

SPECIAL ISSUE

Harmonisation of monitoring zoonoses, antimicrobial resistance and foodborne outbreaks

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ABSTRACT

Harmonisation of monitoring and reporting of biological hazards in the European Union (EU) Member States is crucial to enable proper analyses and interpretation of the information at EU level. The European Food Safety Authority (EFSA) has issued technical specifications for the monitoring and reporting that together with the relevant EU legislation and reports deriving from EFSA's grant projects have importantly improved the comparability and quality of the data submitted by EU Member States on zoonoses, antimicrobial resistance and foodborne outbreaks. EFSA's published technical specifications cover the monitoring of verotoxigenic *Escherichia coli*, *Yersinia enterocolitica* and antimicrobial resistance in food and animals as well as reporting on foodborne outbreaks. The grant project reports submitted to EFSA provide recommendations on the monitoring of foodborne parasites, Q fever and rabies as well as on the conduct of national surveys on zoonotic agents in food. These specification and reports guide the Member States in the implementation of risk-based monitoring and designing surveys in animals and food. EFSA will continue the gradual harmonisation of the monitoring of zoonotic agents in the coming years.

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KEY WORDS

Harmonisation, monitoring, reporting, zoonoses, antimicrobial resistance, foodborne outbreaks

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INTRODUCTION

The collection of relevant data on food safety is a crucial part of the European Food Safety Authority's (EFSA) missions. Such data contribute importantly to the risk assessment work carried out by EFSA, provide for updates on the current situation and help to inform risk managers and Member States on recent developments.

In the field of biological risks for human health, Directive 2003/99/EC² lays down the requirement for a European Union (EU) system for monitoring and reporting of information, which obliges EU Member States to collect relevant and comparable data on zoonoses, zoonotic agents, antimicrobial resistance and foodborne outbreaks and to report these data annually to the European Commission. EFSA is assigned the tasks of examining the data collected and preparing the annual EU Summary Reports in collaboration with the European Centre for Disease Prevention and Control (ECDC), which collects and analyses corresponding data on human cases. EFSA also runs the data collection applications on behalf of the European Commission.

According to the Directive, monitoring is based on the systems in place in Member States. However, the Directive also foresees that detailed rules for monitoring may, where necessary, be laid down in EU legislation, to make the data easier to compile and compare. In addition, EFSA has issued technical specifications or submitted external reports for monitoring and reporting of certain zoonoses, antimicrobial resistance and foodborne outbreaks in order to facilitate better analyses and increase the comparability of the data between Member States.

1. HARMONISATION OF THE MONITORING

1.1. Harmonisation of monitoring of foodborne zoonotic bacteria

The monitoring of *Salmonella* in domestic fowl (*Gallus gallus*) and turkey populations is harmonised by the national surveillance and control programmes of *Salmonella* and is required by the EU legislation³. According to these requirements, each flock is tested at fixed stages of production at farms or hatcheries using the same types of samples and standardised analytical methods. The harmonised datasets from these control programmes provide for fully comparable data between Member States and reporting years. This enables EFSA to analyse whether EU targets for reduction of *Salmonella* have been met by the countries and to follow the progress made over the years.

EU legislation also lays down harmonised monitoring rules for bovine tuberculosis and brucellosis in bovine animals and small ruminants⁴. These rules cover the surveillance of these diseases in herds at farms and slaughterhouses and aim to detect infected herds. The data deriving from this surveillance

² Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonoses and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC. OJ L 325, 12-12-2003 p. 31–40.

³ Commission Regulation (EC) No 200/2010 of 10 March 2010 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of *Salmonella* serotypes in adult breeding flocks of *Gallus gallus*. OJ L 61, 11.03.2010, p. 1–9.

Commission Regulation (EC) No 517/2011 of 25 May 2011 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of certain *Salmonella* serotypes in laying hens of *Gallus gallus* and amending Regulation (EC) No 2160/2003 and Commission Regulation (EU) No 200/2010. OJ L 138, 26.05.2011, p. 45–51.

Commission Regulation (EC) No 646/2007 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of certain *Salmonella enteritidis* and *Salmonella typhimurium* in broilers and repealing Regulation (EC) No 1091/2005. OJ L 151, 13.06.2007, p. 21–25.

