

# Environmental investigations

The use of environmental investigations will differ according to the nature and size of the outbreak, the type of establishments involved, the resources available, local priorities, political and legal concerns, and many other factors. Therefore, only a short overview and some general aspects will be outlined here.

## ***Environmental investigations include:***

1. Collection and microbiological analysis of samples from food, water or the environment
2. Inspection of food production and serving premises
3. Risk assessments
4. Tracing of food products

The last three points are often not emphasized as much as the epidemiological and microbiological investigations, however, they are essential parts of the outbreak investigation, and may support other types of evidence gathered through epidemiological investigations and microbiological sampling of food, water or the environment. If several products are under suspicion as being the source, these investigations may indicate which product is most likely to be involved in the outbreak. Such investigations often involve the food safety authorities and the international organisations involved in food safety.

## **1 Microbiological sampling of food, water and environment**

Sampling from suspected food and water as well as environmental sampling is of course a core part of the environmental investigation of FWD outbreaks. Most local authorities have standard procedures for this. In an outbreak involving several countries, agreements on storage of isolates for further characterization and typing may be needed.

## **2 Inspection**

Inspection of food production and serving sites of suspected food products is important in order to identify failures or deficiencies. This may help to support a hypothesis, in particular where other types of evidence are weak, and is very important in the implementation of control measures. Similar to the epidemiological investigation, the use of standardized forms for environmental investigations provides comparable data for investigations that may involve multiple establishments in different countries.

## **3 Risk assessment**

Risk assessments of the suspected products can indicate which products are more likely to be contaminated and be consumed in a form that can lead to infection. A thorough risk assessment is a

comprehensive process, however in outbreak settings, a more limited assessment may be conducted for the suspected products.

Such an assessment involves qualitatively or quantitatively describing the:

- risk of introduction of pathogens into the food product through ingredients, preparation processes or failures identified in the process
- replication of microbes in food products over time
- destruction of microbes by processing during food production or by consumers (i.e., heat treatment, fermentation etc)
- consumption habits and consumption patterns of the food product
- risk of illness, including assessing specific population groups at risk

More information on food related risk assessments is available from

[WHO](#) and [FAO](#)

## 4 Traceback

Information from traceback/traceforward of food products is of major importance for the implementation of control measures and preventing future outbreaks. It may, however, also be a very important tool for the investigation to identify the source. This information may indicate where cases may occur and which products are more likely to be involved, and may in some outbreaks be an important clue to identifying the source combined with information on the geographical distribution of cases and information from epidemiological interview studies. As such the traceback analysis may be thought of as a core analytical outbreak investigation tool along side e.g. the case-control study. In a recent large outbreak of *Salmonella* Enteritidis caused by eggs in the US, epi guided traceback of suspected foods from separate clusters early in the outbreak was critical in identifying the source ([CDC, 2010](#)).

In international outbreaks with cases in different countries, international traceback investigations may in the same way assist in identifying the source. Such investigations have, however, often proved to be difficult to carry out. With increasing availability of electronic data on food distribution, such investigations may become more straightforward to conduct and they should always be considered. With improved availability of distribution data, geographic correlation analysis between case distribution and product distribution can be helpful in assessing the likelihood that a specific product is the source compared to other suspected products.