

Food Safety

“From Farm to Plate, Make Food Safe”



Expert Committee on Communicable Diseases of the SLMA

Food Safety

“From Farm to Plate, Make Food Safe”

**A collaborative activity of Expert Committee on
Communicable Diseases of the SLMA & WHO Country Office
for Sri Lanka**

to mark the

WORLD HEALTH DAY 2015



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Preface

World Health Organization (WHO) has dedicated the World Health Day - 2015, to '*Food Safety*', which is a priority area of global public health. The challenges and opportunities associated with food safety are highlighted under the slogan "*From farm to plate, make food safe*".

According to the WHO, unsafe food is linked to the deaths of an estimated 2 million people annually. As our food supply becomes increasingly globalized, new threats are constantly emerging. Food containing harmful bacteria, viruses, parasites or chemical substances is responsible for more than 200 diseases, ranging from diarrhoea to cancers.

This data underlines the need for coordinated action and shared responsibility across the entire food supply chain, in order to ensure access to adequate, safe, nutritious food for everyone.

Meanwhile the public needs to be informed about the issue of food safety, to ensure that the food on their plate is safe to eat.

Identifying the responsibility, Expert Committee on Communicable Diseases of the SLMA organized a Symposium, under the theme of "*Food Safety- From Farm to Plate, Make Food Safe*", to mark the World Health Day – 2015 and related activities of the WHO. This collaborative activity of SLMA & WHO was held on 30th April 2015, at the New Building Lecture Hall, Faculty of Medicine, Colombo.

It commenced with the welcome speech by Dr. Ranjith Perera; Chair, Expert Committee on Communicable Diseases of SLMA. First session on "*Health hazards due to contaminated food*" was chaired by Professor Jennifer Perera; President, SLMA. Dr. Sujatha Pathirage, Consultant Microbiologist, delivered a speech on '*Microbial contamination of food & testing of food for pathogens*'.

Mr. Nisala Gunasekara, Research Scientist, delivered a lecture on '*Chemical contamination of food & their testing*'. Dr. Ranjani Amarakoon, Senior Lecturer, spoke about '*Educating the consumer: How to handle, store & prepare food safely*'.

The next session which was on "*Food Hygiene Principles*" was chaired by Dr. Kalyani Guruge. Mrs. Nayana Satharasinghe, Deputy Director-General of Sri Lanka Standards Institution delivered a speech on '*Standards for food safety*'.

Dr. Vipula Dharmawardana, Chief Municipal Veterinary Surgeon conducted a speech on '*The role of Veterinary Public Health in food safety*'. Mrs. Priyanjani Bandara, Additional director of Agri Business Counseling spoke about '*Good Agricultural Practices*'. Dr. Hasini Banneheke, Secretary, Expert Committee on Communicable Diseases of SLMA delivered the Vote of Thanks, concluding the Symposium.

This booklet is prepared by the Expert Committee on Communicable Diseases of the SLMA based on the facts which were discussed in the symposium, in order to make the health care workers and the public aware of the global threats posed by unsafe foods and the part each can play in ensuring that the food on people's plates is safe to eat.

Dr. Hasini Banneheke, Convener-Expert Committee of Communicable Diseases

Health hazards due to contaminated food

Microbial contamination of food & testing of food for pathogens



Dr. Sujatha Pathirage
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Food borne microorganisms include bacteria viruses, fungi, parasites and prions. Bacteria include *Salmonella spp*, *E. coli*, *Vibrio*, *Staphylococcus aureus*, *Bacillus cereus*. Viruses include *Noro virus*, *Hepatitis A*. *Cryptosporidium*, *Amoeba*, *Cyclospora* are some of the parasites which can be transmitted by food. Mycotoxins produce by fungi can also cause food poisoning. Prions though it is morphologically different from bacteria or virus, it is transmitted by food. Clinical presentations vary from Gastro-enteritis, enteric fever, bacteraemia, meningitis, Endocarditis, GBS and Haemolytic-uraemic syndrome.

Contamination of food can occur at production, harvesting and processing distribution and storage .Food spoilage occurs due to various types of microorganisms making food unacceptable to the consumer and change of smell, taste, appearance & texture.

Spoilage of food is a complex process associated with Intrinsic food properties (e.g., endogenous enzymes, substrates, sensitivity for light, oxygen), cross contamination during harvesting, slaughter and processing and temperature abuse.

Prevention of food contamination is a shared responsibility. It should be practiced all along the food chain with a structured approach for food safety.

Food safety management system based on Hazard Analysis Critical Control Point principles (HACCP), Good Manufacturing Practices and Good Agriculture Practices are all important in prevention of food contaminations.

During investigations relatively low proportion of illness traced back to a particular food.

There is a changing trend in food borne diseases due to emerging socio demographic factors. Some of them are rapid population growth and demographic changes towards aging population. Others are global market for vegetable, fruit, meat, farm animal which originate from countries without proper microbiological safety procedures, increase travel, changing eating habits of raw and lightly cooked food eg: *Vibrio* due to shellfish, *Campylobacter* due to undercooked poultry liver pâté, shift

from low to high protein diet, higher proportion of immunologically compromised population, changing farming practices and climate change. In USA it is shown that there is 43% and 32% increase of food borne disease due to *Vibrio* in both 2012 and 2013 respectively.

