MANUAL FOR INTEGRATED FOODBORNE DISEASE SURVEILLANCE IN THE WHO AFRICAN REGION

WORLD HEALTH ORGANIZATION
Regional Office for Africa
Brazzaville 2012

World Health Organization
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Contents

Annexes

Tables

Figures

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Foreword

Recent events have underlined the importance of food safety in the African Region. An unprecedented number of foodborne disease outbreaks have been reported recently, including salmonellosis, entero-haemorrhagic *Escherichia coli* (EHEC), hepatitis A and acute aflatoxicosis. There have also been poisonings associated with consumption of vegetables and beans containing residual pesticide. Cholera outbreaks are common in the Region and available data attest to an upward trend. In addition, there is a high incidence of diarrhoeal diseases among African children, estimated at 3.3 to 4.1 episodes per child annually. Some 700 000 children and adults also die each year from diarrhoea and dehydration.

Ensuring food safety is a critical and fundamental component of public health and food security. Efficient food safety and quality programmes reduce food losses by about 30 percent, which is important for food security. Strengthening food safety within the Region will help minimize the burden of foodborne diseases, reduce poverty and contribute to the achievement of the Millennium Development Goals 1, 4 and 8.

While a number of countries and sub-sectors in the African Region have achieved notable progress in implementing food safety improvement strategies, many are still struggling to tailor their traditional food control systems to current food safety challenges. Key response gaps include lack of policy coherence among the different sectors, inadequate food safety capacities, inadequate financial investments, fragmented food control systems, weak foodborne disease surveillance, obsolete food regulation and weak law enforcement and the inability of small- and medium-scale producers to provide safe food.

Foodborne disease surveillance is essential for estimating the burden of disease, monitoring trends, detecting outbreaks and providing data for advocacy and resource allocation. Therefore, Member States should reinforce their surveillance systems in order to make foodborne diseases part of food control and health systems strengthening. It is mandatory, under International Health Regulations (2002), to report events of international importance that involve contaminated food and outbreaks of foodborne diseases. The WHO Global Foodborne Infections Network has been building capacity in laboratory-based foodborne disease surveillance since 2003. This Manual is intended to complement such efforts and facilitate the strengthening of systems in countries, in a bid to address IHR (2005) requirements.

Abbreviations

AFENET	African Field and Epidemiology Network
CPHL	Central Public Health Laboratory
EQAS	External Quality Assurance System
FBD	Foodborne Disease
FVM	Food and Veterinary Microbiology
GFN	WHO Global Foodborne Infections Network
GHP	Good Hygiene Practice
GSS	WHO Global Salmonella Surveillance
HACCP	Hazard Analysis and Critical Control Points
IDSR	Integrated Disease Surveillance and Response
IHR	International Health Regulations
MAAIF	Ministry of Agriculture
MTTI	Ministry of Tourism, Trade and Industry
MUK	Makerere University
NGO's	Nongovernmental organisation
ORS	Oral Rehydration Solution
PFGE	Pulse Field Gel Electrophoresis
PHEMC	Public Health Emergency Countermeasures
UNBS	Ugandan National Bureau of Standards
WHO	World Health Organization

1. Introduction

1.1 Background

Food may be a silent vehicle for microbial, chemical and physical hazards. There is concern about transmission of multiple antimicrobial resistant bacteria via the food chain. Several devastating outbreaks of foodborne diseases have been reported in the African Region. For instance, acute aflatoxicosis in Kenya, in 2004,[1] associated with maize and bromide poisoning in Angola, in 2007, associated with use of sodium bromide as salt[2]. The Regional Office also recorded several outbreaks associated with contaminated food including: anthrax in Zimbabwe, typhoid fever and botulism in Uganda, chemical intoxication due to consumption of seed beans and maize in Nigeria, pesticide residues from cabbage and other vegetables in Senegal, konzo from bitter cassava in the Democratic Republic of Congo and food poisoning and diarrhoeal diseases in many other countries.[3]

In 1998, the Regional Office, in collaboration with partners, established the Integrated Disease Surveillance and Response (IDSR) in the African Region. This has established stronger systems linked to laboratory support, resulting in the efficient sharing of resources for core surveillance and support functions. The priority diseases addressed by IDSR include cholera, bloody diarrhoea and diarrhoea with dehydration among under-five children. The WHO Global Foodborne Infections Network (GFN), formerly WHO *Global Salmonella Surveillance* (GSS) initiative, has been conducting capacity building aimed at improving laboratory-based foodborne disease surveillance since 2002 and has provided training in isolation, identification and typing of *Salmonella sp*, *Campylobacter sp*., *Vibrio cholerae*, *Vibrio* non-cholerae and *Shigella* from human and food samples. Capacity has also been strengthened for detection of chemical contamination in food through the Total Diet Studies (TDS) programme.

Given the increased number of food-related emergencies in the African Region and food trade globalization which has increased the likelihood of international incidents involving contaminated food, it is necessary to strengthen systems to allow the early detection, management and prevention of spread of foodborne diseases. The International Health Regulations (IHR) (2005)[4] cover events of international importance involving contaminated food and outbreaks of foodborne diseases. The IHR (2005) is based on a risk assessment approach, entered into force on 15 June 2007. It requires Member States to notify WHO of disease outbreaks of international concern, including foodborne diseases. However, the reporting of data generated from the Global Foodborne Infections Network (GFN), formerly *Global Salmonella Surveillance,* and TDS training courses are not sufficiently integrated into IDSR. To remedy this situation and fulfil IHR requirements, it was recommended, at a workshop in 2007, to incorporate foodborne disease surveillance into IDSR. Indicators for foodborne disease surveillance have

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1 Nyika l, et al,. Outbreak of Aflatoxin Poisoning - Eastern and Central Provinces, Kenya, January--July 2004, MMWR Weekly, September 3, 2004/53(34);790-793.

2 WHO Outbreak of neurological illness of unknown aetiology in Cacuaco Municipality, Angola, WHO rapid assessment and cause finding mission 1 Novemebr-23 November 2007. Mission report prepared by Kerstein Gutschmidt, et al. World Health Organisa 2007.

3 http://www.afro.who.int/en/clusters-a-programmes/dpc/epidemic-a-pandemic-alert-and-response/epr-highlights/2248-weekly-bulletin-on-major-epidemicprone-diseases-week-4-2010.html (Accessed June 2010, October 2011).

4 WHO International health Regulation (2005) WHO, Geneva 2006.

therefore been incorporated into the IDSR technical guidelines (2nd Edition, 2010)[5] to facilitate data collection, reporting and detection of foodborne disease outbreaks. This Manual is intended to guide implementation of foodborne disease surveillance programmes at the level of countries. The drafting of the Manual was informed by several other existing manuals and guidelines.[6,7,8]

1.2 Purpose of the Manual

This Manual seeks to provide countries guidance on the strengthening of foodborne disease surveillance as part of IDSR. It should not be used in isolation, but alongside other resource materials including IDSR technical guidelines. It comprises an introduction and five chapters, of which Chapter 2, that focuses on the different types of surveillance systems, Chapter 3 on the integration of FBD surveillance into IDSR, Chapter 4 on the required conditions for FBD surveillance, Chapter 5 on the organization of a FBD surveillance system at country level and Chapter 6 on outbreak investigation, including risk management.

1.3 For whom the Manual is intended

The Manual is intended for managers, decision makers, implementation officers and civil society. In particular:

(a) surveillance officers;
(b) IHR focal points;
(c) International Food Safety Network (INFOSAN) focal points;
(d) INFOSAN emergency focal points;
(e) hospital outbreak coordinators;
(f) national epidemiology unit staff;
(g) national communicable disease programme managers;
(h) district health management teams;
(i) medical and nursing officers;
(j) environmental health officers;
(k) food inspectors;
(l) health facility managers;
(m) public health officers and administrators;
(n) medical, nursing, food science and nutrition educators;
(o) higher education institutions, including polytechnics, universities, veterinary and medical schools;
(p) laboratory personnel; and
(q) communities.

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5 WHO/AFRO (2010), Technical Guidelines for Integrated Disease Surveillance and Response in the African Region.

6 WHO (2008) Foodborne Disease Outbreaks: guidelines for investigation and control. World Health Organisation, France, 2008.

7 FAO/WHO (2006) Food Safety Risk Analysis: A guide for national food safety authorities. Food and Agriculture Organisation, FAO Food and Nutrition Paper.

8 Moren A. et al (1991), Practical field epidemiology to investigate a cholera outbreak in a Mozambican refugee camp in Malawi, 1988. Journal of Tropical Medicine and Hygiene 94:1-7.

2. Strengthening of foodborne disease surveillance

2.1. Objectives of surveillance

Surveillance is defined as the systematic and ongoing collection, analysis, interpretation, and dissemination of data for public health action. It seeks to:

(i) estimate burden of disease in order to determine the magnitude of the problem;

(ii) monitor trends and know whether the situation is improving or worsening;

(iii) detect outbreaks to determine urgent action;

(iv) assess control programmes to obtain information on performance; and

(v) generate data to be used for risk analysis and ensure safety of food supplies.

2.2. Core capacity for foodborne disease surveillance

The improvement of national control efforts to contain, eliminate or eradicate epidemic-prone diseases is fundamental for the improvement of national health security. Similarly, control programmes are aimed at reducing public health risks associated with events of chemical, toxic and environmental origin.

Laboratory services are the cornerstone to foodborne disease surveillance for national epidemic alert and response, including detection, investigation and response. Laboratory analysis of human, food and animal samples is critical and requires collaboration with all stakeholders. This must be based on reliable sample collection and transportation, domestic diagnostic capacity and use of required external capacity.

The identification of the source of an outbreak and containment is a key IHR (2005) requirement. Hence, it is important to develop risk management capacities in order to ensure food control throughout the food chain. If epidemiological analysis identifies food as the source of the outbreak, based on risk assessment, the adopted risk management option for preventing further spread should be put in place.

Overall human capacity development should follow the principle of sustainability at all levels, in particular sufficiently trained and conscious physicians and nurses who will collect samples from patients for submission to laboratories with competent technicians to analyse them. Categories of staff must cut across all disciplines including clinicians, microbiologists, epidemiologists, clinical toxicologists and environmental officers. Strengthening the knowledge and skills of all public health actors, in particular laboratory personnel, is key to the implementation of the foodborne diseases surveillance agenda.

2.3. Categories of foodborne disease surveillance

There are four categories of foodborne disease surveillance as follows: no formal system, syndromic surveillance, laboratory-based surveillance and integrated food chain surveillance (Figure 1)[9]. Laboratory-based surveillance is the preferred foodborne disease surveillance system since it permits rapid detection of outbreak strains. Figure 2

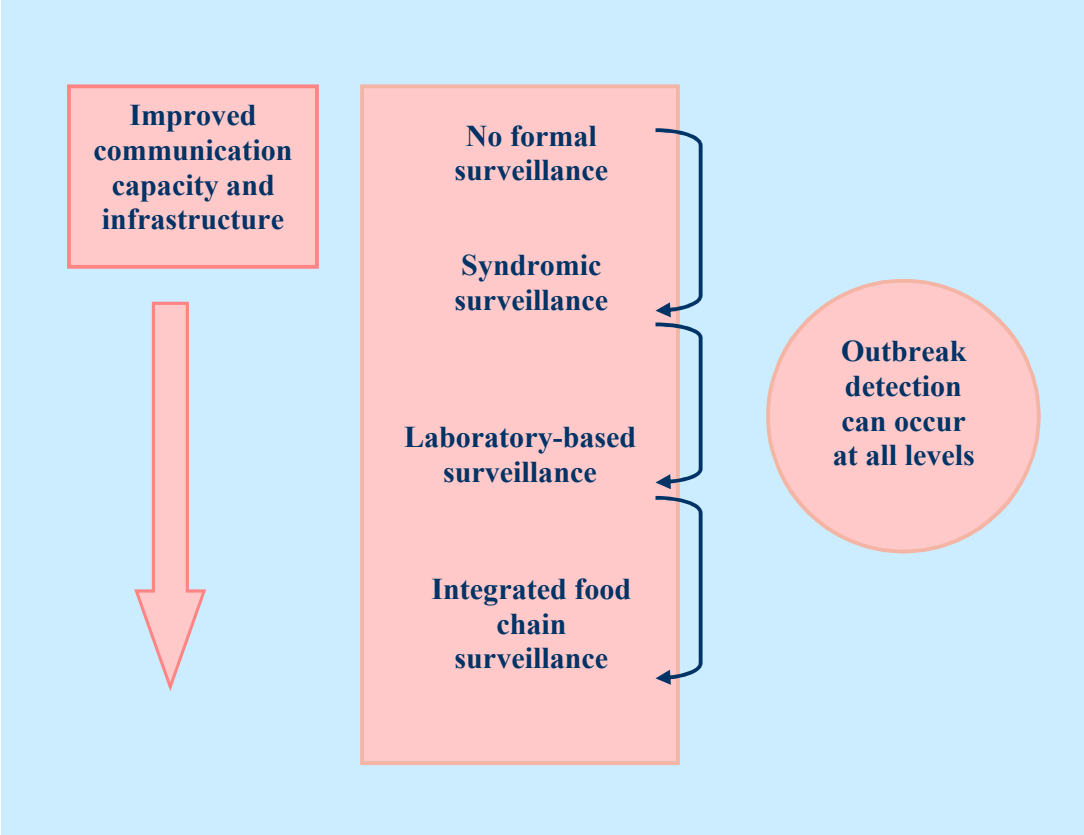
[9] WHO (2002) Methods for Foodborne Disease Surveillance in Selected Sites. Report of a WHO consultation, 18-21 March 2002 Leipzig, Germany. WHO/CDS/CSR/EPH/2002.22.

illustrates a typical example of a laboratory-based foodborne disease surveillance system in Uganda.

