



Overview of Communication Activities and a Plan to Improve Public Perception of Food Additives

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ABSTRACT

Food additives are considered a high-risk factor by the EU and Slovenian consumers, although they are strictly regulated by the authorities and pose a low risk to consumers. However, risk communication about food additives is challenging and involves the interactive exchange of information about hazards, taking into account the risk perception of the target groups. A plan for communication activities aimed at improving public perception of food additives was structured based on the review of scientific literature and the overview of previous communication efforts communicated by various information sources to raise awareness among the Slovenian public from January 2015 to January 2022. The overview included governmental and non-governmental organisations that are credible sources of information on food safety for Slovenian consumers at national and EU level. The objective was to develop an effective communication plan on food additives with defined objectives, target groups, key communication messages, communication activities, tools and channels. The proposed plan can serve as a good basis for launching an effective awareness campaign on food additives to reduce public concern and improve the knowledge of average consumers about the use of additives in food.

Key words: food additives, risk communication, risk perception, consumers, communication plan

INTRODUCTION

Food additives are substances that are intentionally added to food in small quantities for technological purposes (Silva and Lidon, 2016). The increasing need for their use by the food industry is reinforced by the need to ensure the safety and quality of food over time (Carocho et al., 2014; Paşca et al., 2018). Regulation (EU) 1169/2011 lays down rules on food information to consumers and food additive labelling to prevent consumers from being misled.

The proposed conditions of use and levels of food additives must be evaluated on the basis of the available scientific evidence (Regulation (EC) 1333/2008, 2008). As long as the assessed daily dietary exposure to the food additive remains below the scientifically established safe level of exposure, known as the Acceptable Daily Intake (ADI), the food additive does not pose a safety concern (EFSA, 2014; EFSA, 2022b). Although all measures have clearly been taken to ensure consumer safety, adverse reactions to food additives have been a "hot topic" in public for over five decades (Andreozzi et al., 2019). Contrary to public opinion, case reports and reviews of the scientific studies indicate that adverse

reactions to food additives are rare (Andreozzi et al., 2019; Bahna and Burkhardt, 2018; Randhawa and Bahna, 2009; Valluzzi et al., 2019). Furthermore, due to the inconsistency of available research findings (Andreozzi et al., 2019; Carocho et al., 2014; Carocho et al., 2017), further research is needed in this area (Amchova et al., 2015; Randhawa and Bahna, 2009).

Unlike experts, the public's perception of risk is not determined by statistical calculations and analytical reasoning (Cole and Withey, 1981), but rather by intuition, beliefs, attitudes, judgements, personal experiences, feelings, social and cultural predispositions (Pidgeon, 1998; Slovic et al., 1982). Experts perceive and evaluate risks objectively, while the public does so subjectively (Verbeke et al., 2007). Several factors have been identified that influence risk perception: the ability to control the risk (is exposure voluntary or involuntary), the population group affected (when vulnerable groups are affected, interest and concern are greater and a greater risk is perceived) (EFSA, 2017), the perceived benefit (the greater the benefit, the lower the risk is perceived and vice versa (Bearth and Siegrist, 2016; Siegrist et al., 2000), the consistency of communication (are messages from different risk communicators consistent) (Cope et al., 2010), credibility

or trust in information sources (if the credibility of the information source is high, the message itself is likely to be perceived as trustworthy) (Trumbo and McComas, 2003).

Risk communication is an interactive process of information exchange between all parties involved in the risk analysis process, including consumers (Regulation (EC) 178/2002, 2002). Effective communication constitutes continuous communication (Knudsen, 2010), which emphasises the timely exchange of accurate, clear, comprehensive and coherent information (Regulation (EU) 2019/1381, 2019) appropriate for a given target audience (Degeneffe et al., 2009) and involves continuous constructive dialogue between the experts and lay people involved (Lofstedt, 2006). It helps to ensure that the results of risk analysis are perceived by the public (Arnot et al., 2016) and that risk policies are understood and accepted (Arvai, 2003). The key principles of risk communication are transparency, openness and responsiveness (Regulation (EU) 2019/1381, 2019), which form the basis for effective risk communication. Accessible and assessable information should clearly indicate what (scientific) data was used, what information was not considered and what methods were used to reach the decisions (Devaney, 2016; Schreider et al., 2010). Open risk communication indicates the availability of information that can be reviewed and analysed (EFSA, 2017). Responsiveness should be understood as communication that provides information that reaches the target audience in a timely manner (EFSA, 2021). Accountability and communication of uncertainty is also an important factor influencing trust in the risk analysis process (Auger, 2014; Hooker et al., 2017). As uncertainty is always present to some degree, it needs to be acknowledged (EFSA, 2017).