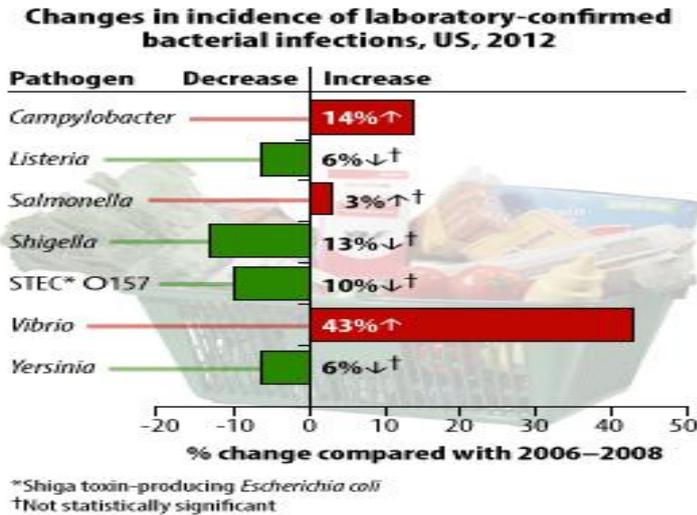


Figure 1: Changes in incidence of laboratory-confirmed Bacterial infections, US, 2012

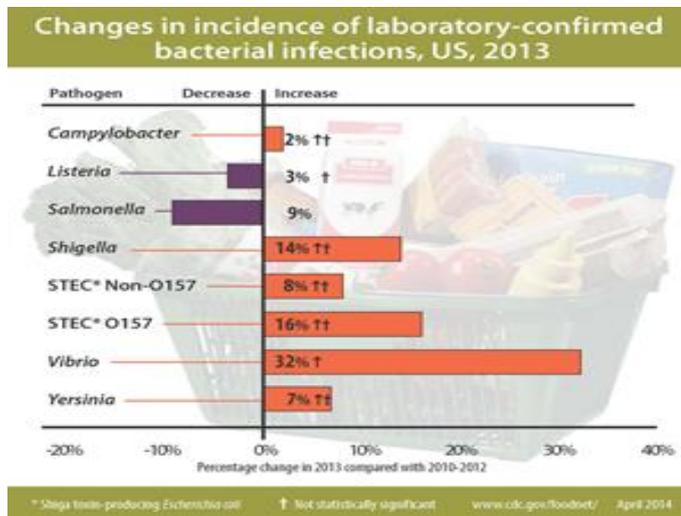


Figure 2: Changes in incidence of laboratory-confirmed Bacterial infections, US, 2013

Laboratory methods

The current gold standard for the detection of bacterial pathogens in food is still the conventional cultivation following standardized and generally accepted protocols. Different culture methods are used depending on the target organism which we are looking for. Multiple tube methods, use of semi-solid media, Membrane filtration are some of the examples.



Figure 3: Multiple tube method



Figure 4: Membrane filtration

In addition presently some laboratories are using molecular methods like PCR, RT PCR, and multiplex PCR.

ELISA method is used for the detection of *Salmonella*, detection of toxins of *S.aureus* and *C.perfringence*. Other methods are immunological methods eg: lateral flow cytometry, Toxin detection methods for Mycotoxins and staphylococcal toxin detection.

However, identification of exact cause for a food borne outbreak depends on various factors.

Testing food samples microbiologically has its own limitations.

Since organisms may not be uniformly distributed in the food sample, it is important to collect adequate amount of samples. Proper sample transport is also equally important.

Microbial cells tend to become damaged in food. Many food matrices interfere with testing procedures. Damaged cells may readily revive under the perfect culture conditions of the human body, but far less well under the relatively harsh conditions of *in vitro* culture. Under some circumstances microbes may exist in food in very small quantities. The distribution of microbial contaminates in a product is usually uneven, making sampling decisions critical to succeed.

Chemical contamination of food & their testing



Mr. Nisala Gunasekara
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Food Technology Section
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Chemical contaminants are substances that have not been intentionally added to food. These substances could enter into the food supply chain at various stages from cultivation, animal farming, processing, packaging, storage, transport and even at the point of consumption. Toxins of natural origin are also considered as food contaminants. Contamination generally has a negative impact on the quality of food and may imply a risk to human health.

FOOD CONTAMINATION

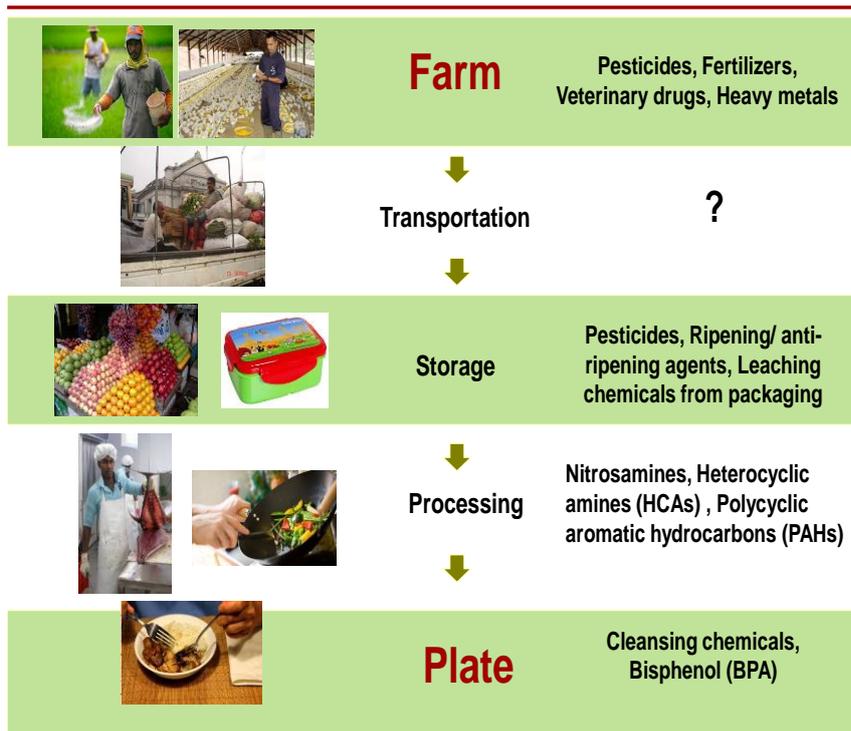


Figure 5: Food contamination at different stages of food supply chain

Most common food chemical contaminants are listed below.

- Pesticide residues
- Persistent organic pollutants – POPs (dioxins, furans, polychlorinated biphenyls-PCBs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Acryl amides
- Natural toxins (Mycotoxins)
- Heavy metals (Mercury, Cadmium, Lead, Arsenic, Tin, Chromium)
- Veterinary drug residues
- Other chemicals such as perchlorates, melamine, etc..

