Testing times: Communicating the role and uncertainty of analytical procedures in a food safety crisis

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Abstract

When people get sick from eating contaminated food, producers, regulators, and consumers confront a food safety crisis. Scientific testing is central both to determining the nature of the contamination, assessing its seriousness, and evaluating future supplies for their safety. This paper examines a case where testing was involved in both the triggering and the resolution of the largest food safety scare ever to hit New Zealand. The 2013 incident involved the country's largest dairy exporter, Fonterra, and the putative presence of *clostridium botulinum* in whey protein sold to business customers who used it in infant formula and other consumer goods. The case highlights the need for food producers to develop narratives around testing for inclusion in their stakeholder-related crisis planning. Such narratives must be compatible with the goals of the audience especially consumers, who wish for certainty and to see decisive action being taken.

Practical Applications

Communicators dealing with food safety-based risks and crises need to take into account lay publics' biases towards assurances of zero risk. This should be part of determining audiences' information needs and calibrating provision of scientific information, including information about necessary testing, in ways that meet these needs. Doing so will help build trust, including about the scientific method and the organisations applying it to determine not only the nature of a given risk but also to assess how best it might be mitigated. While distrust might surface in a risk-based crisis, communicators should focus on messaging that addresses uncertainty through providing consistent and credible information.

Keywords: crisis communication, uncertainty, food safety, scientific testing, case study analysis

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In their systematic review of literature related to food safety communication, Frewer, et al. (2014) found three broad themes related to risk communication: characteristics of the population affected; the contents of the information; and the characteristics of information sources would all substantially influence the effectiveness of communication around food-borne risks. At the heart of their findings, and complementing a large body of research on risk and health communication, were that while scientific testing may reveal the existence of a threat to human health undetectable by other means, such as bacterial contamination of food, effectively communicating about those risks needs to identify key audience information requirements (see also e.g., Bennett, 1998; Breakwell, 2000; Freberg, 2013; Freimuth, Linnan, Potter, 2000; Huerta & Macario, 1999). While there is no such thing as no risk in science and business (Novella, 2014), communicating uncertain or less-than-definitive results to lay audiences is difficult (Covello, Peters, Wojtecki, & Hyde, 2001; Freberg, 2013; Johansson & Harenstam, 2013; Reynolds & Seeger, 2005; Witte, 1996). In particular, Rowan (1996) pointed out that risk communication involves managing: the public's lack of knowledge in science, disagreement amongst experts, the role of advocates, media representation of the issue, and public sentiment. Yet, communicating about uncertain findings and public health risks is vital to maintain public confidence and trust (Breakwell, 2000; Chen, 2008; Miles & Frewer, 2003; Renn & Levine, 1991). One of the barriers to receiving this uncertainty assessment may be message recipients' zero-risk bias, or the tendency to prefer complete elimination of risk, even when some options only reduce risk (Dutt, 2014). In this case study, parents worried by supposed contamination of infant formula sought assurances of zero risk; anything else was deemed insufficient to allay their concerns about possible damage to their infants' health.

The public response showed that while scientists confronting food safety issues might debate the validity or utility of one test regime compared to another, bigger questions are critical. It is not entirely a matter of what the public do or do not believe or understand: experts themselves need to better understand those they seek to reach with risk-based messaging; in fact, this was one of the critical findings of Frewer, et al.'s (2014) systematic literature review of risk communication in the food safety context. Yet, experts often have incomplete pictures of the factors that influence non-expert audiences (Bier, 2001). This is not surprising as research conducted into risk communication associated with food is fragmented (Frewer, et al., 2014).