MATERIALS AND METHODS

Research on public perception of food additives conducted at national level (ARSFSVSPP, 2022) and at EU level (EFSA, 2019) has shown that the public is very concerned about food additives. Therefore, the aim of this study was to develop a communication plan to improve public perception of food additives. The plan was based on the available practises and campaigns described in the scientific literature, as well as on the communication efforts through different information sources in Slovenia over the past years.

Scientific databases such as ScienceDirect, Web of Science, Scopus, PubMed and Google Scholar were searched based on the following keywords: food additives, consumers, risk communication, communication plan. The focus of literature search was on finding general information on food additives reflected in the communication messages.

The overview of communication activities to date included efforts to provide general information on food additives to raise awareness among the Slovenian public

from January 2015 to January 2022. Credible sources of information ranged from governmental to non-governmental organisations whose aim is to inform consumers about food safety issues at national and EU level. The following sources of information were reviewed:

- The Administration of the Republic of Slovenia for Food Safety, Veterinary Sector and Plant Protection (ARSFSVSPP),
- · Slovenian National Institute of Public Health (SNIPH),
- Prehrana.si (website managed by the Slovenian Nutrition Institute and the Slovenian National Institute of Public Health, supported by the Ministry of Health of the Republic of Slovenia),
- Slovene Consumers' Association (SCA),
- Radio and Television Slovenija (RTV Slovenija) a non-profit organisation producing a number of national and regional TV and radio channels,
- · European Food Safety Authority (EFSA),
- European Food Information Council (EUFIC).

Relevant food additive awareness communication activities were identified and key communication messages were extracted. Where available, social media (Facebook, Instagram and YouTube) were also included in the review as they are an important source of information used by 45% of the youngest age group (15–24) when seeking food safety information. In addition, the internet is used by 63% of 15–24-year-olds, compared to fewer (28%) in the older age group (55 or over) who prefer traditional sources of information. Most consumers (69%) choose TV as a communication channel to find out about food safety issues (EFSA, 2019). Slovenian consumers cite the internet as the most used source of food safety information (ARSFSVSPP, 2022).

Based on the findings from the literature and existing communication activities, new communication plan structured with the aim of raising awareness of and improving public perception on food additives. The plan sets communication objectives, identifies the target audience and key communication messages, suggests communication activities (with estimated times for the implementation of each activity), tools and channels that could be used in the proposed campaign.

RESULTS AND DISCUSSION

Review of past information events on food additives in Slovenia

The results of the review of food additive communication events held so far are presented in Tables 1-7, followed by a brief discussion. Information on the use of social media to

raise awareness of food additives is included in the discussion. If not mentioned, no such efforts were identified.

Communication by ARSFSVSPP

Table 1: Ways and means to raise awareness of food additives by ARSFSVSPP

Key communication messages	 Only food additives that are safe for consumers are allowed in the EU. The use of food additives must be beneficial to consumers. Food additives are listed in the list of ingredients.
Communication activities, tools and channels	Publication on the website
Reference	(ARSFSVSPP, 2020)

The food additive content published on the ARSFSVSPP website provides general information about food additives. The term food additive is defined, the most common functional classes of food additives and the general conditions for the use of food additives are listed. It is emphasised that the use of food additives must be beneficial to consumers. EFSA and safety evaluations of food additives are mentioned. General labelling requirements for food additives are also included.