Sources of chemical contaminants include but not limited to widespread use of chemicals such as fertilizers, pesticides, ripening/ anti-ripening agents & veterinary drugs; industrial pollutants from the environment; food processing aids such as high temperature cooking, leaching from food packaging materials & cleansing agents used on utensils. Mycotoxins on the other hand are the secondary metabolites produced by food contaminated with certain types of fungi.

Due to toxicity & potential prevalence of these contaminants their associated risks legislations (Sri Lanka: FOOD ACT, NO. 26 OF 1980, EFSA, FDA) & standards (Sri Lanka: SLS, International: WHO: Codex) have been introduced worldwide as a measure of control. Regional & local regulatory bodies established under the respective food control systems and testing laboratories monitor the levels of food contaminants.

Various analytical techniques such as Chromatography Mass Spectrometry (LC-MS, GC-MS), Plasma Spectrometry (ICP-MS, ICP-OES), Spectroscopy (UV-Vis, AAS) and Bio assay (ELISA) techniques are available for the detection, identification and quantification of these contaminants.

HOW TO ANALYZE FOOD FOR CONTAMINANTS ?

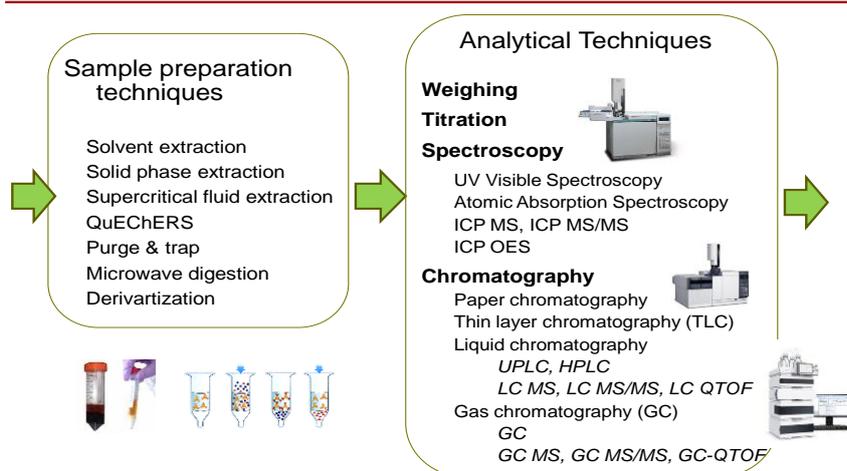


Figure 6: Analysis of food for contaminants

WHICH TECHNIQUE TO USE?

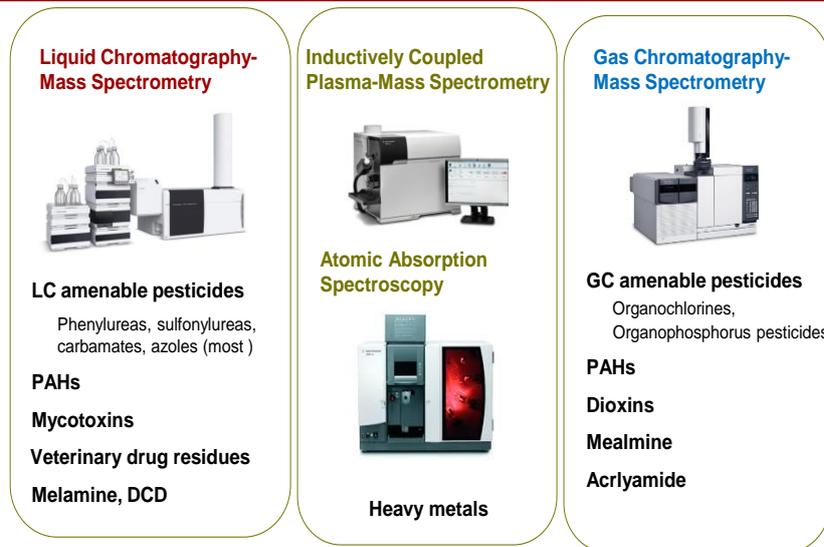


Figure 7: Techniques for analysis of food for contaminants

Educating the consumer: How to handle, store & prepare food safely



Dr. Ranjani Amarakoon
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All animals including humans require food to sustain. It must serve a dual purpose, firstly it must deliver the nutrition at required levels for the man to perform his daily activities & secondly, it should not cause illness and disease. Still, a considerable impact is created to the community by the number of incidents and the number of patients due to illnesses and disease arising out of taking in food. Statistics reveal that food-borne illnesses increase each year globally.

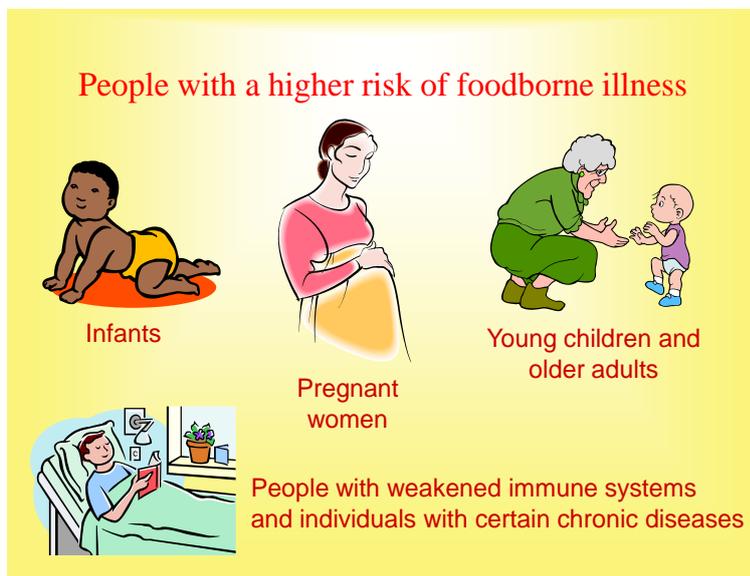


Figure 8: People with a higher risk of food borne illness

Since safe food is the key factor to protect the public from health risks related with food, various countries have instituted legal bodies to ensure food safety, at national, provincial or local government levels.

