

Food risk communication to consumers: The scare of antibiotic resistant bacteria in chicken

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ABSTRACT

In 2014 a food scare following a report on antibiotic resistant bacteria in chicken fillets led to a dramatic drop in sales of chicken. Actors in the food chain as well as the authorities were unprepared for the consequences of the case. The study investigated how risk communicators coped with the crisis through in-depth interviews with 14 relevant actors. The case study illustrated how delayed risk communication from authorities opened for stakeholders with contradictory views and other agendas. Further, although the risk communicators were aware of the concept of risk perception, they may not truly acknowledge the power triggering emotions.

Keywords: Risk communicators; food scare; antibiotic resistant bacteria; consumer risk perception; media storm.

1 Introduction

One of the challenges with risk management is how to communicate with consumers when media blows up a storm around food. Regularly media all over the world distribute news that scare consumers. Health consequences of consuming normal food as red meat, fish, bread, and potatoes engage. Stories of maltreatment of animals make consumers furious. When famous talk show hosts, such as Oprah Winfrey, claims that specific food producers can cause illness for the whole population the consequences are severe. Although researchers have been investigating food risk communication for more than 40 years (see Kasza et al., 2022 for an overview of the literature), there are still unsolved questions. One of the topics that deserved more attention are the distribution of responsibility when the storm hits. Who says what when? These are the questions highlighted in this study. A food scare case from Norway has been used to exemplify the intricacies of food risk communication.

In the past two decades, two food scares in Norway reached nation-wide attention with large repercussions for both food industry and consumers. The first food scare was an outbreak in 2006 of *E. coli* O103 food poisoning causing 17 reported cases, mostly children, and one death (Schimmer et al., 2008). The second scare was the publication of a report in 2014 on the occurrence of antibiotic resistant bacteria in chicken fillets (Norwegian Veterinary Institute, 2014). Both cases led to a dramatic drop in sales of the products involved. In both cases, risk communication played a major role in the development of consumer reactions and concerns.

After the *E. coli* outbreak in 2006 an evaluation report gave a thorough description of the sequence of events with suggestions for improvements on all levels throughout the food value chain and including the regulating authorities (Ministry of Food and Agriculture, 2006). The importance of clear roles and coordination responsibilities for the different actors were some of the points that were highlighted. Currently three ministries have the overall responsibility in food scare situations in Norway: Ministry of Health and Care, Ministry of Agriculture and Food, and Ministry of Trade, Industry and Fisheries (DSB, 2015). The executive responsibility lies with the National Institute of Public Health for public health issues, and the Food Safety Agency for food issues. In food poisoning situations, the institutions collaborate and divide risk communication responsibility depending on the topic. Following the evaluation of the *E. coli* case in 2006 the relevant authorities practised crisis handling, preparedness, made cooperation agreements and trained in risk communication. The procedures were implemented in a series of *E. coli* cases in 2009, that was handled with little media attention (NRK, 2009). Risk communication procedures were therefore considered to be in place before the 2014 food scare with antibiotic resistant bacteria in chicken erupted. When that case broke, the ensuing media storm and consumer reactions took all risk communicators by surprise with confusion and devastating consequences for the food industry.

The aim of the study was to learn from the history of a food scare to be able to improve future risk communication through analysing risk communicators' roles and views of the case, why it happened, what they think went wrong, and which mitigating actions were instigated.

2 Theoretical background

Food incidents happen all the time (Whitworth, Druckman, Woodward, 2017). In some cases, events may be hazardous to human health. In other cases, an event may be a quality issue or perceived as incompatible with norms or current rules. Some of these events appear in the media and take the form of food scares. Since food scares may incorporate many different meanings, in this paper a definition of a food scare presented by Whitworth, Druckman and Woodward (2017) is used: "A food scare is the response to a food incident (real or perceived) that causes a sudden disruption to the food supply chain and to food consumption patterns."

2.1 The food scare

The World Health Organization has defined antibiotic resistance as a global health problem and as one of the largest threats towards modern medicine. Internationally, an increase in reported cases of patients infected with bacteria resistant towards antibiotics is observed, and within EU/EEA 33,000 deaths were estimated to be due to antibiotic resistance in 2020 (ECDC, 2022). In general, use and misuse of antibiotics, both for humans and animals, are considered the main causes of increasing incidence of bacteria resistant to antibiotics. In addition to resistance acquisition during a treatment, people can be infected with resistant bacteria from other people, animals, and the environment, including foods. It has therefore been acknowledged that a One Health approach is necessary to improve the situation, and this is reflected e.g in the EU commission action plan for fighting antimicrobial resistance (European Commission, 2017). One should note that infection prevention is focused on the health care and farming sectors, and not on how consumers can protect themselves through