Communication by SNIPH

Table 2: Ways and means to raise awareness of food additives by (SNIPH)

Key communication	Approved food additives are safe for consumers. Highly processed foods contain more
messages	food additives. 3. Many natural ingredients or substances are used as food additives.
Communication activities, tools and channels	Publication on the website and infographic
Reference	(SNIPH, 2016)

Contents related to food additives published on the SNIPH website begins by stating that all approved additives are safe for the consumer. The term food additive is defined, and it is mentioned that there are 26 functional classes of food additives. General conditions for the use of food additives are listed, safety assessments of food additives and the term ADI are explained. It is highlighted that highly processed foods contain more food additives and that several natural ingredients or substances are used as food additives. The general labelling requirements for food additives are mentioned as well. An infographic with the most commonly

used functional classes of food additives in Slovenia can be found on the website.

Communication by Prehrana.si

Table 3: Ways and means to raise awareness of food additives by Prehrana.si

Key communication messages	 The use of food additives allows consumers to choose from a variety of safe and tasty foods with the desired appearance all year round. The use of food additives is regulated and subject to official control. Exaggerated fear of food additives is unnecessary.
Communication activities, tools and channels	Publication on the website
Reference	(Prehrana.si, 2016)

Firstly, a link to the above-mentioned publication on the website Prehrana.si was posted on 20. June 2017. Secondly, a link to the radio podcast further discussed below (RTV Slovenija, 2019), was posted on 18. September 2019. The publication on the Prehrana.si website defines the term food additives, highlighting their intentional use and their synthetic or natural origin. It states that the use of food additives allows consumers to have their favourite foods all year round without any change in quality characteristics. The general conditions for the use of food additives are listed, some functional classes and general labelling requirements are mentioned. It is emphasised that the use of food additives is regulated and under official control. EFSA and food additive safety evaluations are also included. During the specified review period, the topic of food additives was posted twice on Facebook (https://www.facebook.com/ nutris.zdrava.prehrana). First, a link to the above publication was posted on the Prehrana.si website on 20 June 2017. Secondly, a link to the radio podcast discussed below (RTV Slovenija, 2019) was posted on 18 September 2019.

Communication by SCA

The posting on SCA's website begins by saying that most pre-packaged foods contain food additives. Then the term food additive is defined, E-numbers and general labelling requirements are mentioned. In addition, the functional classes of food additives most commonly used in Slovenia are listed and described in more detail. It is emphasised that the use of food additives is not always necessary and that the food industry could use less food additives. With regard to their safety, it is stated that although safety is assessed on the basis of scientific studies, the actual risk that food additives may pose cannot be precisely defined.

Table 4: Ways and means to raise awareness of food additives by SCA

Key communication messages	 Although food additives are not always necessary, they are added to most pre-packaged foods. The safety of each food additive is assessed by EFSA on the basis of scientific studies. Due to the lack of information on the possible "cocktail effect", it is wisest to choose foods that contain the lowest possible amounts of food additives. 	
Communication activities, tools and channels	Publication on the website	
Reference	(SCA, 2020)	

Communication by RTV Slovenija

In the podcast (RTV Slovenija, 2021) with a guest speaker from the Slovenian Nutrition Institute, the following was emphasised: all authorised food additives are safe for consumers, the use of food additives is subject to official control, food additives play an important role in meeting consumer expectations in terms of food quality and safety. EFSA and its role in the safety assessment of food additives was also discussed. E-numbers and their purpose were explained. It was noted that while food additives have a negative predisposition, excessive fear of food additives is not justified.

In the programme TV (RTV Slovenija, 2020) it was stated that some food additives are harmful, those that can cause

allergies or intolerances were mentioned. Safety assessments, EFSA and some functional classes of food additives were discussed. It was stressed that it is not possible to accurately assess the safety of food additives because the possible "cocktail effect" has not been researched. The fact that consumers are very concerned about food additives but at the same time often behave very indifferently when buying food was discussed. Viewers were also advised to buy seasonal food from the region.

In the podcast (RTV Slovenija, 2019) with another guest speaker from the Slovenian Nutrition Institute, the following was discussed: food additives have a negative predisposition, the term synthetic is often associated with unsafe or harmful, consumer knowledge about food additives is limited. The definition of food additives was also given, and some functional classes were mentioned. Regarding the safety of food additives, it was emphasised that EFSA carries out safety assessments based on scientific research and that all authorised food additives are safe for consumers.