Understanding Factors Influencing Food Risk Perceptions and Uncertainty

The communication of risk with food safety is complex because lay audiences often question the credibility of the recommendations from experts and scientific information communicated. In fact, they may even disagree with the expert opinions (Hansen, Holm, Frewer, Robinson, & Sandøe, 2003). For example, when it comes to testing and food safety crises, lay publics are sceptical about the scientific method itself, as well as the analysts implementing it (Apostolakis & Pickett, 1998; Bier, 2001). This is particularly true in the socially mediated era where trust (Bennett, 1998; Breakwell, 2000; Chen, 2008) and the perceived credibility of information (Freberg, 2013; van Zoonen & van der Meer, 2015) are central problems. Public responses to risk do not hinge on whether members of the public understand technical information; instead, they rely on trust in relevant institutions and social actors (Garvin, 2001; Jasanoff & Wynne, 1998; Miles & Frewer, 2003; Sellnow, 1993; van Zoonen & van der Meer, 2015). Such reliance should not be taken for granted – rather,

distrust may surface in a risk-based crisis, because of loss of trust in leaders and institutions, which has largely occurred over the past 30 years (Bier, 2001; Kasperson, Golding, & Tuler, 1992; Kramer & Lewicki, 2010; McDonald & Cokley, 2013). Responses to a crisis may also tap into pre-existing worries about food safety (Freberg, 2013; Kim, Kim, & Cameron, 2012; Miles, Brennan, Kuznesof, Ness, Ritson, & Frewer, 2004).

Yet, trust and credibility are affected by the uncertainty of the situation. Crises, by their very nature create uncertainty by disrupting the norm and responding to crises is largely an exercise in uncertainty management (Rickard, McComas, Clarke, Stedman, & Decker, 2013; Taylor, 2000). In general, uncertainty is lacking "sure knowledge about the course of past, present, future, or hypothetical events" (Driskill & Goldstein, 1986, p. 41). Levels of uncertainty are influenced by past behaviors and experiences (Afifi & Metts, 1998). When people do not believe they have enough (or the correct) information about a situation, this exacerbates the uncertainty as well (Mohamed & Daud, 2012). This means when the situation itself has created uncertainty and the available information is also perceived as uncertain, then organizations trying to manage the situation face an uphill battle.

The challenges of uncertain information in uncertain contexts helps explain Dutt's (2014) findings for zero-risk biases. In short, lay audiences may not understand the scientific process, may dispute the credibility of the process used to arrive at public recommendations, and may be uncomfortable with uncertain results because they only add to the discomfort of the uncertainty a food-safety risk poses. All of these factors suggest public stakeholder perceptions of a food crisis and their evaluation of their risk may move them to a defensive and fear control stance towards the issue (Witte, 1996), suggesting they are going to be less open to messaging, especially when that messaging communicates uncertainty. This can lead to several problems in communicating vital information and targeting key stakeholders who need information in a food-safety crisis. For example, communicators may not have an adequate way to translate numerical probabilities into lay language (Bier, 2001). It could be that stakeholders may not understand the time required to conduct thorough testing or investigate the integrity of the food supply chain, but may perceive the organization as taking too long to act (Chen, 2008; Kal-kausar, Rafida, Nurulhusna, Alina, & Mashitoh, 2013; Miles & Frewer, 2003; Mou & Lin, 2014). However, the diversity of audiences and stakeholders suggests there will likely be many different kinds of reactions to crises (Bier, 2001; Engdahl & Lidskog, 2014). Therefore, when organizations can be consistent and credible sources of information and explanation of the situation they may improve their chances of managing the crisis more effectively (DiStaso, Vafeiadis, & Amaral, 2015; Hosseinali, de Marcellis-Warin, & Warin, 2015; Garvin, 2001).

Such explanatory narratives are widely used in New Zealand's dairy industry. New Zealand's Ministry for Primary Industries lists on its website (https://www.mpi.govt.nz) 45 dairy laboratories authorized to conduct different types of tests. In the 2012-2013 production season, dairy processors completed millions of tests worth an estimated $NZD64 million' (*Report on New Zealand's dairy food safety regulatory system*, n.d., para. 12). While the challenges of communicating technical information as part of risk messaging have been extensively researched, arguing for the validity of the scientific testing process as well as its outcomes is less researched, yet vital to help provide the information and background that public stakeholders need to trust the results, feel the information coming in the wake of a food-safety crisis is credible, and help to manage stakeholder uncertainty. The present study analyzes the 2013 Fonterra contamination crisis and response as a way to evaluate how food safety crisis managers can use arguments about the scientific testing process as a way to improve trust and credibility in the communication of risk-information, even when the results may not be completely certain.

