

Fruits & vegetables
- microbiology and safety
Food safety requirements in Australia

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Outlines



- Microbiology and safety of fruits & fruit products
- Microbiology and safety of vegetables
- Food safety requirements in Australia

Fruits fruit products – microbiology and safety



Fruit products



- Whole fruit
- Fruit juice
- Fruit pulp
- Concentrate
- Fruit salad

Quality deterioration of fruits

- Post harvest
 - Fruits are relatively low pH and well protected unless injured
 - Natural flora
 - Bacteria and fungi
 - Processing fruit products
 - Washing
 - Cutting
 - Drying
 - Fruit concentrate
 - Canning and freezing
 - Fruit juice



Typical pH values of fruits

Fruit type	pH range
Apple	3.1-3.9
Apricot	3.3-4.4
Blackberry	3.0-4.2
Blueberry	3.2-3.4
Cantaloupe	6.2-6.5
Cherry	3.2-4.0
Cranberry	2.5-2.7
Grape	3.0-4.0
Grapefruit	2.9-3.4
Lemon	2.2-2.6
Lime	2.3-2.4
Orange	3.3-4.0
Peach	3.3-4.2
Strawberry	3.0-3.9
Tomatoes	4.0-4.4



Quality deterioration of fruit products

- Limited due to low pH, high sugar and presence of permitted preservatives in fruit preparations - yeasts, moulds and aciduric bacteria
- Spoilage leads to off flavours and odours, turbidity and gas production
- Preservatives are often added to fruit juice, pulps, concentrates and fruit salads



Sources of contamination

- Micro-organisms present in the whole fruit – air, soil, water, insect pests and animals in fruit growing areas
- Equipments – manual harvesting equipment and equipment in the packing shed
- Unsound and rotten fruit may contaminate fruit products during processing
- Build up on processing equipment, e.g. presses, mills, extractors, pipelines, conveyors, filling machines, etc.
- Processes reducing bacterial load: washing, peeling, pasteurisation, etc



Contaminating micro-organisms

- Yeasts

- Many grow under anaerobic conditions and low pH
- Spoil fruit products by production of gas (CO₂), alcohol, turbidity, flocculation, pellicles and clearing of product due to destruction of natural pectin by pectin esterases
- Degrade organic acids to form acetaldehyde – fermented flavour
- *Candida parapsilosis*, *Rhodoturula mucilaginosa*, *R. glutinis*, *Torulopsis holmii*, *Zygosaccharomyces bailii*, *Z. bisporus* and *Z. rouxii*



Contaminating micro-organisms

- Yeasts

- Yeasts are not particularly heat resistant mild heat treatment of fruit products can destroy them (70-90°C)
- Resistant to weak acid preservatives
- Fruit concentrates due to high sugar (65-80° Brix) and low water activity are spoiled by xerophilic (osmophilic) yeasts (e.g. *Z. rouxii*, *Z. bailii* and *S. cerevisiae*) – if concentrates are frozen, spoilage cannot occur until these are thawed. Longer the storage greater the problem.



Contaminating micro-organisms

- Moulds

- Spoilage mostly depends on the availability of oxygen (some species, e.g. *Byssochlamys fulva*, can grow at low oxygen levels)
- Fruit salad occasionally spoiled by surface mould
- Heat treatment may allow survival of fungal ascospores and those of *Byssochlamys*, *Neosartorya* and *Talaromyces* are most likely to survive heat treatment



Contaminating micro-organisms

- **Lactobacillus and Leuconostoc**
 - Growth of lactic acid bacteria may result in the production of acetylmethylcarbinol and diacetyl that give an off flavour similar to buttermilk
 - Other products are acetic acid, ethanol, formic acid and CO₂
 - Spoilage is mainly due to marginal heat treatment, leaking containers or cross contamination during filling
 - *Lb. Fermentum*, *Lb. Plantarum*, *Leuconostoc mesenteroides subsp. mesenteroides* and *dextranicum* have been isolated from un-pasteurised orange juice



