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Risky behaviours from the production to the consumption of bivalve molluscs: Involving stakeholders in the prioritization process based on consensus methods

S. Crovato [a,*], A. Pinto [a], G. Arcangeli [b], G. Mascarello [a], L. Ravarotto [a]

[a] Istituto Zooprofilattico Sperimentale delle Venezie, Health Awareness and Communication Department, Italy
[b] Istituto Zooprofilattico Sperimentale delle Venezie, National Reference Laboratory for Fish, Crustacean and Mollusc Pathology, Italy

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ABSTRACT

The most recent data show that shellfish farming represents approximately 60% of the total aquaculture production in Europe. Bivalves molluscs are internationally recognized as a potential vehicle for food-borne diseases especially when consumed raw or improperly cooked. Bivalves are filter-feeding animals that may accumulate particles present in the surrounding water, including viruses and pathogenic microorganisms. For these reasons consumers have to be careful during purchasing, handling and cooking of this food. In Europe several regulations have been adopted to protect consumers' health. However in the development of new food safety strategies it is also crucial to find an effective approach to guide authorities' decisions on priorities for controlling foodborne risks. In the article a study for the selection and ranking of behavioural information on bivalve risks is reported. The "consensus methods" provide a means of synthesising information and of harnessing the insights of experts to enable decisions shared and validated by the scientific community. The Delphi method and Nominal Group technique (NGT) were applied for their capability to assess the level of agreement and to develop consensus among participants. In the article, the NGT is presented as a way to involve relevant stakeholders in the ranking of risky behaviours from the production to the consumption of bivalve molluscs previously selected by scientific experts through the Delphi method. The inclusion of a full range of experts and stakeholders in a community participatory research project regarding food risk management represents an innovative approach in the Italian public health context, especially in the analysis of bivalve risks.

1. Introduction

Food-borne disease is a relevant worldwide public health problem (WHO, 2015). Looking at European Union (EU) Member States (MS), a total of 5251 food-borne outbreaks, including both weak- and strong-evidence outbreaks, were reported by 26 MS in 2014 (EFSA, 2015a). Over the years, all food-borne pathogens have developed efficient and effective strategies that exploit food as a vehicle to travel from one human host gut to another or from an animal to a human (Newell et al., 2010). Food can be a vehicle of virus transmission, which, in some cases, is highly contagious and may contribute to the spread of significant outbreaks (EFSA, 2015a; WHO, FAO, 2008; WHO, 2015). In 2014, food-borne viruses were, for the first time, identified as the most commonly detected causative agent in the reported food-borne outbreaks (20.4% of all outbreaks), followed by Salmonella (20% of all outbreaks), bacterial toxins (16.1% of all outbreaks) and Campylobacter (8.5% of all outbreaks) (EFSA, 2015a). The food vehicle was reported in all strong evidence outbreaks (592 in total) registered in the EU. In particular "eggs and egg products" were the most common food vehicle associated with strong-evidence outbreaks (18.2%), followed by "mixed food" (12.8%), "crustaceans, shellfish, molluscs and products thereof" (8.1%) and "vegetables and juices" (7.1%). Information on the food vehicle was also provided for all 4659 weak-evidence outbreaks reported by the EU MS, where "mixed food" was the most frequently reported food vehicle (7.7%), followed by "eggs and egg products" (2.8%), 'crustaceans, shellfish, molluscs and products thereof' (2.3%) and "fish and fishery products" (2.2%).

In a country with a significant production of shellfish, controlling virus prevalence and levels is crucial for the protection of

* Corresponding author.
E-mail address: scrovato@izsvenezie.it (S. Crovato).

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consumers' health (Suffredini et al., 2014). In recent years, the production of aquaculture has seen a rapid increase, especially in the Mediterranean area. In Europe, shellfish farming represents approximately 60% of the total aquaculture production. In 2011, mussels were produced mostly in Spain (209,000 t); oysters in France (85,000 t); and clams in Italy (32,000 t) (Lane, Hough, & Bostock, 2014). Shellfish is the most productive sector of the Italian aquaculture industry (Prioli, 2007), and Italy is the third main European producer of bivalve molluscs, with a 2014 average of more than 100,000 tons per year (MiPAAF, 2014). This situation necessitates a reflection on the risks related to bivalves. Bivalve molluscs are filter-feeding animals that may accumulate particles present in the surrounding water, including viruses (Bellou, Kokkinos, & Vantarakis, 2013; Burkhardt & Calci, 2000; Pepe et al., 2012; Pinto, Costafreda, & Bosch, 2009) and pathogenic microorganisms (Rodriguez-Lazaro et al., 2012; WHO, 2010). They are internationally recognized as a potential vehicle for human enteric virus transmission (Bellou et al., 2013; EFSA, 2015a; Lees, 2000; Potasman, Paz, & Odeh, 2002), especially when consumed raw or improperly cooked. According to data reported in the EFSA zoonoses database (2007–2013), the outbreaks related to bivalve molluscs were caused by Norovirus (NoV), which is associated with oysters, mussels and unspecified bivalve molluscs (EFSA, 2015b).