Case Study: Fonterra's 'Botulism Botch-up'

In August, 2013 the world's largest dairy exporter, New Zealand-based Fonterra, announced that some of its whey protein ('WPC80') used in manufacturing could have been contaminated with *clostridium botulinum*, a bacterium that can cause the rare and potentially fatal illness botulism. Fonterra had sold the whey material to eight business customers. They incorporated the whey protein into products such as infant formula and beverages and exported them to China, Australia, Saudi Arabia, Sri Lanka, and other countries. Therefore, Fonterra's news sparked an international, as well as a local food safety scare. The material crisis was ended three weeks after the initial announcement when new Government-ordered tests revealed the bacterium was not *clostridium botulinum* and no health hazard existed. In the meantime, however, significant reputational damage was done to Fonterra, the New Zealand dairy industry, and New Zealand as a safe country of origin for foods and food ingredients. A subsequent independent report to Fonterra's board spoke of a failure to recognise explosive reputation risk. But elements of the botulism 'botch-up' (*Fonterra cleared of botulism but not of 'botch-up*,' Radio New Zealand, 2013, 28 August), as it is now popularly known in New Zealand, were even more fundamental, especially in relation to the timeline of events.

Fonterra's public announcement about suspected risk came more than 18 months after the WPC80 was manufactured in February, 2012. Initial contamination occurred when a torch was sucked into a dryer and its hard plastic lens broke. Subsequently, the WPC80 was reworked and sold to customers between July 2012 and February, 2013. It was not quarantined. On August 3, 2013 a media statement announcing a quality issue followed months of internal discussion and tests (Dean, Astin, & Nowell, 2014). The tests were ordered after an Australian customer complained of high levels of sulphite-reducing clostridium (SRC) anaerobic bacteria in the reworked product. Testing focused on possible bacterial contamination based on the assumption that it was "EXTREMELY UNLIKELY" (Hodder, Heida, & Trainor, 2013, p. 42, capitalisation in the original) that the SRC bacteria identified in the WPC80 were toxic. Rather, it was considered that the results were more likely to be associated with food spoilage and therefore not dangerous to humans. However, when tests indicated the presence of *clostridium botulinum* that can cause the botulinum toxin, the company acted. When the drawn-out process the company followed was revealed (see more detail below), the Prime Minister of New Zealand, John Key, raised questions about perceived delays and their possible implications. He stated:

> I'm a bit staggered that in May of 2012, when this whey was produced, that it (Fonterra) did show something in its testing, but clearly not something that was of concern to the company because they allowed it to go out,' he told Radio New Zealand. You would have thought that for a business where its top business is essentially based around consumer confidence, food safety and the quality of its products, that they are risks that you wouldn't take. (Sands, 2013)

A chorus of media commentators and consumers underscored his concerns. One hold-up had a direct impact on consumer confidence: at the outset of the crisis, the company was unable to state clearly which infant formula brands might be affected. Media interviews in New Zealand and China featured worried parents expressing fears about whether using popular formula products might harm their babies. When overseas testing later revealed the SRC bacteria was not *clostridium botulinum*, the outcome did not allay consumer worries or stem other criticism of the company; trust had been undermined. As Hansen et al. suggested, if people have a negative bias towards information about hazards, "no risk" messages will not

necessarily be reassuring (2001, p. 117). Moreover, negative feelings, rarely based on knowledge of the issues, may be combined with distrust in scientific expertise (Holm & Kildevang, 1996).

Initially, Fonterra sought to mitigate the suspected hazard thought to be associated with its whey by engaging in scientific testing: a reasonable approach in an industry that relies on rigorous testing standards to sustain public confidence in its products. However, once it became public that the testing took months, during which time the company did not quarantine the questionable product but allowed it to be sold, the reputation of the company, the regulators, the dairy sector, and even the country itself were under attack. Stakeholders actuated by right-to-know concerns perceived the delays as risk factors.