kitchen hygiene, probably because the latter is of minor significance (except for resistant pathogens) (EFSA and ECDC, 2022). Consumers are advised to protect themselves from pathogenic bacteria through hygienic handling of raw meats and thorough cooking, but antibiotic resistance is not mentioned specifically in consumer food hygiene information and advice (EUFIC, 2022; EFSA, 2022). The case investigated in this paper is a food scare that erupted in the fall in 2014 about occurrence of antibiotic-resistant *E. coli* in chicken in Norway. Due to restricted use of antibiotics, the occurrence of antibiotic resistance in animals has been low in Norway. The Norwegian Veterinary Institute presents yearly reports on occurrence of antibiotic resistance in animals. In 2012, the surveillance program conducted by the Food Safety Authorities in Norway reported ESBL (Extended Spectrum Beta-lactamase, resistance mechanism for penicillin and cephalosporin)-producing *E. coli* in 32.2 % of poultry fillets and the first detection of quinolone-resistant *E. coli* in chicken. In 2013, the occurrence of quinolone-resistance had increased to 70 % of chicken fillets in Norway (Norwegian Veterinary Institute, 2014). Probably, resistant bacteria were imported through the breeding stock and increased occurrence was a result of improved methodology for detection. One should note that in this context, *E. coli* is used as an indicator organism and possible reservoir of antibiotic resistance genes, thus exposure is not associated with foodborne illness but with possible spread of antibiotic resistance to other bacteria. Internationally, it is a concern that ESBL may be transferred from *E. coli* to *Salmonella*, but the incidence of *Salmonella* in the Norwegian poultry chain is very low, with no positive samples (N=4 674) in 2021 (Heier et al., 2022; EFSA and ECDC, 2022). A report concluded that exposure would not lead to foodborne illness, and risk assessment concluded that the probability of exposure for consumers to resistant bacteria from poultry was non-negligible, but that there was no strong evidence on negative impact on human health (VKM, 2015). During the food scare, consumers were advised by the authorities to follow general food safety advice and manage risk through good kitchen hygiene and safe cooking practices.

2.2 Risk perception

Consumer responses to food scares vary depending on the risk and how it is perceived (Slovic, 1987). Research show that the two most important dimensions driving risk perception are severity of the risk and uncertainty related to the risk (Finucane and Holup, 2005; Fischhoff et al., 1978; Gaskell et al., 2004). Risks perceived as severe are often uncontrollable and have potentially serious or fatal consequences. The uncertainty dimension is associated with unfamiliarity, what is unknown or unobservable, or has delayed consequences. A third dimension of importance for risk perception, although to a lesser degree, concerns which consumers are at risk (FifeSchaw and Rowe, 1996). In general, food scares score low on the list of what consumers are most afraid of (Ueland et al., 2012). Still, food scares may considerably affect consumers' daily life. Thus, it is important to understand how risk communication can influence when and why consumers react.

2.3 Risk communication

Risk communication is particularly important to lessen uncertainty, increase perceived controllability, and enable consumers to take risk reducing actions. It is accepted that risk communication in general should communicate *uncertainty*, be *transparent* and coming from *trusted* sources (Frewer, 2004; Lofstedt, 2006; Miles and Frewer, 2003). Challenges with openness and transparency are that the public must take more responsibility for which information to trust and follow in cases where more than one source of information does exist (Osman, Heath, Lofstedt, 2018). In the later years, the number of information channels have had an enormous increase accentuating the need for overarching acceptance of who are responsible for providing information (Regan et al., 2016). The management of food scares has varied across countries, and consumers from different countries also vary in who they consider to be trusted sources (Kjærnes, Harvey, Warde, 2007; van Kleef et al., 2006). However, in Norway regulators and governmental agencies may be considered such sources (van Kleef et al., 2009). In general, organisations that are not suspected of having vested interests, or that are acting on behalf of consumers, are normally trusted (Cope et al., 2010; Lofstedt et al., 2011).

Another possible effect of risk communication concerns the *social amplification of risk paradigm*, where communication from one source can spread to other sources and cause a ripple effect or amplification (Frewer, 2003). This may lift the scare to a higher attention level (Bearth and Siegrist, 2021). Of relevance to the Norwegian case of *E. coli* O103 from 2006 (Schimmer et al., 2008), *stigma* caused by faulty accusation of one product for another, may lead to consumers erroneously perceiving an innocent product as hazardous which may have long-lasting effect for the affected product (Lofstedt, 2006).

Studies show that agencies with no own interest, or that represent consumers, are most trusted to provide truthful information (Houghton et al., 2008; van Kleef et al., 2006). Following this, scientists are also considered trustworthy, although studies have shown that open debate between scientists, or scientists that are found to advocate certain standpoints for own purposes, may damage their reputation (Kjærnes, Harvey, Warde, 2007; Lofstedt, 2006).

Risk communication is therefore crucial to consumers' perception of risk. There are several issues complicating the risk communication chain (Barnett et al., 2011). Consumers' expectations to what they need of information may not coincide with the information provided (Cope et al., 2010; Frewer, 2004; Tonkin et al., 2020). Furthermore, consumers' expectations of trusted or preferred sender may not coincide with who has the formal responsibility to divulge the information (van Kleef et al., 2006). Lastly, information providers may not be cognizant of their own or others' roles and responsibilities in risk communication in different cases (Tonkin et al., 2018). For consumers to receive good information about food scares, it is necessary to understand what stakeholders perceive their role to be in relevant cases (Tonkin et al., 2018).

Food risk communicators

Different actors may be involved in a food crisis. When a crisis is declared because of reported illnesses, identifying the source of the food hazard may be extremely difficult and often involves the whole value chain (see bean sprout case from Germany in 2011 (Hyde, 2011), or E. coli from cured lamb sausage in Norway in 2006 (Schimmer et al., 2008)). On the other hand, when no crisis has yet occurred, but a risk has been identified, only parts of the value chain may be directly affected, such as in the present case of antibiotic resistance in chicken from Norway in 2014 (Bjørkhaug, Vik, Richards, 2017), or the horse meat scandal in UK in 2013 (Premanandh, 2013). However, in both situations, risk communication is essential for providing information and trust in the population (Tonkin et al., 2019). Actors responsible for communicating risks to the consumers will depend on the case and vary between countries and situations. In a One Health perspective, the boundaries between animal health, food, water, and people are not strict, and thus, in Norway, the responsibilities will overlap between the Norwegian Institute of Public Health and the Food Safety Authority during a scandal involving the whole food production chain.

