

# Assessing the impact of the fipronil egg scandal on consumer behavior in Hungary

**Keywords:** fipronil, gamma-aminobutyric acid, egg scandal, authority risk communication, food chain safety, consumer survey, RASFF

## 1. Summary

In addition to high pathogenicity avian influenza outbreak that started in the fall of 2016, the European poultry sector was also affected by the fipronil egg scandal that escalated quickly in August 2017. The above-mentioned incidents demanded rapid, decisive and coordinated action on the part of food chain safety authorities across Europe. Fast and continuous flow of credible information has been made possible by the Rapid Alert System for Food and Feed (RASFF) of the European Union.

However, adequate authority measures alone do not guarantee the minimization of the economic damages caused by food scandals, therefore, great emphasis should be placed on risk communication as well in similar cases. The basic principles of risk communication include objectivity, timeliness and clarity [5]. This way, it is possible to avoid unreasonably high drops in consumption in cases where the real health risk is not significant, or the risk has already been eliminated by the action taken by the authorities or businesses.

Changes in consumption habits were assessed by the National Food Chain Safety Office (NFCSSO) in the fall of 2017 through a questionnaire survey based on personal interviews with 1,000 people. According to the results, thanks to the consistent communication activity of the authority, the confidence of Hungarian consumers in eggs and egg-containing products did not fundamentally drop, and this is of particular importance in the reduction of economic damages.

## 2. Introduction

### 2.1. Fipronil

Fipronil {5-amino-1-[2,6-dichloro- $\alpha,\alpha,\alpha$ -trifluoro-p-tolyl]-4-trifluoromethylsulfinylpyrazole-3-carbonitrile} is a broad spectrum insecticide, initially synthesized in 1987. Development of a new insecticidal molecule was necessary because of the widespread resistance to organophosphate and carbamate insecticides. [7]. Fipronil exerts a non-competitive inhibitory effect on the ionotropic GABA (gamma-aminobutyric acid) receptor of insects, thus, in terms of its mechanism of action, it causes overstimulation of neural networks [3]. The molecule exhibits a relatively good selectivity,

because the GABA receptors of insects are 1 to 2 orders of magnitude more sensitive to it than those of humans [8]. Its degradation is influenced by a number of environmental factors, including sunlight, temperature, humidity, and the pH of the soil and the biological medium [7]. Fipronil is widely used in agriculture, especially in the control of invertebrate pests and in veterinary medicines. However, it is forbidden to use it in food-producing animals [18]. Fipronil can accumulate in the body in the case of sustained or repeat exposure, resulting in a neurotoxic effect. According to the present state of scientific knowledge, it is a possible carcinogen, therefore, it is classed by the World Health Organization as a Class II moderately hazardous pesticide [20].

1 National Food Chain Safety Office

2 Ministry of Agriculture

## 2.2. Chronology of the fipronil egg scandal from a risk communication point of view

The first news about the fipronil contamination appeared in the RASFF system on July 20, 2017. Thanks to the exchange of information on the online interface (iRASFF), authorities of the countries concerned can act swiftly and in a coordinated way to avert food safety risks, thereby contributing to the protection of consumers' health [4]. It was established during official investigations that the contamination was caused by fipronil mixed illegally into biocidal products used at poultry farms [16]. Results of the official investigation were not unexpected to the experts due to the fact that the overwhelming majority of chemical contaminants, including fipronil, enter the bodies of the animals or find their way to the surface of the plants during the primary production process, through the application of agricultural technologies [12].

Risk communication as one of the key elements of risk assessment was incorporated into domestic food law by Act No. XLVI of 2008 on food chain and its control. Food chain safety risk communication tasks are carried out by the National Food Chain Safety Office (NFCSSO) as an integrated authority covering the entire food chain. Many researchers have dealt, and still deal today, with the determination of the principles of effective risk communication [2], [6], [9], [13], [17], [19], so risk communication as part of communication science can be characterized by progressive development. However, designing, developing and maintaining a successful risk communication strategy absolutely requires to get to know the way society thinks, its media usage habits, as well as its demographic and other characteristics [19].

In the case of the fipronil egg contamination, it concerned a basic food consumed by a wide range of social groups, therefore, already after the publication of the first information, it was apparent that rapid, continuous communication based on firm foundations on the part of all concerned member state organizations was of paramount importance. We strove to achieve the same in Hungary, considering that in recent years, both the population and the press have become increasingly sensitive to issues related to food chain safety. There was therefore a risk that the potential crisis could widen to a communication crisis as well, due to insufficiently prudent and prepared communication. Thanks to the timely detection of the possible crisis, the experts of NFCSSO immediately got ready, in addition to perform authority measures, to answer the expected questions of the population and the press.

