Reflections on food chain surveillance

Corinne Danan (corinne.danan@agriculture.gouv.fr) (1), Didier Calavas (2)

(1) Directorate General for Food, Sub-directorate for Food Safety, Support Office for Food Chain Surveillance, Paris, France
(2) ANSES, Lyon Laboratory, France

Abstract

Food surveillance activities produce valuable safety-related data under the responsibility of many stakeholders in the food chain but are often under-exploited. The optimisation of surveillance systems at national level is expected in the framework of the French law for the future of Agriculture, implementing an epidemiological surveillance Platform. In the food safety sector, this project is being built step by step through consultations with the different stakeholders. This paper summarises the results of these consultations organised by the Directorate General for Food since the end of 2015; it describes the fundamental elements of an epidemiological surveillance approach on which future work can be based.

Keywords
Food safety, Epidemiological surveillance

Résumé

Réflexions autour de la surveillance épidémiologique des aliments

Les activités de surveillance des aliments, sous la responsabilité de nombreux acteurs, représentent une source précieuse de données sanitaires souvent sous- exploitées. Une optimisation des dispositifs de surveillance des aliments au niveau national est envisagée avec la mise en place d'une plateforme d'épidémiosurveillance, telle que prévue par la loi d'avenir pour l'agriculture. Dans le secteur de la sécurité sanitaire des aliments, cette perspective se construit progressivement par une concertation avec les différents partenaires. Cet article fait la synthèse des résultats des consultations organisées par la DGAL depuis fin 2015 et décrit les éléments fondamentaux d'une approche d'épidémiosurveillance sur lesquels pourront se fonder les travaux futurs.

Mots-clés
Sécurité sanitaire des aliments, surveillance épidémiologique

Epidemiological surveillance is essential to any public health policy, because it helps provide accurate and reliable information and analyses on the status and development of biological and chemical safety hazards. It does not directly "act" on the spread of a safety hazard but provides information about its status and development.

The relevance and quality of a surveillance programme are therefore factors that directly influence the relevance of the measures taken by risk managers, the quality of expert appraisals undertaken for risk assessment purposes, and the quality and feasibility of research work to be carried out[1]. It should also be noted that epidemiological surveillance covers both surveillance and vigilance activities, devoted respectively to current safety hazards in France and to exotic or emerging hazards (i.e. hazards not identified in France at a given time).

In the areas of human and animal health, epidemiological surveillance benefits from more experience than epidemiological surveillance in the field of food safety. The concepts, definitions and tools developed in this framework should thus be adapted to the characteristics and particularities of food safety. The Epidemiological Surveillance Platform for Animal Health (ESA Platform), established in October 2011, is an example to be taken into account, but cannot be transposed unless it is adapted, in view of developing such a Platform for food safety.

Epidemiological surveillance relies on multidisciplinary and multi-partner activities. In a sector as broad and varied as food production, there are many stakeholders, who are often focused on one type of product or one stage in the food chain for which they are responsible. The reflections under way to develop epidemiological surveillance actions in the area of food safety should therefore optimise relations between stakeholders in the food chain. They should also ensure that stakeholders take ownership of the guidelines and tools offered by epidemiologists, to help them implement effective programmes and interpret their results.

In this context, an essential prerequisite consists in agreeing on a common vocabulary, in a sector that is generally unfamiliar with this type of approach. Moreover, a distinction should be made between epidemio-surveillance and risk management or assessment, even though the stakeholders are sometimes the same.

The reflections presented in this article draw on the experience of the ESA Platform and collective brainstorming sessions organised by the DGAL since the end of 2015 with several representatives of inter-professional associations involved in the food chain, ANSES scientists, agricultural and agro-industrial technical centres, and analytical laboratories. During these sessions, the use of the terms "epidemiological surveillance" and "epidemio-surveillance" did not seem natural, since surveillance applies to categories of foods that cannot be associated with a "state of health" in the strict sense. In addition, epidemiological surveillance was instinctively associated with the surveillance of "epidemics" in most cases. And yet this association does not fit with the definitions used by epidemiologists in the fields of human and animal health who are more familiar with epidemio-surveillance approaches.