Commission Regulation (EC) No 584/2008 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of certain *Salmonella enteritidis* and *Salmonella typhimurium* in turkeys. OJ L 162 21.06.2008, p. 3–8.

⁴ Council Directive 64/432/EEC of 26 June 1964 on animal health problems affecting intra-Community trade in bovine animals and swine. OJ L 121, 29.7.1964, p. 1977–2012.

Council Directive 91/68/EEC of 28 January 1991 on animal health conditions governing intra-Community trade in ovine and caprine animals. OJ L 46, 19.2.1991, p. 19–36.

have enabled a close monitoring of the occurrence of these diseases and a thorough assessment of the impact of eradication programmes in non-disease-free Member States.

EFSA has issued monitoring and reporting specifications to the Member States for verotoxigenic *Escherichia coli* (VTEC) and *Yersinia enterocolitica* in food and animals (EFSA, 2009a,b). A risk-based sampling strategy has been proposed for VTEC, aimed at estimating the prevalence of VTEC O157 contamination at slaughter, primarily on the hide of young cattle and, secondarily, on sheep fleeces. In addition to the monitoring of VTEC O157, which is the most often reported serogroup in VTEC cases in humans in the EU, Member States may extend the monitoring to the serogroups VTEC O26, O103, O111 and O145, which are also identified as causes of human infections. Regarding foodstuffs, general guidelines are given for carrying out specific surveys on the food categories that are most likely to be sources of VTEC O157 and non-O157 infections in humans. In the case of *Y. enterocolitica*, the harmonised monitoring specifications include risk-based sampling of slaughter pigs and estimating the prevalence of these bacteria in the tonsils of the pigs at slaughter. The isolates are to be biotyped in order to estimate the prevalence of human pathogenic *Yersinia enterocolitica* types.

Furthermore, the sampling and analytical methods to be applied for *Salmonella* and *Listeria monocytogenes* are harmonised to a certain extent by the regulation on microbiological criteria⁵. In addition, a report (Käsbohrer et al., 2010) submitted to EFSA, on work funded by an EFSA grant for the development of harmonised survey methods for foodborne pathogens in foodstuffs in the EU, provides guidance to Member States on survey protocols. The suggested protocols are to be used to estimate the prevalence of the pathogens in specified foodstuffs at a specific point in the food chain, and they cover *Salmonella*, *Campylobacter*, VTEC, *Y. enterocolitica* and *L. monocytogenes* in different food categories.

1.2. Harmonisation of monitoring of foodborne parasites

EFSA has addressed the monitoring of the foodborne parasites by providing grants to consortia of institutes in Member States to support them with the development of harmonised monitoring schemes for these parasites in animals and food. These schemes are to be applicable in all Member States. The outcomes of these grant projects are published as scientific reports submitted to EFSA.

The report on monitoring of *Trichinella* (Pozio et al., 2010) suggests a preliminary harmonised monitoring scheme that relies on compartmentalisation to identify regions and categories of animals at lower risk of *Trichinella* infection in which a lower level of testing could be carried out. Member States or their regions are categorised into three groups based on the degree of confidence with which *Trichinella* can be considered absent from fattening pigs. Within these three regions, different animal populations are proposed to be monitored at different levels of intensity. The animal populations monitored include sows and boars, horses, hunted wild boar and other susceptible wildlife species consumed by humans.

Taking into account the public health importance, the report on monitoring of *Echinococcus* (Boue et al., 2010) focuses on *E. granulosus* and *E. multilocularis*, which have a significant impact on human health and both of which are circulating to various degrees in Europe. In the case of *E. granulosus*, monitoring of intermediate hosts (sheep, goats, pigs and cattle) at slaughterhouse level through meat inspection is recommended. Genotyping to subspecies level should be performed consistently to improve strain identification. The monitoring of *E. multilocularis* should be carried out in the definitive host (fox or raccoon dog) in order to identify geographical risk areas.

⁵ Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs. OJ L 338, 22.12.2005, pp. 1–26.

Commission Regulation (EC) No 1441/2007 of 5 December 2007 amending Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs. OJ L 322, 7.12.2007, pp. 12–29.