3 Material and methods

In this chapter we present the chicken scare case and two studies used to elicit information from risk communicators. In the first study, in-depth interviews on risk communication issues related to the case were conducted with relevant stakeholders. In the second study, four years later, findings from in-depth interviews where risk communication was discussed with a selection of risk communicators were included in the study as the chicken case was explicitly and unprovoked mentioned by the participants.

3.1 The chicken case

On 13th of September 2014, a news article in Norway about antibiotic resistance and chicken was presented in *Nationen* (a daily national newspaper with a specific focus on agriculture). In this article, a researcher from the Norwegian Institute of Public Health suggested a health warning on all Norwegian chicken. The article had the title: "Researcher suggests health warning on Norwegian chicken" and the ingress: "Antibiotic resistant bacteria is so common in Norwegian chicken that the authority should consider labelling them". The title and ingress were followed by the researcher's own personal rule: "I never touch chicken with my bare fingers". This news article, that presented the spokesperson as an expert on antibiotic resistance and an experienced researcher within the field, started a media storm; a storm that was immediately followed by a large decrease in the sales of chicken.

In the ensuing months, experts, the Norwegian Food Safety Authority, the Government, and producers presented a variety of views on the case. This culminated with press releases from actors in the food value chain in December 2014, where they stated that they would stop using Narasin in the feed to chickens and clearly label products for sale. Narasin is in Norway classified as a coccidiostat used for prevention of intestinal disease in chicken. As late as December 2015, a risk assessment of antibiotic resistance in the Norwegian food chain was published (VKM, 2015). The report concluded that the risk of antibiotic resistant E. coli from poultry was non-negligible, but there were not sufficient data to estimate the magnitude of the risk, the role of consumers to mitigate risk, or to say anything about the role of Narasin.

3.2 Study 1: In-depth interviews, stakeholders

The interview guide for stakeholders was based on information collected in a focus group study about chicken consumers' view on the severity of the food scare, and how the food scare had influenced their perception of chicken and their food behaviour (Veflen et al., 2017). The main results from the focus groups used for interview guide development are presented in table 1.

Table 1.
Main findings from focus group discussions.*

<ul style="list-style-type: none"> • Most of the respondents said they had not been much influenced by the chicken case. However, they did not eat as much chicken as before. • Some were sceptical and worried that chicken production was not conducted in a good way i.e. animal welfare. • Many had become more sceptical to imported foods in general. Many had stopped buying chicken in Sweden (Sweden has lower prices than Norway for most food items, and shopping in Sweden is particularly popular among consumers living close to the border). • The respondents were generally more trusting of Norwegian foods, and they were worried they might become food poisoned when on vacation abroad. • The respondents were more confident in the information provided by NRK (the Norwegian Public Broadcasting Corporation) than VG (largest daily newspaper in Norway). • The respondents had the greatest trust in the Norwegian Food Safety Authority and expected clear messages from them. However, the respondents did not seek information on the webpages either from the Norwegian Food Safety Authority or from the Norwegian Institute of Public Health.
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* Veflen et al., 2017

3.2.1 Procedure

Stakeholders were chosen based on their different roles and involvement in the chicken scare case. From these stakeholders, respondents that had been central at one point or another in the chicken case were chosen and asked to participate in the interviews. The interviews were conducted in 2015-16. Respondents were contacted by phone, and on accepting the interview appointment, they were provided with an e-mail with more information on the aims of the project. Before the start of the interview, the respondents were informed of recording procedures and their rights to withdraw their consent at any time without any consequences.

3.2.2 Participants

In-depth interviews were conducted with representatives of relevant stakeholders, namely, food producer (1), retailer (2), food safety authority (1), research institution (1) and food policy/government (5) (Table 2).

Table 2.
List of participants, study 1.

Stakeholder	Participant name
Food producer	Producer_study1
Retailer	Retailer_1_study1
	Retailer_2_study1
Food Safety Authority	FSA_study1
Research institution	Researcher_study1
Ministry1	Ministry1_A_study1
	Ministry1_B_study1
	Ministry1_C_study1
Ministry2	Ministry2_A_study1
	Ministry2_B_study1

3.2.3 The interviews

Information was collected using a semi-structured interview guide (Appendix 1). The guide was adapted between interviews to reflect the roles and characteristics of the institutions of the interviewees. Two researchers covering food safety and risk communication participated in all the interviews. Relevant topics were how the respondents viewed the case, their perceived role in communication, who was/should be the main responsible communicator, strategies for communication, important information channels, and consequences of the crisis. At the end of the interview the subjects were presented with the consumer responses from the focus groups (See Table 1). The duration of the interviews was 1-1.5 hours. Following the

interviews, the researchers compared notes, and a summary was written. The interviews were recorded on a voice recorder, transcribed, and checked for correctness. After transcription, the voice recordings were deleted, and the transcripts were modified where names were mentioned. Finally, the anonymised transcripts were coded using Atlas.ti (Atlas.ti Scientific Software Development GmbH, 8.1-8.4.24)

3.3 Study 2: In-depth interviews, risk communicators

Four years later, in 2019, as part of the EU-project SafeConsume (H2020–SFS–2017–2022: Project no. 727580), 20 risk communicators across Europe were interviewed on food risk communication practices. Four interviews were conducted in Norway, and data from these are included in the present study (Table 3). The decision to include these interviews was a result of two of the respondents referring to the chicken case explicitly and without prompting. Thus, contributing with additional information on roles and perspectives of risk communicators to major food scares.

The main aim of these interviews was to identify best practices in risk communication from the view of risk communicators representing different stakeholders. The interview guide included many of the topics addressed in the first study (Appendix 2). Among these were: risk communication strategy in general and in the organisation, risk communication during a food scare, successes, barriers, and challenges in risk communication. The interviews were conducted one to one, summed up, transcribed, and coded using Atlas.ti as described above.