In the podcast (RTV Slovenija, 2015) with a guest speaker from ARSFSVSPP, the purpose of labelling food additives with E numbers was discussed. The fact that food additives are intentionally added to food was highlighted. The mandatory labelling of colours and sweeteners was pointed out. It was noted that food additive legislation is harmonised in the EU and the role of EFSA in ensuring the safety of food additives was further discussed. It was also emphasised that highly processed foods usually contain more food additives and that the use of food additives is subject to official controls.

Table 5: Ways and means to raise awareness of food additives by RTV Slovenija

Key communication messages	Communication activities, tools and channels	Reference
 Food additives are intentionally added to food to perform certain functions. Based on scientific studies, EFSA has evaluated the safety of all authorised food additives. All authorised additives are safe for consumers. 	Podcast on radio	(RTV Slovenija, 2021)
 Since the potential "cocktail effect" of food additives is unknown, it is impossible to accurately assess the safety of food additives. The wisest choice is to eat seasonal and local food. Due to the consumer demand for a constant variety of affordable food with a desired appearance and long shelf life, the use of food additives is increasing. 	Broadcast on TV	(RTV Slovenija, 2020)
 EFSA evaluates the safety of food additives based on scientific studies before they can be added to food. All food additives are safe when used according to the proposed conditions and levels. Public' concern about food additives is high, but their knowledge about food additives is limited. 	Podcast on radio	(RTV Slovenija, 2019)
 E-numbers are used to simplify and standardise the list of food additives. The use of food additives is harmonised in the EU. The use of food additives is subject to official control. 	Podcast on radio	(RTV Slovenija, 2015)

Communication by EFSA

The food additive content published on EFSA's website highlights that food additives are intentionally added to food and that they all have an E number. It mentions general labelling requirements and lists the most common functional classes of food additives used in the EU. How scientists conduct safety evaluations of food additives and set safe levels is explained in a video on the website.

Table 6: Ways and means to raise awareness of food additives by EFSA

Key communication messages	 Food additives are intentionally added to food to fulfil certain technological functions. In the EU, all food additives are labelled with an E-number. EFSA carries out safety evaluations of food additives.
Communication activities, tools and channels	Publication on the website and video
Reference	(EFSA, 2022a)

Communication by EUFIC

The food additive content published on the EUFIC website, which also includes a video (EUFIC, 2022), highlights the functionality of food additives. EFSA's role in evaluating the safety of food additives is mentioned, as well as the general labelling requirements. The publication on the EUFIC website from 2021 (EUFIC, 2021) provides information on what food additives are and why they are used, how they are regulated in the EU, how their safety is assessed and the general requirements for food additive labelling. A section is also dedicated to the topic of adverse effects caused by food additives. The topic of food additives has been posted several times on Facebook (https://www.facebook.com/EUFIC). Links to the EUFIC website on food additives were posted 3 times, along with a post on E numbers and labelling. The same video

as in the above posting on the EUFIC website was posted 4 times on Facebook and also shared on the YouTube channel (https://www.youtube.com/c/EUFICMedia) on 7 December 2017.

Communication plan on food additives

To improve general acceptance and knowledge of additives, we propose a new communication plan with defined objectives, target groups, key messages, activities, tools and channels. The communication objectives include:

- · Educating the public about food additives
- Raising awareness about the use of food additives
- · Influencing public risk perception of food additives
- · Building confidence in food safety in the EU
- Building confidence in official food safety controls

The issue of food additives concerns all consumers. To reach all groups of the public, different means of communication were chosen. Based on the literature review and previous communication activities, we identified the following key communication messages:

- · Food additives are added to food on purpose.
- The safety of approved food additives has been scientifically proven.
- Food additives are used in the smallest possible quantity to achieve a desired effect.
- The use of food additives must be beneficial to the consumer.
- Some food additives ensure that food is safe, while others make food more attractive and enjoyable to eat.
- The use of food additives enables consumers to buy safe and tasty food with the desired appearance all year round.
- Food additives are listed as an ingredient on food packaging.

Table 7: Ways and means to raise awareness of food additives by EUFIC

Key communication messages	Communication activities, tools and channels	Reference
 Food additives are added to food in small amounts to perform a specific function. Food additives have been thoroughly tested and approved by EFSA. Read food labels. 	Publication on the website and video	(EUFIC, 2022)
 Food additives play an important role in meeting consumer expectations of food. Food additives ensure the safety and quality of food that consumers expect. Before food additives are approved, they must undergo a rigorous scientific safety assessment to ensure consumer safety. 	Publication on the website	(EUFIC, 2021)

- The use of food additives is subject to regular official controls.
- Read the food labels!
- The best choice is to buy fresh, seasonal food from your local supplier.