The report by Dorny et al. (2010) recommends that the monitoring and reporting of *Cysticercus* in animals and foodstuffs in the EU should focus primarily on the parasite species most relevant to public health, namely *Taenia saginata* and *Taenia solium*. In addition, *Taenia multiceps* is to be considered in certain areas of the EU. The animal species to be monitored are cattle in the case of *T. saginata* and pigs in the case of *T. solium*. Current monitoring should continue to be based on visual meat inspection in accordance with the current EU legislation, because more sensitive methods are not yet commercially available or fully validated for a routine diagnosis.

In the case of *Sarcocystis*, the report by Taylor et al., (2010) concluded that a harmonised monitoring scheme cannot be justified from a public health perspective without further evidence of an adverse impact on public health.

1.3. Harmonisation of monitoring of non-foodborne zoonoses

EFSA has also provided grants *in the case of Q fever and rabies* to consortia of institutes in Member States to support them in developing harmonised monitoring schemes for these *two non-foodborne* zoonoses in animals. The outcomes of these grant projects have been published as scientific reports submitted to EFSA.

The report on Q fever (causative organism Coxiella burnetii) (Sidi-Boumedine et al., 2010) states that domestic ruminants (cattle, sheep and goats) represent the source most often associated with human outbreaks of Q fever and proposes that monitoring should focus on these animals. A standardised definition is suggested for a herd/flock considered to be clinically affected with Q fever. This includes the occurrence of serial abortions, confirmation of the presence of C. burnetii and positive serology. The monitoring should mainly rely on a passive system aimed at the identification of clinically affected herds and flocks. Active monitoring schemes may be applied in countries that need to evaluate Q fever prevalence in their animal populations when the disease frequency in humans or animals is suspected to be high. Active monitoring can involve either bulk tank milk testing or serological surveys.

The report on rabies (Cliquet et al., 2010) emphasised that surveillance should be evenly distributed in time and space and should target animals suspected of having contracted the disease. All Member States should report both positive and negative results of rabies diagnosis. In countries with oral rabies vaccination programmes, monitoring of rabies vaccination, by investigating hunted animals from vaccinated areas, should be undertaken to assess the efficacy of these programmes. In addition, a national bat rabies surveillance network should be established in all European countries based on the testing of sick, rabies-suspect or dead bats of all species for lyssavirus infections.

1.4. Harmonisation of reporting of foodborne outbreaks

Data on foodborne outbreaks provide interesting information on the relevance of different food categories as vehicles in outbreaks and on the causative agents most frequently associated with these food vehicles. The first harmonised reporting specifications for foodborne outbreaks were issued by EFSA in 2007 (EFSA, 2007a). After three years of implementation, the specifications were reviewed and the updated reporting specifications were published in 2011 (EFSA, 2011). In these updated specifications, outbreaks are categorised based on the strength of evidence implicating the food vehicle in the outbreak. In the case of foodborne outbreaks in which no particular food vehicle is suspected and foodborne outbreaks in which the evidence implicating a particular food vehicle is weak, only a limited dataset is reported. A detailed dataset is to be reported only for foodborne outbreaks in which the evidence implicating a particular food vehicle is strong, based on an assessment of all available evidence. The information to be reported for these outbreaks includes the nature of the evidence to support the link between cases of disease in humans and the food vehicle as well as data on causative agents, food vehicles and the factors in food preparation and handling that contributed to the foodborne outbreaks.

1.5. Harmonisation of monitoring of antimicrobial resistance

EFSA has issued two reports on technical specifications on monitoring and reporting of antimicrobial resistance. The first report (EFSA, 2007b) concerned the monitoring and reporting scheme in *Salmonella* in domestic fowl (*Gallus gallus*), turkey, and pigs and *Campylobacter jejuni* and *C. coli* in broilers. These specifications recommend testing of a common set of antimicrobials using common epidemiological cut-off values and a specified concentration range to determine the susceptibility of the bacteria. The section regarding *Salmonella* in poultry flocks and pigs has been also laid down in EU legislation⁶. The second report (EFSA, 2008) provides for similar specifications for harmonised monitoring and reporting of antimicrobial resistance in indicator (commensal) *E. coli* and *Enterococcus* bacteria (*E. faecium* and *E. faecalis*) from animals, including guidance on the monitoring of extended-spectrum beta-lactamases (ESBLs) in *E. coli*.