Table 3.
List of participants, study 2.

Stakeholder	Participant name
Food producer	Producer_study2
Retailer	Retailer_study2
Consumer organisation	NGO_study2
Media actor	Media_study2

3.3.1 Ethics

The procedure and interview guide were submitted for ethical guidance and approval by SIKT, Norwegian Centre for Research Data (255466). The study complied with GDPR requirements.

4 Findings and discussion

Almost two years after the chicken scandal was launched in the media, the most central risk communicators still remembered the case as if it had happened the day before. Furthermore, more than four years later, the chicken case was mentioned by risk communicators as a horror example where risk communication had failed. The structure of the discussion is based on the risk communicators’ perception of the initial phase of the crisis, their roles, how the crisis was managed, and which communication strategies they employed.

4.1 The initial phase

Some communicators felt that the media storm came as a surprise as the report that triggered the case was based on two years old data.

“We weren’t really prepared for the case. We were not informed by [relevant institutions] beforehand, so that we could have a good enough understanding of the nature of the case beforehand.”
(Ministry1_B_study1)

“If we had known how the case would progress, I would think that we had ... Nobody could have foreseen this.” (Industry_study1)

Several of the actors in the food value chain were involved in an on-going collaborative work on antibiotic resistance.

“But when the backdrop is there [antibiotic resistance nationally and internationally] and we worked with antibiotic resistance as part of the order of the day in the ministry at that time as well, it probably contributed to firing up such a case I believe.” (Ministry1_B_study1)

It is interesting to note how the actors were concerned with antibiotic resistance and its challenges in general, as part of on-going work. However, one should observe that food preparation and consumption are not parts of the general strategy of combating antibiotic resistance, since other measures to reduce antibiotic resistance earlier in the food chain are of much higher significance (European Commission, 2017). Lack of significance of the case, both for being acutely ill and as a role in spread of antibiotic resistance, may explain why the professional stakeholders were not prepared for the consumers' reactions. This is in line with how experts and lay people may view risks differently (Gaskell et al., 2004; Ueland et al., 2012).

As concluded in Veflen et al. (2017), emotions were more important than reflections about the risk itself for the consumers during this food scare. In addition, there were aspects of uncertainty and unfamiliarity of the risk as represented by the following quote:

"One might say that it became kind of hysterical around chicken, many misunderstood this."
(NGO_study2).

A main issue with the chicken case was that the classification of the risk; a food safety threat or a threat to public health, was unclear. The resistant bacteria were identified in food but did not cause illness. If the hazard had been a resistant *Salmonella*, the case would have been an indisputable food safety issue with a clear idea of the actual risk and necessary risk mitigation actions, triggering active risk communication with consumers. However, the case could also be regarded as a part of a larger public health problem with spread of antibiotic resistance, but where the main targets for information were farmers, breeders, food producers and health personnel. Thus, communication responsibility had to be decided between the two different Norwegian governmental agencies; the Food Safety Authority (FSA) and the Norwegian Institute of Public Health (NIPH). This type of uncertain handling of risk communication in the initial phase has also been seen in other countries (Lofstedt, 2019).

4.2 Risk communication roles

In the first phase after the crisis broke, the communicators assembled crisis management and communication teams, tried to establish facts about what the case really was about, who should be responsible for communication, and, finally, looked for the best ways to address and combat the crisis. A scientific risk assessment was not at hand, and even the scientific risk assessment conducted after the food scare was not able to inform about the actual risk, illustrating the complexity for risk communication at the time (VKM,2015).

The risk communicators clearly emphasised that risk communication when public health was compromised was the responsibility of NIPH. While in cases when food safety was involved, but without immediate risk to public health, FSA was responsible communicator. The uncertainty expressed by some of the stakeholders about where the case belonged, and who should be responsible communicator, could explain some of the confused and delayed communication that occurred. Other studies show that lack of ownership to the problem, or acceptance of responsibility, may contribute to unbalanced, faulty or missing risk communication (Lofstedt, 2019).

"It's much better if authorities and others who should actually be able to make a balanced communication make themselves even clearer." (Producer_study1).

In this case, the communicators finally agreed that the case belonged with the Food Safety Authority, and that they were the main responsible communicators. Scientific credibility and expertise were also highlighted as important in taking the role as responsible communicator.

"The Norwegian Food Safety Authority's websites and the Norwegian Food Safety Authority are also very quick to go out to the media and explain. And it inspires more confidence that the director of the Norwegian Food Safety Authority goes out and explains than the minister does. We have many examples of that." (Ministry1_A_study1).

4.3 Risk management

The retailers and food industry were unprepared for the case but launched an already planned strategy for phasing out a feed ingredient as crisis management (Ministry of Food and Agriculture, 2018). The introduction of narasin (coccidiostatica used for preventive measures in the chicken feed) in the communication of the case by industrial actors worked as a defuser in the current situation.

"It seems like the narasin case has contributed to reinstate trust. Narasin has nothing to do with this case, but that one now has removed narasin from the feed, may have led to reinstating trust in the chicken products for many." (Ministry1_B_study1).

However, in this case, there was also confusion regarding divergent messages from different actors.

“For example, the [NGO] is very critical to what one says about narasin and the antibiotic warranty [Authors’ note: Removal of narasin from feed]. And we have tried to understand that, but we don’t quite understand it.” (Retailer_1_study1)

This study showed that in the suddenness of the food scandal, communication started too late, was uncoordinated, and addressed different issues. The risk communicators had initial difficulties in assessing which agency was the problem owner, thus the communication was delayed, and the stage was open for anyone willing to talk with a journalist. The result was confusion among consumers.