The three sectors of animal health, human health and food safety ultimately use common definitions, referring to a population of individuals (foods, animals, plants or humans) with a state of safety to be monitored for which it is necessary to adopt monitoring, control measures, etc. (Box 1).

In the rest of this document, preference will be given to the expression "Food chain surveillance" (FCS) instead of "Epidemio-surveillance of foods"; this term seems more suitable and avoids the use of "epidemio-surveillance" which has too many "health" connotations.

Food chain surveillance: objectives and methods

Objectives

The objectives of surveillance activities are different from those of control activities which involve, when a non-conformity or safety status of concern is identified, implementing measures to eliminate the source or reduce the risk of consumers being exposed to the detected contaminant.

1. According to a working document on the future of the ESA Platform (2016).

FCS can have various objectives:

- estimate the level of contamination in a "population" (i.e. a category of food in a stage of the food chain) and analyse its trends. This objective can contribute to verifying the level of safety control in upstream stages, assessing the impact of a management measure, or disseminating/communicating representative data for a "population" to users of this information (risk assessors and managers),
- detect unusual contamination early on, as part of a risk prevention approach, before pathological cases emerge in humans.

Stakeholders in food chain surveillance

Managers of FCS programmes can be:

- public risk managers (national control authorities: DGAL, DGCCRF, DGS) managing official surveillance plan and official control programmes,
- private risk managers (operators in all stages of the food chain) managing their own-checks programmes on an individual or collective basis,
- managers of integrated thematic surveillance programmes, most often in National Reference Laboratories (e.g. the *Salmonella* network managed by ANSES).

Within these programmes, there can be many stakeholders taking place at national and local level (Box 3). The sustainability of surveillance actions relies on the ongoing coordination of the stakeholders involved and feedback for producers and users of data (private or public risk managers, risk assessors, and consumers as needed).

Box 1. Definitions

In the area of animal health, epidemio-surveillance is an observation method based on continuous recording to monitor the state of health or risk factors in a defined population, particularly to detect the emergence of pathological processes and to study their development over time and space with a view to adopting appropriate prevention measures (Toma *et al.*, 1991).

In the area of human health, epidemiological surveillance means the systematic ongoing collection, collation and analysis of data for public health purposes and the timely dissemination of public health information for assessment and public health response as necessary (International Health Regulations[1]).

In the area of food safety, the "epidemio-surveillance of foods" is a set of activities aiming to: i) continuously collect data on levels of one or more contaminants (Box 2) in a category of food in a stage of the food chain (the "population"), ii) interpret them, and iii) communicate the resulting information to organisations and structures responsible for food safety. In all cases, the "epidemio-surveillance of foods" encompasses long-term activities and is ultimately focused on human health issues for which risk assessment, risk management or other prevention or surveillance measures need to be taken.

1. http://www.who.int/ihr/publications/9789241596664/en/.

Box 2. What is a contaminant?

A contaminant is any chemical element, chemical substance or biological agent not intentionally added to food which is present in such food as a result of the production (including operations carried out in crop and animal husbandry), processing, preparation, treatment, packing, packaging, transport or holding of such food, or as a result of environmental contamination. Radionuclides are considered physical contaminants in the context of official surveillance. Extraneous matter (such as, for example, insect fragments, animal hair, etc.) is not covered by this definition.

In relation to Regulation (EEC) No 315/93, we include biological agents (viruses, bacteria, parasites) in the definition of contaminant.

"Contaminant/product" pairs to be monitored

The choice of contaminants to be included in FCS activities should take into account diseases and adverse health effects in humans.

The scope covers all contaminants likely to be found in foods of plant or animal origin (Box 2). The surveillance stage can differ depending on the contaminant, as a function of its development across stages in the food chain (some contaminants appear or disappear as a result of production processes) and as a function of the surveillance programme's objective. This choice should be risk-based, using an integrated approach, and corresponds to the most suitable stage of the food chain for taking effective action. Due to the risk of the possible transfer of contaminants from animal feed to food, the surveillance of animal feed should be included in the scope of food chain surveillance.

Unlike in the areas of animal and plant health, food-related safety hazards have not yet been officially classified. The discussions held as part of the action plan of the Interministerial Committee for the Modernisation of Public Action (CIMAP) are expected to lead to such a classification (see above).