The contamination was classified as an alarm by the Commission of the European Union at the beginning of August. Two days later, with the involvement of

NFCSSO, the general public was informed by the Ministry of Agriculture about the launch of targeted inspections in Hungary, which was followed by active press inquiries (Figure 1). The most significant communication event of the Hungarian aspect of the scandal took place in the second half of August, when the contamination was detected in domestic egg batches by the staff of the NFCSSO laboratory. In order to protect the interest of law-abiding producers and the domestic egg sector, it was a key aspect during the measures to provide accurate information about the batches concerned to interested parties by the authority. To this end, a thematic collection page was set up on the website of the office, which played a central role in further communication activities. All interested parties could find information easily and quickly on the easily available subpage, in addition to being able to find all relevant information related to the topic on a single interface. Following the launch of the collection page, although there was still a significant interest in the topic by the press, the number of press inquiries decreased significantly.

During the three-month period of the crisis, a total of 129 press inquiries have been received by NFCSSO. The priority status of the topic is well illustrated by the fact that questions and interview requests related to the fipronil egg scandal made up approximately 10% of all press inquiries registered by the office in 2017.

Most of the inquiries (59%) requested verbal information, which was provided by the leading experts of NFCSSO. More than 95% of the questions posed by the press were answered within 24 hours.

Comparison of the questions received by NFCSSO from the population and from the press (requiring a written answer) clearly illustrates that the two major target groups were concerned with quite different questions regarding the topic. While consumers contacting the customer service of the office were understandably interested primarily in their personal involvement and the health risk to them, media representatives were mainly interested in the results of authority work and the possible sources of the contamination (Table 1).

This has repeatedly underlined the importance of examining and processing the given subject from the point of view of several target groups by the authority in a crisis situation similar to the fipronil egg scandal. Based on the feedback received by the authority, it has been proven that the creation of thematic subpages on the website of the authority and using them as the main communication channel could be an effective way of publishing information. This is also supported by the fact that, from August to October of 2017, in the main period of the scandal, the page providing information on the fipronil contamination had more than 22,000 unique views.

### 3. Research methodology

Data that the analysis is based on come from a questionnaire consumer survey using a quantitative methodology. Between November 7 and 22, 2017, personal interviews were conducted with a total of 1,000 persons. The questionnaire contained both open and closed questions and, in the case of attitude-type questions, a 5-point Likert scale was used. In terms of the gender, age and place of residence of the respondents (NUTS 2 design-statistical regions), the sample is considered representative of the total adult population of Hungary, based on the 2016 microcensus of the Hungarian Central Statistical Office [10]. Statistical analysis of the data was carried out using the IBM SPSS Statistics 22.0 software package.

### 4. Results

#### 4.1. Communication tools

It was investigated using an open question what recent food chain safety related events, "food scandals" could be recalled spontaneously by the consumers. More than one fifth of respondents (21.10%) recalled without help the fipronil egg scandal. When it was asked using a closed question whether they had heard about the fipronil egg scandal, almost two thirds of the respondents (65.09%) answered yes.

Most consumers first heard about the scandal through the television (50.74%), followed by internet news portals (21.25%) and the radio (14.37%) (Figure 2). Social media sites (4.91%), information from family, acquaintances and relatives (4.55%), printed newspapers and magazines (2.95%), and the websites of the authorities and other institutions (1.23%) were significantly behind in comparison.

#### 4.2. Effects of the fipronil egg scandal on consumer behavior

Based on the results, the vast majority (86.07%) of Hungarian consumers did not alter their egg consumption habits despite the scandal, a small fraction of them (0.63%) even increased their consumption (Figure 3). As a result of the egg scandal, 8.61% of respondents consumes significantly less eggs since the case, 0.94% of them abandoned egg consumption completely, while 3.76% of them had not eaten eggs before either.

The goal of our research was to gain information about consumer habits related not only to fresh eggs, but also egg-containing foods. Looking at the issue, we came to the conclusion that the majority of consumers (57.21%) trusted in traceability, i.e., that objectionable products were going to be eliminated, and so they did not alter their purchasing habits, they did not consider it important whether the given processed food contained eggs or not (Figure 4).