No formal surveillance

This system is typical of countries where there is political instability, recent history of war or extreme poverty. In this case, the public health system is generally not a priority or is inexistent and certain aspects of surveillance are often undertaken by outside agencies. There are no data, though large or unusual outbreaks may be detected and investigated by outside agencies such as NGO's.

Figure 1: Categories of foodborne disease surveillance (adapted from WHO 2002)[10]



Over time, syndromic surveillance has been used to target investigation of potential cases. For instance, in the case of a normal influenza outbreak, once it begins to affect the population, people may call in sick for work or school, visit their drugstore and purchase medicine over the counter, see their doctor or present symptoms that are severe enough to keep them in an emergency room.

Syndromic surveillance systems monitor data through school absenteeism, emergency calls, hospitals, over-the-counter drug sale records, Internet searches, and other data sources to detect unusual patterns. When an activity spike is noticed in any of the disease

[10] WHO (2002) Methods for Foodborne Disease Surveillance in Selected Sites. Report of a WHO consultation, 18-21 March 2002 Leipzig, Germany. WHO/CDS/CSR/EPH/2002.22.

monitoring systems, epidemiologists and public health professionals are alerted that there may be an issue.

Data aspects relate to case counts, trends-based information and seasonal variation, defined at-risk and high-risk populations, recognized point sources of outbreaks at the local level, as well as unusually large outbreaks at the national level.

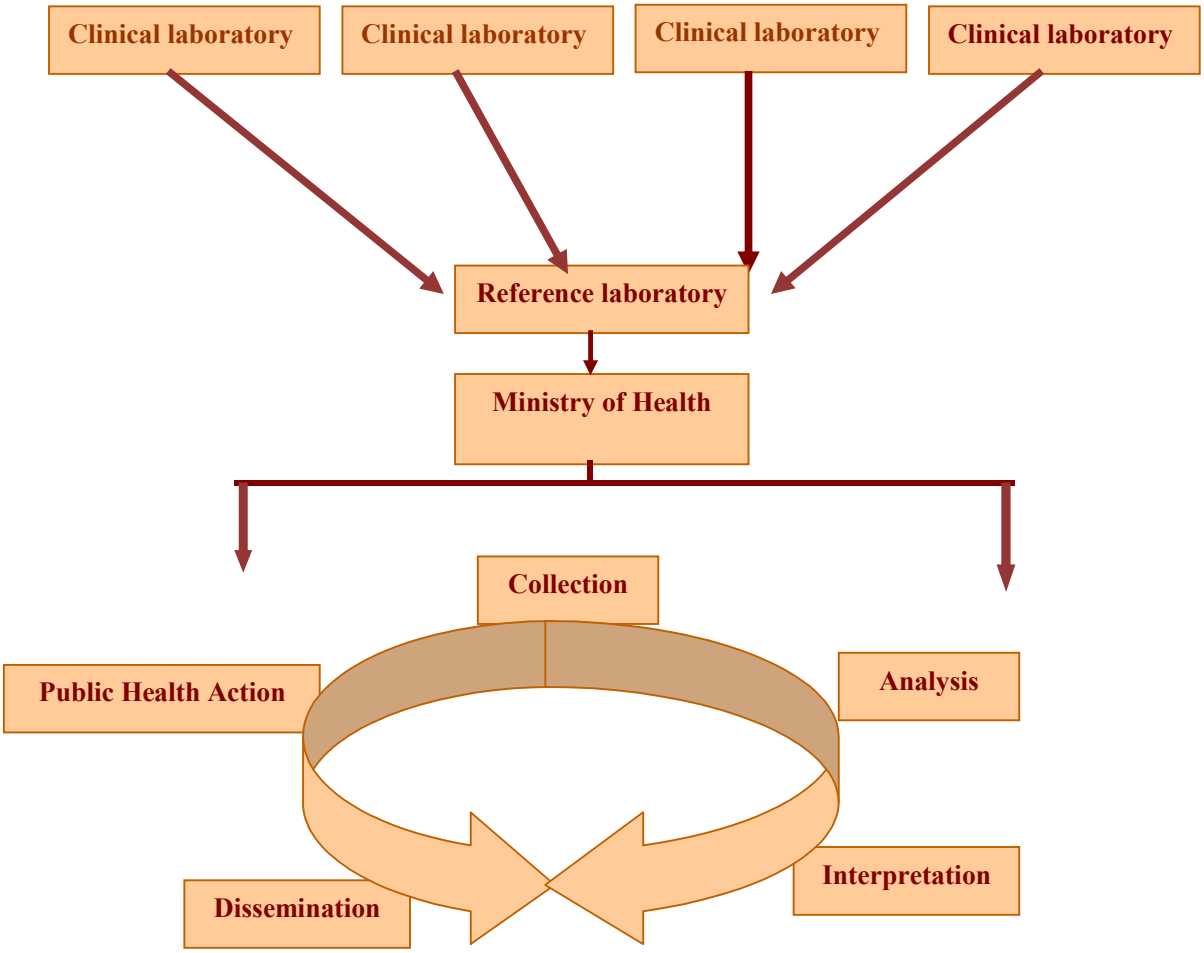
Laboratory-based surveillance

Laboratory-based surveillance is the systematic and ongoing collection, analysis, interpretation and dissemination of data based on laboratory-confirmed infections for public health action. The surveillance system uses standard case definitions for classifying diseases. Clinical laboratories are key sources of isolates for laboratory-based surveillance and should routinely send random isolates to reference laboratories for confirmation or subtyping. Subtyping is important as it provides clues to the sources of infection and helps distinguish strains enabling the detection outbreaks. Subtyping methods include:

(i) serotyping;
(ii) phage typing;
(iii) antibiotic resistance profiling;
(iv) molecular typing, for example, pulsed-field gel electrophoresis (PFGE).

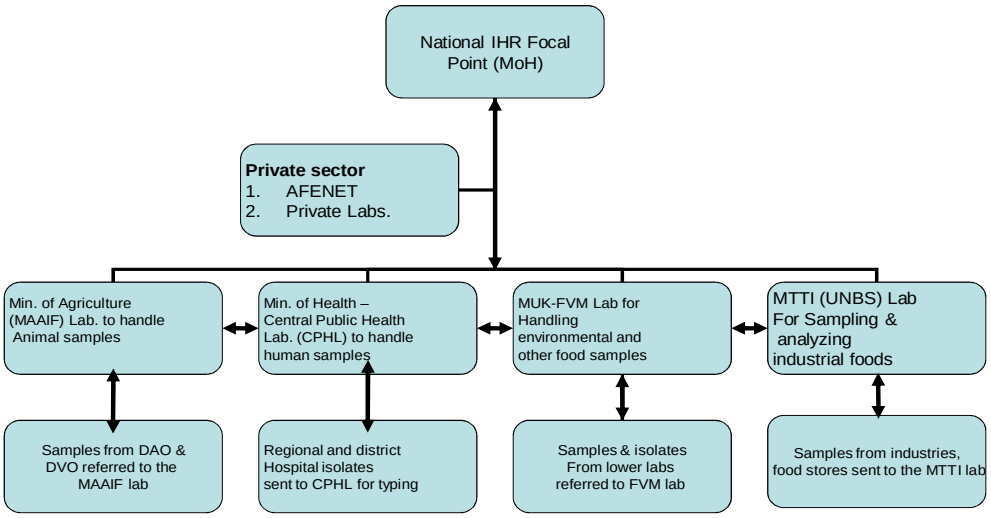
For instance, *Salmonella*, a common cause of foodborne disease, has over 2500 serotypes, each of which has its own biology and epidemiology. Serotype typhi causes typhoid fever, serotype enteritidis is commonly transmitted by eggs and serotype typhimurium is transmitted by a wide variety of animal source foods.

Figure 2: Schematic diagram of laboratory-based surveillance



Source: CDC

Figure 3: Schema for Laboratory-based Foodborne Disease Surveillance, Uganda



Source: MoH, Uganda

Laboratory-based foodborne disease surveillance:

(i) permits aetiologic identification;

(ii) determines which pathogens are causing illness or allows aetiologic agent-specific case counts;

(iii) helps detect and investigate outbreaks;

(iv) helps monitor trends by pathogen over time and in selected populations;

(v) helps determine control programme priorities;

(vi) helps determine control programme effectiveness;

(vii) determines which subtypes of pathogens are causing illness.

Information generated include aetiologic agent-specific trends over time and seasonal variation, definition of at-risk and high-risk populations and recognition of point source at local level and how to diffuse outbreaks at national level.

Steps in implementing laboratory-based surveillance are as follows:

(i) encourage doctors to request stool cultures;

(ii) consider using sentinel sites to capture data from culture of specimens from sentinel clinics or regions;

(iii) to preserve resources, use a systematic sampling scheme, for example, reference laboratories can serotype or subtype every 10th positive stool sample;

(iv) conduct a survey of clinical laboratories to know the number of stools tested each month, the tests performed and the results over a given time;

(v) encourage or require clinical laboratories to report certain isolates to the national reference laboratory. Also request them to send certain isolates to reference laboratory;

(vi) train clinical laboratory staff in reporting methods and requirements.

Laboratory-based foodborne disease surveillance can be improved by:

(i) holding meetings to encourage regular and rapid sharing of information between reference laboratories and epidemiologists;

(ii) using laboratory data to support epidemiological investigation of outbreaks. Test specimens based on epidemiological hypotheses including specimens from patients and specimens from highly suspected sources, for example, food or water. It is essential to subtype certain pathogens;

(iii) developing laboratory quality assurance programmes, for example, the External Quality Assurance System (EQAS);

(iv) subtyping routinely or upon request, for example, serotyping or phage typing;

(v) conducting antibiotic resistance profiling, molecular typing, for example, pulsed-field gel electrophoresis (PFGE);

(vi) taking advantage of regional and global networks such as GFN, WHO Collaborating Centres, regional centres, GFN External Quality Assurance System, country data bank and electronic listservs.

This surveillance system provides higher quality data compared to syndromic surveillance and countries are urged to make resources available for its development.

Integrated food chain surveillance

Integrated food chain surveillance is the collection, analysis and interpretation of data from animals, food and humans. This surveillance system uses standard case definitions for classifying disease. Data is routinely reported, collated at central level and promptly disseminated to the public health community. The integrated food-chain surveillance system enables to attribute burden of illness to specific food categories through the use of detailed information from the monitoring of food and animals.

Aspects of integrated food chain surveillance include aetiologic identification; aetiologic agent-specific case counts in the population, aetiologic agent-specific prevalence in food and animals, pathogen characterization (for instance, serotyping, antibiogram, etc.) and community-level case counts. The following information can be generated:

(i) aetiologic agent-specific trends over time and seasonal variation;

(ii) reliable incidence rates;

(iii) defined at-risk and high-risk populations;

(iv) recognized point source at the local level and how to diffuse outbreaks at the national level;

(v) hypotheses for human disease outbreaks using food and/or animal data;

(vi) comprehensive estimate of burden of foodborne disease outbreaks;

(vii) information on effectiveness of food safety policy interventions;

(viii) association of burden of foodborne disease to food category;

(ix) detection and control of food hazards;

(x) reporting of emerging pathogens in animals and at the animal-human interphase;

(xi) routine monitoring in selected sites for outbreak investigations purposes.