Regulatory context of food surveillance

Principles of the European legislation

General principles

The objective of the European legislation on food safety is to guarantee a high level of safety for consumers. No foods are to be placed on the market if they are considered hazardous under Regulation (EC) No 178/2002. In order to achieve this objective, the European regulations have laid down general principles relying on risk analysis, the primary responsibility of operators, and traceability and information requirements for the control authorities (Hygiene package). Risk assessment and management are clearly defined.

In addition, Member States are to implement surveillance programmes whose results (regarding agents responsible for zoonoses and chemical contaminants in foods) are reported annually to the European Food Safety Authority (EFSA).

Role of own-checks

Food chain operators have performance obligations and rely on an analysis of hazards and critical points for their control (HACCP) to define their own-checks schemes. This own-checks enables them to confirm the effectiveness of safety control measures. It is to be undertaken in all stages of the food chain (production, processing, distribution) from feed to food, except for primary production. For microbiological agents found in foods, Regulation (EC) No 2073/2005 establishes a minimum list of criteria to be included in the health control plans of operators. This list is not exhaustive and should be tailored to the hazard analysis of each company. For chemical contaminants, the choice of contaminants to be included in safety control plans is based only on the hazard analysis undertaken by each company.

The Hygiene package thus gives priority to own-checks to demonstrate the effectiveness of the programmes put into place by operators in the food sector in controlling contamination. These own-checks therefore represent a massive quantity of data on food contaminants, spread out among companies.

Official controls

Official controls contribute to the overall assessment of the safety control plans implemented in companies and to the verification of compliance with the legislation. They are organised according to a harmonised European approach to their design and implementation (Regulation (EC) No 882/2004). This verification partly relies on annual food sampling campaigns for the detection of contaminants, whether or not there are regulatory maximum values (system/programme of surveillance & control plans, SCPs).

Box 3. Stakeholders in food chain surveillance[1]

- The administrative authority (General Directorate and decentralised services) takes all measures intended to collect, process and disseminate epidemiological data and information regarding Category 1 health hazards as well as, when necessary, Category 2 health hazards
- (Articles L. 201-3 and -4 of the French Rural Code); these measures currently apply only to the sectors of animal health and plant health, for which health hazards have been classified; discussions are being held in the area of food safety as part of the action plan of the Interministerial Committee for the Modernisation of Public Action (CIMAP).
- Sanitary networks: a sanitary network is a group of stakeholders recognised by the State, representing 60% of the monitored population; the authority can recognise these sanitary networks in order to promote the prevention of sanitary hazards, the surveillance of animal and plant health, and the pooling of related costs (Article L. 201-10 of the French Rural Code; Order No 2015-1242 of 7 October 2015); specific reflections are necessary in the area of food safety for which no sanitary networks are currently recognised.
- Regional sanitary associations: a federation of sanitary organisations in the form of an association governed by the French Act of 1901 can be recognised by the State for the prevention, surveillance and control of sanitary hazards (Article L. 201-11 of the French Rural Code); specific reflections are necessary in the area of food safety for which no regional sanitary associations are currently recognised.
- Accredited analytical laboratories contribute to epidemiological surveillance and the early detection of outbreaks and at-risk sanitary situations, through their analytical knowledge and involvement in the local epidemiological context. They can participate in the epidemio-surveillance Platforms mentioned in Article L. 201-14 of the French Rural Code. (Decree No 2015-1902 of 30 December 2015). French *départements* are involved in sanitary monitoring through departmental analytical laboratories (Order No 2015-1242 of 7 October 2015).
- National Reference Laboratories (NRLs) contribute to the epidemio-surveillance missions undertaken by the State, primarily through the confirmation of first-line analysis results, the development and deployment of analytical methods, and the coordination of official laboratory networks.
- ANSES provides its supervisory ministries with scientific and technical support for surveillance and reference activities. It also carries out monitoring, alert, surveillance and vigilance missions; as part of its reference missions, ANSES is responsible for issuing alerts in the areas of veterinary medicinal products, plant protection substances, food safety (including drinking water) and animal and plant health. ANSES relies on data collection systems, primarily those of networks of laboratories run by NRLs, by definition giving it surveillance missions.
- Agro-industrial technical institutes (ITAIs) can provide scientific and technical support to operators in the implementation of their safety control plans; they perform general interest missions and are recognised by the authorities (Articles D823-1 and 2 of the French Rural Code).
- Joint technology networks (RMTs), recognised by the State pursuant to Article 91 of the French Act on agriculture No 2006-11 of 5 January 2006, are dedicated to the pooling of human resources by network members for carrying out collaborative work on priority topics for the development of the agricultural and agri-food sectors. Some RMTs have activities dealing with food safety (e.g. the Qualima and Quasaprove RMTs).