As this is a global issue, the World Health Organization (WHO) too has drawn attention to this issue & recognized that,

- Food borne diseases (FBD) can be defined as those conditions that are commonly transmitted through ingested food
- FBD comprise a broad group of illnesses caused by enteric pathogens, parasites, chemical contaminants and bio-toxins

The commonest outward manifestation of FBD is gastroenteritis.

Since FBDs are preventable, WHO has identified five key steps for food safety,

- Keep clean
- Separate raw and cooked food
- Cook thoroughly
- Store food at safe temperatures
- Use safe water and raw materials



Figure 9: Five key steps for food safety

The preventive action can be understood even by primary school children. However, the practice and adherence to the same is poor and therefore the message must reiterate many times so that it practiced religiously with the view to reduce the FBD.

Personal hygiene is one of the aspects of cleanliness. Keeping finger nails short and clean, proper bath/shower, keeping hair clean, wearing clean clothes and hair restraints, removal and storage of aprons etc are some of the measures of personal hygiene. Care must be taken to wash hands with warm soapy water for at least 20 seconds. Food contact surfaces must be cleaned before sanitizing. New paper towels or clean cloth must be used to wipe spills and clean areas.

The following common types of food contact surfaces are identified namely; tables, utensils, containers and packaging materials, processing equipment, overhead structures, aprons, outerwear, hand gloves etc. Recommended types of food contact surfaces must be used.

In maintaining cleanliness, various types of food soils need to be identified, such as, fat based soils, Protein based soils, carbohydrate based soils, mineral based soils, microbiological Films, Lubricating Greases and Oils and Inert soils such as sand, clay, or fine metal. The danger and the impact of biofilms need to be identified noting that they are matrix-enclosed bacterial population adherent to each other and/or to surfaces or interfaces. It must always be borne in mind that unless surface has been thoroughly cleaned, it cannot be sanitized.



Figure 10: Cleaning the surfaces of utensils

The following steps in cleaning and sanitizing a surface must be noted,

1. Pre rinse- remove food residue
2. Wash- the right cleaner for the right soil, concentration, temperature & time exposed
3. Post rinse- remove cleaner
4. Application of disinfecting or sanitizing solution-kill bacteria
5. Final potable water rinse if required

Separation of raw and cooked food is the second major step that needs to be noted in preventing FBD. Cross-contamination occurs when pathogenic bacteria are passed from one food or object to another.

Cross contamination can take place due to People, Equipment, Utensils, Other foods and Pests. Covering wounds is mandatory and use of disposable gloves prevents cross contamination. Further preventive measures of cross contamination are as follows:

- Wash cutting boards, dishes, utensils, and counter tops with hot soapy water after preparing each food item and before you go on to the next food.
- Use one cutting board for raw meat, poultry and seafood and another for salads and ready-to-eat food.
- Store raw meat, poultry, and seafood in a container or on a plate so juices can't drip on other foods.
- When shopping, keep raw meat, poultry, seafood and their juices apart from other ready-to-eat or unpackaged food items in your grocery cart.



Figure 11: How to take care when preparing raw chicken

FBD may be passed on by pests like rodents, flies and cockroaches and their droppings and urine.

Food must be cooked maintaining recommended temperatures for recommended durations. Cooking does not destroy all spores and toxins, but can lower some bacteria and viruses to safe levels.

Food needs to be cooked to minimum temperatures for specific amounts of time. Using a food thermometer, quick serving after cooking and avoiding overcook of food are also beneficial.



Figure 12: Use of a food thermometer

Bacteria grow rapidly between 5 and 60 degrees Celsius and food must be stored outside this range.

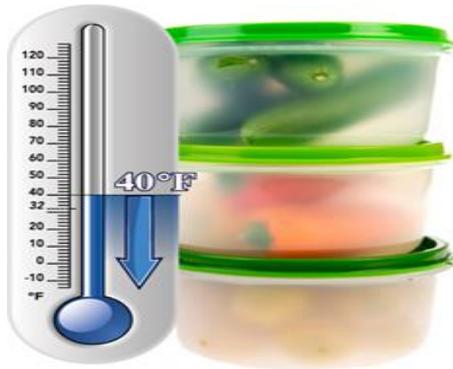


Figure 13: Maintenance of the temperature in the refrigerator

Another most important aspect in food safety is the use of safe water and raw materials. An aspect that is often overlooked by many is the reading of food labels in obtaining food. People fail to observe the expiry date, the food ingredients/contents especially with respect to allergens, requirements of storage and other facts relevant to the individual who gets the food.