3. Integration of foodborne disease surveillance into IDSR

3.1 Integrated Disease Surveillance and Response

The Integrated Diseases Surveillance and Response (IDSR) system promotes rational use of resources by integrating and streamlining ordinary surveillance activities. Many programmes still rely on this system which has been successfully implemented and have enabled programmes to generate reliable data to inform health action. Under this system, the district level which is the first level in the health system, remains the focus in integrating surveillance functions. The system is not a vertical programme but involves more robust surveillance systems linked to laboratory support in order to enhance efficiency and share resources for core surveillance and support functions. Some of the relevant diseases under the IDS strategy include cholera, diarrhoea with blood (*Shigella),* diarrhoea among under-five children, diarrhoea with dehydration and typhoid fever.

Since the IHR (2005) has a broader scope and applies to "any emergency with international repercussions on health, including outbreaks of emerging and re-emerging epidemic-prone diseases, outbreaks of foodborne diseases, natural disasters and chemical or radionuclear events, whether accidental or caused deliberately", it is of vital importance to extend the list of priority diseases to include at least foodborne diseases of bacterial aetiology. These, together with their signs and symptoms are listed in Annex 1.

3.2 Implementation of national surveillance of laboratory isolates (laboratory-based foodborne disease surveillance)

The ability to successfully implement and sustain foodborne surveillance requires excellent microbiological and chemical or biochemical laboratory facilities to test clinical, food and other environmental samples. Thus, the principal aetiological agents can be detected in time, for example, microbiology laboratories could identify prevalent serotypes or subtypes together with their antibiotic sensitivity patterns. It provides information on pathogen trends at national and laboratory levels that can be analysed using various parameters such as age, sex, location. Laboratory capability for detection of chemical and biological residues including pesticides, heavy metals, mycotoxins, anabolic agents, veterinary drugs, additives and other contaminants is also required.

Such laboratories must participate actively in capacity building activities aimed at standardization of techniques and procedures and development of new diagnostic techniques. Laboratory management should ensure that laboratory personnel operate under appropriate safety requirements to safeguard their health. Apart from their routine responsibilities, laboratories must be involved in outbreak investigation by testing clinical, food and environmental samples. The system examines a large number of foodborne illnesses linked to specific aetiological agents (for example, *Salmonella*,

Shigella, *Vibrio sp.*, *Campylobacter sp*. and *Escherichia coli*) which can be identified and serotyped to help detect outbreaks.

3.3 Methodology for sample collection and transportation

Specimens must be collected in prescribed containers, labelled appropriately and delivered to the laboratory, as quickly as possible, under approved conditions.

A completed form must accompany each specimen upon submission. The required information include:

(i) date, time and place of collection;
(ii) description of sample;
(iii) source of sample. If human, provide name, age and sex;
(iv) type of specimen;
(v) analysis required;
(vi) name and signature of collector.

A. Faecal specimens

Faecal specimens should be collected in the early stages of onset of symptoms including nausea, vomiting, abdominal cramps and **diarrhoea**, when pathogens are present in highest numbers and preferably before treatment with antibiotics is started. Ideally, specimen should be collected in the morning, such that they can be delivered to the laboratory before noon and processed during the day. A fresh faecal sample is preferred to a rectal swab but this may be acceptable if faecal sample cannot be obtained immediately. Specimens must be sealed once collected and delivered to the laboratory immediately. In case of delay of more than two hours, the specimen must be transferred into a container with transport medium (Cary-Blair or Amies) using two or three swabs. Pathogens may survive in such media for up to one week but refrigeration is recommended.

B. Food specimens

Leftover foods and other food samples should be collected aseptically and placed in sterile jars or sterile plastic bags. Perishable foods that are not frozen at the time of collection should be chilled rapidly at 4^{o}C and maintained at that temperature until examined. The laboratory must be consulted on proper sample collection and must be notified when submitting samples for testing. Do not freeze the samples.

Meat, poultry and dairy products should be refrigerated. Collect five random samples of at least 500g each and place in a clean plastic bag. For already packaged products, five random packages are acceptable. Place on ice and submit to the laboratory within 24 hours.

Similarly, for fruits, collect five random samples of at least 500g and place in clean plastic bags. Transport them on ice to the laboratory within 24 hours.

Canned products or shelf-stable products may be transported to the laboratory after collecting five random samples of at least 500g into clean plastic bags.

C. Water samples

For bottled water, collect five random samples and send to the laboratory on ice. 100 ml of other water samples should be collected in a sterile container (available upon request in laboratories). Containers must not be filled to the brim, to avoid spillage and contamination. Screw on, cover tightly, place in bags with zips and seal. Place in cooler with ice and submit to the laboratory.

4. Conditions required for developing and sustaining an effective foodborne disease surveillance system

The following conditions must be met in order to develop and sustain effective foodborne disease surveillance:

(i) **knowledge and awareness** of the existence of diseases associated with food contamination;

(ii) **country ownership and political commitment** since the fundamental responsibility for the FBD surveillance system lies with the relevant national authority, notably in the health sector. The health sector should commit itself to establishing a FBD surveillance system as part of its food safety programme;

(iii) **existence of a functional and organized epidemiological surveillance structure within health services into which FBD surveillance is integrated.** It is neither necessary nor desirable to create a parallel structure. FBD surveillance should be established as part of already existing Integrated Disease Surveillance and Response (IDSR) system;

(iv) **collaboration and coordination** is **necessary** since food contamination is a farm-to-fork occurrence and must be addressed against that backdrop. It is a shared responsibility involving, among others, the health, public, agriculture, veterinary and animal and ports health sectors;

(v) **availability of competent laboratory services with capacity for identification and typing of pathogens including standardization of methods, technical procedures and materials** that will be used in epidemiological and laboratory-based foodborne disease surveillance is essential;

(vi) **information sharing, dissemination and reporting,** including the application of risk management, is paramount.

5. Epidemiological surveillance

Epidemiological surveillance of FBD involves data collection, processing, analysis, interpretation and dissemination of information.

5.1 Data collection

Only relevant data should be collected, for instance, specific syndromes such as diarrhoea and vomiting and particular infectious agents such as *Salmonella, Campylobacter* and *Shigella.* This must be defined using standardized criteria to ensure that data collected is interpreted using uniform criteria by all personnel at all times, places and levels.

The national, regional and district levels are the three levels of care and will have the following responsibilities:

(i) District level

The district level is responsible for collecting, processing, interpreting and analysing data. District hospitals can also receive samples from health centres, provide culture and sensitivity tests and store pathogens for further testing by reference laboratories. They should be able to observe unusual trends and implement preventive and remedial measures and undertake impact assessments. District personnel should perform all necessary actions within their technical capabilities and forward all relevant data to the regional level for consolidation, analysis and further action.

Doctors and nurses at all levels of healthcare, including health centres and health posts, must be sensitized on the need to collect samples from all suspected cases and test them in the laboratory before antibiotic therapy is started. Similarly, the laboratories should be trained on how to carry out basic culture and sensitivity tests and store isolates for further analysis at regional or national levels.

The district team should have basic training in foodborne disease surveillance so as to be able to implement prevention and control actions timely and propose a basis for the programming and evaluation of the FBD surveillance system.

(ii) Regional level

The regional level is intermediate between the district and national or central levels. At this level, data is collected, compiled, analysed and assessed and proposals made for appropriate administrative measures to be taken at the district level.

This level will be able to conduct typing and other advanced tests to identify foodborne pathogens in order to determine their relatedness.

(iii) National or central level

This level defines policies and advises the other levels on epidemiological surveillance. Information received at this level is compiled, processed and analysed in order to identify the status of foodborne diseases in the country. The outcomes of such assessment will inform policy. The epidemiology unit will be responsible for reporting FBD to relevant stakeholders and international agencies. If a case report enters the system at regional or central level, the district level should be informed as well.

5.2 Data processing

Data will be tabulated, compiled and integrated at this stage.

5.3 Analysis and interpretation of data

Data on foodborne diseases and their trends will be compared with national, regional and international data.

5.4 Dissemination of information

Information obtained will be published and disseminated to the general public, the private sector and all relevant stakeholders. This will be the responsibility of the national team.

5.5 Reporting

Effective reporting involves timely, continuous and regular flow of information on the occurrence of cases of foodborne diseases in particular, to the foodborne diseases surveillance system for action.

Cases of foodborne diseases outbreaks should be reported immediately to the district or regional hospital authority for timely and appropriate action as follows:

(a) upon receipt of information on suspected outbreak of foodborne disease, the relevant authority at the regional level activates the investigation team and informs the national epidemiologist and microbiologist;

(b) a preliminary report should be submitted to the Director of Health Services or Director of Public Health and the epidemiology unit within a stipulated time, for example, 24 hours following receipt of the report. ***Source of information includes hospitals, pharmacies, laboratories, patients, news media and community leaders;***

(c) the investigation team referred to in Section 6.1.2 will be activated to:

  (i) assemble investigation tools;

  (ii) collect data;

  (iii) collect and examine specimens;

  (iv) examine exposed persons;

  (v) review laboratory and other findings;

  (vi) implement control measures;

  (vii) prepare a report comprising, for instance, an introduction, case definition, field and laboratory methods, results or findings, discussions, control and preventive measures, conclusions and recommendations.

Facilitation of resource allocation and provision of guidance will be the responsibility of the regional level.

6. Investigation of outbreaks

The following 10 measures should be considered when investigating a suspected or confirmed case of FBD outbreak:[11]

(i) Prepare for field work.

Investigators should be familiar with the disease and develop a plan of action which includes lists of supplies, assignment of tasks among team members and administrative and travel arrangements.

[11] http://infectiousdiseases.about.com/od/basics/a/outbreaks.htm (Accessed 10 October 2011).

(ii) Establish the existence of an outbreak.

An outbreak is defined as the occurrence of more cases of disease than normally expected within a specific place or group of people over a given period of time. To establish that an outbreak is real (that is, more cases than expected), an investigator can examine health department surveillance records, hospital records, and other disease-related registers. If this information is unavailable, other options include interviews with doctors or people within the community.

(iii) Verify the diagnosis.

An investigator will need to review clinical findings (Annex 1) and laboratory tests in order to verify the diagnosis, as well as determine the specific nature of the disease. For example, in the case of infectious disease outbreaks, additional laboratory tests may be necessary to determine the specific microbe strain causing the outbreak.

(iv) Define and identify cases.

The investigator is responsible for case definition, which usually includes information about the disease, characteristics of the patients, information about the location and a specific time range. Thus, investigators can eliminate an excess of false-positives. To identify cases, it is important to entertain open communication with personnel of healthcare facilities and other relevant structures or people who will be on the radar for observing potential cases.

(v) Describe and orient data in terms of time, place, and person.

An investigator will understand more about the outbreak by compiling a comprehensive description of its trends over time, place, and persons (age, race, sex, etc.) affected by the disease (Annex 2).

(vi) Develop hypotheses.

The hypothesis is an educated guess about the source of the disease, mode of transmission, and/or exposures causing the disease, based on available information.

(vii) Evaluate hypotheses.

The credibility of the hypotheses can be evaluated by analysing facts or processing figures to obtain actual statistics, based on available information.

(viii) Fine tune hypotheses and carry out additional studies

Additional studies may include laboratory tests or environmental studies, among other methods of evaluation.

(ix) Implement control and prevention measures.

Control and prevention methods usually target the source of the disease, but may also involve interrupting transmission or limiting exposure.

(x) Communicate findings.

Findings of the investigation should be communicated to local health authorities who are responsible for implementing control measures. In addition, a written report provides a legal record of the findings and contributes to public health awareness. An outbreak report outline is presented in Annex 3. Control measures can be implemented using the tools provided in Annex 4.

The team investigating the report of a suspected foodborne disease outbreak will complete the *Suspected Foodborne Illness Case History Form* for submission to the Epidemiology Unit. Forms for outbreak investigation and reporting are found in Annex 2.

A number of task teams are required for that purpose.

