An evaluation of freezing as an intervention to reduce the numbers of campylobacters isolated from chicken livers

Area of research interest: Foodborne pathogens
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Background

Campylobacter, often found in poultry, is the most common cause of food poisoning in the UK.

There has been a notable increase in reported human outbreaks of campylobacter in the UK in recent years. Most of these incidents have been associated with chicken liver pâté or parfait, prepared in catering settings. In 2011, over 90% of outbreaks of campylobacter food poisoning at catering venues were linked to chicken liver pâté consumption (HPA 2011). Strachan et al. (2012) have reported that strains of campylobacter from chicken liver were most similar to those found in humans.

The reason for the recent increase is not fully understood but appears to be related to the use of undercooked livers in preparing pâté and parfait dishes. Campylobacter levels up to 104cfu/g have been reported in uncooked chicken livers. Campylobacter spp. in poultry meat are known to be sensitive to freezing and this work has assessed the impact of freezing on the levels present in chicken livers.

Freezing is a proven effective intervention to control campylobacter contamination of poultry meat. However, there has been a lack of evidence on how effective this treatment is with chicken livers, particularly under conditions similar to those in catering or domestic kitchens where freezer temperatures and freezing rates may vary.

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Research Approach

This research project aimed to establish the impact of freezing on campylobacter contamination levels, following thawing and subsequent storage. It also looked at the impact of a second freezing treatment.

The research project:

- used international standard methods for campylobacter enumeration and took into account the impact of freezing on recovery
- examined chicken livers sourced from a selection of UK retail outlets and catering suppliers and provided an indication of the levels of contamination present. The sample consisted of 30 livers and detailed information on the products (brand, ‘use by’ date, product code, etc) have been recorded
- used livers which have not previously been frozen to determine whether freezing for 24-hours or seven days reduced the campylobacter count in chicken livers and by how much
- identified whether a subsequent (second) freeze reduced levels further
- assessed whether different freezing temperatures, between the range of -15°C and -25°C (i.e. those of domestic freezers versus commercial freezers) had an impact on campylobacter levels
- assessed the impact of storage at 4oC for 24- and 48-hours on campylobacter levels, post-thaw
- will retain representative pre- and post-freezing isolates for at least 12 months and make these available for other FSA-funded studies if required

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Results

Chicken livers naturally contaminated with campylobacters were subjected to freezing at -15°C and -25°C for one and seven days. Numbers of campylobacters on the livers were determined immediately before and after a 24 hour or seven day freeze treatment, and daily during three days post-thaw refrigerated storage. Freezing for 24 hour at -25°C reduced numbers of campylobacter by up to 2 log10 cfu g-1. Freezing the livers for 24 hour at -25°C, thawing overnight in a fridge set to 4oC and refreezing for another 24 hour at -25°C, reduced the numbers of campylobacters by up to three log cycles. There were significantly greater reductions in the numbers of campylobacters when the first and second freeze treatments were compared.

Freezing chicken livers can reduce, but not eliminate, campylobacters. If poultry processors were to freeze livers destined for human consumption as part of routine processing, there is a potential for a reduction in campylobacteriosis associated with the consumption of imperfectly cooked chicken livers and derivatives, such as pâté.

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Published Papers

1. Harrison, D., Corry, J.E.L., Tchorzewska, M.A., Morris, V.K., Hutchison, M.L., (2013) Letters in Applied Microbiology, doi: 10.1111/lam.12098 Related media

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