Very recently, EFSA, at the request of the European Commission, issued a report (EFSA, 2012) that includes proposals to improve further the harmonisation of the monitoring and the reporting of antimicrobial resistance in food-producing animals and meat thereof in the EU. The report suggests that, since the prevalence of *Salmonella* is decreasing, monitoring of antimicrobial resistance should be enforced in indicator bacteria, such as commensal *E. coli* and enterococci. Monitoring and reporting should be specifically carried out in those animal populations, and food derived from them, that are at risk of harbouring resistant strains. In the case of *Salmonella*, these populations include laying hens, broilers and fattening flocks of turkeys, fattening pigs, calves under one year of age and meat from broilers, turkeys, pigs and bovine animals. *C. jejuni* should be monitored in broilers and broiler meat and *C. coli* in fattening pigs. Indicator *E. coli* and enterococci should be monitored in broilers, fattening pigs and in calves under one year of age and in broiler, pig and bovine meat.

The EFSA (2012) report also introduces the concept of a threshold (size of the population) for some animal populations and their meat to determine whether monitoring of antimicrobial resistance should be mandatory. The report also gives recommendations for broadening the harmonised panel of antimicrobials to be tested, with the inclusion of substances that either are important in human medicine or can provide clearer insight into the resistance mechanisms involved. Several analytical methods are suggested for monitoring of ESBL-/AmpC-producing *E. coli*. Finally, the report strongly supports the collection and reporting of antimicrobial resistance data at isolate level, to enable more in-depth analyses to be conducted, in particular on the occurrence and diffusion of multi-resistance, i.e. simultaneous resistant to many substances.

1.6. EFSA's other activities regarding zoonoses data collection and analyses

Covered by the annual zoonoses data sets provided by the Member States to the European Commission, EFSA publishes, in collaboration with the ECDC, the annual European Union Summary Reports on zoonoses, zoonotic agents and antimicrobial resistance and food-borne outbreaks. The data and information on zoonoses, zoonotic agents and food-borne outbreaks are summarised in one European Union Summary Report, whereas the data on antimicrobial resistance are described in a separate report. Information on the zoonoses cases in humans are provided by the ECDC already in a summarised and analysed format. Together, twelve European Union Summary Reports have been issued so far, and they cover the years 2004-2010.

EFSA also analyses the results from the EU-wide baseline surveys on zoonotic agents in animal and food populations. These results have been published for the baseline surveys on *Salmonella* in holdings of laying hens, in flocks of broilers and turkeys, in slaughter pigs and in holdings with breeding pigs, and on broiler carcasses; the baseline surveys on *Campylobacter* on broiler carcasses and methicillin-resistant *Staphylococcus aureus* (MRSA) in holdings with breeding pigs. The EU-wide baseline surveys on zoonotic agents in animal and food populations are underpinned by a data

⁶ Commission Decision 2007/407/EC on a harmonised monitoring of antimicrobial resistance in *Salmonella* in poultry and pigs. OJ L 153 14.06.2009, p. 26–29.

collection and reporting scheme that are fully harmonised by Commission Decisions laying down the surveys, and thus result in fully comparable data across Member States.

CONCLUSIONS

- The EU rules described above, EFSA's technical specifications and the reports of work funded by grants have all played an important role in the harmonisation of the monitoring and reporting of zoonoses, foodborne outbreaks and antimicrobial resistance throughout EU Member States. The quality and comparability of the data have improved, which has facilitated better analyses and interpretation of the data at EU level, as demonstrated in the recent EU Summary Reports on zoonoses, foodborne outbreaks and antimicrobial resistance.
- In particular, improved datasets have been received on antimicrobial resistance, foodborne outbreaks, VTEC and *Yersinia*. In addition, the reporting of data on rabies and *Echinococcus* at regional level has been instituted based on the recommendations.
- EFSA's technical specifications and the reports from the grant funded work submitted to EFSA are also guiding Member States in the implementation of risk-based monitoring and to conduct well-designed national surveys in animals and food in their country.
- Harmonisation of approaches is continuing, currently focusing on vector-borne zoonoses, antimicrobial resistance and methicillin-resistant *Staphylococcus aureus* (MRSA). Furthermore, the existing monitoring specifications need to be regularly updated to keep them up to date with the latest developments.

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