Figure 14: Information in food label

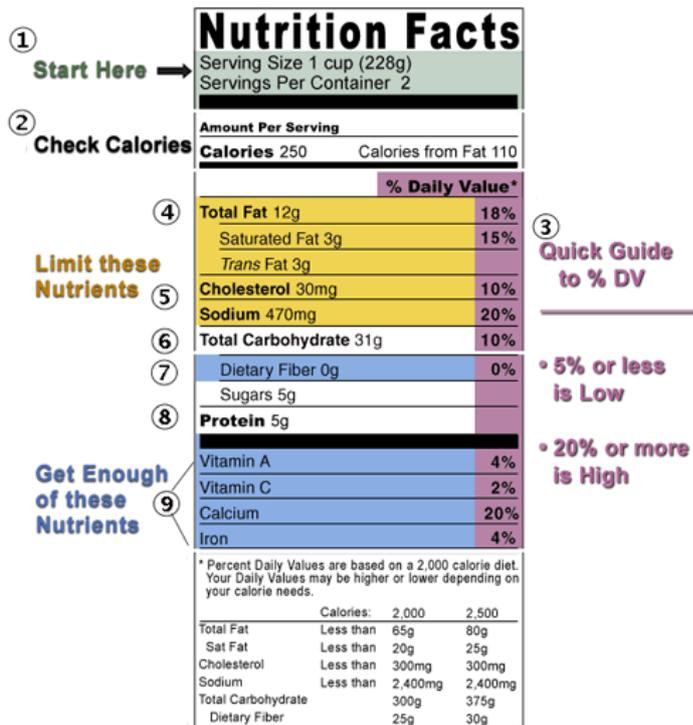


Figure 15: Nutrition facts

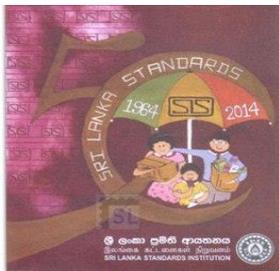
Further, in handling and cooking risky food like chicken, cassava and foods consume as fresh i.e. vegetables, sprouts etc, it requires special measures unique to them for the prevention of FBD.

The message of the World Health day is to ingrain the concept of food safety to prevent FBD. It is not awkward to display in pictorial form on measures of food safety in places where food is prepared and stored. This message of good personal hygiene and safety practices of handling food from farm to plate must reach others in your community and make safe food a top priority to prevent food borne diseases, protect the health of your family and community, and be confident about the safety of the food you eat.

Standards for food safety



Mrs. Nayana Satharasinghe
Deputy Director-General,
Sri Lanka Standard Institution, Colombo



The Sri Lanka Standards Institution (SLSI) which was established under an Act of Parliament in 1964, is the national standards body of the country, having the primary function of formulation of national standards to be used by all sectors of the economy. It is a semi government organization, presently functioning under the Ministry of Trade and Commerce.

In line with the vision of the Institution to be the premier national organization providing leadership to uplift the quality of life of the nation through standardization and quality improvement in all sectors of the economy, SLSI also carries out various other activities.

The Product Certification (the SLS Marks Scheme), Systems Certification such as ISO 9001, ISO 14001, GMP, ISO 22000 etc., providing training, providing laboratory services, providing information services, calibration of equipment and checking quality of certain identified products are some of the services thus provided. SLSI acts as a facilitator for quality but it is not a regulatory body.



Figure 16: Product Certification & Systems Certification

A Standard, as defined by the International Organization for Standardization (ISO), is a document established by consensus and approved by a recognized body, that provides for common or repeated use, rules, guidelines or characteristics, for activities or their results, aimed at the achievement of optimum degree of order, in a given context.

Different types of standards are available such as,

- Specifications which define characteristics for a product (e.g. SLS 729:2010 Ready-To-serve fruit drinks)
- Code of practices which give recommended practices for a given activity/industry (e.g. SLS 872:2009 Code of hygienic practice for dairy industry)
- Test methods which define how a particular test is to be carried out so that tests done at different laboratories are comparable (e.g. SLS 516 Microbiological test methods)
- Glossary of terms which help to have common understanding of words used in a particular industry/activity (e.g. SLS 71:1981 Glossary of tea terms)
- Symbols which facilitate communication (e.g. SLS 809:1988 Recommended shipping marks for goods) etc.

Though use of standards is not mandatory when compared with technical regulations; the adherence to which is compulsory, use of standards helps ensure safety, reliability and environmental care. Further it also facilitates interchangeability and variety reduction providing economic benefits. As a result, users perceive standardized products and services as more dependable – this in turn raises user confidence, increasing sales and the take-up of new technologies.

However, standards are frequently referenced by regulatory bodies for protecting user and business interests, and to support government policies. National standards on food products have been adopted under the Food Act [Food (Adoption of Standards) Regulations 2008 revised in 2013], whenever separate regulations have not been published under the Food Act.

The national standards are developed following the internationally accepted procedures. While SLSI as the national standards body, coordinates and provides the technical secretariat support for development of national standards, these standards are developed by experts in the fields representing different stake holders. A two month period is given to the public to comment at the draft standards level.

In product specifications, the characteristics of the product are defined in terms of physical, chemical and microbiological parameters. It may be a minimum, maximum or a range, as relevant to the product and the characteristic concerned.

In order to ensure safety in food, suitable controls need to be exercised throughout the food chain from farm to fork. Good manufacturing practices form the foundation for a Food Safety Management system.

The Sri Lanka Standard Code of Practice for general principles of food hygiene, SLS 143 gives general guidelines on the necessary hygienic conditions for producing food which is safe and suitable for consumption throughout the food chain, from the primary production to the final consumer. In addition, there are number of industry specific guideline standards such as for the dairy industry, bottling of water industry etc.

Guidelines with respect to,

- * Providing suitable facilities including construction and layout of buildings, associated utilities, premises, workspace and employee facilities
- * Providing supporting utilities including air, water and energy
- * Providing supporting services including waste and sewage disposal, cleaning and maintenance
- * Management and control of purchased materials
- * Prevention of cross contamination
- * Pest control
- * Personal health and hygiene
- * Chemical control
- * Product trace and recall
- * Complaint investigation

are defined in SLS 143.

A Food Safety Management System that can be applied to any organization in the food chain, from farm to fork, is specified in the International Standard ISO 22000 which has been adopted as a Sri Lanka Standard. Applying the principles of Hazard Analysis and Critical Control Point (HACCP) system for reducing the risk of safety hazards in food is an important aspect of this system. A HACCP System requires that potential biological, chemical and physical hazards are identified and controlled at specific points in the process.

The standard also addresses other important aspects of the management system to ensure food safety. Standards can thus be effectively used to ensure food safety.



The role of Veterinary Public Health in food safety



Dr. Vipula Dharmawardana
Chief Municipal Veterinary Surgeon, Colombo



The definition of Veterinary Public Health is the sum of all contributions to the physical, mental and social well-being of humans through an understanding and application of veterinary science. In other words, it is the application of veterinary professional skills to improve physical, mental and social wellbeing of human.