“Then there were many professors and researchers here, specialists who took advantage of the situation even then, or abused the situation to promote their own interests perhaps. And yes- Used the horror and fear that was then in society to drive their own agenda. It’s normal in situations like that, I think. So they helped scare people then too.” (Retailer_1_study1).

Research emphasizes that quick and coordinated response from risk communicators are essential for good risk communication (Lofstedt, 2019). In the present case, where one or more factors were unclear; “what was the risk?”, “who were at risk?”, and, most importantly, “what to do?”, the main finding was that one responsible authority should immediately have taken a leading role in the risk communication.

“The Norwegian Food Safety Authority are, in my opinion, the ones who really should have been up front and communicated very clearly that this is nothing dangerous.” (Retailer_1_study1).

Furthermore, the scandal did not lessen until actions to rectify the risk were taken, which is in line with what others have found in food scares receiving high media attention (Lofstedt, 2010). Thus, retailers’ and food producers’ intentions and actions were necessary to address consumers’ concerns.

“And that led to us, in collaboration with the [Food producer], which is our main supplier of white meat, also launching a concept with a chicken, where we have a guarantee that no coccidostatica are used in the feed for the chicken.” (Retailer_1_study1)

The risk communicators agreed that advice concerning food safety risks of chicken consumption should always be about following hygiene rules in the kitchen.

“So the only thing we could say then, before the case was clarified – Because you couldn’t stop that ball. ... you must cook the chicken and treat it like you have always done, or should have done. That’s mainly what we- we didn’t say that this is nothing to be afraid of.” (Ministry1_A_study1)

4.4 Risk communication strategies

Following this crisis, the governmental offices have instigated new routines requiring pre-launch warnings in case of new potential crises. The relevant state authorities have regular meetings and an option for more frequent meetings in case of crises.

The risk communicators from the ministries pointed out that the reaction to the 2014 report took them completely by surprise. For the presentation of the 2015 report, they had therefore prepared assiduously with press releases, back-up from experts and advance informing of relevant Ministers of State.

“But we learned from that by realizing that we had to, we should have these reports in advance actually, and so - It’s the way that the Norwegian Food Safety Authority and the Veterinary Institute, when they have something that they know is going to hit the media then it is procedure that we should be notified if possible in advance so that we are prepared”. (Ministry1_A_study1).

No media outcry was evident after the presentation of the next report, which came as a surprise and may indicate that the trigger for the crisis was not the content of the report, but confounding factors that they had not, or could not, predict. One such factor can be agendas of various interested parties that has been shown to influence consumer perceptions in other cases (Lofstedt, 2010).

“But it probably has some connection also with who benefits from the case being scaled up and becoming big issues They profit from it.”. Ministry1_B_study1.

Another factor from the chicken case was the framing of the message and who did the framing. The high-risk scenario was highlighted by a scientist from the NIPH, and the argument that chicken should be warning labelled and that she did not touch chicken with her hands (ABC News, 2014). This caused a worry in the population that chicken might not be safe despite the generally low occurrence of pathogens in chicken in Norway, in contrast to consumer perceptions from other countries with much higher levels of pathogens (Mørretrø et al., 2021). Similarly, impact of influential persons in raising the public worry has been seen in other countries such as in the UK, in a case from 2005 concerning the sweetener Aspartame and possible cancer risk.

In that case, influential persons publicly demanded that the substance should be banned causing a big media storm with repercussions among the public and an ensuing drop in sales (Lofstedt et al., 2011).

Coordinated early communication efforts were coined as important to avoid media scares. This is in line with research that emphasizes the need to be prepared and coordinated in providing risk messages (Ueland, 2019).

5 Conclusions

When food scares erupt, they are usually communicated through media. To mitigate the effects of food scares, immediate communication from responsible actors is needed.

A food scare may have serious consequences for different actors along the food chain, from producers to consumers. Depending on type of hazard and who or what is at risk, it is therefore essential for actors to have strategies in place for risk assessment, management, and communication. In the food scare concerning antibiotic resistant bacteria in chicken, actors in the food chain were not prepared for the ensuing media storm, the consumer reactions, or the subsequent dramatic drop in sales. Important factors for successful risk communication were not in place: it was not clear what the risk was about, who potentially were at risk, or who were the owners of the case. Thus, precious time was lost for risk communication. The study showed that:

- *Boundaries between governmental agencies can make responsibility and risk communication unclear, particularly if a scandal involves or belongs to both agencies and the risk assessment phase has unclear ownership.*

Risk communication has a better chance of success if it is followed by concrete actions to remove or minimize the risk. EFSA (EFSA et al., 2021) has recommended more research on the public perception of the difference between hazards and risks, and this case study is an example of a food incidence caused by an important hazard, but where the actual risk was very difficult to assess (and therefore communicate), and this probably affected the public response. A practical guideline from a central body, such as EFSA, suggesting consumer information with advice for different risks, including those not obviously belonging to food could be of substantial help for risk communicators. Food safety information should be based on a trans-disciplinary approach (Langsrud et al., 2023). Also, it raises the question about how risk communication can be integrated into the One Health framework. For example, social sciences seem to be lacking in the majority of European One Health projects (OHEJP, 2019). Following the chicken food scare, more attention has been accorded by authorities to how reporting about food safety issues should be conducted to ensure openness, transparency, and that relevant information is communicated.

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References

ABC news (2014). Researcher: - I never touch raw chicken with my fingers. [in Norwegian: Forsker: – Jeg tar aldri i rå kylling med fingrene.] <https://www.abcnheter.no/nyheter/2014/09/11/207692/forsker-jeg-tar-aldri-i-ra-kylling-med-fingrene>.