The tools and channels of the communication campaign, as well as the stakeholders, participants and estimated time for the implementation of the activities are listed in Table 8.

A variety of communication activities, tools and channels could be utilised in the communication campaign. In a real-life scenario, the resources dedicated to the realisation of such communication campaign dictate the selection of communication activities. Regardless of communication activities selected, the public must be informed on the progress of the campaign. This includes posting all created visual aids and links to interviews on websites and social media. To achieve all communication objectives, it is likely that several communication campaigns would have to be realised. When organising a campaign, it is crucial to take into consideration the findings from previous campaigns.

DISCUSSION

Food additives are considered a high-risk factor by the EU public (EFSA, 2019) and also by the Slovenian public (ARSFSVSPP, 2022). In 2019, a survey was conducted on European citizens' interest and awareness of food safety issues and risk perception. The results showed that food additives ranked fourth in the most concerning categories on various food safety topics (EFSA, 2019). In Slovenia, national surveys monitoring public concern about various food safety issues, including food additives, were conducted in 2011, 2013, 2015, 2017 and 2020. The results showed, similar to the EU survey, that food additives are perceived as a high-risk factor by Slovene citizens, as they always ranked among the top five issues that caused the highest concern (ARSFSVSPP, 2022). The highest perceived risks for food relate to chemicals, including additives such as colours, preservatives or flavours, used in food or beverages. The level of concern is highest among the older population (55 years and older) and lowest among younger consumers (18 to 35 years).

Overall, the overview of communication activities on food additives published by selected information sources

Table 8: Plan of communication campaign

Activity	Stakeholder	Participant	Estimated time to implement activity
Conducting a public survey	Selected service Project manager	Public Relation Service (PR)	2–3 months
Selecting key communication messages	Project manager	PR	14 days
Creating and printing posters	Selected service	Project manager PR	1–2 months
Creating and printing leaflets	Selected service	Project manager PR	1–2 months
Creating videos	Selected service	Project manager PR	1–2 months
Designing infographics	Selected service	Project manager PR	1 month
Designing motion graphics	Selected service	Project manager PR	1 month
Publishing content on websites and social media	Project manager	PR	Constant activity
Conducting interviews with experts on television	Expert in the field TV presenter	Project manager PR	1 day
Conducting interviews with experts on radio	Expert in the field Radio presenter	Project manager PR	1 day
Posting links to interviews on websites and social media	Project manager	PR	Constant activity
Conducting a public survey	Selected service Project manager	PR	2–3 months
Comparing the results of the two surveys	Project manager	PR	21 days
Adjusting the current communication plan and planning a further campaign	PR	Project manager	1 month

shows that efforts are made to inform consumers as much as possible about all aspects of additive use (regulatory procedures, safety, purpose, labelling, official control). It is obvious that the communicators do not all cooperate with each other to educate consumers. They communicate separately and at different times, which makes communication ineffective and reduces the impact on consumer perception.

Consumers have a strong negative attitude towards chemicals and often associate the term synthetic with toxic and natural with safe. Interestingly, the term E-numbers also has a negative predisposition, even though the purpose of E-numbers was to simplify and standardise the list of food additives (Varela and Fiszman, 2013). Furthermore, consumers are more likely to believe research indicating the presence of adverse reactions to food additives than research demonstrating the safety of food additives. This negative association makes any communication on this topic difficult (Bearth et al., 2016).

One of the most important messages that risk communicators should emphasise is the difference between the terms hazard and risk, which are often mistakenly understood as synonyms. A hazard is the ability of an organism or substance to cause an adverse reaction. Risk is determined by exposure to the hazard; therefore, a hazard can become a risk if exposure to the hazard is sufficient (depending on the hazard itself). The correct use of the terms is crucial for understanding the results of the risk analysis and the correct perception of risk. The latter is another important factor to consider when communicating about risks, as risk perception varies widely between experts and the general public (EFSA, 2017). A study by (Jansen et al., 2020) shows that the public is concerned about the presence of chemicals in food, regardless of the potential risk a chemical may pose. And while the vast majority understand that exposure determines whether there is a risk, a significant minority believe that all chemicals are equally harmful.

