<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Frozen and Chilled Ready Meals (RMs): An Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Authors(s)</strong></td>
<td>Gormley, T. R. (Thomas Ronan)</td>
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FROZEN AND CHILLED
READY-MEALS (RMs)

~ AN OVERVIEW ~

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APPROACH

• Market

• PPP and TTT factors

• R&D at the NFC

• Conclusions

3

MARKET (MEuro) for RMs

<table>
<thead>
<tr>
<th></th>
<th>Frozen</th>
<th>Chilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>890</td>
<td>830</td>
</tr>
<tr>
<td>FR</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td>DE</td>
<td>260</td>
<td>64</td>
</tr>
</tbody>
</table>

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UK MARKET for RMs

• Growth/annum: frozen (10%); chilled (15%)

• One retailer controls 50% of chilled

• 50% of frozen is private label

• 80% of chilled is private label

• Retailer ‘pull’ a huge factor

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FR and DE MARKETS for RMs

FR

• 10% is private label

DE

• Mostly owned by a frozen home delivery company
DYNAMIC GROWTH OF RM s IS DUE TO LIFESTYLE CHANGES

- RM s are foods to fit lifestyles
- Working couples ↑
- Convenience requirements ↑

PPP and TTT

Product
Process → Influence shelf-life, safety and quality
Package
Time
Temperature → Influence shelf-life and safety
Tolerance

RM s REQUIRE HIGH QUALITY INGREDIENTS

<table>
<thead>
<tr>
<th>Protein</th>
<th>Carbohydrate</th>
<th>Vegetable</th>
<th>Sauce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>Rice</td>
<td>Peas</td>
<td>Stocks</td>
</tr>
<tr>
<td>Pork</td>
<td>Pasta</td>
<td>Beans</td>
<td>Flavours</td>
</tr>
<tr>
<td>Chicken</td>
<td>Potato</td>
<td>Carrots</td>
<td>Oil-based</td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td></td>
<td>Hollandaise</td>
</tr>
</tbody>
</table>

Water-based

<table>
<thead>
<tr>
<th></th>
<th>Oil-based</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mayonnaise</td>
</tr>
</tbody>
</table>
MEAL ASSEMBLY (automated)

- Protein: cook, freeze (IQF)/chill
- Vegetables: cook: freeze (IQF)/chill
  - deliver frozen/chilled to trays
- Sauce: cook; blast-chill
- Carbohydrate: cook; blast-chill
  - deliver chilled to trays

PROCESS

- Frozen
  - Compact plate freezer for regularly shaped trays
  - In-line spiral blast freezer for high volume applications (-18°C in 1.5h)
  - Cryogenics (LN) for low volumes
- Blast chilling
- Freeze-chilling
- Heat treatment (ambient stable)

'INNOVATIONS'

- Sous-vide cooking is being used increasingly for high quality
- Microwave pasteurisation gives a rapid rise in product temperature with minimum quality damage

TIME-TEMPERATURE-TOLERANCE

<table>
<thead>
<tr>
<th>Frozen RMs</th>
<th>Chilled RMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-factory (3w±2d to 6w)</td>
<td>shelf life (6d)</td>
</tr>
<tr>
<td>in-depot (10d)</td>
<td>range produced daily</td>
</tr>
<tr>
<td>in-store (7d)</td>
<td>logistics challenge</td>
</tr>
<tr>
<td>shelf-life &gt; 1y</td>
<td>very vulnerable</td>
</tr>
</tbody>
</table>
PACKAGE

- Microwavable; ovenable; boilable
- PET for trays
- PE + nylon for B in B
- New films (with rubberizer) retain their functionality (-40°C to -200°C)

SAFETY

- RM follow the 'normal' rules for frozen and chilled foods

FREEZE-CYLING OF RM COMPONENTS (NEC)

Freeze-chilling involves:

- freezing and frozen storage

followed by

- thawing and chilled storage

FREEZE-CYLING AND thAWING PLATEAU: INFLUENCE ON SAFETY AND QUALITY

CHILLED FOODS are for the perfectionist!
FREEZE-CHILLING:

- streamlines production
- improves logistics/flexibility
- enables 'chilled' products to reach more distant markets
- labelling and use-by date issues must be addressed

EFFECT OF FREEZE-CHILLING

Four comparisons:

- Freeze-chill 7 days at -28°C
  5 days at 4°C
- Freeze 7 days at -23°C
- Chill 5 days at 4°C
- Prepare and test as fresh

Products under test:

- Mashed potato
- Salmon
- Broccoli
- Ready meals
CONCLUSIONS

- RMs are 'lifestyle' foods
- RMs are showing dynamic growth
- PPP and TTT factors apply
- The 'rules' of frozen/chilled foods apply
- Quality is very good
- A competitive sector