6.1 Task teams

The following task teams are required for effective epidemiological surveillance of foodborne diseases:

National foodborne disease surveillance committee

The national foodborne diseases committee will oversee and support the implementation of all activities towards a successful foodborne disease surveillance system. It shall comprise of the members of the IDSR committee and relevant food safety officials including:

(i) the national epidemiologist (team leader);
(ii) the chief public health inspector or environmental health officer;
(iii) the director of the central medical laboratory;
(iv) the director of food safety;
(v) the chief veterinary officer or director of animal health;
(vi) representatives of ministries in charge of food safety, agriculture and tourism;
(vii) the representative of medical and dental associations;
(viii) the representatives of the food and tourism industries;
(ix) the representative of consumer associations.

Investigation teams

There will be two investigation teams.

(a) National FBD surveillance team

This team will ensure the standardization of methods, including processes during an outbreak investigation at the regional level, provide technical support during outbreaks at regional and national levels submit a report on all investigations to the Director of Medical Services or Public Health and to the Epidemiology Unit.

The team members will include:

(i) the national epidemiologist (team leader);

(ii) a bio-statistician;

(iii) the chief public health inspector or environmental health officer;

(iv) the chief medical technologist;

(v) the health promotion technical adviser;

(vi) the Director of Food Safety;

(vii) the chief veterinary officer or Director of Animal Health.

(b) Rapid response team

The regional outbreak team shall be responsible for response to the FBD outbreaks in the region, ensures regional investigation and reporting of outbreaks to the Epidemiology Unit that reports to the Director of Public Health and/or Director of Health Services and ensure ongoing surveillance at the regional level.

The Team can be composed of:

(i) an epidemiologist of medical officer;

(ii) a statistician;

(iii) a public or community health nurse;

(iv) a public health inspector;

(v) a health educator;

(vi) a food safety inspector with support from the central medical laboratory and other laboratories;

(vii) food producers and processors;

(viii) consumer groups.

7 Outbreak response

The purpose of integrated disease surveillance and response is to generate data for public health action. When an outbreak, acute public health event or condition is detected, an investigation is conducted to determine the cause of the problem. The findings of the investigation should guide the selection of appropriate response. Most foodborne disease prevention and control programmess promote recommended response actions such as administering antibiotic and oral rehydration salts, as appropriate. Successful responses are carried out with community involvement and often include a community education and behavior change component. Regardless of the specific recommended response, the role of the district in selecting and implementing a recommended response is essential for safeguarding the health and wellbeing of communities in the district.

Pursuant to I IHR (2005), districts are also involved in responding to zoonotic, chemical, radio-nuclear, as well as other unknown infectious events when they are detected. This section describes the necessary steps for conducting a public health response and provides general directions for immediate response actions to the leading causes of foodborne

illness. This Manual can be used alongside other WHO guidelines including those for responding to chemical and radionuclear events. This section is based on IDSR 2010 guidelines. Outbreak response tools are listed in Annex 2 A – C of this Manual.

7.1 Convening of the district public health emergency management committee

Once an outbreak or event is confirmed, the District Health Management Team (DHMT) convenes the public health epidemic management committee to assess and implement response. The following steps should to be followed:

(a) the outbreak or event must be reported to the next level even if it is likely that this has already been done and investigation coordination is ongoing;
(b) communication with the response coordination level must be continuous;
(c) funds should be released for outbreak or event response;
(d) nearby districts must be informed of the outbreak. If they report a similar outbreak, coordinate response efforts jointly;
(e) individuals or teams must be assigned clearly stated responsibilities for specific response activities;
(f) training, alongside adequate relevant supplies for the district response team and health facility staff must be provided;
(g) The national level and the district must together determine whether the event is a potential public health event of international concern (PHEIC), using the decision instrument;
(h) existing resources, as defined in the preparedness plan, must be reviewed for adequacy and to determine required additional resources, notably human resources, required funds for response activities, emergency stocks or required drugs and other medical supplies, laboratory support for confirmation of pathogens responsible for the epidemic and logistical support.

In the case where the district does not have the capacity to collect, package and ship the specimen, the reference laboratory should be contacted for assistance. Where supplies are not available locally, the provincial or central levels should be contacted to request alternate supplies and identify practical low-cost substitutes.

7.2. Selection of appropriate public health response

It is essential to review investigation results and data, as well as their interpretation, in order to select appropriate response activities to contain the confirmed outbreak or public health problem. Reference may be made to Section 9 of IDSR 2010 Guidelines and national disease-specific guidelines to select response activities, for instance:

(a) proven measures to prevent avoidable deaths or disabilities;
(b) joint activities to immediately control the outbreak in the short term and reduce the risk of ongoing transmission in the long term through prevention activities;
(c) involvement of communities, health care facilities and district personnel.

Some outbreaks or public health problems or events may require:

(a) provision of relevant chemoprophylaxis and immunization of health workers;
(b) improvement of access to clean water;
(c) improvement of safe of human waste disposal;
(d) improved food handling practices.

7.3 Mobilization of response teams for immediate action

Rapid response teams should be identified in advance during preparedness activities. Teams should be mobilized, ensuring that their composition reflects the response technical requirements. Refer to Section 5 of the IDSR 2010 Guidelines for recommendations on the composition of rapid response teams and their roles and responsibilities.

7.4 Implementation of response activities

Response entails taking operational measures to ensure that actions are carried out as planned. Regardless of the specific causes of the outbreak or event, the success of response relies on general factors such as case management, provision of supplies and trained health staff. The selected general factors for responding to outbreaks or public health events include:

Strengthening of case management and control measures

Measures should be taken to ensure improved clinical practices in the district. A review of the recommendations on treatment of cases as well as preparation of health workers to provide response during an outbreak is required for such response to be successful. In addition, a review of each health facility must be conducted to ensure that the clinical staff knows and uses recommended protocols for case management of outbreak diseases and ensure that clinicians receive laboratory results to confirm the aetiology. During large outbreaks, the medical officer at each health facility must identify an area that can be used to accommodate a large number of patients. Standard operating procedures, including infection control guidelines, must be made available and infection control and risk mitigation measures implemented for highly infectious diseases.

Updating of health staff skills

Health staff must receive information and updates on the outbreak or event including case definition, case management procedures, reporting process and required data elements. It is essential that members of the rapid response team are aware of and have access to any required personal protection equipment and all relevant infection control practices, depending on the disease.

To update the health staff and rapid response team:

(a) provide health workers taking part in the response with clear and concise directions;
(b) select topics for orientation or training. Emphasize case management according to disease-specific recommendations. Select other training topics depending on the risk of exposure to the specific public health hazard, for example:

   (i) enhancing standard precautions (use of clean water, handwashing and safe sharps disposal);
   (ii) barrier nursing and use of protective clothing;
   (iii) isolation precautions;
   (iv) treatment protocols such as delivering oral rehydration salts (ORS) and using intravenous fluids;
   (v) disinfecting surfaces, clothing and equipment and disposing of bodies safely.

(c) orient or reorient the district epidemic management committee, the rapid response team and other health and non-health personnel on outbreak management, depending

on the prevailing epidemic. In an emergency situation, there is often little time for formal training, where the need to provide on-the-job training as necessary. Ensure that there is an opportunity for the training of physician or nurses and ensuring that they use the updated or new skills. Monitoring participants' performance and reviewing their skills is key to the effectiveness of response.

Enhancing surveillance during response

During response to an outbreak, health staff at all health facilities should exercise vigilance during surveillance of a disease or condition. For instance, members of response teams and the health staff in affected facilities should:

(a) identify a greater number of persons affected by the disease and refer them to the health facility or treatment centre or, where necessary, quarantine households and manage patients;
(b) ensure timely exchange of laboratory information with the team;
(c) update the line list, undertake data analysis by time (epi-curve), person (age and sex) and place (mapping of cases);
(d) monitor effectiveness of the outbreak or response activity;
(e) report daily at the beginning of the epidemic. Once the epidemic matures, the committee can adopt a different reporting schedule;
(f) actively trace and follow up contacts.

Conduct of community information, education and communication activities

Effective risk communication is an essential element in the management of public health events. When the public is at risk of a real or potential health threat, treatment options may be limited. Direct interventions may take time to organize and resources insufficient. Therefore, communicating advice and guidance may be the most important public health tool for managing risk.

The public should be constantly informed in order to appease their fear and encourage cooperation with the outbreak response team. Community education messages should be developed and information provided on how to recognize the illness, prevent transmission and when to seek treatment. Communication activities should begin in the community as soon as an epidemic or public health problem is identified.

(a) Decide what to communicate by referring to disease-specific recommendations in Section 9 of the IDSR 2010 Guidelines and Annexes 1 and 4 of this Manual. Communication should focus on:

(i) the signs and symptoms of the disease;
(ii) how to treat the disease at home, where home treatment is recommended, including the preparation of disinfectant solutions;
(iii) prevention behaviours that are feasible and can prevent disease transmission;
(iv) when to visit the health facility for assessment and treatment;
(v) using the Five Keys to Safer Food messages in local terminology, while ensuring they are culturally sensitive and acceptable, clear, concise and conform to local traditions;
(vi) addressing local beliefs about the disease.

Sample community education messages are listed in Annex 4.

(b) select appropriate communication mediums in the health district including mass media (radio, television, newspapers), gatherings (involving health personnel, community, religious, opinion and political leaders), educational and communication materials (posters, fliers, etc.), multi-media presentations (movies,, visual or oral presentations) market places, health centres, schools, various community groups, professional organizations and religious centres;
(c) deliver health education messages to community groups and service organizations and request them to disseminate the said massages at their meetings;
(d) deliver health education messages to trusted and respected community leaders and require them to transmit the said messages to the community;
(e) designate a community liaison officer, focal point, or health worker to serve as spokesperson before the media, to which he is introduced as soon as the outbreak is identified. All information concerning the outbreak or event must be communicated through the spokesperson to ensure that the community receives clear and concise information.

(f) meet regularly with the community spokesperson to provide:

(i) frequent and up-to-date information about the outbreak and response activities;
(ii) clear and simple health messages that the media will use, as provided;
(iii) clear instructions to communicate to the media only information and health education messages issued by the epidemic response committee.

The Five Keys to Safer Food, used for food hygiene education, are presented in Annex 4 of this Manual.

Improvement of access to safe water

Drinking water containers can be a vehicle for outbreaks including cholera, typhoid, S*higella* and hepatitis A and E. Ensure that the community receives adequate supply of safe water for drinking and other uses. Water needs are much higher during an outbreak, in particular, of diarrhoeal diseases and it should range between 20-1- litres per day.[12]

Safe sources of drinking water include: piped chlorinated water, chlorination at point-of-use to ensure safe drinking water, protected water sources (for example, closed wells with a cover, rain water collected in a clean container) and boiled water from any source.

If no local safe water sources are available during an emergency, water supply may need to be brought from outside. To make sure that families have ***safe drinking water at home*** (even if the source is safe) provide:

(a) community education on how to keep home drinking water safe;
(b) containers that prevent contamination of water. For example, provide containers with narrow mouths so that people cannot contaminate the water by putting their hands and cups or vessels for collecting water into the container;
(c) Sites for disposal of wastes including faeces should be situated at least 30 metres from sources of water.

[12] Refugee Health: an Approach to Emergency Situations, Medecins sans Frontieres, 1997 MacMillan.

Ensure safe disposal of infectious waste

To make sure that human excreta are disposed of safely and to avoid secondary infections due to contact with contaminated substances:

(a) assign teams to inspect human waste disposal sites. Safe practices include disposing of faeces in a latrine or burying them in the ground more than 10 metres from water supply;
(b) in case unsafe practices are identified, provide the community information about safe wastes disposal. With the cooperation of community members, construct latrines that suit local conditions;
(c) conduct effective community education on sanitation practices.

Improvement of food handling practices

Ensure that households, restaurants, food vending establishments and factories handle food safely. Refer to nationally established standards and control measures for the proper handling and processing of food. To ensure food hygiene:

(a) educate the community on general and food industry hygiene practices;
(b) visit restaurants, food vendors, food packaging factories, etc., to inspect food handling practices. Identify safe practices such as handwashing, cleanliness and adherence to national standards;
(c) close restaurants, vending settings or factories where inspection attests to unsafe food handling practices;
(d) strengthen national control measures as necessary.

