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Poultry consumers' behaviour, risk perception and knowledge related to campylobacteriosis and domestic food safety

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ABSTRACT

Campylobacteriosis is an emerging foodborne illness of high relevance and implication for public health and is frequently linked to the consumption of inadequately prepared poultry. Despite extensive scientific efforts to find possibilities to eradicate the bacteria at the production stage and particular measures currently implemented, it has not been possible to provide *Campylobacter*-free poultry to the consumer. Therefore, it is important to inform consumers about the risk and appropriate mitigation measures. The primary goal of this study was to investigate Swiss consumers' knowledge of pathogenic bacteria and mitigation measures and domestic food safety behaviour. Thus, the relevant information that should be included in risk communications could be identified. The secondary goal was to identify target groups for risk communication who exhibit particularly unsafe behaviour when preparing poultry. These research questions were investigated in a mixed-method study, combining findings from a qualitative pre-study with the quantitative findings from a survey administered to a large sample of people who occasionally cook poultry ($N = 465$). The core of the questionnaire was behaviour and knowledge scales, as well as variables assessing risk perception and cooking experiences. Despite a high overall level of knowledge about pathogenic bacteria in poultry and mitigation measures, prevalent misconceptions and knowledge gaps were uncovered. Major violations of food safety behaviour were reported related to avoiding cross-contamination. Lack of specific knowledge and personal risk perception were estimated to be central reasons for violations of food safety behaviour during poultry preparation. Three different consumer groups were identified and analysed according to socio-demographics and socio-psychological variables: unsafe cooks, who reported overall unsafe behaviour, intermediate cooks, who reported some unsafe behaviour, and safe cooks, who reported only little food safety violations. As a last step, the study's findings were discussed in terms of implications for further research and risk communication practice by isolating the most important knowledge and behaviour aspects. Furthermore, targeted risk communication strategies are considered for the three different target groups.

1. Introduction

Campylobacteriosis, caused by the bacterium *Campylobacter*, is currently one of the most important emerging foodborne diseases around the world, with symptoms such as diarrhoea, stomach aches and nausea (World Health Organization, 2013). In 2011, campylobacteriosis was the most frequently diagnosed zoonosis in Europe, with more than double as many confirmed cases than salmonellosis (European Food Safety Authority, 2013). The disease burden is estimated to be 7.5 million disability-adjusted life years (DALY), a measure that combines number of years lost due to illness and early death, and hence, campylobacteriosis is of high importance for public health (World Health Organization, 2013). Cases are most frequently linked to the consumption of contaminated poultry and attributed to consumers' lack of awareness of microbial contamination and measures to prevent foodborne illness (Bergsma, Fischer, Van Asselt, Zwietering, & De Jong, 2007; Kittl, Kuhnert, Hachler, & Korczak, 2011; Strachan et al., 2013). Informing and alerting poultry consumers to the matter could reduce the rates of campylobacteriosis. Thus, this study's goal was twofold. Firstly, it sought to systematically assess which information poultry consumers lack and hence should be included in food safety communications. Secondly, it aimed to determine what groups of consumers are particularly prone to unsafe food preparation and

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thus, should be targeted by communication efforts. Qualitative and quantitative approaches, based on the Mental Models Approach (Morgan, Fischhoff, Bostrom, & Atman, 2002) were combined in order to attain these research goals.

2. Theoretical background

2.1. Campylobacter and risk communication

As noted before, poultry is frequently identified as the main source of campylobacteriosis (Kittl et al., 2011). Retail poultry exhibits high rates of contamination, mostly due to contamination during slaughtering (Baumgartner & Felleisen, 2011; Nauta et al., 2009; Suzuki & Yamamoto, 2009). However, the consumption of poultry with *Campylobacter* is not a risk for human health per se, as *Campylobacter* are highly sensitive to high temperatures (>70 °C) and are killed off when poultry is cooked thoroughly (Bell & Kyriakides, 2009). Furthermore, contact between raw poultry and ready-to-eat foods via kitchen utensils or hands should be avoided. In short, safe poultry preparation comes down to four main instructions: (1) avoiding cross-contamination of raw poultry and ready-to-eat foods, (2) maintaining high standards of hygiene, (3) cooking poultry thoroughly and (4) preserving the cold chain when transporting and storing raw poultry (Bell & Kyriakides, 2009; Lawley, Curtis, & Davis, 2008). In order to reduce incidences of campylobacteriosis, prevention should be implemented at all stages in the food chain, from the rearing and slaughtering of the chicken to processing, transport and retail of poultry to the buying and handling of the poultry by the consumer. However, constructing risk communications targeting laypeople is not straightforward; consumers have to be reached and their attention has to be caught and kept. Behaviour change theories (Becker, 1974; Schwarzer, 2008) assume that people with higher risk perception exhibit safer behaviour, and risk communication should raise consumers' risk perception but not cause anxiety (Breakwell, 2000). In their review article, Jacob, Mathiasen, and Powell (2010) summarise the most important points that should be considered when devising effective risk communications. Among other things, they stress the importance of understanding the target group's beliefs, perceptions and, last but not least, existing knowledge of the communication topic. As the name implies, the Mental Models Approach (Morgan et al., 2002) offers a method by which to investigate lay consumers' mental models in relation to a certain risk. It pursues the systematic development of risk communications that include the central topics of communication from a risk-related viewpoint as well as from the consumers' viewpoint. In this study the Mental Models Approach was adapted for the investigation of Swiss consumers' beliefs and mental models related to domestic food safety when cooking poultry.

