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Consumer acceptability of interventions to reduce *Campylobacter* in the poultry food chain

L.A. MacRitchie [a,*], C.J. Hunter [b], N.J.C. Strachan [a,b]

[a] Institute of Biological and Environmental Sciences, School of Biological Sciences, University of Aberdeen, Cruickshank building, St Machar Drive, Aberdeen, AB24 3UU, Scotland
[b] School of Geography & Geosciences, University of St Andrews, Irvine Building, North Street, St Andrews, KY16 9AL, Scotland

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ABSTRACT

Reducing human *Campylobacter* cases has become a priority for the UK Government. However the public's views on acceptability of interventions to reduce *Campylobacter* in poultry production are poorly understood in the UK and in other countries around the world. The objective of the study was to investigate how increasing awareness and knowledge changes consumer acceptability of interventions that reduce human campylobacteriosis in the poultry food chain. This approach is readily applicable to other risks and associated interventions. It involved a survey of the views of consumers in the Grampian region in North East Scotland. This found that better hygiene practices on farm, freezing chicken meat and vaccination of chickens were acceptable to the majority of participants (95%, 53% & 52% respectively) whilst irradiation and chemical wash of chicken meat were acceptable to <50%. Increasing consumer awareness by providing information on the *Campylobacter* disease burden in humans increased the number of participants finding them acceptable. However, chemical wash and irradiation remained the least acceptable interventions, although highly effective at reducing *Campylobacter*, and were found to be never acceptable to >50% of respondents. It was found on average that food poisoning concern, previous awareness of *Campylobacter* and living in rural or urban areas had either no or little effect effect on the acceptability of interventions. Further, previous awareness of *Campylobacter* did not influence consumer concern of harmful bacteria on chicken meat. Overall, findings indicate that increasing consumer acceptability of the most effective interventions is likely to be a difficult process.

1. Introduction

1.1. The Campylobacter problem

Campylobacter is the most common cause of bacterial gastrointestinal disease in the developed world (Gabriel et al., 2010) and caused a reported 70,298 cases in the UK in 2010 (Defra, 2011). However, most cases are underreported and the actual number in the UK is estimated to be over 500,000 per year (Tam et al., 2012). Symptoms of human campylobacteriosis include diarrhoea, abdominal pain and nausea, which tend to last for 5–7 days with minor relapses occurring in 15–25% of cases (Blaser & Engberg, 2008). 10% of cases are hospitalised (Bessell et al., 2010) and 0.2% end in death (Adak, Meakins, Yip, Lopman & O'Brien, 2005). Post infection complications associated with campylobacteriosis include Guillian–Barré syndrome, reactive arthritis and inflammatory bowel disease (Moore et al., 2005). In addition, the financial burden of *Campylobacter* was estimated to be £583 million in 2008 in the UK (Food Standards Agency, 2010).

Many pathways of *Campylobacter* infection have been identified, but the consumption of contaminated poultry is considered to be the most common source of campylobacteriosis in humans (Moore et al., 2005). The association with chicken was demonstrated when chicken products were removed from sale due to dioxin contamination in Belgium and in a 40% reduction in human *Campylobacter* cases (Vellinga & Van Loock, 2002). Therefore a decrease of *Campylobacter* on chicken meat is crucial for reducing the number of human infection cases.

Campylobacter infection in poultry begins at the farm caused by, for example, poor biosecurity, contaminated feed or transmission from one crop to the next. Therefore good hygiene and biosecurity practices are required to be in place to avoid contamination of

* Corresponding author. Present address: St Magnus House, Aberdeen, 25 Guild Street, Aberdeen, AB11 6NJ, Scotland. Tel.: +44 (0)1224272699; fax: +44 (0) 1224272703.
E-mail addresses: laurel3@hotmail.co.uk, laura.macritchie@foodstandards.gsi.gov.uk (L.A. MacRitchie).

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flocks (Gibbens, Pascoe, Evans, Davies & Sayers, 2001). The infection is asymptomatic and once in a flock *Campylobacter* is rapidly transmitted by the faecal-oral route throughout the broilers (Wassenaar, 2011). The bacteria can then survive during poultry processing (stages comprise of transport, slaughter, processing and preparation) through to human consumption (Hartnett, Kelly, Gettinby & Wooldridge, 2002) and causing subsequent illness. However at each of the process stages interventions either are in place or can be implemented to control *Campylobacter*.

Biosecurity practices at the farm include disinfecting poultry houses, boot dips (Galanis, 2007), fly screens (Hald, Sommer & Skovgård, 2007) disinfecting equipment and vehicles, and treating the flock water supply (Wassenaar, 2011). Alternative practices to antibiotic additives in broiler feed currently being investigated are probiotics (Gaggìa, Mattarelli & Biavati, 2010), bacteriocins (Svetoch & Stern, 2010), bacteriophage (Monk, Rees, Barrow, Hagens & Harper, 2010) and vaccination (De Zoete, van Putten & Wagenaar, 2007). Interventions at the slaughter stage include steaming, forced air chill, electrolysed oxidising water as a disinfectant agent (Wassenaar, 2011), chemical wash (Keener, Bashor, Curtis, Sheldon & Kathariou, 2004), crust freezing (Rosenquist et al., 2009) and irradiation (Havelaar et al., 2007). In the home, good hygiene is important to avoid cross contamination and chicken meat should be cooked properly to prevent consumption of potentially harmful food.