- Barnett, J., McConnon, A., Kennedy, J., Raats, M., Shepherd, R., Verbeke, W., Fletcher, J., Kuttschreuter, M., Lima, L., Wills, J., Wall, P. (2011). Development of strategies for effective communication of food risks and benefits across Europe: design and conceptual framework of the FoodRisC project. *BioMed Central Public Health*, **11**: 308. <https://doi.org/10.1186/1471-2458-11-308>
- Bearth, A., Siegrist, M. (2021). The Social Amplification of Risk Framework: A Normative Perspective on Trust? *Risk Analysis*. <https://doi.org/10.1111/risa.13757>.
- Bjørkhaug, H., Vik, J., Richards, C. (2017). The Chicken Game – Organization and Integration in the Norwegian Agri-Food Sector. In: Miele, M. et al. (Eds), *Transforming the Rural*. Emerald Publishing Ltd, pp. 45-69. <https://doi.org/10.1108/s1057-19222017000024003>.
- Cope, S., Frewer, L. J., Houghton, J., Rowe, G., Fischer, A. R. H., de Jonge, J. (2010). Consumer perceptions of best practice in food risk communication and management: Implications for risk analysis policy. *Food Policy*, **35**(4): 349-357. <https://doi.org/http://dx.doi.org/10.1016/j.foodpol.2010.04.002>.
- DSB (2015). Risk analysis of "Foodborne infection". Interim report for National risk scenario 2015. [In Norwegian: Risikoanalyse av «Matbåren smitte». Delrapport til Nasjonalt risikobilde 2015.] Tønsberg: The Norwegian Directorate for Civil Protection (DSB) (ISBN 978-82-7768-374-4).
- ECDC (European Centre for Disease Prevention and Control) (2022). Assessing the health burden of infections with antibiotic-resistant bacteria in the EU/EEA, 2016-2020. Stockholm: ECDC; [Accessed 2022 24.11].
- EFSA (European Food Safety Authority) (2022). Biological hazards <https://www.efsa.europa.eu/en/topics/topic/biological-hazards>: EFSA; 2022 [Accessed 2022 24.11].
- EFSA, Maxim, L., Mazzocchi, M., Van den Broucke, S., Zollo, F., Robinson, T., Rogers, C., Vrbos, D., Zamariola, G., Smith, A. (2021). Technical assistance in the field of risk communication. *EFSA J*, **19**(4): e06574. <https://doi.org/10.2903/j.efsa.2021.6574>.
- EFSA and ECDC (European Food Safety Authority, European Centre for Disease Prevention and Control). (2022) The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019–2020. *EFSA Journal*, **20**(7209):197. <https://doi.org/10.2903/j.efsa.2022.7209>.
- European Commission (2017). A European one health action plan against antimicrobial resistance. Available at: https://health.ec.europa.eu/antimicrobial-resistance/eu-action-antimicrobial-resistance_
- EUFIC (European Food Information Council) (2022). Food facts for healthy choices <https://www.eufic.org/en/2022> [cited 2022 24.11].
- FifeSchaw, C., Rowe, G. (1996). Public perceptions of everyday food hazards: A psychometric study. *Risk Analysis*, **16**(4): 487-500. <https://doi.org/10.1111/j.1539-6924.1996.tb01095.x>.
- Finucane, M.L., Holup, J.L. (2005). Psychosocial and cultural factors affecting perceived risk of genetically modified food: an overview of the literature. *Social Science Medicine*, **60**: 1603-1612. <https://doi.org/10.1016/j.socscimed.2004.08.007>.
- Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences*, **9**(2): 127-152. <http://dx.doi.org/10.1007/BF00143739>.
- Frewer, L.J. (2004). The public and effective risk communication. *Toxicology Letters*, **149**(1-3): 391-397. <https://doi.org/https://doi.org/10.1016/j.toxlet.2003.12.049> .
- Frewer, L.J. (2003). Trust, transparency and social context. In: N. Pidgeon, R. E. Kasperson, P. Slovic (Eds.), *The Social Amplification of Risk* (pp. 122-137). Cambridge: Cambridge University Press.
- Gaskell, G., Wagner, W., Kronberger, N., Torgersen, H., Hampel, J., Bardes, J. (2004). GM Foods and the Misperception of Risk Perception. *Risk Analysis*, **24**(1): 185-194. <http://dx.doi.org/10.1111/j.0272-4332.2004.00421.x>.
- Heier B, Hopp P, Mork J, Bergsjø B. (2022) The surveillance programme for Salmonella spp. in live animals, eggs and meat in Norway 2021. Surveillance programme report. Veterinærinstituttet; 2022. Available at: <https://www.vetinst.no/overvaking/salmonella>.
- Houghton, J.R., Rowe, G., Frewer, L.J., Van Kleef, E., Chryssochoidis, G., Kehagia, O., Korzen-Bohr, S., Lassen, J., Pfenning, U., Strada, A. (2008). The quality of food risk management in Europe: Perspectives and priorities. *Food Policy*, **33**(1): 13-26. <https://doi.org/10.1016/j.foodpol.2007.05.001>.