12.04% of the respondents did not alter their previous purchasing practice, because they believed that even if the food was produced using contaminated eggs, the finished product is likely to contain negligible amounts of fipronil. There is a fairly large percentage of consumers who buy a lot less egg-containing products since the scandal (9.83%), as well as those who, by their own admission, completely stopped purchasing egg-containing foods (10.78%). 10.14% of respondents stated that they had not purchased egg-containing foods previously either.

Because of the fipronil egg scandal, more than 100,000 poultry had to be killed, affected commercial batches had to be recalled or destroyed. These measures resulted in a significant increase in the consumer price of eggs [1], [11]. Based on the data of the Agricultural Research Institute and the Hungarian Central Statistical Office, the price increase that significantly exceeded the 2016 trend could already be felt by consumers at the time of the present research and, in light of this, the above results could be considered to be very positive. Changes in the packaging place sales price of size M boxed eggs for the years 2016 and 2017 are shown in Figure 5.

The serotype H5N8 high pathogenicity avian influenza outbreak in Hungary might have also contributed to the increase in the market price of eggs. As a consequence of the epidemic, in Hungary, the forced slaughter of about 2.65 million poultry was ordered by the authority, which resulted in 10.1 billion HUF in direct damages to livestock farmers [15]. Economic damages were not only caused by direct deaths and forced slaughter, but also by import restrictions imposed by non-EU countries [14].

### 5. Conclusions

The August 2016 Western European fipronil egg scandal affected Hungary as well. Because of the illegal use of the active ingredient, not authorized for use in poultry farming, based on the measures of the National Food Chain Safety Office egg distribution had to be restricted and the animals at large poultry farms had to be killed. Food chain safety measures prevented eggs contaminated with the insecticide from damaging the health and quality of life of consumers to a measurable extent. Through the communication activity of the experts of NFCSO, news of the fipronil contamination reached the public from a confirmed source and with information updated daily. Based on data obtained by the authors through personal interviews, the response of the population was presented with the help of statistical methods. The data and experience gathered in connection with the fipronil scandal can be helpful in the minimization of the adverse consequences of any potential events that could threaten food chain safety in the future.