1.2. Consumer acceptability of interventions

In general, the acceptability of interventions by consumers is a potentially important determinant for government decision making as effective policy initiatives are reinforced by public preferences and concerns (Cope et al., 2010). Consumers may be more willing to accept new interventions where they have a role in choosing these themselves rather than having them imposed by government and industry (Krebs, 2001).

Factors that may influence acceptability of interventions include: the level of concern that people associate with interventions (e.g. irradiation intervention may be perceived to be risky in itself); the awareness the public has about the intervention; the willingness to voluntarily accept it (Breakwell, 2007); and, the severity or extent of the consequences the consumer would have to endure if it was not in place (e.g. a higher incidence of *Campylobacter* cases) (Renn, 2008). Previous research indicates that concern of meat being safe to eat more generally and an awareness of *Campylobacter* and are factors that can influence acceptability of interventions (Breakwell, 2000,Fife-Schaw & Rowe, 1996). Other factors that may play a role in influencing acceptability of interventions are cultural perception (Renn, 2005), individual attitudes, demographic characteristics (Breakwell, 2000) such as where people live, and measures that the public put in place to protect themselves (Renn, 2008); e.g. a change in shopping habits to avoid unsafe products (Dillaway, Messer, Bernard & Kaiser, 2011).

It is suspected that those living in rural areas could have greater awareness because they have higher incidence of campylobacteriosis compared to urban residents in Grampian (Strachan et al., 2009).

Investigation into acceptability of interventions to improve food safety has been carried out for other meats, for example, a European study on acceptability of interventions and new technologies in the beef (De Barcellos et al., 2010; Van Wezemael, Verbeke, Kügler & Scholderer, 2011), turkey meat (Yan, Lee, Nam, Min & Ahn, 2006) and pork (Mørkbak, Christensen & Gyrd-Hansen, 2012) food chain.

Recent publications from New Zealand and the UK have highlighted consumer views on interventions to reduce *Campylobacter* on poultry meat (Gilbert & Cressey, 2008; Jordon & Stockley, 2010). In 2008 the New Zealand Food Safety Authority published a report investigating (by telephone questionnaire) consumer knowledge, attitudes and beliefs with respect to *Campylobacter* and poultry. Chemical wash was found to be the least favoured intervention, with the most popular intervention being stricter farm management. A quarter of respondents were found to be willing to pay a 10–20% premium on safe chicken through stricter farm management (Gilbert & Cressey, 2008). However, the New Zealand study did not investigate the factors that could influence acceptability of interventions.

In 2009 the Food Standards Agency (FSA) used consumer discussion forums to determine the levels of awareness and understanding of *Campylobacter* and collate opinions for reducing levels of foodborne disease (Jordon & Stockley, 2010). The process included showing participants a film of the poultry process and *Campylobacter* risks. The study found that consumers recognised that *Campylobacter* posed a risk to public health, and that 'on farm' interventions, lactic acid spray, heat treatments and packing interventions to prevent cross-contamination were most favoured. Other factors found to influence consumer attitudes on interventions were convenience, additional cost, the effect on consumer experience, food safety and ethical concerns. However, it should be noted that this research used qualitative methods through focus groups.

Although there has been some research conducted on the acceptability of interventions for *Campylobacter* in poultry (Gilbert & Cressey, 2008; Jordon & Stockley, 2010) there is a gap in understanding with regards to how changing consumer awareness and knowledge on both the burden of disease and efficacy of interventions might lead to changes of opinion on intervention acceptability (Breakwell, 2000). This paper develops an approach to address this which is applicable to other risks and their associated interventions.

1.3. Aim and objectives

The aim of the research reported here, therefore, was to investigate consumer acceptability of a range of interventions in the poultry food chain. Specific objectives were to:

I) determine the most and least acceptable interventions;
II) ascertain the effect on the acceptability of interventions by providing additional information (i.e. increasing awareness) on *Campylobacter* and by suggested effectiveness caused by the interventions on acceptability; and,
III) investigate if acceptability was influenced by prior concern and awareness of *Campylobacter* as well as living location (rural or urban).

The paper concludes by considering the implications of findings for developing strategies to reduce human campylobacteriosis.

2. Material and methods

2.1. Study population

Research was focused on the Grampian region of North East Scotland ($n = 210$) (population of 519,979). This region was selected as studies conducted in Grampian have identified consumption of chicken as a major source of campylobacteriosis (Strachan et al., 2009) and Grampian has a high incidence rate of infection (138.8/100,000 population in 2010) (Locking, Browning, Smith-Palmer & Brownlie, 2012). From the Grampian population a sample of residents living in rural ($n = 103$) and urban ($n = 107$) areas was collected, where rural was defined as postcode sectors with <200 people per km^2 (Strachan et al., 2009). Given that half of the Grampian population reside in rural