iTag protein binding technology
- iTag automatically added to sample & homogenised
- Proteins released
- iTag bound proteins ‘fall out’ of solution
- Remaining liquid is filtered and delivered to Colorimeter
- Lighter the colour = more binding = more protein
## Real Data

<table>
<thead>
<tr>
<th>SKYR SAMPLE</th>
<th>Kjeldahl</th>
<th>SPRINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blueberry</td>
<td>9.56%</td>
<td>9.62%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.58%</td>
</tr>
<tr>
<td>Black Cherry</td>
<td>9.14%</td>
<td>9.12%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.08%</td>
</tr>
<tr>
<td>Peach</td>
<td>9.83%</td>
<td>9.87%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.83%</td>
</tr>
<tr>
<td>Mixed Berry Acai</td>
<td>9.45%</td>
<td>9.37%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.46%</td>
</tr>
<tr>
<td>Raspberry</td>
<td>9.74%</td>
<td>9.79%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.81%</td>
</tr>
</tbody>
</table>
What is the ORACLE?

- Rapid 1H NMR requiring no method dev or calibration
- Accurately analyses fat in any sample
- Plant, animal, synthetic fat all Treated equivalently
The Basics of 1H NMR for %Fat
# ORACLE advantages

<table>
<thead>
<tr>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO METHOD DEVELOPMENT</td>
</tr>
<tr>
<td>FTIR – liquid samples</td>
</tr>
<tr>
<td>NIR – solid/ well characterised products</td>
</tr>
<tr>
<td>No calibration maintenance, no drift</td>
</tr>
<tr>
<td>Insensitive to additives, colour, and texture</td>
</tr>
<tr>
<td>Insensitive to sample density/ solids in sample</td>
</tr>
<tr>
<td>No chemometrics</td>
</tr>
<tr>
<td>Entire sample measured, not just surface of small area</td>
</tr>
</tbody>
</table>
CRM method validation

- 27 CRM materials analysed
  - Collaborative studies
  - 10+ certified labs

Outsourced 1000’s of samples
- Blind/ non-blind
- Eurofins/ Silliker

R² = 0.9995

ORACLE Fat % vs Reference Fat %
CRM method validation – Dairy specific

- Cecelait considered “Experts” in Dairy analysis and processing equipment
- Validate and publish technologies for the dairy industry
Simple to Operate

- Responsive Touchscreen
- Multi-level operators
- Lab or Factory Environment
- One universal method for all samples

CEM
Sophisticated but Simple

- Advanced data processing
- LIMS
- USB
- Balance pairing
- Import/ Export
- Data filtering
- QC/ CRM tracking
Operation with SMART 6

**Smart6**
Moisture / Solids Analysis
2-3 mins

**Rapid NMR Conditioning**
30 - 60 seconds

**ORACLE NMR**
Fat Analysis
30 seconds
Operation with Drying Oven

Air Oven
Moisture / Solids Analysis
4h

Conditioning in heater block

ORACLE NMR
30 seconds
Application Success

Nearly 2,000 sample types have been tested

- **Dairy** – raw, cultured, egg, alternative (soy, oat, nut, etc), powders
- **Meat** – raw, processed, smoked/cured, alternative (vegan)
- **Snack Foods** – cookies, crackers, nuts, chips
- **Prepared Foods** – condiments, frozen dinner, cereals, sauces, peanut butter
- **Confectionary** – chocolate, syrup, cake, caramel, cocoa
- **Fats/Oils** – rendered fats, cooking oils, fish oil, butterfats
- **Feeds/Meals** – feed ingredients, additives, nutraceuticals, corn germ

Over 1000 units installed globally since release in 2016/2017

- Manufacturing, R&D, Contract/Certified Labs, Government Labs, Academia
Accreditation

• ISO/ IDF approved new draft standard
• Milk and Dairy Products – Guidance for the application of CPMG pulsed NMR for fat determination
• ISO 16756
• IDF 259
• Recognition as safer, greener alternative
Thank you all for listening