Main areas of concern in Veterinary Public Health are,

- ▶ Surveillance, Prevention & Control of Zoonoses, Meat borne diseases, Milk borne diseases & Food infections
- ▶ Prevention & Control of environmental contamination (Chemical residues, Animal waste, Clinical waste)
- ▶ Animal welfare (at farm, transport, lairage & at slaughter)

There has been an increasing pressure on the livestock sector to meet the growing demand for food of animal origin. This includes meat and meat products, milk and milk products, fish and fish products & eggs and egg products.

Safe food which is free from Biological, Physical & Chemical hazards is a priority area of global public health concern.

In order to ensure production of safe food, the quality of the entire chain of food production should be maintained. This chain includes,

- A. Pre harvest (Animals reared on farms)
- B. Post-harvest
 - Primary processing (Abattoirs)
 - Secondary processing & Distribution

At the farm level (pre-harvest),

- ✦ Disease diagnosis, treatment and prevention
- ✦ Animal welfare
- ✦ Animal feed & Feed ingredients
- ✦ Biosecurity measures
- ✦ Prevention of environmental pollution should be concerned.

Meat inspection, which is another important step, is a process of application of the science of, comparative anatomy comparative pathology & Microbiology to the judgment of food composed of partially or entirely of the flesh of animals. Authorized officers for examination of meat are Medical officer of health, Public health inspectors & Veterinary Surgeons.

It is essential that the veterinary surgeon should take his rightful share in controlling the nation's food, in order to ensure production of safe food.



Figure 17: Meat inspection

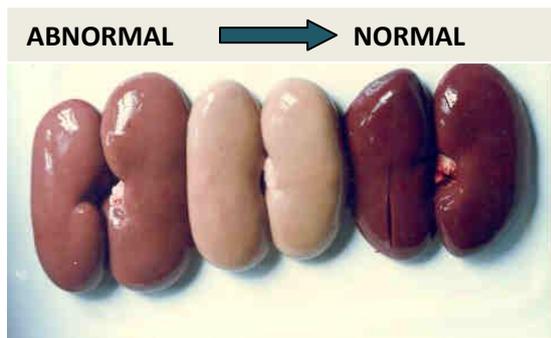


Figure 18: Identification of abnormal organ meat

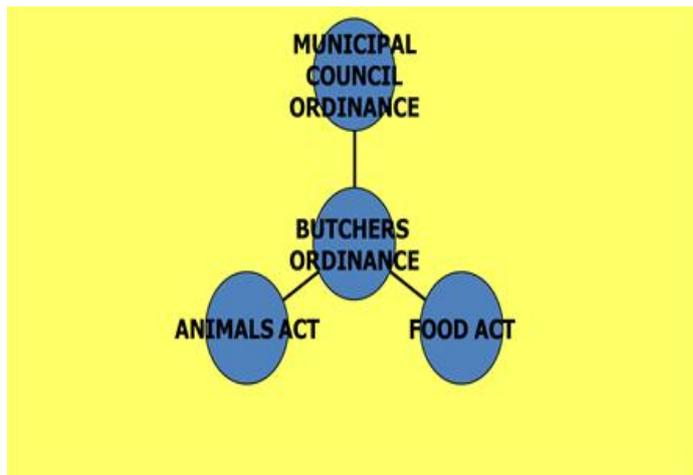


Figure 19: Current food legislation in Sri Lanka

Laws and regulations of veterinary public health in Sri Lanka are as follows,

- BUTCHERS ORDINANCE - 1893
- RABIES ORDINANCE - 1907
- PREVENTION OF CRUELTY - 1907
- MUNICIPAL COUNCIL ORDIN - 1947
- DOG REGISTRATION ACT - 1956
- ANIMALS ACT - 1958
- BY LAWS OF CBO MUNI - 1958
- FOOD ACT - 1980
- ANIMAL DISEASES ACT - 1992

Some of the diseases we observe as veterinary surgeons among animals raised for food are as follows, lympho-sarcoma (goats), bovine sarcocystosis, fatty liver (cattle), abscess in spleen (pig), lung worms, bovine hydatid cysts in kidney, pig liver-intensive larval migration, bovine paramphistomiasis in liver, schistosomiasis (goat), larval migration in hepatic lymph nodes (pigs), sarcocystosis, kidney worms in peri renal fat, hydatid cysts in spleen (goat), macrocantho (pigs), sarcocystosis, foot & mouth disease (pig).

Therefore, inspection of meat & meat- products is a fundamental safe guard to public health.

Good Agricultural Practices



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Additional Director, Agri Business
Counseling
Department of Agriculture, Peradeniya



Food is safe if it is free from pathogenic microorganisms, chemical and physical contaminants. Food safety begins at the farm. Therefore, Good Agricultural Practices (GAP) must be implemented to ensure food safety. The definition of GAP as given by United Nations Food & Agriculture Organization (FAO) is the practices to ensure environmental, economical & social sustainability of on-farm & post production practices resulting in safe and quality food.

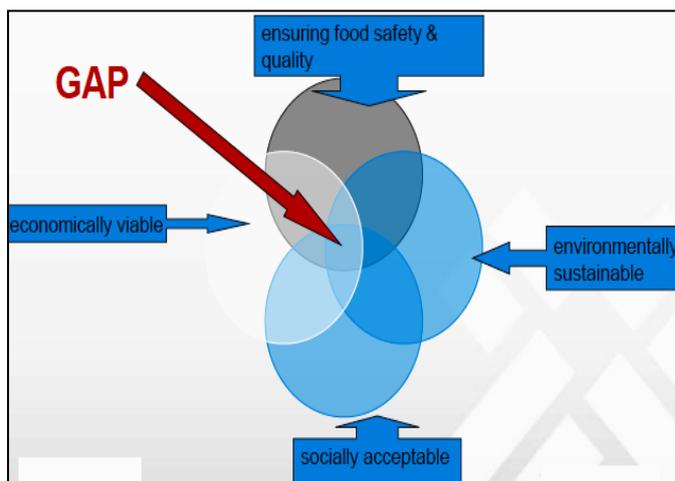


Figure 20: Components of Good Agricultural Practices

GAP includes practices in primary production to ensure Safety & Quality of food products and to minimize the negative impact on the environment as well as workers health.