Bivalves are characteristically tender, easily digested, additive-free and minimally processed, traditionally consumed raw or lightly cooked as a whole (viscera included) (Lees, 2000; Murchie et al., 2005). Normally, consumers can control microbial risk and ensure product safety through proper refrigeration, storage, handling, cleaning and cooking procedures, but the hazard related to the contamination of bivalves is often due to the traditional cooking procedure of these molluscs that does not ensure consumers' safety (Oliveira, Cunha, Castilho, Romalde, & Pereira, 2011).

For this reason, hygienic measures, such as the Regulation (EC) 854/2004 (29 April 2004, 206–320), (EC) 2073/2005 (15 November 2005, 1–26) and the recent Commission Regulation (EU) 2015/2285 (8 December 2015, 2), have been adopted by European authorities for the control of the faecal contamination of live bivalve molluscs (LBM). These measures are effective in the control and reduction of bacterial pathogens with oral-faecal transmission, but they are ineffective against viral pathogens such as Norovirus (NoV) and hepatitis A (HAV) outbreaks (Baker et al., 2011). To protect consumers from these kinds of pathogens, regulations based on the measurement of the levels of bacterial enteric pathogens in shellfish tissues or in the water in which shellfish are grown have been instituted (Le Guyader et al., 2010). However, outbreaks linked to shellfish consumption still occur after either accidental contamination or ineffective depuration (Le Guyader et al., 2008; Xerry, Gallimore, Iturriza-Gomara, & Gray, 2009). Shellfish may also be contaminated post-harvesting during the storage of the product. Potential hazards due to contaminant agents may also be introduced through cross-contamination, re-contamination or faulty handling and processing (Huss et al., 2000; Shumway & Rodrick, 2009, p. 608) not only by consumers but also by producers and retailers. EFSA data on the place of exposure to the food that causes an outbreak show that the "household" category was the most commonly reported setting (37.3%), followed by "restaurant, café, pub, bar, or hotel" (26.0%), "school or kindergarten" (5.4%) and "residential institution" (nursing home, prison or boarding school) (4.6%).

After the entry into force of the Regulation EC 853/2004 (29 April 2004, 22–82), each European member state defined its national guidelines for consumer protection regarding the production and the marketing of bivalve molluscs. The production chain is monitored not only for the microbiological contamination but also for biotoxins and for chemical hazards (heavy metals, pesticides and drug residues) that are, in general, uncommon among commercially harvested shellfish (Huss et al., 2000). However, consumers seem to be more informed about the benefits arising from the consumption of this food rather than on the risks, where there is often confusion (Olmedo et al., 2013). Although molluscs consumption requires consumers to be careful during the handling and the cooking of this food, risk communication information addressed to consumers is still extremely limited, patchy and fragmented and is often left to the discretion of individual local or regional healthcare directorates. This study presents a risk communication project funded by the Italian Ministry of Health on consumer protection. It aims to spread correct information about the purchase, manipulation and consumption of bivalve molluscs, contributing to the decrease of foodborne disease. In particular, the article focuses on the methods implemented for selecting information on bivalve risks through the involvement of experts and stakeholders.

1.1. Consensus methods for selecting information on bivalve risks

European institutions and governments have undertaken efforts to develop new and more efficient food safety controls directed at specific foodborne hazards with the aim to improve public health. In this process, it is crucial to find an effective approach to selecting and ranking data and information needed to guide authorities' decisions on priorities for controlling foodborne risks (Grover, Chopra, & Mosher, 2016; Ruzante et al., 2010; Speybroeck et al., 2015). Over the past 20 years, quantitative risk assessment (QRA) associated with the involvement of important stakeholders has become a central part of food safety management (Barker et al., 2010). Different from quantitative methods, such as meta-analysis, the application of 'consensus methods' provides another means of synthesising information and of harnessing the insights of appropriate experts to enable decisions to be made through matching expert opinions (Jones & Hunter, 1995; Van Teijlingen, Pitchforth, Bishop, & Russel, 2006). These methods are different from many other methods because they incorporate both qualitative and quantitative approaches. The aim of consensus methods is to determine the extent to which experts, stakeholders or lay people agree about a given issue. They seek to overcome some of the disadvantages normally found with decision making in groups or committees, which are commonly dominated by one individual or by coalitions representing vested interests (Jones & Hunter, 1995).

The main characteristics of these methods – anonymity, the iteration process (which allows participants to change their opinions during the process), controlled feedback and the statistical group response – allow consensus methods to be applied in a wide range of studies (Van Teijlingen et al., 2006). The Delphi method and Nominal Group technique (NGT) are among the methods that allow assessing the level of agreement (consensus measurement), and NGT is also applied to develop consensus (Jones & Hunter, 1995). Moreover, the NGT is used to rank priorities but requires a physical meeting of participants and, as such, is open to group processes that are not required in the Delphi method (Van Teijlingen et al., 2006). These two methods are extensively adopted for priority setting and for the development of guidelines in medical, nursing and health services research (Adler & Ziglio, 1996; Glasier, Brechin, Raine, & Penney, 2003; Jones & Hunter, 1995; Krska & Mackridge, 2014; Zeitlin et al., 2003).

For the application of these methods, the involvement of experts and stakeholders is needed. In the international literature, experts' and stakeholders' participation in the decision-making process and consensus methods has been reported in several studies, particularly those related to environmental problems (Beierle, 2002;