Botulism, Scientific Certainty and Assumption

A number of different SRC anaerobic bacteria exist in the environment with most being benign to humans. However, some can affect humans through food spoilage, tetanus or toxicity caused by eating food contaminated by *clostridium botulinum*, the microorganism initially thought to be present in Fonterra's product. *Clostridium botulinum* produces a nerve toxin regarded as the most toxic of all poisons; the minimum concentration needed to disrupt a vulnerable cell is unkown (Simpson, 2004). Eatng food contaminated with *clostridium botulinum* can cause botulism, a serious illness, especially in infants, with effects ranging from "mild muscle hypotonia, manageable on an outpatient basis, to sudden death caused by respiratory arrest" (Vanella de Cuetos, et al., 2011, p. 1845). Recovery from botulism poisoning can be lengthy.

According to the independent report commissioned by Fonterra's board, when an Australian customer queried the SRC levels, it was assumed that the problematic bacterium was likely a benign form of SRC usually associated with food spoilage. Distinguishing between the benign and active forms is difficult and because *clostridium botulinum* in dairy products is rare, the possibility of it being present in this case was discounted (Hodder et al., 2013). Because of its rarity the International Commission on Microbiological Specitifcation for Foods (ICMSF) does not recommend routine testing for *clostridium botulinum* as part of a quality assurance regime of dairy manufacturing (ICMSF, 2014). Although tests by Crown Research Institute AgResearch (government- run) showed high levels of SRC in April, 2013, products were not recalled until August, 2013.

The following short timeline of the WPC80 case is drawn from Hodder et al. (2013). The full narrative runs 19.5 pages:

2 February, 2012	'Foreign matter' contamination found
16 March, 2012	AsureQuality (the relevant regulatory authority) rejected a request to categorise the product as not fit for human consumption. A related request was for permission to dispose of the product for stock food. The request was not approved and further processing was suggested.
11 April 2012	AsureQuality approved reprocessing of the product and also approved it for stock food. Part of the equipment to be used in the reworking had not been used for about two years (*Independent Report*, p.39).
July 2012-February 2013	37.8t of product was sent to customers for use in nutritional powders and UHT beverages.
21 March 2013	High levels of SRCs found in product at Darnum plant in Australia.
24 May 2013	Decision made not to proceed with testing for presence of *clostridium.botulinum*

22 – 25 June 2013	Testing for botulinum decided upon and initiated.
26 July 2013	Decision to put product on hold but not to tell customers until 5 August when final test result confirmation was expected.
3 August	Media announcement
3 August 2013	Media conference at which Fonterra could not identify customers who received the product.
7-8 August 2013	Media release confirming product subjected to 195 tests in both New Zealand and the United States was safe and free of botulism (Gray, 28 August, 2013)

The tests commissioned in June 2013 from AgResearch required the use of mouse bioassays and were not necessarily conclusive, as mice can die from causes not related to clostridium botulinum (Hodder at al., 2013). On 31 July AgResearch advised that the test results indicated the SRC present could be *clostridium botulinum*, although it recommended further testing. A product recall followed days later in New Zealand and overseas. Two elements delayed the recall of the product thought to have been contaminated. One was a cognitive bias that assumed *clostridium botulinum* was extremely unlikely to be present, while the other factor was Fonterra's decision to wait until it was scientifically proven whether *clostridium botulinum* had been found in the product. Acknowledging that the testing regime is particularly difficult, arguably the company sacrificed stakeholder confidence on behalf of its search for certainty – which, equally, can be interpreted as a responsible strategy to ensure any action is soundly based. Further questioning the actions of Fonterra, Dr Russell Norman, of the Green Party, asked, "Why was MPI [the Ministry of Primary Industries] able to test the product for the bacterium in less than a month whereas it took Fonterra three months and it now seems that they came up with an incorrect result?" (Gray, 28 August, 2013).

Discussion

When risk communication centres on food and food-related items consumed by vulnerable populations such as infants, and occurs in a politicized climate where scientific uncertainties are involved, communication becomes complicated. Yet, the need for organizations to maintain their reputation, trustworthiness, and credibility is vital if it is going to be successful in responding to a crisis.