There are hazards and risks for food safety. Food safety hazards are found throughout the entire food supply chain and can be described as: “Food Consist of a biological, chemical, or physical agent with a potential of causing an adverse health effect”. Risk for food safety is “the probability of occurring food safety hazards”.

Identify causes of food safety hazards & take preventive and control measures are two major components in implementation of GAP.

Biological, chemical and physical hazards in primary production associate with environment, inputs (soil, water, seeds, fertilizers, pesticides, and human), cultivation practices, harvesting & transporting, storage facilities, equipment, machine, & utensils.

Chemical and faecal contaminations of water, soil and crop are the main hazards associated with environment. Chemical contamination of water, soil and crop is usually caused by industrial activities, application of agricultural pesticides and fertilizers, or improper way of waste disposal. Leaking, leaching, or over flowing manure storage sites and flooding of polluted surface water also contributed for chemical contaminations.

Agricultural chemical contaminations mainly occurred by chemical run off and spray drifts. Safe use of agro chemicals is very important factor in GAP to avoid these hazards.



Figure 21: Chemical contamination



Figure 22: Faecal contamination

Faecal contamination of soil, water, crops can happen through access of wild, farm or domestic animals to the farm or production sites and also flooding polluted surface water through adjacent animal husbandry farms.

Control measures should be implemented to reduce hazard to maintain the soil conditions up to the acceptable level. If favorable conditions are cannot be achieved by available control measures, growers should not use these soils for primary production. Growers should be aware of the source of water use on the GAP farm. Where necessary, growers should have tested the water they use for microbial and chemical contaminants.



Figure 23: Irrigation of quality water to the edible portion of products

Special attention on water quality should be paid when irrigation water exposed to the edible portion of products, especially during the harvesting period and in post-harvest practices.

Water used for the application of fertilizers, pesticides; especially when spraying edible portion of Food; should not contain microbial contaminants at the level that may adversely affect the safety.

Indirect hazards are associated with improper seed selection, use of poor quality seeds etc, thereby increasing the use of agrochemical to control pest and diseases resulting higher risk of chemical residues in the final product.

In GAP farming, use only certified seeds adaptable to the growing region & quality seeds having higher or intermediate tolerance to the most common diseases and insects to avoid hazards.

Safe use of agro chemicals are very important to minimize the hazards associated with chemicals to the applicators and consumers. The best practices are, follow the recommendations when applying chemicals, keep record of applications and use properly calibrated sprayers. Organic fertilizer associated hazard is the potential of microbiological contaminations. Adaptation of proper treatment procedures designed to reduce or eliminate pathogens should be followed by the growers.

Allow sufficient time for harvesting after applying, get reports on origin, treatments, tests & results from the supplier and minimum contacts of manure, bio-solids with Food, especially close to harvest are included in preventive measures.



Figure 24: Cultivation practices

Integrated Crop Management (ICM) and Integrated Pest Management (IPM) practices should be followed by growers where ever possible to ensure environmental, economical a social sustainability. Minimum tillage & soil conservation techniques, nitrogen fixing plants, green manures, agro-forestry, crop rotation, Integrated pest management (IPM), minimum use of chemical fertilizer pesticide & non-renewable fuel resources & maintenance and improvement of ecological diversity are key components of ICM.

Major components of IPM are proper land preparation, timely cultivation, identification of pest threshold levels, forecasting and monitoring of pest outbreaks, pest trapping, cultural controls, biological controls, record keeping and follow up, chemical control if necessary.

Proper storage of pesticide and fertilizers, safe handling and application of agrochemicals, proper pesticide waste management are very important to avoid the risk of occurring hazards.



Figure 25: Integrated Pest Management

Worker in GAP farming should refrain from behaviors which could result in the contamination of food for example: smoking, spitting chewing gum or eating or sneezing or coughing over unprotected fresh food.

Workers suspected to be suffering from or to be a carrier of a disease or illness should not be allowed to enter any food handling area.

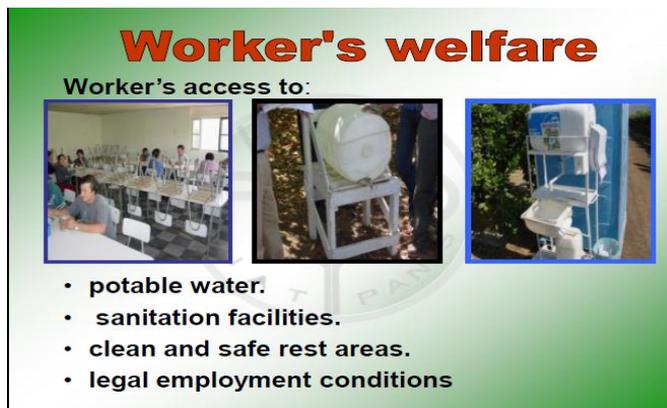


Figure 26: Worker's welfare

Another important factor in GAP farms is introducing good practices to ensure workers safety and welfare. Workers should have access to potable drinking water, hygienic and sanitary facilities and clean and safe rest areas. Legal employment conditions are also essential to make sure their social security. Hygienic and sanitary facilities should be provided to ensure appropriate degree of personal hygiene.

This has to be located in close proximity to the fields and/or indoor premises, with sufficient number, having appropriate design to ensure hygienic removal of wastes and avoid contamination of growing sites, facilities to hygienically wash and dry hands, with appropriate maintenance of facilities.

Use of appropriate harvesting and transporting techniques, choose correct ripening stages & time, avoid direct contact of final products with soil and dirty surfaces are also very important.

To minimize hazards related to harvesting and transport, clean and appropriate containers must be used according to the nature of produce. Farm vehicles use for transporting harvested produce to be used only for this proposes and to be kept clean and well maintained. Product should be covered during the transport (from field to the packaging center) and fixed or mobile hand washing equipment and sanitary facilities should be provided to the workers engaged in this chain.