2.2. The Mental Models Approach

The Mental Models Approach (MMA) comprises five qualitative and quantitative steps (Morgan et al., 2002). In the first step (step 1), the scientific literature is consulted and expert interviews are conducted, collecting all information that laypeople need to make informed decisions in relation to a certain risk. Consequently, all information is combined in an influence diagram that covers all relevant aspects of the investigated risk and serves as a protocol for the subsequent interviews with laypeople (step 2). The aim of the laypeople interviews is to broadly uncover all potential beliefs and concepts that laypeople might have, and not to make statements about quantitative frequencies in the public. This latter goal is not pursued until the third step (step 3): a representative survey that tests the representativeness and distribution of these concepts in the broad public. The concepts uncovered in the expert and laypeople interviews are condensed into a questionnaire with closed-form questions, which is subsequently distributed to a large, representative sample of the target population. In the final two steps, concrete risk communication material is developed (step 4) and evaluated (step 5). The MMA has been used for the development of communications for a variety of risks, for example, climate change (Bostrom, Morgan, Fischhoff, & Read, 1994), mobile communication (Cousin & Siegrist, 2010) and novel foods (Hagemann & Scholderer, 2007, 2009). However, to our knowledge it has not yet been applied to the topic of *Campylobacter* and domestic food safety. Before communicating with the consumer, it is furthermore important to investigate which groups exhibit deficient safety behaviour and should be targeted. Incidence rates of campylobacteriosis in different socio-demographic groups point to the fact that young men might pay less attention to food safety issues, as they exhibit higher incidence rates than other groups (Baumgartner, Felleisen, & Gut, 2012).

2.3. Study goals

The primary goal of this paper was to investigate lay consumers' beliefs, knowledge and behaviour in relation to *Campylobacter* and compare them to experts' risk mitigation suggestions. Thus, the paper aimed to give recommendations for potential content of risk communication material and ultimately to improve consumers' food safety behaviour. The following research questions related to the identification of potential risk communication content were investigated: (a) What do the Swiss consumers know in relation to pathogenic bacteria and poultry, (b) what food safety behaviour do they exhibit when cooking poultry and (c) how are consumers' risk perceptions, behaviour and knowledge related? A secondary goal of this study was to identify potential target groups for risk communications in terms of groups of Swiss consumers reporting unsafe behaviour when preparing poultry. Two research questions were examined: (d) What groups can be differentiated related to their food safety behaviour and (e) how can the different groups be characterised in terms of socio-demographics, risk perception or knowledge? Thus, the first steps of the MMA (Morgan et al., 2002) were applied in the form of a pre-study (expert and lay consumer interviews) and a main study (representative survey). In the pre-study 11 food safety experts and 13 consumers were extensively interviewed on the topic of *Campylobacter* and food safety. These findings served as a basis for the paper-and-pencil questionnaire applied in the main study, which comprised data from 465 consumers.

3. Pre-study: qualitative interviews

3.1. Expert interviews

3.1.1. Sample and procedure

Firstly, in-depth, semi-structured interviews with Swiss food safety experts from various professional backgrounds were conducted. A total of 11 experts were interviewed: four university researchers from different fields (food safety and hygiene, microbiology, food microbiology, poultry bacteriology), two experts from government offices (health, veterinary), two experts working in poultry production, one medical microbiologist and two representatives from consumer organisations. The interview protocols were developed based on extensive literature research and were continuously refined and supplemented with information gained from previously conducted interviews. The interviews took, on average, 60 min and were recorded to support accurate documentation of the interviews' contents. At the end of each interview, the