## 6. References

- [1] Agrárgazdasági Kutató Intézet (2017): Baromfipiaci információk. Heti tojáspiaci információk. <https://www.aki.gov.hu/publikaciok/publikacio/a:221/Baromfipiaci+inform%C3%A1ci%C3%B3k> (utoljára letöltve: 2018. január 17.)
- [2] Bánáti, D., & Lakner, Z. (2002). The food safety issue and the consumer behaviour in a transition economy: A case study of Hungary. *Acta Alimentaria*, 31(1), p. 21-36
- [3] Cole, L. M., Nicholson, R. A. & Casida, J. A. (1993): Action of Phenylpyrazole Insecticides at the GABA-Gated Chloride Channel Pestic Biochem Physiol. 46(1). p. 47-54
- [4] Dorogházi, E., Maczák, B. & Mészáros, L. (2017): Az Európai Unió élelmiszer- és takarmánybiztonsági riasztási rendszere. *Élelmiszer- vizsgálati közlemények*. 63(2). p.1564-1577
- [5] EFSA (2017): Risk Communication Guidelines. When food is cooking up a storm. Proven recipes for risk communications. Third edition. ISBN 978 92 9199 778 7 <https://www.efsa.europa.eu/en/corporate/pub/riskcommguidelines170524> (utoljára letöltve: 2018. február 1.)
- [6] Frewer, L. (2004): The public and effective risk communication. *Toxicology letters*, 149(1). p. 391-397
- [7] Gunasekara, A. S., Truong, T., Goh, K. S., Spurlock, F. & Tjeerdema, R. S. (2007): Environmental fate and toxicology of fipronil. *Journal of Pesticide Science*. 32(3). p. 189-199
- [8] Hainzl, D., Cole, L.M. & Casida, J. E. (1998): Mechanisms for selective toxicity of fipronil insecticide and its sulfone metabolite and desulfinyl photoproduct. *Chem Res Toxicol*, 11(12). p. 1529-1535
- [9] Klinke, A. & Renn, O. (2002): A new approach to risk evaluation and management: risk-based, precaution-based, and discourse-based strategies. *Risk analysis*, 22(6). p. 1071-1094
- [10] KSH (2016): Mikrocenzus 2016 – 3. Demográfiai adatok [http://www.ksh.hu/mikrocenzus2016/kotet\\_3\\_demografiai\\_adatok](http://www.ksh.hu/mikrocenzus2016/kotet_3_demografiai_adatok) (utoljára letöltve: 2018. január 15.)
- [11] KSH (2017): Fogyasztóiár-indexek a termékek és szolgáltatások részletes csoportjai szerint. [http://www.ksh.hu/docs/hun/xstadat/xstadat\\_evkozi/e\\_qsf002i.html](http://www.ksh.hu/docs/hun/xstadat/xstadat_evkozi/e_qsf002i.html) (utoljára letöltve: 2018. január 17.)
- [12] Laczay, P. (2012): Élelmiszer-higiéniá, élelmiszer-biztonság. *Magyar Tudomány*. 173(1). p. 4-10
- [13] Lakner, Z., Szabó, E., & Hajdu, I. (2005). The 2004 paprika scandal: anatomy of a food safety problem. *Studies in Agricultural Economics* (Budapest), 102, p. 67-82
- [14] NÉBIH (2018): Kereskedelmi tudnivalók a hazai magas patogenitású madárinfluenza kitérővel kapcsolatban. <http://portal.nebih.gov.hu/-/kereskedelmi-tudnivalok-a-hazai-magas-patogenitasu-madarinfluenza-kitores-sel-kapcsolatban> (utoljára letöltve: 2018. január 23.)
- [15] NÉBIH (2017): Országos Főállatorvosi Jelentés. 2016. évi jelentés az élelmiszerlánc-biztonságról és az élelmiszerlánc-felügyeleti díj felhasználásáról. <http://portal.nebih.gov.hu/orszagos-foallatorvosi-jelentes> (utoljára letöltve: 2018. január 23.)
- [16] NÉBIH (2017): Tájékoztató a fipronilról és a holland tojásszennyezési esetről. [https://portal.nebih.gov.hu/informaciok/elelmiszer/lakossagi/elelmiszerbiztonsag/elelmiszerbiztonsag-lakossagi/-/asset\\_publisher/4ndba0yRXvQX/content/kerdezz-felelek-a-fipronilrol-es-a-holland-tojasszennyezesi-esetrol/egyuttmukodesi-megallapodast-kotott-a-nebih-es-a-tej-termektanacs-a-magyar-tejagazat-vedelmeert](https://portal.nebih.gov.hu/informaciok/elelmiszer/lakossagi/elelmiszerbiztonsag/elelmiszerbiztonsag-lakossagi/-/asset_publisher/4ndba0yRXvQX/content/kerdezz-felelek-a-fipronilrol-es-a-holland-tojasszennyezesi-esetrol/egyuttmukodesi-megallapodast-kotott-a-nebih-es-a-tej-termektanacs-a-magyar-tejagazat-vedelmeert) (utoljára letöltve: 2018. január 23.)
- [17] Shan, L., Regan, Á., De Brún, A., Barnett, J., van der Sanden, M. C., Wall, P., & McConnon, Á. (2014). Food crisis coverage by social and traditional media: A case study of the 2008 Irish dioxin crisis. *Public Understanding of Science*, 23(8), p. 911-928
- [18] Simon-Delso, N., Amaral-Rogers, V., Belzunces, L. P., Bonmatin, J. M., Chagnon, M., Downs, C., Furlan, L., Gibbons, D. W., Giorio C., Girolami V., Goulson, D., Kreutzweiser, D. P., Krupke, C. H., Liess, M., Long, E., McField, M., Mineau, P., Mitchell, E. A., Morrissey, C. A., Noome, D. A., Pisa, L., Settele, J., Stark, J. D., Tapparo, A., Van Dyck, H., Van Praagh, J., Van der Sluijs, J. P., Whitehorn, P. R. & Wiemers, M. (2015): Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites. *Environmental Science and Pollution Research*, 22(1). p. 5-34
- [19] Verbeke, W., Frewer, L. J., Scholderer, J., & De Brabander, H. F. (2007). Why consumers behave as they do with respect to food safety and risk information. *Analytica Chimica Acta*, 586(1), p. 2-7
- [20] WHO (2009): The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification. ISBN 978 92 4 154796 3 [http://www.who.int/ipcs/publications/pesticides\\_hazard/en/](http://www.who.int/ipcs/publications/pesticides_hazard/en/) (utoljára letöltve: 2018. január 23.)