Reduction of exposure to infectious or environmental hazards

In the case of an outbreak or event, take action to reduce exposure to hazards or factors contributing to the outbreak or event. This may involve chemical, physical or biological agents. Technical requirements for reducing exposure will be determined by national policy and through collaboration with persons who have experience in these areas. For example, chemical contaminants will require coordination with multiple ministries and partners. Community education and behaviour change interventions can be supportive in engaging the community to adopt behaviours that will limit exposure to dangerous chemicals levels and other hazards.

Ensuring appropriate and adequate logistics and supplies

Throughout the outbreak, monitor the effectiveness of the logistics system and delivery of essential supplies and materials. Carry out logistical planning to ensure efficient transportation. Monitor the reliability of communication between teams during the outbreak and if additional equipment is needed (for instance, additional airtime for mobile phones), take action to provide teams what they need to implement response actions.

Monitoring outbreak response is key to control. The monitoring results will be an important element of the report submitted to the supervisory levels and community leaders and for future advocacy. For instance, ensure the continuing monitoring of:

(a) disease trends in order to assess the effectiveness of response measures, scope of the epidemic and risk factors;
(b) effectiveness of response, notably case fatality rate, incidence, etc.;

(c) implementation of response, that is, programme coverage, meetings of the epidemic management committee etc.;
(d) availability and adequate use of resources, supplies and equipment.

7.5 Provide regular situation reports on the outbreak or event

Prepare periodic reports on outbreak response activities (Annex 3). Provide information developed by the Public Health Emergency Medical Countermeasures (PHEMC) to the affected communities and health facilities.

In the situation updates, provide information including:

(a) details on response activities. Include dates, places, and individuals involved in each activity. Also include the "Epi" curve, spot map, table of analyses, and the line list of cases;
(b) any developments since the last report;
(c) recommended changes to improve epidemic response in the future such as an immunization strategy to enhance the effectiveness of immunization or the transportion processes of laboratory specimens to ensure that they reach the reference laboratory promptly and in good condition.

The situation reports will be an important reference for evaluating response and developing a final report. A suggested format of the report is provided in Annex 3.

7.6 Documenting the response

At the end of response activities, the district health management team should:

(a) compile all relevant documents including minutes, activity reports, process descriptions, epidemic reports, evaluation reports, etc.;
(b) prepare a coversheet listing of all the above documents.

This will serve as an essential source of data for evaluating the response.

8. Control of foodborne disease outbreaks

A significant reduction in the number of cases of foodborne diseases in the Region would be achieved by focusing on food preparation. Indeed, foodborne diseases caused by viral infection, *Clostridium perfringens*, staphylococci and *Bacillus* toxins can only be controlled through action at that level. While control in the food production sector can contribute to a decline in *Campylobacter* and *Salmonella* infections, the greatest reductions of such infections, as of present, could also be achieved through actions in the formal and informal catering sectors and in households. Hence, efforts should be concentrated on these sectors. The tools used for the control of foodborne diseases are presented in Annex 4.

Wider use of the Hazard Analysis and Critical Control Points (HACCP) principles in the food industry should be a major component of any foodborne disease control strategy. The HACCP system, which is science-based and systematic, identifies specific hazards and control measures to ensure the safety of food. HACCP is a tool used to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing. Any HACCP system is capable of accommodating change such as advances in equipment design, processing procedures or technological developments. HACCP can be applied throughout the food chain from primary production to final

consumption and its implementation should be guided by scientific evidence of risks to human health. In addition to enhancing food safety, implementation of HACCP can provide other significant benefits. Moreover, the application of HACCP systems can help inspection by regulatory authorities and promote international trade by increasing confidence in food safety.

The successful application of the formal HACCP system requires the full commitment and involvement of management and the work force. It also requires a multidisciplinary approach that would include, as appropriate, expertise in agronomy, veterinary health, production, microbiology, medicine, public health, food technology, environmental health, chemistry and engineering, according to the specific study. HACCP comprises seven principles, namely: conduct of a hazard analysis, determination of critical control points (CCP), establishment of critical limit(s), establishment of a system to monitor control of CCP, determination of corrective actions where monitoring indicates that a particular CCP is not being controlled, establishment of verification procedures to confirm the proper functioning of HACCP and establishment of documentation concerning all procedures and records appropriate to these principles and their application.

The HACCP system should be accompanied by an evidence-based **communication strategy**, to raise awareness amongst all food handlers. This should be the principal method for reducing risks in the catering industry. Home action also requires a **communications drive**. **Training, education and user-friendly** guidance are key requirements. The healthy settings approach, based on healthy food markets, healthy kitchens, healthy slaughter houses and butcheries is a useful asset. Countries should therefore be supported in the establishment of effective countrywide networks of food safety stakeholders from across the various sectors of the food industry, in partnership with other organizations.

8.1 Improving food safety in food establishments and households and during production, storage, distribution, handling and preparation

The catering and hospitality sector

The catering and hospitality sector is widely known to contribute to most foodborne disease outbreaks but their contribution to sporadic cases is not well documented. The shift from consumption of home-prepared food to a new tradition of eating out of home could impact the overall contribution of this sector to the burden of foodborne diseases.

In addition to organisms contained in ingredients, food handlers may introduce *Staphylococcus aureus*, *Salmonella*, *Shigella* and pathogenic *Escherichia coli* into foods. Thus, effective control in this sector would potentially reduce all sorts of foodborne diseases.

The preferred approach for controlling hazards in this sector is the Hazard Analysis and Critical Control Points (HACCP). However there are a number of barriers to the formal HACCP system, particularly amongst smaller and less developed enterprises. The system has therefore been adapted for use by small businesses.[13]

[13] WHO, Strategies for Implementation of HACCP in Small and/or Less Developed Businesses: Report of WHO Consultation in collaboration with the Ministry of Health, Welfare and Sports, The Netherlands, The Hague, 16-19 June 1999.

Improvements to food safety in the catering business will depend on bringing about change in terms of practices and attitudes. Measures might include guidance of caterers, support for enforcement of regulations through strengthening of national food control systems and incentives to compliance with regulations. Management systems and commitment to food safety are key to ensuring the safety of catering foods. A number of documents could be used to facilitate the process, for instance, CAC/GL-22-Rev. 1 1999.[14]

Table 1 summarizes factors that could influence the safety of food, both at home and in catering facilities. It shows that using the same tools for cutting raw and cooked food, preparing food well in advance of consumption, road-side food sale, lack of knowledge of food and water as routes for the transmission of foodborne pathogens, excessive handling of food after cooking, exposure of food to flies, handling of food at ground level and washing crockery with dirty water are risk factors for food contamination. A number of best practices that prevent and reduce food contamination have been documented, for instance, cooking and sale of food in enclosed areas, knowledge on diarrhoea, sale of food in the container used for cooking, reheating of food before sale, serving food with spoon, fork etc. and use of soap to wash crockery. Certain practices including cooking at a minimum of 60◦C, refrigeration at 0◦C or below and fermentation could ensure food safety. Messages based on these findings will form the communication strategy for education of both producers and consumers.

The main purpose of foodborne disease prevention measures should be to ensure that businesses adopt effective food safety management systems, both the formal and informal sectors of the food trade. The following measures are proposed:

(a) awareness raising and understanding of effective food safety management systems targeting small and less developed businesses;

(b) a number of initiatives to support implementation of effective food safety management systems in catering businesses including;

(c) development of a model guidance tailored to different types and sizes of businesses, possibly based on good hygiene practices (GHP);

(d) pilot schemes to test the effectiveness of specific approaches to HACCP implementation, including training courses and local resource and counseling centres;

(e) promotion of existing good HACCP practices, particularly in small businesses, using existing WHO manuals;

(f) initiatives should take into account local and traditional catering needs;

(g) effective enforcement;

(h) agreement of timeframes for implementation of HACCP-related schemes in food premises.

[14] Codex Alimentarius Commission revised regional guidelines for design of control measures for street-vended foods in Africa CAC/GL-22-Rev.1 1999.

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Table 1: Summary of factors that could influence food contamination Adapted from Mensah et al 2002.[15]

Hazards
Sale of food in schools
Sale of food at the road side
Not associating diarrhoea with dirty food
Not associating dirty water with diarrhoea
Use of same tools for cutting raw and cooked food
Scooping of food into large polythene bags after cooking
Scooping of food into a bowl and keeping in a sieve
Food exposed to flies
Handling of food at ground level
Use of dirty water for washing crockery
Practices that reduce food contamination
Cooking of food in a chop-bar
Sale of food at chop-bar
Knowledge of diarrhoea as passage of three or more loose stools in a day
Knowledge of diarrhoea as passage of watery or liquid stool
Selling of food from container used for cooking
Food reheated before sale
Serving of food with spoon or fork
Use of soapy water to wash crockery

Food Safety in households

About 11% of overall foodborne outbreaks are associated with food prepared in households for extended family or community events. They are often associated with breeches in personal and food hygiene.

Effective controls at household level can reduce all sorts of foodborne illnesses. This includes infections due to food contaminated with *Salmonella, Campylobacter*, pathogenic *E coli*, *Staphylococcus aureus* and illnesses due to toxins formed by *Clostridium perfringens* or *Bacillus*. There is a potential for reducing cross-contamination but this will require fundamental change in attitudes and habits and considerable vigilance in what is largely an informal setting. A frequently asked question is whether it is possible, in domestic settings, to avoid cross-contamination with pathogens such as *E coli* 0157 and *Campylobacte*r that have low infectious doses, particularly when raw products are heavily contaminated. This is nevertheless possible if the food hygiene messages developed in the WHO Five Keys to Safer Food are observed (Annex 4).

[15] Patience Mensah, et al. Street foods from Accra, Ghana: How safe? Bulletin of the World health Organization 2002;80(7):546-54.

High levels of contamination associated with complementary foods, as well as the increased burden of diarrhoeal diseases associated with such foods calls for concerted efforts to improve food hygiene in households in order to break the cycle of diarrhoea and malnutrition.

The main activities to that end would include:

(a) a high-profile media campaign to stimulate public interest and deliver key messages based on the WHO Five Keys to Safer Food (Annex 4);

(b) development and implementation of training for key professionals (nurses, health visitors, midwives, teachers, social workers);

(c) development of effective communication programmes for potentially vulnerable groups such as elderly persons;

(d) negotiating with the ministries in charge of education to introduce food hygiene in school curricula as part of a safe and healthy eating package;

(e) continued promotion of breastfeeding;

(f) continued promotion of improved hygiene in the preparation of complementary foods for young children and cleaning of tools, utensils and feeding cups or bowls.

Improving food production and sale

The responsibility of ensuring food safety does not concern food processors only, since events occurring even before the crop is planted are equally important. The location and history of the land on which food is grown are the factors to be considered initially. Fields that have been grazed by livestock and wild animals often harbour enteric pathogens. Certain bacteria, for example, *Salmonella* and *Listeria monocytogenes* could survive for prolonged periods in sewage sludge commonly applied to agricultural soil. Unhygienic handling of fresh produce at markets exposes them to more contamination. Handling at ground level also exposes food to dust and mud. Due to irregular supply of water, produce are not washed with sufficient quantities of clean water and are often not sanitized.

There are problems associated with the packaging and display of fresh produce. For instance, lack of refrigeration, where products are displayed at high ambient temperatures that permit bacteria growth. Also, inappropriate drying and storage of cereals and pulses increase the risk of aflatoxicosis.

(i) Poultry and poultry products

A number of studies have detected *Campylobacter*, *Shigella*, *Salmonella* and *E coli* from both live poultry and poultry products. Imported products are also contaminated. Poultry and poultry products are sold in open markets at ambient temperature that is conducive to the multiplication of pathogenic bacteria to infectious levels. Activities in this regard will focus on:

locally produced and imported products

(a) regular microbiological monitoring to determine the routes of transmission of salmonella and campylobacter to poultry farms and the development of effective control methods;

(b) harmonization of import and export procedures of poultry and poultry products to ensure conformity to international standards and monitor implementation thereof;
(c) evaluation of slaughter processes in order to develop practical guidance for the mitigation of cross-contamination.

Sale

(a) key activities will focus on the education of vendors as concerns:
(b) hazards associated with handling of poultry at ambient temperature;
(c) the importance of refrigeration;
(d) hygienic handling of poultry during sale.

(ii) Meat and meat products

Several stakeholders are involved in slaughter house antemortem and postmortem inspections at country level. It is essential to adopt a multisectoral approach to such activities that must be carried out by qualified veterinary officers.

