Cold storage in private households: recommendations and consumer real life behaviour

Jasmin Geppert, Olga Reger, Sandra Bichler, Rainer Stamminger

University of Bonn/ Germany
Institute of Agricultural Engineering
Household and Appliance Technology Section

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Introduction
Introduction

- Foodborne diseases: relevant public health problem (RKI, 2002)

- Origin: Restaurants, canteens, communal catering, private households

- Influencing factors:
  - Inadequate storage and cooking temperatures
  - Contaminated raw materials
  - Improper food handling
Introduction

Preventive measures

- Production, transport, storage and retail display:
  → hygiene of foodstuff regulated by law
- Transport to private homes and in private households:
  → no regulations
  → numerous recommendations to assist consumer

How is the quality of these recommendations?
Do consumers agree with these recommendations?
How do consumers act in real life?
Introduction

Aim of the present study:

- Analysis of consistency and correctness of recommendations concerning proper handling of perishable food
- Investigation of consumer real life behaviour regarding cold storage of perishable food
- Assessment of real life consumer behaviour with regard to food safety and hygiene
Materials and Methods
## Concept of the studies

### Implementation of an online survey (n=1000)

<table>
<thead>
<tr>
<th>4 Countries:</th>
<th>D, F, E, GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment/ Hosting:</td>
<td>Market research company</td>
</tr>
<tr>
<td>Quotation:</td>
<td>Young single household (&lt; 30 years of age)</td>
</tr>
<tr>
<td></td>
<td>Elder single household (&gt; 55 years of age)</td>
</tr>
<tr>
<td></td>
<td>Couple household</td>
</tr>
<tr>
<td></td>
<td>Household with 3 or 4 members</td>
</tr>
<tr>
<td></td>
<td>Extended family households (≥ 5 persons)</td>
</tr>
<tr>
<td>Questionnaire:</td>
<td>43 questions covering the aspects: demography, temperature adjustment, food storage behaviour</td>
</tr>
<tr>
<td>Data analysis:</td>
<td>SPSS, version 14</td>
</tr>
</tbody>
</table>
Concept of the studies

Implementation of an in-home study (n=100)
Quotation: Identically equal to online survey
Recruitment: 2 market research companies with large European panels
Temp.-Logger: Data were recorded every minute over a period of 11 days. Logger was placed and fixed centrally on the middle shelf of the refrigerator
Photos: One photo of the compartment and one of the opened door was taken every day over a period of 14 days. Digital cameras were provided
Analysis of recommendations

- Online search via Google™:
  - Food storage refrigerator
  - Lebensmittellagerung Kühlschrank
  - Almacenaje de alimentos refrigerador
  - Conservation des aliments réfrigérateur

- Review of the first ten hits of each keyword

- Comparison with scientifically sound recommendations (source: Federal Institute for Risk Assessment (BfR))
Results and Discussion
Temperature adjustment of the refrigerator

Scientifically sound vs. publicly available recommendations

Scientifically sound recommendation: Optimal temperature adjustment: < 5 °C

Diagram:

- < 5 °C: 50%
- 5 - 7 °C: 20%
- According to manufacturer’s recommendations: 5%
- No specification: 25%
Temperature adjustment of the refrigerator

*Consumer behaviour*

**Scientifically sound recommendation:** Optimal temperature adjustment: < 5 °C

Average:
- D: 6,2 °C
- GB: 5,2 °C
- F: 6,7 °C
- E: 4,1 °C

42,7 % of households agree with scientific recommendations
Optimal place to store meat, poultry and fish

*Scientifically sound vs. publicly available recommendations*

**Scientifically sound recommendation:** bottom shelf on the bottom drawer

![Bar chart showing relative frequencies of storage recommendations. The bottom shelf recommendation is the most frequent, followed by temperature 3-4 °C and no specification.](chart.png)
Optimal place to store meat, poultry and fish

*Consumer behaviour*

**Scientifically sound recommendation:** bottom shelf on the bottom drawer

Only 21.8% of perishable foodstuff is placed correctly.
Packaging/ wrapping of food

*Scientifically sound vs. publicly available recommendations*

**Scientifically sound recommendation:** Store food (especially raw meat/ fish) in closed containers or wrap/ cover it completely to prevent cross-contamination.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>In closed containers or completely wrapped/covered</td>
<td>50%</td>
</tr>
<tr>
<td>Covered (not specified)</td>
<td>20%</td>
</tr>
<tr>
<td>No specification</td>
<td>30%</td>
</tr>
</tbody>
</table>
Packaging/ wrapping of food

Consumer behaviour

Scientifically sound recommendation: Store food (especially raw meat/ fish) in closed containers or wrap/ cover it completely to prevent cross-contamination

Good knowledge about food packaging/ wrapping

[Diagram showing frequency of different packaging options]
Prevention of temperature rise inside the refrigerator

Scientifically sound vs. publicly available recommendations

Scientifically sound recommendation: Only open the door as often as necessary and do not leave the door open

<table>
<thead>
<tr>
<th>Relative frequency</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>Open the door rarely as possible and close it as soon as possible</td>
</tr>
<tr>
<td>100%</td>
<td>No specification</td>
</tr>
</tbody>
</table>
Prevention of temperature rise inside the refrigerator

*Consumer behaviour*

**Scientifically sound recommendation:** Only open the door as often as necessary and do not leave the door open.

- **0 - 5 times**
- **6 - 10 times**
- **11 - 15 times**
- **16 - 20 times**
- **21 - 25 times**
- **26 - 30 times**
- **31 - 35 times**
- **36 - 40 times**
- **≥ 40 times**

Mean: 11 openings/day
Optimal place to store raw eggs

*Scientifically sound vs. publicly available recommendations*

**Scientifically sound recommendation:** **Maximal storage temperature: 7 °C**
Optimal place to store raw eggs

*Consumer behaviour*

**Scientifically sound recommendation:** Maximal storage temperature: 7 °C

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**Graph: Frequency of Storage Place Choice**

- **Door/egg tray:** 80%
- **Upper shelf:** 20%
- **Middle shelf:** 10%
- **Bottom shelf:** 10%

*Warmest place of the refrigerator*
Summary/ Conclusion
Summary *Consumer behaviour*

- 57.3% of measured temperatures exceeded the recommended temperature of the BfR → adequate food handling is not guaranteed

- 78.2% of meat, poultry and fish products are stored inadequately

- 83.3% of raw eggs are stored at the warmest place of the refrigerator
Summary *Consumer behaviour*

- Good consumer knowledge with regard to adequate food packaging and wrapping

- Frequency of door openings extremely high in some households
  → potential risk of temperature rise inside the refrigerator
Summary *Publicly available recommendations*

- Recommendations do not always agree with scientifically sound advice
- Recommendations concerning temperature adjustment are not consistent
- Several recommendations only cover few aspects of adequate food storage and handling → no comprehensive support
Conclusion

- Food storage at home most critical link in food chain
- Consumer’s role in maintaining cold chain is important

→ Recommendations have to be improved
→ Appropriate dissemination of information material
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Thank you for your attention!

Contact:
Jasmin Geppert
University of Bonn/ Germany
Phone: +49 228/732384
e-mail: haushaltstechnik@uni-bonn.de