Often the public is unaware of food safety crises until they are announced by the organisation themselves or health authorities. Messages announcing such crises normally follow an informative public relations strategy, offering unbiased facts to the audience and establish a perception that the crisis can be resolved (Zaltman and Duncan, 1977). However, such strategies assume an audience that is rational and motivated. In the case of Fonterra parents whose children could be potentially contaminated with a deadly toxin were unlikely to be rational in their response to conservative, scientific arguments. Rather, they wanted to be reassured and shown that decisive action was being taken to ameliorate the problem. In a situation of food safety risk the public are constrained in taking action to safeguard themselves if there is a paucity of clear information. Such constraint recognition also needs to be taken into account when organisations craft messages in food safety crises. In Fonterra's case the goals of their messages and those of the audience, the parents of small children, were incompatible, as they did not give clear information nor did they illustrate that clear decisive action was being taken.

When we compare Fonterra's botulism scare to cases of potential food contamination where the company has been more successful in maintaining its credibility and public trust, we note a distinct difference in communication – namely using scientific argument to

reassure stakeholders that the problem is being solved. For example, in the XL Foods crisis in Canada – where pathogenic Escherichia coli 0157:H7, a shigatoxin-producing Escherichia coli was found in ground beef, the manufacturer immediately recalled all meat packaged from the plants and focused on the communication of process considerations to ensure that the problem could be avoided in the future (Charlebois, et al., 2015). In the case of XL foods, the company like Fonterra, was not the end manufacturer but unlike Fonterra XL did not focus on the question of 'proof' of contamination in their crisis response strategy; instead, XL foods focused on risk mitigation in addition to discussing how it was testing for contamination. In so doing their messages were more compatible with the goals of the audience. This is born out by the fact that XL's recall was the largest food recall in Canadian history, yet a year after the incident, consumers trusted the safety of eating ground beef (Charlebois, et al., 2015).

Using Information to Manage Uncertainty in Food Safety Crises

The Fonterra case suggests the application of scientific information in crisis response itself is not the problem; however, the manner in which it is positioned may well be the problem. Science often fails to inspire public confidence because it is conservative in drawing conclusions and often fails to provide absolute answers (Garvin, 2001). For this reason it can be unsatisfactory to publics that emotionally need reassurance in the face of health crises because crisis management requires uncertainty management (Mohamed & Mohd Daud, 2012; Rickard, et al., 2013). This suggests the problem with scientific information during crises may not be the lack of trust in science; rather, the emotional need for certainty. As noted, the case of XL Foods suggests publics can accept mistakes, contamination, and potentially even the evidence of health problems when they believe the material cause of the problem can be identified and solved. Therefore, informative messages in a food safety crisis must always contain the latter message if they are to be effective. For Fonterra, there was no evidence of illness or any measurable harm done to consumers; yet, the company's seeming lack of decisive action and focus on scientific testing detail instead of showing protective and preventative action on the company's part is more likely the reason for the negative credibility and trust outcomes for the company.

In the food industry, in particular, Chen (2008) found that trust is based on perceptions about the problem of food safety itself. In the case of Fonterra, because the food safety question involved the most vulnerable people, the problem would have been heightened, as was evidenced in the development of the case. This already poses a problem in stakeholder trust. In addition, Chen also found that three other factors influenced trust after a food scandal – trust in the institutional actors, perceptions of safety monitoring by the company, and truth- telling related to the scandal. In the Fonterra case, there was little evidence that perceptions of truth telling were a problem. However, in the politicization of the crisis, trust in the institutional actors was clearly called into question as were perceptions of Fonterra's safety monitoring. Therefore, while communicating about the complexity of the testing process may have been transparent and scientifically accurate, it likely hurt the trust in the company. However, more problematic than communicating about the complexities of the scientific information, Fonterra failed to communicate a knowledge of the likely distribution of its product and delayed in communicating to the public about the potential contamination. Previous research has found that the food recall activity itself has significant impact on regaining consumer trust; that is, when companies are better able to track product batches globally and execute a quick and effective recall consumers respond more favorably to the organization (Kal-kausar, et al., 2013).

