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

~ AN OVERVIEW ~

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2

APPROACH

- Market
- PPP and TTT factors
- R&D at the NFC
- Conclusions

3

MARKET (MEuro) for RM

<table>
<thead>
<tr>
<th></th>
<th>Frozen</th>
<th>Chilled</th>
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<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>

4

UK MARKET for RM

- 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

5

FR and DE MARKETS for RM

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**

<table>
<thead>
<tr>
<th>Product</th>
<th>Process</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Influence shelf-life and safety and quality</td>
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<td></td>
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<td></td>
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<tr>
<td>Time</td>
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<td></td>
<td></td>
<td>Influence shelf-life and safety</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
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<tr>
<td>Tolerance</td>
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</table>

**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><strong>Oil-based</strong></td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td></td>
<td>• Hollandaise</td>
</tr>
</tbody>
</table>

*Water-based*
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

Frozen RMs       Chilled RMs

- in-factory (3w±2d to 6w)   • shelf life (6d)
- in-depot (10d)              • range produced daily
- in-store (7d)               • logistics challenge
- shelf-life > 1y             • very vulnerable
**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)

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**SAFETY**

- RMs follow the ‘normal’ rules for frozen and chilled foods

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**FREEZE-CHILLING OF RM COMPONENTS (NFC)**

Freeze-chilling involves:

- freezing and frozen storage

followed by

- thawing and chilled storage

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**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

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