- Hyde, R. (2011). Germany reels in the wake of E coli outbreak. *The Lancet*, **377** (9782). [https://doi.org/10.1016/s0140-6736\(11\)60847-7](https://doi.org/10.1016/s0140-6736(11)60847-7).
- Kasza, G., Cenki, E., Szakos, D., Izsó, T. (2022). The evolution of food safety risk communication: Models and trends in the past and the future, *Food Control*, **138**. <https://doi.org/10.1016/j.foodcont.2022.109025>.
- Kjærnes, U., Harvey, M., Warde, A. (2007). *Trust in Food. A Comparative and Institutional Analysis*. New York, NY, Palgrave MacMillan. <https://doi.org/10.1057/9780230627611> .
- Langsrud, S., Veflen, N., Allison, R., Crawford, B., Izsó, T., Kasza, G., Lecky, D., Nicolau, A.I., Scholderer, J., Skuland, S.E., Teixeira, P. (2023). A trans disciplinary and multi actor approach to develop high impact food safety messages to consumers: Time for a revision of the WHO - Five keys to safer food? *Trends in Food Science Technology*, **133**: 87-98. <https://doi.org/10.1016/j.tifs.2023.01.018>.
- Lofstedt, R. (2019). The management and communication of a food risk controversy: the Swedish campylobacter case. *Journal of Risk Research*. <https://doi.org/10.1080/13669877.2019.1608287> .
- Lofstedt, R., Boudier, F., Wardman, J., Chakraborty, S. (2011). The changing nature of communication and regulation of risk in Europe. *Journal of Risk Research*, **14**(4): 409-429. Article Pii 935978615. <https://doi.org/10.1080/13669877.2011.557479>.
- Lofstedt, R.E. (2010). Risk communication guidelines for Europe: a modest proposition. *Journal of Risk Research*, **13**(1): 87-109. <https://doi.org/10.1080/13669870903126176>
- Lofstedt, R.E. (2006). How can we Make Food Risk Communication Better: Where are we and Where are we Going? *Journal of Risk Research*, **9**(8): 869-890. <https://doi.org/10.1080/13669870601065585>
- Miles, S., Frewer, L.J. (2003). Public perception of scientific uncertainty in relation to food hazards. *Journal of Risk Research*, **6**(3): 267-283. <https://doi.org/10.1080/1366987032000088883>.
- Ministry of Food and Agriculture (2006). E.COLI-CASE. Evaluation of the authorities' and industry's handling winter/spring 2006. [In Norwegian: *E.COLI-SAKEN. Evaluering av myndighetenes og næringens håndtering vinter/vår 2006.*] Evalueringsutvalget: Oslo, 301838 e.coli-rapporten 151206.
- Ministry of Food and Agriculture (2018). Action plan against antibiotic resistance within the Ministry of Agriculture and Food's sectoral responsibility - status as of April 2018. [In Norwegian: *Handlingsplan mot antibiotikaresistens innenfor Landbruks- og matdepartementets sektoransvar – status per april 2018.*] Oslo: LMD Retrieved from <https://www.regjeringen.no/contentassets/ce39ba2114884049a803a9441281985c/handlingsplan-mot-antibiotikaresistens---status-april-18.pdf>.
- Møretrø, T., Nguyen-The, C., Didier, P., Maitre, I., Izso, T., Kasza, G., Skuland, S. E., Cardoso, M. J., Ferreira, V. B., Teixeira, P., Borda, D., Dumitrascu, L., Neagu, C., Nicolau, A. I., Anfruns-Estrada, E., Foden, M., Voysey, P., Langsrud, S. (2021). Consumer practices and prevalence of Campylobacter, Salmonella and norovirus in kitchens from six European countries. *International Journal of Food Microbiology*, **347**: 109172. <https://doi.org/10.1016/j.ijfoodmicro.2021.109172>.
- Norwegian Veterinary Institute (2014). NORM/NORM-VET 2013. Usage of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Norway. Oslo: Norwegian Veterinary Institute. ISSN: 1502-2307 (print) / 1890-9965 (electronic).
- NRK (2009). E.coli eruption in 2009. [in Norwegian: *E.coli-utbruddet i 2009*]. <https://www.nrk.no/emne/e.coli-utbruddet-i-2009-1.6543993> [cited 2022 12/12].
- OHEJP (2019). One Health European Joint Programme. Strategic Research Agenda. <https://onehealthjp.eu/wp-content/uploads/2018/12/One-Health-EJP-Strategic-Research-Agenda.pdf>.
- Osman, M., Heath, A. J., Lofstedt, R. (2018). The problems of increasing transparency on uncertainty. *Public Understanding of Science*, **27**(2): 131-138. <https://doi.org/10.1177/0963662517711058>.
- Premanandh, J. (2013). Horse meat scandal – A wake-up call for regulatory authorities. *Food Control*, **34**(2): 568-569. <https://doi.org/10.1016/j.foodcont.2013.05.033>.
- Regan, A., Raats, M., Shan, L.C., Wall, P.G., McConnon, A. (2016). Risk communication and social media during food safety crises: a study of stakeholders' opinions in Ireland. *Journal of Risk Research*, **19**(1): 119-133. <https://doi.org/10.1080/13669877.2014.961517>.

