FSA Project FS101025

Freezing as an intervention to reduce the numbers of campylobacters isolated from chicken livers
Background

- Caterers
- Colour
- Texture
- Undercooking

Chicken liver food poisoning link

Over 90% of cases of a common form of food poisoning seen in catering venues this year were due to people eating undercooked chicken liver pate, often at weddings, infection experts have said.

The Health Protection Agency (HPA) analysed 18 outbreaks of Campylobacter in 2011 across England.

In all, 443 people became unwell and one had to be hospitalised.

The Food Standards Agency (FSA) has reminded caterers to cook poultry livers to prevent infection.
Assessment of freezing as an intervention

Two main project strands:

- Small retail survey of fresh and frozen livers
- Freeze some livers and see what happens
Retail survey

- 30 frozen and 33 fresh livers
- Differences in numbers of campylobacters
- Used ISO 10272-2 (with modification on low dilution)

- 51 retail premises
- 14 different processing plants

- 48 supermarkets, 10 butchers, one deli, two commercial catering suppliers, two corner shops
Locations

Sample collections piggy-backed onto FSA retail survey of Lm in CSM
Comparison results

Banded counts of *Campylobacter* numbers in unfrozen chicken liver samples purchased at retail (cfu/g)

Banded counts of *Campylobacter* numbers in frozen chicken liver samples purchased at retail (cfu/g)

Fresh mean log 2.25 cfu/g liver

Frozen mean log 1.55 cfu/g liver

t-test:  $P = 0.015$  Frozen livers in retail samples contained less *Campylobacter*
Retail survey

Nothing interesting:

- No correlation between purchase temperature and numbers of campylobacters
- No correlation between remaining shelf life and numbers of campylobacters
Strand two

- Effect of freezing fresh livers on natural campylobacters
- Collected livers from slaughterhouses (to be sure) and final clearance flocks (max chance)
- After standard process – trimmed, chilled and cleaned in slush ice
- Broadly comparable numbers to the retail livers with longer shelf life (no sig. dif. whole retail sample set)
Freeze treatments - using two freezers

4 graphs showing temperature fluctuations over time for 4 different temperature sensors labeled 650343, 649187, 649224, and 630651.
The -15°C freezer (n=30)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Log₁₀ numbers of Campylobacter (log₁₀ cfu/g)</th>
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<tbody>
<tr>
<td>Pre-freeze</td>
<td></td>
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<tr>
<td>24h freeze, post thaw day 1</td>
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<tr>
<td>24h freeze, post thaw day 2</td>
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<tr>
<td>24h freeze, post thaw day 3</td>
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<tr>
<td>7d freeze, post thaw day 1</td>
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</tbody>
</table>

Log₁₀ numbers of *Campylobacter* (log₁₀ cfu/g)
The -15°C freezer

- Freeze for 24h significantly lower numbers of campylobacters compared with unfrozen livers (t-test $P<0.01$)
- Freeze for 1 wk significantly lower numbers of campylobacters compared with 24h frozen livers (t-test $P<0.01$)
- No evidence of recovery from sub-lethal injury (ANOVA)
The -25°C freezer (n=30)

Log10 numbers of Campylobacter (log10 cfu/g)

- Pre-freeze
- 24h freeze, post thaw day 1
- 24h freeze, post thaw day 2
- 24h freeze, post thaw day 3
- 7d freeze, post thaw day 1
- 7d freeze, post thaw day 2
- 7d freeze, post thaw day 3

Log10 numbers of Campylobacter (log10 cfu/g)
The -25°C freezer

- Freeze for 24h significantly lower numbers of campylobacters compared with unfrozen livers (t-test $P<0.01$)
- No difference when freeze for 24h compared with 1 wk frozen livers (t-test $P=0.18$)
- No evidence of recovery from sub-lethal injury (ANOVA)
The effect of two freezes to -25°C
The effect of two freezes to -25°C (n=30)

- Pre-freeze
- Single freeze PT day 1
- Two freezes PT day 1
- Two freezes PT day 2
- Two freezes PT day 3

Log_{10} numbers of Campylobacter (log_{10} cfu/g)
The effect of two freezes to -25°C

- First freeze significant reduction compared with unfrozen livers ($P = 2 \times 10^{-26}$)

- Second freeze significant reduction compared with unfrozen livers ($P = 9 \times 10^{-10}$)

- Significant benefit of freezing twice

- 3 logs reduction to *Campylobacter* numbers
Project team

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