Choosing an appropriate person for direct communication is of paramount importance. When it comes to trusting information about food risks, consumers are most likely to trust scientists and consumer organisations, followed by farmers. Interestingly, consumers with a higher level of education are more likely to be interested in food safety issues, know more about food safety issues, are more concerned about most of these issues and are more likely to have changed their consumption behaviour as a result of food risk information. Two-thirds of EU citizens have changed their consumption behaviour as a result of food risk information, and one-third of these say that this change in behaviour is permanent. This suggests that effective communication using user-friendly language and timely coordination between all communicators could bring better results. Our analysis of communication efforts in Slovenia clearly showed that while different communicators convey

similar messages and information about additives, they do so in different ways. The language of key messages is different - risk managers tend to use more scientific language and objective words. Consumer organisations, on the other hand, try to use friendly, non-scientific language with simple words and sentences. If key messages and information are not aligned in terms of content and timing of delivery, there is a high likelihood that they will not reach consumers in an effective way.

CONCLUSION

The communication plan presented is based on a review of food additive research, risk perception and risk communication, and builds on the findings of the review of established ways and means of raising awareness of food additives in Slovenia. The review listed the communication activities, tools and channels selected for food additive awareness and identified three key communication messages from information sources that a Slovenian is likely to use when looking for general information on food additives. It would be beneficial if food additive content was updated and expanded, using different visual aids and wider and regular use of social media. It appears that while the information sources included in the review highlight similar aspects of food additives, these do not seem to be reaching the public. More attractive and stronger avenues of information require stronger tools to achieve better knowledge about the safe use of additives among consumers, especially older consumers who are particularly concerned. This points to the need to develop a national communication plan on food additives, coordinated by all stakeholders and harmonised in terms of the content of key messages and timing of dissemination (time-coordinated). This was proposed together with other communication activities to achieve a more objective risk perception among consumers. Based on current practises, a novel communication plan with clear objectives, target groups, ten key messages and channels was proposed as the basis for a coordinated national communication campaign on food additives. We believe that this type of communication on food additive use could improve consumer knowledge, positively influence the public's perception of risk and also increase confidence in official controls and the food safety assurance system.

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Pregled aktivnosti ozaveščanja potrošnikov in priprava komunikacijskega načrta o aditivih za živila

POVZETEK

Tako evropski kot slovenski potrošniki aditive za živila dojemajo kot nevaren dejavnik tveganja, kljub zakonodajni ureditvi in harmonizaciji le-te na območju EU. Komuniciranje o tveganju aditivov predstavlja izziv, saj vključuje aktivno izmenjavo informacij o nevarnostih, mora pa upoštevati, kako širša javnost dojema tveganja v zvezi z aditivi v živilih. Z namenom ozaveščanja, s ciljem izboljšanja dojemanja in razumevanja uporabe aditivov s strani javnosti, je predstavljen komunikacijski načrt o aditivih za živila. Pripravljen je na podlagi pregleda literature, dosedanjem obveščanju javnosti o tveganjih in na osnovi pregleda aktivnosti ozaveščanja slovenskih potrošnikov v obdobju od januarja 2015 do januarja 2021. Slednji je vključeval vladne in nevladne potrošniške organizacije na nacionalnem in EU nivoju. Pripravljen komunikacijski načrt predstavlja jasne smernice za izvedbo komunikacijske kampanje z namenom ozaveščanja potrošnikov o aditivih za živila. Vključuje opredelitev ključnih komunikacijskih sporočil, predlaga komunikacijske aktivnosti in orodja za njihovo izvedbo. Predlagani načrt je lahko dobra podlaga za začetek učinkovite kampanje ozaveščanja o aditivih, s ciljem zmanjšanja zaskrbljenosti in izboljšanja znanja povprečnih potrošnikov o uporabi aditivov v živilih.

Ključne besede: aditivi za živila, obveščanje o tveganju, dojemanje tveganja, potrošniki, komunikacijski načrt