- Schimmer, B., Nygard, K., Eriksen, H.M., Lassen, J., Lindstedt, B.A., Brandal, L.T., Kapperud, G., Aavitsland, P. (2008). Outbreak of haemolytic uraemic syndrome in Norway caused by stx2-positive *Escherichia coli* O103:H25 traced to cured mutton sausages. *BMC Infect Dis*, **8**: 41. <https://doi.org/10.1186/1471-2334-8-41>.
- Slovic, P. (1987). Perception of risk. *Science*, **236**(4799): 280-285. <https://doi.org/10.1126/science.3563507>.
- Tonkin, E., Coveney, J., Webb, T., Wilson, A.M., Meyer, S.B. (2018). Consumer Concerns Relating to Food Labeling and Trust-Australian Governance Actors Respond. *Journal of Consumer Affairs*, **52**(2): 349-372. <https://doi.org/10.1111/joca.12155>.
- Tonkin, E., Henderson, J., Meyer, S.B., Coveney, J., Ward, P.R., McCullum, D., Webb, T., Wilson, A.M. (2020). Expectations and everyday opportunities for building trust in the food system. *British Food Journal*, **132**(2): 702-719. <https://doi.org/10.1108/bfj-05-2020-0394>.
- Tonkin, E., Wilson, A. M., Coveney, J., Henderson, J., Meyer, S.B., McCarthy, M.B., O'Reilly, S., Calnan, M., McGloin, A., Kelly, E., Ward, P. (2019). Food-system actors' perspectives on trust: an international comparison. *British Food Journal*, **121**(2): 561-573. <https://doi.org/10.1108/bfj-05-2018-0291>.
- Ueland, Ø. (2019). How to make risk communication influence behavior change. *Trends in Food Science Technology*, **84**: 71-73. <https://doi.org/10.1016/j.tifs.2018.02.003>.
- Ueland, Ø., Gunnlaugsdottir, H., Holm, F., Kalogeras, N., Leino, O., Luteijn, J.M., Magnússon, S.H., Odekerken, G., Pohjola, M.V., Tjihuis, M.J., Tuomisto, J.T., White, B.C., Verhagen, H. (2012). State of the art in benefit-risk analysis: Consumer perception. *Food and Chemical Toxicology*, **50**(1): 67-76. <https://doi.org/10.1016/j.fct.2011.06.006>.
- van Kleef, E., Frewer, L.J., Chrysoschoidis, G.M., Houghton, J.R., Korzen-Bohr, S., Krystallis, T., Lassen, J., Pfenning, U., Rowe, G. (2006). Perceptions of food risk management among key stakeholders: Results from a cross-European study. *Appetite*, **47**(1): 46-63. <https://doi.org/https://doi.org/10.1016/j.appet.2006.02.002>.
- van Kleef, E., Ueland, Ø., Theodoridis, G., Rowe, G., Pfenning, U., Houghton, J., van Dijk, H., Chrysoschoidis, G., Frewer, L. (2009). Food risk management quality: Consumer evaluations of past and emerging food safety incidents. *Health, Risk Society*, **11**(2): 137-163. <https://doi.org/10.1080/13698570902784265>.
- Veflen, N., Storstad, O., Samuelsen, B., Langsrud, S., Hagtvedt, T., Ueland, Ø., Gregersen, F., Scholderer, J. (2017). Food Scares: Reflections and Reactions. *International Journal of Food System Dynamics*, **8**(2): 155-164. <https://doi.org/10.18461/ijfsd.v8i2.826>.
- VKM (2015). *Assessment of antimicrobial resistance in the food chains in Norway. Scientific Opinion of the Panel on microbiological hazards of the Norwegian Scientific Committee for Food Safety*. (VKM, Ed. Vol. 2015:29). Oslo: Norwegian Scientific Committee for Food Safety.
- Whitworth, E., Druckman, A., Woodward, A. (2017). Food scares: a comprehensive categorisation. *British Food Journal*, **119**(1): 131-142. <https://doi.org/10.1108/Bfj-06-2016-0263>.

Appendix 1 – Interview guide Study 1

1: How have your institution and you experienced the chicken case? The media storm, communication, influence on own organisation, measures and interaction with others.

2: What experiences have this brought about? Something you would have done differently or would do differently on another occasion?

3: How do you think in relation to a) own risk communication in the case? Was there misinformation that came out? Who was important in this matter? Who should be important?

b) risk communication by others? What should have been done differently and how?

4: Where do you think the responsibility lies regarding informing the consumer in such a case? How does your institution understand its role in this case? How is the division of responsibility with other agencies? Who should inform about what? Is the division of roles clear or could there be ambiguities here?

5: Do you have your own guidelines for risk communication in such a media case? What do these guidelines say? Were they used in this case? Have they changed later?

6: Which information channels would you highlight as important for reaching out with information about this case?

7: Who do you consider having the most consumer trust when it comes to information about food safety?

8: What has this case done to trust in chicken and in Norwegian agriculture?

9: Influence on the sales of chicken?

10: Influence of the case on other products?

11: What do you think about the continuation of the case?

12: What do you think about information about food safety in Norway in general? How does the dialogue and cooperation between the various actors work from their perspective?

13: Is there anyone else you think we should talk to about this case?

Appendix 2: Interview guide study 2

1: Introduction

How do you perceive risk communication within the food safety area to be in Norway?

2: Topics to be discussed:

What types of food risks are you responsible for communicating about in your department?

Could you give some examples? For example, do you communicate risks related to how to behave or how to eat?

3: General information on risk communication:

Do you have different risk communication strategies for different groups of consumers?

Is risk communication in your organization an ongoing activity? or is it ad hoc, based on situations that arise?

What is the objective of your risk strategy?

What is the content of the risk communication strategy?

Do you use good or bad examples of safe behaviour/risky behavior or both in your communication?

How interactive is the risk communication strategy?

4: Risk communication in a food crisis situation:

How do you carry out risk communication in a food crisis?

When a crisis occurs, who else is involved in the design of a communications strategy?

4: Successes:

What makes a communication strategy successful in your organisation? Can you give some examples? Are there success criteria for an information campaign? What could be the factors/reasons why it is a success? Can you derive any best-practice advice from this?

5: Challenges/barriers:

On a general basis, what do you think are the challenges or barriers related to good risk communication? For example, type of risk, target group for the communication, communication channel, etc.

What are the challenges or internal and external barriers related to risk communication in your organisation?

Are there other factors (political, social, ethical, etc.) that can influence a decision NOT to communicate a risk?

6: Evaluation, suggestions for improvements:

Are you evaluating your risk communication strategy?

Based on your experience, how can we improve risk communication?

7: Vision:

What future development do you expect regarding risk communication?