Figure 27: Avoid poor transportation methods

Hazards associated with equipment, machines and utensils can be avoided by ensuring the equipment and containers coming into contact with products made of non-toxic materials. It must be designed and constructed for easy cleaning; it should be disinfected and maintained to avoid contamination of food products.

Equipment and tools should be used for the purposes which are designed without damaging the produce. Equipment should be maintained in good order.

Implementation of GAP programmes has launched new approach to monitor the entire value chain with National GAP & Organic Certification System for Agri-Foods.

SRI LANKAN G.A.P. (SL G.A.P.)

CHECK LIST
WITH
CONTROL POINTS & COMPLIANCE CRITERIA



SRI LANKAN ORGANIC (SL ORGANIC)

CHECK LIST
WITH
CONTROL POINTS & COMPLIANCE CRITERIA



Figure 28: Implementation of GAP programmes

There are programmes for proper management of pesticide application which include reduce over dose applications, waste management, address policy issues, train officers, operators, retailers and train 700 sale persons island wide and monitor their activities through pesticide control authorized officers.



Figure 29: Improper handling of pesticides



Figure 30: Improper handling of pesticides

List of Banned Pesticides in Sri Lanka

Active Ingredient	CAS Registry Number	Chemical Family	Chemical Name (IUPAC)
2,4,5-T	93-76-5	phenox	2,4,5-trichlorophenoxy acetic acid
arsenic (arsenites and arsenates)	7440-38-2	inorganic	arsenic
binapacryl	485-31-4	nitrophenol	2-sec-butyl-4,6-dinitrophenyl 3-methylcrotonate
bromacil	314-40-9	uracil	5-bromo-3-sec-butyl-6-methyluracil
captafol	2425-06-1	thalamide	1,2,3,6-tetrahydro-N-(1,1,2,2-tetrachloroethylthio)phthalimide
chlordane	57-74-9	organochlorine	1,2,4,5,6,7,8,8-octachloro-2,3,3alpha,4,7,7alpha-hexahydro-4,7-methanoindene
chlorobenzilate	510-15-6	organochlorine	ethyl 4,4'-dichlorobenzilate
DDT	50-29-3	organochlorine	1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane
dibromoethane (EDB)	106-93-4	-	1,2 – dibromoethane
dichloropropane	542-75-6	-	1,3 – dichloropropane
dieldrin	60-57-1	organochlorine	2,7,3,6-dimethanonaphth-2,3-b/oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-(1a.alpha,2.beta,2a.alpha,3.beta,6.beta,6a.alpha,7.beta,7a.alpha)
dinoseb/dinoseb salts	88-87-7	dinitrophenol	2-sec-butyl-4,6-dinitrophenol
ethyl parathion	56-38-2	organophosphate	O,O-diethyl O-4-nitrophenyl phosphorothioate
ethylene dichloride	107-06-2	-	1,2-dichloroethane
ethylene oxide	75-21-8	epoxide	dimethylene oxide
fluoroacetamide	640-19-7	luoroacetamide	2-fluoroacetamide
HCH (mixed isomers)	608-73-1	organochlorine	hexachlorocyclohexane
heptachlor	76-44-8	organochlorine	1,4,5,6,7,8,8-heptachloro-3alpha,4,7,7alpha-tetrahydro-4,7-methanoindene

hexachlorobenzene (HCB)	118-74-1	organochlorine	hexachlorobenzene
leptophos	21609-90-5	organophosphate	phosphonothioic acid phenyl-O-(4-bromo-2,5-dichlorophenyl) O-methyl ester
lindane	58-89-9	organochlorine	1alpha,2alpha,3,b4alpha,5alpha,6B-hexachlorocyclohexane
maleic hydrazide	123-33-1	pyridazine	6-hydroxy-2H-pyridazine-3-one
mercuric chloride	7487-94-7	inorganic	mercuric chloride
mercuric oxide	21908-	inorganic	mercury(11) oxide

GAP programs include Introduction of mechanization technology to reduce herbicides (Row planting, Use of weeders), genetic screening programme for traditional rice by PGRC and promotion of pest resistance local vegetable varieties.



Figure 31: Row planting



Figure 32: Use of weeders

Recommendations and follow up actions

1. It was brought to notice that food inspection is done by a category of health care workers (public health inspectors) without specific training on the expected activity while those who are trained to do the food inspection (veterinary surgeons with much needed anatomy, pathology and microbiology knowledge) have not been deployed to this task except in Colombo district. Thus it was felt that food inspection does not happen scientifically or systematically in all other districts except Colombo. Therefore it is timely that training is given to those who are involved in food inspection. If the public health inspectors are to be continued, their training should include a specific training to carry out their job effectively. Further the veterinary surgeons who are already trained on this should be appointed in all districts to provide technical advice and to supervise food inspection activity.
2. It was noted that different stakeholders involved in the food related matter pertaining to health care are coming under different ministries and authorities (Eg: slaughter houses are under the relevant municipal or urban council while food inspection is an activity done by Ministry of Health). The partnership within these authorities seems lacking for practical difficulties. Food safety related activities are being bound by different legal acts (Eg: butchers ordinance, animals act, food act etc) coming under different authorities. As a result the responsibility seems to get diluted or pass to the other side. It is recommended to seek the administrative possibility of bring all different stakeholders under one roof for smooth and more regularized operation of activities pertaining to food safety.
3. These acts related to food safety have not been reviewed or revised for a long time. It is highly to recommend bringing this to the notice of relevant authorities to update these legal documents according to current standards and needs.
4. Poultry is the main meat providing farming sector in Sri Lanka (17 million chickens and 155 000 Metric Tons per annum). However no inspection of slaughtering procedure or meat inspection is carried for poultry products. Instead inspection is for less consumed meat products such as cattle (200 000 cattle, 34 000 Metric Tons per annum). Installation of poultry products inspection is highly recommended for this reason.

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