The main initiatives would concern:

(a) the passing and enforcement of proper laws and regulations;
(b) healthy slaughter house initiatives;
(c) hygienic slaughter;
(d) improved antemortem inspection;
(e) postmortem inspection improvement measures;
(f) implementation of HACCP in slaughter houses;
(g) guidance on hygienic transportation of meat and meat products;
(h) hygienic sale as emphasized under poultry.

(iii) Vegetables and other foodstuffs

The following activities could be undertaken to improve the safety of vegetables and other foodstuffs:

(a) guidance on the type of water that is suitable for production in order to avoid contamination;
(b) guidance on manure use;
(c) guidance on packaging and transportation of produce to markets (use easily washed and disinfected trays;
(d) guidance on product display at markets (sale of food at ground level prohibited).

(iv) Cereals and pulses

Unlike bacterial toxins that are macromolecular proteins that produce symptoms almost immediately, mycotoxins are low molecular weight compounds that do not produce immediate symptoms. They are toxic secondary metabolites of fungal origin which; when ingested, inhaled or absorbed through the skin, cause lowered performance, sickness or death in humans and animals. Five agriculturally important mycotoxins are currently known (aflatoxins, fumonisins, ochratoxin A, zearalenone and deoxynivanelol). Of these,

aflatoxin has received greater attention in scientific literature. Maize and groundnuts have been found to be excellent substrates for aflatoxin contamination, while fumonisins are widely distributed in maize. Other food products for which mycotoxin contamination has been reported include dried yam chips, tiger nut, melon seeds and stored herbal plants.

Mycotoxin contamination is favoured by stress factors during plant growth, late harvesting of crops, high ambient humidity that prevents thorough drying, harmful storage practices and lack of awareness of risks associated with fungal contaminants. The tropical climate in some parts of Africa with all-year-round high ambient temperature and relative humidity provide optimal conditions for growth of toxigenic moulds. This is compounded by poor processing, storage and transportation facilities and lack of skilled manpower.

Control of mycotoxins has both economic and health gains in Africa, since it generates international trade and long-term health benefits. Some of the potential control measures include:[16]

(a) public awareness on the health and economic implications of mycotoxin food contaminations;

(b) adoption of good agronomic practices to limit factors predetermining mycotoxin contaminations, in particularly pre-harvest insect damage of crop, discussed earlier;

(c) rapid drying of agricultural produce and their storage at low moisture contents and low relative humidity. Drying harvested grains (0 to < 15.5% moisture content) within two days will reduce the risk of fungi growth and consequent aflatoxin production. The practice by African farmers of spreading harvests on the ground, rock surfaces and nylon under the sun to dry requires longer drying time, even with frequent manual stirring. Solar driers are available and would be useful to farmers, but capital investment is a hindrance to their use by poor farmers;

(d) physical separation of damaged and infected grains, identified by coloration, from apparent healthy grains, as well as the removal of damaged cobs and grains has been reported to reduce mycotoxin contamination. This method may be feasible only for small amounts at the household level;

(e) clearing of stores before loading a new harvest and destruction of heavily damaged produce has been reported to correlate with reduced aflatoxin contamination levels in the new stored produce;

(f) smoking is also an efficient method of protecting crop produce from fungi infestation and it is comparable to a chemical known as actellics (primiphosmethyl) in protecting the grains against insect infestation. This practice is quite common in rural areas and it is reported to have reduced aflatoxins levels in farmers' stores in Nigeria.

8.2 Control measures

It is essential to institute minimum control measures, pending the results of the outbreak investigation and laboratory data to confirm the aetiology of the outbreak.[17] Such

[16] Hell K, Bandyyopadhyay R, Cardwell KF. Detection and management options for aflatoxin in maize in Benin, West Africa. Paper presented at the Expert group Meeting on Impact of aflatoxins on Health and Nutrition Brazzaville 24-27 May 2005.

measures may not target the specific source of the outbreak, but will focus on prevention of secondary spread among cases and communication with health workers, communities and the public. Health care providers will be advised on specific treatment and case management measures, instructions on the personal hygiene of affected persons and prevention of spread of disease to other persons, and hospital infection control. Practical food hygiene measures including avoiding preparation and consumption of high-risk foods and basic food safety messages based on the WHO Five Keys to Safer Foods (Annex 4) may be provided to communities and the public. They could also be sensitized on how to contact public health authorities to report related suspected cases.

Nonspecific measures could also be taken in the case where no specific food has been identified. For instance:

(a) proper handling of leftovers for further laboratory tests;
(b) preventing bare-hand contact and emphasizing handwashing with soap;
(c) strengthening monitoring of food cooking time and temperature control;
(d) excluding employees with symptoms suggestive of a foodborne illness;
(e) excluding uncooked food from the menu.

Specific control measures may be taken if a specific food is identified by prohibiting its consumption, cleaning and sanitization, followed by microbial verification, training of staff on food hygiene, ensuring that food preparation methods are modified to prevent further contamination, reinforcing the inspection and monitoring, as well as institutionalization of HACCP.

Similar measures may be taken to prevent secondary transmission, in addition to public information, food hygiene education, exclusion of infected persons from settings where there is a high risk for disease transmission, and infection control actions. Particular attention must be paid to groups that are at high risk of infection, namely, infants, pregnant women and immunocompromised persons.

9. Monitoring and evaluation of surveillance and response

Monitoring and evaluation of surveillance and response systems is essential for assessing the success of intervention in view of further action and systems improvement. Information on timely reporting from one level to the another, and the quality of routine prevention and control activities may be used for the routine monitoring and annual evaluation of surveillance and response systems.

Agreed indicators, in accordance with set national goals and specific plans for improving the surveillance system may be used. Such indicators would include data on reported cases of specific foodborne illness including exposure history, case onset and availability of dated documented report, laboratory investigation of stools and submission of at least 50% of isolates for laboratory confirmation.

[17] Council to Improve Foodborne Outbreak Response (CIFOR). Guidelines for Foodborne Disease Outbreak Response. Atlanta, Council of State and Territorial Epidemiologists, 2009.

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WHO/AFRO (2010), Technical guidelines for Integrated Disease Surveillance and Response in the African Region.

Annex 1: Case definition, aetiological agents and clinical features

(i) Case definition

Foodborne illnesses are defined as diseases that are generally either infectious or toxic in nature and caused by agents that enter the body through the ingestion of food. The first symptoms often occur in the gastrointestinal tract. Nausea, vomiting, abdominal cramps and diarrhoea are frequent symptoms of foodborne diseases.

(ii) Aetiological agents and clinical features

The following is a list of aetiological agents of foodborne diseases (WHO 2008).[18]

*Details on the predominant signs and symptoms associated with these microbes and chemical substances are shown in the tables in Section (iii).

Pathogenic Bacteria

*Aeromonas hydrophila**
*Bacillus cereus**
Brucella spp*
Campylobacter spp*
*Clostridium botulinum**
*Clostridium perfringens**
Escherichia coli spp.*
- *E. coli* - enterotoxigenic (ETEC)
- *E. coli* - enteropathogenic (EPEC)
- *E. coli* – enterohemorrhagic (EHEC)
- *E. coli* - enteroinvasive (EIEC)

*Listeria monocytogenes**
Mycobacterium bovis
Salmonella typhi and *paratyphi**
Salmonella (non-typhi) spp*
Shigella spp.*
*Staphylococcus aureus**
*Vibrio cholerae O1**
*Vibrio parahaemolyticus**
*Vibrio vulnificus**
*Yersinia enterocolitica**

[18] WHO, Foodborne Disease Outbreaks: Guidelines for investigation and control. World Health Organization, France, 2008.

Viruses*

Hepatitis A virus*
Hepatitis E virus
Small, round, structured viruses (SRSVs) including norovirus
Poliovirus*
Rotavirus

Protozoa

Cryptosporidium spp*
*Entamoeba histolytica**
*Giardia lamblia**
*Toxoplasma gondii**
Cyclospora cayetanensis

Trematodes

*Clonorchis sinensis**
*Fasciola hepatica**
Fasciolopsis buski
*Opisthorchis felineus**
*Opisthorchis viverrini**
*Paragonimus westermani**

Cestodes

Diphyllobothrium spp
Echinococcus spp
Taenia solium and *saginatum**

Nematodes

Anisakis spp*
*Ascaris lumbricoides** and *Trichuris trichiura*
*Trichinella spiralis**
Trichuris trichiura

Natural Toxins

Marine biotoxines
Ciguatera poisoning
Shellfish toxins (PSP, DSP, NSP, ASP)
Scombroid poisoning/histamine
Tetrodotoxin (pufferfish)
Mushroom toxins
Mycotoxins (e.g. aflatoxins)
Plant toxicants
Pyrrolizidine alkaloids
Phytohaemagglutinin (red kidney bean poisoning)
Grayanotoxin (honey intoxication)

Chemicals

Pesticides (organophosphates, antimony)
Toxic metals (cadmium, copper, lead, mercury and t

in)
Polychlorinated biphenyls
Radionuclides
Fluoride
Zinc
Nitrite (food preservatives)
Sodium hydroxide
Monosodium glutamate

(iii). Major foodborne pathogens: predominant clinical features

Approximate onset time of symptoms	Predominant symptoms	Associated organism or toxin	Appropriate samples from cases and food service providers
Upper gastrointestinal tract symptoms (nausea, vomiting) occur first or predominate			
Less than 1 h	Nausea, vomiting, unusual taste, burning of mouth	Metallic salts	Vomit, urine, blood, stool
1-2 h	Nausea, vomiting, cyanosis, headache, dizziness, dyspnoea, trembling, weakness, loss of consciousness	Nitrites	Blood
1-6 h, mean 2-4 h	Nausea, vomiting, retching, diarrhoea, abdominal pain, prostration	*Staphylococcus aureus* and its enterotoxins	Stool, vomit, [swabs from nostril, skin lesions]
8-16 h (2-4 h if emesis predominant)	Vomiting, abdominal cramps, diarrhoea, nausea	*Bacillus cereus*	Rectal swab, stool
6-24 h	Nausea, vomiting, diarrhoea, thirst, dilation of pupils, collapse, coma	Mycotoxins (Amanita species mushrooms)	Urine, blood (SGOT, SGPT), vomit
12-48 h (median 36 h)	Nausea, vomiting, watery non-bloody diarrhea, dehydration	Norovirus	Stool
Sore throat and respiratory symptoms occur			
12-72 h	Sore throat, fever, nausea, vomiting, rhinorrhoea and, sometimes, rashes	*Streptococcus pyogenes*	Rectal swab, stool
2-5 days	Inflamed throat and nose, spreading grayish exudates, fever, chills, sore throat, malaise, dysphagia, oedema of cervical lymph node	*Corynebacterium diphtheriae*	Swabs of skin lesions, nose, oropharynx,; blood for toxin testing

Lower gastrointestinal tract symptoms (abdominal cramps, diarrhoea) occur first or predominate			
2-36 h, mean 6-12 h	Abdominal cramps, diarrhoea, putrefactive diarrhoea (*Clostridium perfringens*), sometimes nausea and vomiting	*Clostridium perfringens, Bacillus cereus, Streptococcus faecalis, S. faecium*	Rectal swabs, stool
6-96 h, (usually 1-3 days)	Fever, abdominal cramps, diarrhoea, vomiting, headache	*Salmonella* species, *Shigella*, *Aeromonas*, enteropathogenic *E. coli*	Rectal swabs, stool
6 h to 5 days	Abdominal cramps, diarrhoea, vomiting, fever, malaise, nausea, headache, dehydration. Sometimes bloody or mucoid diarrhea, cutaneous lesions associated with *Vibrio vulnificus*	*Vibrio cholerae* (O1 and non-O1), *V.vulnificus*, *V. Fluvialis, Vibrio parahaemolyticus*	Stool
1-10 days (median 3-4 days)	Diarrhoea (often bloody), abdominal pain, nausea, vomiting, malaise, fever (uncommon with *E. coli* O157)	Enterohemorrhagic *E. coli* (including *E. coli* O157), *Campylobacter*	Stool, rectal swabs
3-5 days	Fever, vomiting, watery non-inflammatory diarrhoea	Rotavirus, astrovirus, enteric adenovirus	Stool, vomit
3-7 days	Fever, diarrhoea, adominal pain. Can mimic acute appendicitis	*Yersinia enterocolitica*	Stool
1-6 weeks	Mucoid diarrhoea (fatty stools) abdominal pain, flatulence, weight loss	*Giardia lamblia*	Stool
1 to several weeks	Abdominal pain, diarrhoea, constipation, headache, drowsiness, ulcers, variable -- often asymptomatic	*Entamoeba histolytica*	Stool
3-6 months	Nervousness, insomnia, hunger pains, anorexia, weight loss, abdominal pain, sometimes gastroenteritis	*Taenia saginata, T. solium*	Stool, rectal swab
Neurological symptoms (visual disturbances, vertigo, tingling, paralysis)			
Less than 1 h	Neurologic and/or gastrointestinal symptoms	Shellfish toxin (see final section of this table)	Gastric washing
	Gastroenteritis, nervousness, blurred vision, chest pain, cyanosis, twitching, convulsions	Organic phosphate	Blood, urine, fat biopsy
	Excessive salivation, perspiration, gastroenteritis, irregular pulse, pupils constricted, asthmatic breathing	Muscaria-type mushrooms	Vomit
	Tingling and numbness, dizziness, pallor, gastric haemorrhage, and desquamation of skin, fixed eyes, loss of reflexes, twitching, paralysis	Tetradon (tetrodotoxin) toxins	
1-6 h	Tingling and numbness, gastroenteritis, temperature reversal, dizziness, dry mouth, muscular aches, dilated pupils, blurred vision, paralysis	Ciguatera toxin	