Had Fonterra been more effective in this regard, it is also possible that the matter of the contamination might not have become such a politicized issue because the problem may not have escalated the recall to a reputational problem for the safety of all of New Zealand's food exports. Yet, at the point that the recall did become a national reputation issue, it is not suprising that New Zealand's government officials responded negatively towards Fonterra. Findings in the case of the horsemeat scandal in Sweden (i.e., horsemeat was repackaged by a distributor as 'beef' and distributed throughout Northern Europe in 2012) suggested the company in crisis – Findus Nordic – effectively managed the scandal by not only focusing on its tradition of excellence, but also by shifting the blame towards the supplier (Falkeimer & Heide, 2015). In essence, this response strategy emerged by government officials in order to protect the larger New Zealand 'brand'. Therefore, the political responses communicated disbelief and focused on blaming the process Fonterra used, taking the confusing scientific process and using that as a source of criticism. Against this background, Fonterra's response demonstrates a limitation in communicating scientific information during food scandals – the scientific information must match the communication and information needs of the public. This disconnect between scientific information and public information desires is well known because publics often want quick and simple solutions to problems that are complex (Garvin, 2001).

Coherent and Proactive Scientific Narrative, Dialogue in Risk Communication

In the case of health risks, when people consume the media, they are seeking information, suggesting that the accounts of the health risks that are present in the media are vital for how different publics will interpret and manage the risk (Ryan & Dunwoody, 2001). This is also vital in a modern context where media coverage influences social media engagement about crises, with research demonstrating that the news media's reporting on crises can soothe public panic and speculation (van der Meer & Verhoefen, 2013). However, in Fonterra's case, worried parents were cast as victims not only of a flawed production system but also of a company and the regulatory system under which it operated, neither of which were seen as being able to provide timely, straightforward answers to the vital question of whether formula made with supposedly contaminated whey was safe. Fonterra failed to provide a coherent narrative around the testing process and what could be expected of it, or of the timeline involved. The timeline is important: as Bubela et al. asserted, "the lay public and experts have very different perceptions of timelines" (2009, p. 516).

Developing effective scientific narratives is vital today because the growing range of risks is fueling public scepticism about risk communication (Löfstedt, 2013). In the case of the Fonterra crisis, these issues included: (a) the perceived risk to consumers of if the whey was contaminated; (b) the reputational risk to Fonterra; (c) the New Zealand dairy industry as well as the New Zealand '100% pure' branding; and (d) the marketplace risk not only to Fonterra but also to smaller infant formula exporters who suffered collateral reputation and market damage. The multiplexity of issues at risk with the Fonterra crisis and range of identities threatened is a clear indicator that the crisis would receive substantial media coverage with a potential for many different narratives emerging.

Löfstedt (2013) argued that top-down forms of risk communication are insufficient: instead he suggests that approaching foodborne contamination, illness, and scandal requires openness, transparency, and dialogue is needed. After analysing three cases of foodborne illness and contamination, Löfstedt concluded the cases demonstrating a more scientific approach in the communication of food-related risks and benefits showed that highlighting scientific uncertainty is problematic. Instead, his research suggests that proactive risk communication improves organizations' trustworthiness while reactive communication harms

public trust (Löfstedt, 2013). For Fonterra, the lack of a coherent explanation from a trustworthy source of what was involved in the testing process along with a lack of uncertainty reduction undermined public confidence, at least in the short term.

