

Controlling campylobacter during the manufacture of chicken liver pâté

Area of research interest: [Foodborne pathogens](#)

Study duration: 2013-09-01

Planned completion: 1 February 2014

Project code: FS101062

Conducted by: University of Bristol

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Background

In 2010, there were more outbreaks of campylobacter than salmonella and most of these were associated with chicken liver pâté/parfait dishes served in catering settings. In the absence of clear evidence-based advice to caterers and consumers on safe preparation of organoleptically acceptable products (this means that the products are acceptable in terms of taste, appearance, smell and touch), outbreaks are likely to continue with associated public health and economic costs. This research has the potential to identify safer preparation steps which could form the basis of advice to consumers and caterers on preparing these products. The work is not seen as a replacement for good hygienic practice or the application of HACCP principles which are the responsibility of food businesses.

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Research Approach

Approach 1: Initial recipe development

Chicken liver pâté/parfait recipes were sourced from randomly-selected cookbooks, the internet and from retail packs of chicken livers. Before use, all recipes were assessed by scoring the Provenance, Relevance, Objectivity, Method, Presentation and Timeliness of each between 0 and 5 for each attribute. Acceptably-scored recipes were scrutinised as a means of identifying any practices that were likely to be beneficial in reducing the numbers of campylobacters contaminating livers. From assessment of these recipes a protocol was developed from the identified likely beneficial manufacturing stages and ingredients.

Approach 2: Pilot scale assessment of the pâté recipe

Using contaminated livers, the recipe was trialled and a batch of pâté was manufactured with rigorous monitoring of the cooking temperature. The pâté was stored under refrigeration and a portion tested (ISO 10272-2) to confirm that the effective cooking had destroyed the campylobacters. The pilot batch of pâté was subjected to an initial round of assessment by a trained test panel to determine if the recipe generated a palatable pâté.

Approach 3: Determination of the contribution of each antimicrobial pâté: manufacture stage

This study proposed five campylobacter interventions of freezing livers, organic acid wash, exposure to essential oils in herbs in a marinade, a flambé in brandy and heat treatment to 70oC. The effect of freezing raw livers is already known (Harrison et al 2013). The relative impacts of organic acid immersion, a herbal milk marinade, flambé and effective cooking on Campylobacter populations was measured. Three different batches of livers were washed in organic acid and marinated with different batches of herbs under refrigeration and the numbers of campylobacters determined before and after each treatment. The marinated livers were further processed into pâté with numbers of campylobacters determined before and after flambé and the cooking of the livers. Replication was as described in the microbiological testing section.

Approach 4: A comparison of the sensory characteristics of pâté manufactured from fresh and frozen livers

A blind taste comparison was made of two parfaits prepared from a single batch of livers, half of which were frozen overnight; with the other half being chilled overnight. The trial also assessed the sensory characteristics of the parfait (texture, juiciness, taste, colour). At the end of the trial, a statistical analyses report was generated to indicate any significant differences between the treatments and rank the samples based on user-stipulated attributes.

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Results

A literature search identified 40 pâté manufacture recipes. Recipes were appraised and stages that were likely to be antimicrobial were assembled to form a new protocol that included washing with organic acid, freeze-thaw and flambé in alcohol. Contaminated livers from organic clearance flocks were obtained directly from slaughterhouses as high-risk material and the effect of each stage of the protocol to campylobacter populations on naturally contaminated livers was determined.

It was found that:

- organic acid washing changed the colour of the liver surfaces
- there were no significant differences between liver surface colour changes when a range of concentrations of lactic acid and ethanoic acid washes were compared by reflective spectrophotometry
- both organic acid washes reduced the number of indigenous campylobacter bacteria by around 1.5 log₁₀ cfu/g at a concentration of 5% (w/v)
- liver cooking effectiveness was appraised by thermography and temperature loggers and the use of a Bain Marie (also known as a water bath) was found to more reproducibly apply heat compared with pan-frying

The antimicrobial protocol stages did reduce the number of campylobacter bacteria, but not significantly if thermal processing was ineffective. Cooking to 63oC was confirmed to be a critical control point for campylobacters in pâté. Sensory assessment of pâté manufactured using the protocol from fresh or frozen livers were determined both to be acceptable, with an overall preference for pâté made from frozen livers.

This study has validated a protocol for commercial quantities of pâté that reliably destroys campylobacters in highest risk livers sourced from final clearance flocks. In addition, the protocol generated pâté that is pink in colour and has other organoleptic properties considered desirable by caterers.

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Published Papers

1. Hutchison, M, Harrison, D, Richardson, I and Tchórzewska, M, A Method for the Preparation of Chicken Liver Pâté that Reliably Destroys Campylobacters, Int. J. Environ. Res. Public Health 2015, 12(5), 4652-4669; doi:10.3390/ijerph120504652

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Final report

England, Northern Ireland and Wales

PDF

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