	Nausea, vomiting, tingling, dizziness, weakness, anorexia, weight loss, confusion	Chlorinated hydrocarbons (insecticides, pesticides)	Blood, urine, stool, gastric washing
2 h to 6 days, usually 12-36 h	Vertigo, double or blurred vision, loss of light reflex, difficulty in swallowing, speaking and breathing, dry mouth, weakness, respiratory paralysis. Characteristic syndrome is descending, bilateral flaccid paralysis, starting with cranial nerves and preserved sensorium	*Clostridium botulinum* and its neurotoxins	Blood, stool, gastric washing
More than 72 h	Numbness, weakness of legs, spastic paralysis, impairment of vision, blindness, coma	Organic mercury	Urine, blood, hair
	Gastroenteritis, leg pain, ungainly high-stepping gait, foot and wrist drop	Triorthocresyl phosphate (oil substitute)	Muscle tissue

Allergic symptoms (facial flushing, itching)			
Less than 1 h	Headache, dizziness, nausea, vomiting, peppery taste, burning of throat, facial swelling and flushing, stomach pain, itching of skin	Histamine (scombroid)	Vomit
	Numbness around mouth, tingling sensation, flushing, dizziness, headache, nausea	Monosodium glutamate	
	Flushing, sensation of warmth, itching, abdominal pain, puffing of face and knees	Nicotinic acid (food additive, preservative)	
Generalized infection symptoms (fever, chills, malaise, prostration, aches, swollen lymph nodes)			
4-28 days, mean 9 days	Gastroenteritis, fever, oedema about eyes, perspiration, muscular pain, chills, prostration .	*Trichinella spiralis*	Serum, muscle tissue (biopsy)
7-28 days, mean 14 days	Malaise, headache, fever, cough, nausea, vomiting, constipation, abdominal pain, chills, rose spots, bloody stools	*Salmonella typhi*	Rectal swab, stool
10-13 days	Fever, headache, myalgia, rashes	*Toxoplasma gondii*	Lymph node biopsy, blood
Varying periods (depends on specific illness)	Fever, chills, headache, arthralgia, prostration, malaise, swollen lymph nodes, and other specific symptoms of the disease in question	*Bacillus anthracis, Brucella melitensis, B. abortus, B. suis, Coxiella burnetii, Francisella tularensis, Listeria monocytogenes, Mycobacterium tuberculosis, Mycobacterium* species, *Pasteurella multocida, Streptobacillus moniliformis, Campylobacter jejuni, Leptospira* species.	
Gastrointestinal and/or neurological symptoms			
0.5 to 2 h	Tingling, burning, numbness, drowsiness, incoherent speech, respiratory paralysis	Paralytic shellfish poisoning (PSP) (saxitoxins) mussels, clams	Gastric washing
2-5 min to 3-4 h	Reversal of hot and cold sensation, tingling, numbness of lips, tongue & throat, muscle aches, dizziness, diarrhoea, vomiting	Neurotoxic shellfish poisoning (NSP) (brevetoxins)	Gastric washing
30 min to 2-3 h	Nausea, vomiting, diarrhoea, abdominal pain, chills, fever	Diarrhoeal shellfish poisoning (DSP) (dinophysis toxin, okadaic acid, pectenotoxin, yessotoxin)	Gastric washing
24 h (gastrointestinal) to 48 h (neurological)	Vomiting, diarrhoea, abdominal pain, confusion, memory loss, disorientation, seizure, coma	Amnesic shellfish poisoning (ASP) (domoic acid)	Gastric washing

Annex 2: Forms used for investigation of foodborne disease outbreaks

(vii) Detailed outbreak investigation forms can be found in IDSR (2010) and the WHO Foodborne Diseases Outbreak Investigation Manual WHO (2008). The following rapid assessment tools may be adapted as appropriate:

Sample questionnaires

Enquiry into a suspected outbreak of foodborne disease involving the community

A. General assessment (there are certain aspects of the checklist which are not featured in this general assessment. The checklist should simply provide a quick overview of the issues/questions to be considered)

I. Water supply (accessibility, adequacy and quality)

Accessibility

1.1 How distant is water collection points from where people live?

(a) less than 500 m.
(b) more than 500 m.

1.2 Are there any problems of accessibility by some population segments, if so, what are other alternative sources?

Quantity

1.3 How much water is available per person a day (for cooking and personal hygiene)?

Quality

1.3 Where do people get water for washing their hands and cooking food?

(a) Standpipe
(b) Water piped in the home
(c) Well water
(d) Vendor
(e) Roof collection
(f) Others

1.4 What are the key hygiene issues related to water supply, including water storage and handling practices?

1.5 What means do people employ for hygienic water use?

Storage

1.6 How is water transported?

(a) Uncovered bucket
(b) Uncovered bowl
(c) Basin
(d) Covered plastic jerry cans

1.7 Is there any possibility of contamination during storage and transportation due to the containers used?

(a) covered containers
(b) containers without covers

II. Sanitation

2.1 Do people have access to sanitation facilities? Which facilities?

(a) Bucket
(b) Flush toilet
(c) Pit latrine
(d) Others, specify

2.2 If so, are they sufficiently used?

2.3 Where is waste disposed of?

III. Household food handling and hygiene practices

3.1 Are there handwashing facilities in households?

(a) Yes
(b) No

3.2 If yes, please describe.

3.3 How many times do you wash hands?

(a) Three times or less.
(b) More than three times.

3.4 what causes diarrhoea?

(a) Dirty food
(b) Dirty water
(c) Germs
(d) Dirty hands
(e) Others

3.5 How will you describe the immediate environment where food is prepared?

(a) heavily littered
(b) some litter
(c) no litter
(d) flies present
(e) stagnant water
(f) Others

3.6 Is food cooked at home?

(a) Yes.
(b) No.

3.7 If so, where is food cooked?

(a) In the open.
(b) In the kitchen.
(c) Others.

3.8 How many times is food cooked?

(a) Twice or less.
(b) More than twice.

3.9 What are the types of food items commonly consumed?

3.10 Are there any traditional dishes containing raw foods?

3.11 What precautions are taken to avoid poor handling of food?

3.12 Is food well-covered?
(a) Yes.
(b) No.

3.13 Is food exposed to flies?
(a) Yes.
(b) No.

3.14 Is food at ground level?
(a) Yes.
(b) No.

* Food history: raw fruits or vegetables, fruit drinks, room-temperature, street foods, cooked foods containing grains such as rice, millet, or sorghum, eaten at room temperature, undercooked fish or shellfish.

IV. Food safety in markets

4.1 Are there accessible and adequate water supply facilities in markets? Describe them.

4.2 Do markets have adequate toilet and handwashing facilities?

4.3 Is the drainage system designed according to the different market needs?

4.4 Is the market cleaned regularly?

4.5 How can you describe the immediate market environment and operations (functioning, administrative system, food inspection, etc.)?

4.6 Is the market properly zoned to avoid cross-contamination? For example, live animals and raw foods of animal origin should be separated from ready-to-eat foods.

4.7 Are there any cold storage facilities?

V. Safety of street foods, food stalls, restaurants and other food handling establishments

5.1 Are there any educational programmes for the training of street food vendors and other food handlers in food hygiene and basic sanitation?

5.2 Are there any existing measures for controlling the hygienic quality of food and the hygiene of vendors?

5.3 Are there any regulations, codes or guidelines on food hygiene and sanitation for street -vended foods/restaurants and community kitchens? If so, are such regulations suitable to cholera control?

5.4 Do vendors wash their hands before preparing and serving food? Is clean water used for washing dishes?

5.5 How will you describe the immediate environment where food is prepared?

(a) heavily littered
(b) some litter
(c) no litter
(d) flies present
(e) stagnant water
(f) others

VI. **Response/interventions planning?**

6.1 What health promotion media are available to the affected populations? Are there any specific messages relating to food preparation, consumption and storage- street vendors, restaurants, households?

6.2 What is the target audience – food vendors, caterers and community kitchen staff?

6.3 Are there any planned interventions to improve food hygiene?

6.4 If so, what would be required to achieve this?

(B) RAPID NEEDS ASSESSMENT OF FOOD SAFETY
CONTENT CHECKLIST

	CONTENT	REMARKS
	I. OVERVIEW	
	Current foodborne diseases(FBD) epidemiology	
	What areas of the country are affected (urban, peri-urban, rural); what are the morbidity rates; what is the case fatality rate in the most affected areas; what studies of FBD transmission are available (water and environmental sampling, case control, studies of risk factors etc; what are the main findings?	
	II. ENVIRONMENTAL SANITATION RISK FACTORS	
	Water supply ***(site visits to treatment facilities - interviews with water agency personnel, observation of distribution systems, home visits)***	
	Accessibility*:* (i) proportion of potable water systems – urban/rural; (ii) distance of water collection points from live area (less than 500 m); (ii) problems of accessibility to some segment of the population, if so, other alternative sources. **Adequacy/quantity:** (i) how much water is available, per person per day (cooking and personal hygiene)? (adequacy of water in the case of point sources should determine how many sources are available for the population. Accepted norm for a pipe tap is 250 people per source (based on a flow of 7.5 litres/minute); 500 people per hand pump (based on a flow of 16.6 l/m); 400 people per single-user open well (based on a flow 12.5 l/m).	

	Quality*:* where do people obtain water for washing their hands and preparing food (standpipe, water piped in the home, well water, vendor, roof collection, others)? *(i) Municipality* – what proportion of municipal water supplies have chlorination facilities; what type of chlorination system is used; are current chlorine stocks adequate for chlorination needs; is there a system for monitoring chlorine levels at the treatment plant, in the distribution system or at the tap; is there an operations and maintenance programme to manage back-siphoning, cross-connection and leakage problems? *(ii) Community* - what proportion of non-municipal water sources (wells, tanks, vendors) is chlorinated; who is responsible for chlorinating non-municipal water supplies; what are the obstacles to chlorination of non-municipal water supply? *(iii) Household water supply* - what means do people have for hygienic water use (are chlorination materials available for household water disinfection and use of clean storage containers); are there standard guidelines for household disinfection of water supply and storage facilities; what are the key hygiene issues related to water supply, including water storage and handling practices? ***Storage:*** (i) what do people use to transport water (uncovered bucket, uncovered bowl, basin, covered jerry cans); (ii) is there any possibility of contamination during storage and transportation due to containers used?	
	Sanitation ***(observations and interview with sanitation personnel)***	
	Access and type of sanitation facilities: do people have access to sanitation facilities; which facilities (bucket, flush toilet, pit latrine, others)?	