(1) To date, no regional health associations or health networks have been recognised in the target sectors of animal health and plant health.

Moreover, Regulation (EC) No 854/2004 defines specific rules for the organisation of official controls for products of animal origin intended for human consumption. Among other things, official controls are routinely organised at the slaughterhouse to reduce the risk of transmitting food-borne zoonoses (in particular testing for bovine cysticercosis and trichinellosis). These "controls" are part of programmed surveillance in reality.

National regulations

The State is responsible for organising food safety throughout France. As such, it has to implement conditions for the detection and control of health hazards, together with all stakeholders.

General provisions on epidemio-surveillance in the areas of plant health, animal health and food safety were specified in Order No 2015-1242 of 7 October 2015 on the organisation of surveillance related to animal health, plant health and food. This order provides for "epidemio-surveillance platforms" in order to provide (public and private) risk managers with support.

Definition and expected missions of the FCS platform

Definition and objectives

A platform can be defined as a multidisciplinary and multi-partner consultation space whose objective is to optimise surveillance actions to achieve a high level of food safety. It should provide support to risk managers for the "design, deployment, coordination, promotion and assessment of surveillance programmes" (Order No 2015-1242) as well as validated information to risk assessors. Consultations between partners also aim to identify research actions in the area of surveillance.

Nonetheless, every manager remains responsible for his/her programme. Such a platform can only be put into place if private and public partners from different fields agree to share resources, expertise and tools to the benefit of all.

Missions

For information, in the area of animal health, the general objective of the ESA Platform is to "facilitate the coordination, operational implementation and monitoring of the animal health surveillance policies adopted and implemented by its members. It should in particular ensure that the measures taken to monitor threats to animal health are adequate for dealing with current health hazards or hazards which threaten French territory"[2]. From an operational standpoint, it also leads and coordinates the surveillance systems that make up its work programme and is a centre of epidemiological expertise for these various systems.

For the establishment of the FCS Platform, it is essential to clarify the boundaries of surveillance support with missions involving:

- surveillance strictly speaking, whose management and organisation remain the responsibility of surveillance programme managers (see above),
- risk assessment, which is the responsibility of ANSES at national level,
- risk and alert management, under the supervision of private and public risk managers.

Note that the primary objective of a Platform is not to access or *a fortiori* to hold data but rather to strengthen systems enabling high-quality data to be acquired.

Thus, the actions taken in the framework of an epidemio-surveillance Platform provide two types of support: scientific and technical

2. Calavas *et al.* (2015). Bulletin Épidémiologique on animal health & nutrition, No 48. http://bulletinepidemiologique.mag.anses.fr/sites/default/files/BEP-mg-BE48-art1.pdf.

support (which can be described as "surveillance engineering") as well as strategic support:

- Scientific and technical support upstream of data collection.
  - Methodologies for the development of surveillance programmes.
  - Sampling protocols (sampling plan, identification of stakeholders, analytical methods, sampling tools, etc.).
  - Recommendations for data collection, information systems, programme coordination.
  - Charter for the use of data.
- Scientific and technical support downstream of data collection.
  - Statistical analysis and result reporting methods.
  - Expert appraisal and multidisciplinary interpretation of the health situation.
- Strategic support for surveillance.
  - Assessment of the effectiveness and efficiency of programmes (Oasis, RiskSur, etc.).
  - Monitoring of emerging hazards (in particular related to technological developments or new consumer practices).
  - International monitoring (e.g. risk of importing contaminated raw materials or finished products).
  - Identification of requirements for research into surveillance methodologies.

The DGAL is currently holding discussions to produce a proposal for the organisation and governance of the FCS Platform at national level. Based on the commitments of the various private and public partners, the FCS Platform is expected to start its work by the first quarter of 2017.