As New Zealand's largest newspaper, the *New Zealand Herald*, pointed out, it was one dead mouse that "brought New Zealand's dairying giant Fonterra to its knees" (Fisher, 2013 p. 7). The newspaper also claimed "scientists told of the tests were appalled they were the basis for a decision which threatened New Zealand's international reputation as a quality food exporter" (Fisher, 2013, para. 24). Yet, had the scientific information been coupled with a more effective narrative that focused on managing uncertainty and seeking engagement with potentially affected stakeholders, it might have more effectively managed public concerns. Publics are certainly aware that they are dependent on 'experts' and systems to work effectively to protect public safety, yet they are also aware they typically lack the power to influence the situation (Engdahl & Lidskog, 2014). However, Fonterra created no narrative, no opportunity for dialogue, and were reactionary at best, setting themselves up for communicative failure in a 'post-trust' era (Löfstedt, 2013). The poor narrative from Fonterra created an interpretation vacuum, more effectively opening the door to advocacy groups and the self-selection of information in online environments that may perpetuate fears or interpret complicated scientific information and testing procedures in ways that are not necessarily based on good science but rather on public fear and alarms from media attention and hype (Löfstedt, 2013). In the absence of an effective narrative and dialogue from Fonterra, the climate of institutional distrust intensified Fonterra's dilemmas.

One result of this climate was social amplification of the perceived risk. Kasperson et al. (1998) contended that people receive signals about risk through personal experience with a risk or through receiving information about the risk. These signals can be amplified through various communication channels including individuals or social groups or organisations -- for example, scientists, politicians, government agencies and departments, activist groups and the media (Petts, Horlick-Jones, Murdock, Hargreaves, McLachlan, & Löfstedt, 2001). Media coverage seemed to intensify public concerns, particularly because news stories consistently reported that parents were furious about the lack of information about the actual risks to their children (Rutherford & Johnson, 2013). In the social amplification of the perceived risk and situational uncertainty, it also seems clear that frustration emerged from a lack of control over the situation. Uncertainty combined with a lack of control intensifies perceptions of the seriousness of the situation compared to those situations where people believe that personal control is greater (Diers-Lawson, 2017; Miles & Frewer, 2003). Therefore, in situations where there are heightened emotional states and increased perceptions of severity and vulnerability, people are less likely to process information effectively (Hansen, et al., 2003) leading to a greater likelihood for misinterpretations and other barriers for communication (Benson, 2011; Seeger, Sellnow, & Ulmer, 2003).

In this case, failing to develop a clear and engaging narrative and dialogue with critical stakeholders, like parents, it amplified their anger over the situation. This is particularly true because parents are already likely to have heightened emotions on issues regarding their children. Diers-Lawson (2017) found that one of the strongest predictors of negative emotional reactions to crises was the emotional involvement of the stakeholders with the crisis issue – in this case, the safety of their children. As such, the parents' expressions of anger quoted above are consistent with Pidgeon and Kasperson's (2003) findings that amplification of risk can produce 'ripples' of secondary and tertiary consequences that spread far beyond the initial impact of the event. However, the authors also found this ripple effect can require more 'radical' managerial interventions in order to reduce the risk associated with the consequences.

Theoretical Implications

The case of Fonterra's botched botulism response higlights a critical challenge in the use of scientific information as part of crisis response: it is often not accessible to lay audiences and fundamentally fails to meet their informational and emotional demands particularly in a food safety crisis. Yet the Fonterra case also provides two important contributions to our understanding of crisis response in these cases. First, information must be used to manage stakeholder or public uncertainty. This suggests that scientific information must be framed so that publics understand the importance of the scientific testing procedures while having the reassurance that the same level of rigor is being applied to mitigating any potential harm done because of the crisis. Second, this case suggests that if an organization is going to be successful in managing uncertainty, it must produce a coherent and proactive scientific narrative and dialogue to manage public risk perceptions. In so doing the messages must be compatible with the audience's goals. In the case of food safety they should not only contain information about scientific testing but also they need to give information for consumers to take effective action and be accompanied by strong messages of decisive action that will promptly alleviate the crisis.

This paper's purpose was to analyse how food safety crisis managers can use arguments about scientific testing as a way to improve trust and credibility in risk information – even when the results were uncertain. Through the critical reflection on the Fonterra case, it seems that the most important conclusion is that scientific testing must be presented in a manner that is responsive to stakeholder concerns, communicates pre-emptive action to mitigate crisis impact, and most importantly cannot be used as a stand alone crisis response. Scientific testing can build institutional trust and credibility when it is coupled with decisive action, reassurances, and public engagement.

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