	Adequacy and proper functioning of sanitation facilities: are they sufficiently used and operated? **Solid waste**: where are solid waste disposal sites located with regard to living areas; in what way does solid waste disposal sites represent a cholera transmission hazard for the population (fecal contamination by diapers, used toilet paper, location, used as defecation site, children scavenge in them)?	
	III. HOUSEHOLD FOOD HANDLING AND HYGIENE PRACTICES	
	Food handling in households ***(home visits, interviews)***	
	Handwashing: availability of handwashing facilities – describe them; current handwashing practices (in terms of number of times hands are washed during the day– with soap/ash - 3 or less/ more than 3 times. **Description of the immediate environment where food is prepared*:*** describe the immediate environment where food is prepared (heavily littered, presence of flies; stagnant water, others). **Cooking**: is food cooked at home, if so, how many times; where is food cooked (in the open; in the kitchen)what precautions are taken to avoid poor handling of food; is food well-covered; is food exposed to flies; is food at ground level? **Food consumption:** what types of food items are commonly consumed, whether cooked or raw; are there any traditional dishes containing raw foods?	

	IV. FOOD SAFETY IN FOOD MARKETS	
	Food safety requirements of food Markets (site visits, observation, interviews with vendors and key personnel)	
	Accessible and adequate water supply and sanitation, **including handwashing facilities*:*** are there accessible and adequate water supply facilities in markets; do markets have adequate toilets and hand washing facilities? **Adequate waste disposal and drainage*:*** is the drainage system designed according to the different market needs; are markets cleaned regularly? **Description of operations and immediate environment?** describe the immediate market environment and operations (functioning, administrative system, including food inspection) ; are markets properly zoned to avoid cross-contamination , for instance, live animals and raw foods of animal origin should be separated from ready-to-eat foods; are there any cold storage facilities; what is the frequency of inspection?	
	V. STREET VENDING AND OTHER FOOD ESTABLISHMENTS	
	Safety conditions of street food vending sites and other food establishments	
	Educational programmes for food handlers: are there educational programmes for training street food vendors and other food handlers in food hygiene and basic sanitation? **Food safety measures for controlling food hygienic quality and vendors' hygiene**: do measures exist for controlling food hygiene of food and practices of vendors?	

	Existing regulations and guidelines on food hygiene: are there any regulations, codes or guidelines on food hygiene and sanitation for street-vended foods, restaurant and community kitchens; what agencies regulate these different areas, If so, are such regulations adequate for foodborne disease control; What is the frequency of inspection? **Description of the immediate environment where food is prepared**: describe the immediate environment where food is prepared (a lot of litter around, presence of flies; stagnant water).	
	VI. FOOD SAFETY INTERVENTIONS	
	Food safety planning and interventions	
	Planning: is there a national foodborne disease plan; how does it tie with the other government initiatives (for instance, water and sanitation coverage and , food safety plans); to what extent does the plan address surveillance, water supply safety, sanitation, food safety and public education issues; has a national foodborne disease committee been established; what concrete foodborne disease-related measures have been undertaken as a direct result of the plan? **Interventions:** what responses and/or planned interventions are being implemented in order to improve food hygiene, If so, what would be required to achieve this? **In the absence of planning*:*** which government and international organizations carry out activities related to foodborne control and food safety?	
	Educational messages	
	Existence of educational messages on food safety: are any health or hygiene education programmes being conducted at the level of the community?	

	Materials*:* what health promotion media are available to the affected populations (which media are being used); what kind of educational materials, if any, are used by hygiene educators; are there any specific messages relating to food preparation, consumption and storage by street vendors, restaurants, and households; what is the target audience – food vendors, caterers community kitchen staff; which government agencies are involved in IEC activities?	
	VII. OVERALL CAPACITY BUILDING NEEDS FOR FOOD SAFETY	
	Institutional Framework	
	Institutional framework and responsibilities: what agencies are involved in food safety and what are their roles; how is coordination ensured; what are the strengths and weaknesses; how effectively do the agencies work together?	
	Resources	
	Human resources: what is the level and adequacy of available personnel? **Financial resources:** can the available resources satisfy current needs?	
	Legal framework	
	Policy and legislation: what are the legal basis for food safety; how are food legislation and policies enforced and implemented; to what extent is the legislation adequately enforced in the country; what are the strengths and weaknesses of policy and legislation? **Food inspection:** how does legislation facilitate food inspection; how are food inspection services structured; what is the consistency of inspection services in different locations; what is the adequacy and level of skills of food inspection services; what are the strengths and weaknesses of food inspection?	

	National strategy and action plan: is there a national strategy or plan; to what extent are the current and emerging food safety challenges facing the country being addressed?	
	Food Laboratories	
	Food laboratories: how many official food control laboratories are available; How are they structured; what are the procedures and methods of analyses followed by the laboratories; what are the capabilities of the laboratories in terms of food analysis; what infrastructure is available; what is the technical level of laboratories?	

C. Outbreaks investigation tools

Initial response form

Today's date:	Name of the person completing form:
Information on the person reporting disease outbreak	
Last name:	First names:
Address:	
Phone number(s):	
Daytime contact details (work address, phone):	
Other information (organization, affiliation, request for anonymity)	
Information on disease outbreak	
Description of event:	
Suspected exposure (for example, event, meal, restaurant visit, food):	
Number of suspected cases:	Geographic location:
Number of persons at risk:	Date of first suspected case:
Date of first suspected exposure:	Date of most recent case:
Is the suspected exposure still occurring?	Yes No
How was the event first discovered?	

Initial case report form

Case Id:	Today's date:	Name of the person completing form:
Information on persons affected		
Last name:		First names:
DOB:	Sex: M F	Occupation:
Address, phone number:		
Daytime contact details (work address, phone):		
Clinical details		
Date and time of onset of symptoms:		Date and time when symptoms stopped:
Predominant symptoms *(severity, duration)*		
Doctor consulted? *(if yes, provide name and details)*		
Hospital attended? *(if yes, provide name and details)*		
Laboratory specimen taken? *(if yes, provide details)*		
Diagnosis available?		
Suspect food? *(if yes, provide source of food, preparation mode, when consumed)*		
Suspect meal, event, place? *(if yes, describe; provide, name, date, address, phone)*		

Persons attending suspect meal/event	**ill/well**	**Address and Phone**
1		
2		
3		
4		
5		

Other relevant information

Line listing

ID	Name	Age	Sex	Date & time of onset of illness	Major signs and symptoms						Laboratory tests	
											Specimen	Result

(III) Enquiry into a suspected outbreak of foodborne disease after a community meat-feast (please add additional foods based on local palette)

Interviewer's name _____ Interviewer's code /___/___/

Date and time of interview _____ at _____
date *time*

Interview number /___/___/

Person interviewed: self □ other □ (please specify) _____

Section 1 - Personal Details

1. Forename _____ Surname _____

2. Sex M F

3. Age: _____ years

4. Address _____

5. Home phone number if any _____

6. Occupation *(describe what the person actually does)* _____

_____

7. Workplace contact _____

Section 2 - Clinical Details

8. Since Sunday, -------, have you had an illness with diarrhoea (3 loose motions / 24 hours) or any gastrointestinal ailment?

yes -1- no -2- **(GO TO Q25)**

9. When did your symptoms start? _____ at _____
date *time*

10. Did you have any of the following symptoms?
(if symptoms still continuing code 9999)

	yes	***no***	***DK***	***duration***
Diarrhoea	1	2	9	_____
Blood in stool	1	2	9	_____
Nausea (feeling sick)	1	2	9	_____
Vomiting (being sick)	1	2	9	_____
Feeling feverish	1	2	9	_____
General aches and pains	1	2	9	_____
Other symptoms (please describe)	1	2	9	_____

_____

_____

11. Were you off work because of this illness? yes -1- no -2-

12. Did you contact your doctor/nurse because of this illness?
yes -1- no -2- **(GO TO Q16)**

13. Name and address of doctor/nurse
_____

_____

14. Did you take any medication? yes -1- no -2- **(GO TO Q16)**

15. Who prescribed it? _____

_____

16. Were you admitted in hospital because of this illness?
yes -1- no -2- **(GO TO Q21)**

17. When were you admitted in hospital? _____ at _____
date *time*

18. In which hospital were you admitted? _____

19. What is the name of your doctor? _____

20. How long were you in hospital? _____

21. Has any member of your family or person living with you been ill and shown the same or similar symptoms since Sunday, 18 August?
yes -1- no -2- **(GO TO Q23)**

22. Please specify ***(ONLY for persons who did not take part in the meat feast and for whom no questionnaire will be completed)***

_____

_____

Section 3 - Food history

23. Between _____ have you been eating in some unusual places?

yes -1- no -2- **(GO TO Q25)**

24. Please describe activity, place, date type of food, etc.

_____

_____

25. Since _____ have you eaten any of the following?

(Please get answer for all items; overlaps between food items are allowed)

	yes	***no***	***don't know***
Fish	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Goat meat	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Chicken	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Beef	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Bush meat	☐	☐	☐
	if yes, specify quantity:		portion ☐

			half portion ☐ "a bite" ☐ don't know ☐
Maize meal	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Boiled plantain/banana	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Greens	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Other vegetables	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Boiled cassava	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Tomato sauce	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Peanut sauce	☐	☐	☐
	if yes, specify quantity:		portion ☐ half portion ☐ "a bite" ☐ don't know ☐
Other ***(specify)***	☐	☐	☐

_____ _____

_____ _____

26. Would you like to make any additional comments?

This completes the interview. Thank you very much for your co-operation.

Annex 3: Outline of an outbreak investigation report

Cover page

Title of report

Indicate if this is a preliminary or a final report. Keep the title short and easy to memorize, but include information on the nature of problem under investigation, location and date.

Date of report

Names and affiliations of the main authors and investigators

Abstract

The abstract should be written after the report has been completed. It should stand seperately and contain the most relevant data, points and conclusions. All data mentioned in the abstract must also appear in the main report. Sentences in the discussion section can be used verbatim in the abstract.

Report

1. **Introduction**

   Statement of the problem and its public health importance

   Details and timeframe regarding initial source of information

   Reasons for investigating event

   Type of investigations conducted and agencies involved

2. **Background**

   General information to help the reader interpret epidemiology and data presented in the report (e.g. population size, socio-economic status of community, ethnicity, etc.)

   If outbreak occurred in a food premise, provide description of premise (e.g. size of restaurant, usual practices and operations, etc.)

   Description of the problem

   Sequence of events leading to the study or investigation

   Brief statement of the working hypothesis

3. **Objectives**

   Specify investigations goals

   Keep objectives concise and follow a logical, sequential pattern

   The objectives may include hypotheses, if any, to be tested

4. Methods

Epidemiology

- Description of study population
- Type of study conducted
- Case definition
- Procedures for case-ascertainment and selection of controls (if any)
- Methods of data collection, including questionnaire design, administration and contents
- Methods of data analysis

Medical laboratory testing

- Methods of specimen collection and processing
- Name of laboratory conducting tests
- Laboratory techniques employed and methods of data analysis

Food and food testing

- Description of inspection process
- Methods of food and environmental sampling
- Name of laboratory carrying out tests
- Laboratory techniques employed and methods of data analysis

5. Results

Present all relevant results from clinical, laboratory, epidemiological and environmental findings.

Present results in same order as described in the methods section.

Do not interpret or discuss the data in this section.

Epidemiology

- Number of cases, overall attack rate
- Clinical details of illness (symptoms, duration, hospitalisation, outcome, etc.)
- Descriptive epidemiology by time (epidemic curve), place and person (age, sex, race, specific characteristics) expressed as rates
- Risk factor exposures
- Further data analysis and data presentation depending on specific studies undertaken (e.g. cohort or case-control study)

Laboratory (microbiology, chemical, toxicology)

- Number of specimens collected
- Findings by type of laboratory analysis

Food investigation and food testing

Findings of food inspections

Results of laboratory tests performed on food and environmental samples

6. Discussion

The discussion is the most important part of the report and should cover:

- summary of major findings;
- likely accuracy of results;
- conclusions with their justification and rejection of alternative explanations;
- relationship of results to other studies and literature;
- implications of findings;
- assessment of control measures;
- requirements for future research.

7. Recommendations

Initial recommendations and those for future prevention and control should be listed numerically.

8. References

Select appropriate references, including reviews in major scientific journals. Follow a standard style referencing system (e.g. Vancouver style) with numbering of references in the order in which they appear in the text.

9. Appendices

Questionnaires and/or other survey forms

Appropriate field reports

Any other relevant documents, including press releases

Annex 4: WHO Five Keys to Safer Food

The Five Keys to Safer Food tools include:

(i) The guide on Healthy Food Markets;
(ii) Colourful promotional posters, pamphlets and leaflets of the Five Keys to Safer Food;
(iii) Manuals on the WHO Five Keys to Safer Food;

Figure 3: for the five keys to Safer Food tools