Contaminating micro-organisms

- *Gluconobacter* and *Acetobacter*
 - Commonly present at the surface of many fruits
 - Cause bacterial rot of apples and pears, accompanied by different shades of browning
 - Cause pink disease in pineapples
 - *Acetobacter* prefer alcohol enriched space while *Gluconobacter* prefer sugar enriched environment
 - These organisms are inactivated by pasteurisation but may be present in fresh squeezed product



Contaminating micro-organisms

- *Bacillus*
 - A soil organism frequently isolated from processing environment
 - Excessive spores built up during processing can lead to under processing
 - *Bacillus coagulans* is a common contaminant in tomato products



Contaminating micro-organisms

- *Alicyclobacillus*
 - Acid dependent, thermo-tolerant spore formers – *A. acidocaldarius*, *A. acidoterrestris*, *A. heptanicus* and *A. hesperidum*
 - Only *A. acidoterrestris* implicated in spoilage
 - Pasteurisation and low pH in fruit processing is sufficient to inactivate traditional spoilage organisms (yeasts, fungi and lactic bacteria) but spore forming alicyclobacilli can still spoil aseptically packaged fruit products
 - Adherence to good manufacturing practice needed

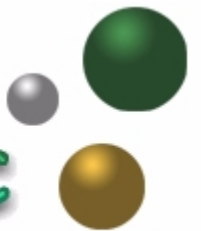


Contaminating micro-organisms

- *Clostridium*
 - Some cases of *C.botulinum* reported in acid food products

Vegetables and vegetable products – microbiology and safety

OzScientific



Introduction



- The category consists of
 - Edible plant components including roots, leaves, stalks, tubers, bulbs, flowers, fruiting bodies and seeds
- Increased consumption of vegetables in Australia
 - Fresh cut due to high sensory quality and convenience – lettuce varieties, broccoli florets, carrot
 - Salad, stir-fry and soup products



Introduction



- Vegetables exposed to numerous conditions during
 - Growth, harvest, distribution & processing
- Susceptible to microbial contamination through
 - Air, soil, water, insects, animals & human activity
 - pH 5-7 and the presence of nutrients may contribute to high microbial load in domestic refrigerators

Vegetable categories



- Raw and minimally processed vegetables
- Frozen vegetables
- Canned vegetables
- Dried vegetables
- Fermented and acidified vegetables

Raw and minimally processed vegetables

- **Raw vegetables**
 - Receives no processing post harvest (except washing, sorting, grading and packaging)
 - Generally sold as whole
- **Minimally processed vegetables**
 - Prepared by washing, slicing, peeling and shredding
 - Sold as single variety pack, complex mixture with or without dressing or mayonnaise, and in combination with meat or poultry products

Raw and minimally processed vegetables

- Initial microflora

- Many micro-organisms dispersed over the plant or microcolonies embedded in the plant tissue
- Predominance of bacteria
 - E.g. aerobic mesophilic - $<10^2$ - 10^8 cfu/g tissue
 - Dominated by gram -ve : fluorescent pseudomonads, *Enterobacter* spp., *Erwinia* spp., *Klebsiella* spp., *Serratia* spp., *Xanthomonas* spp., *Flavobacterium* spp., *Chromobacterium* spp. and *Alcaligenes* spp.
 - Also present coryneforms, lactic acid bacteria, sporeformers, coliforms and micrococci
- Significant number of yeasts & mould
 - E.g. moulds $<10^2$ - 10^5 cfu/g tissue (*Botrytis*, *Penicillium*, *Sclerotinia*, *Aureobasidium*, *Fusarium* & *Alternaria*)
 - Yeasts – *Candida*, *Kloeckera*, *Rhodotorula*, *Cryptococcus*, *Sporobolomyces*



Raw and minimally processed vegetables

- Effects of harvesting and transportation on micro-organisms
 - Number might increase
 - Natural sites such as stem scars, hair sockets, lenticels and stomata – injury during harvesting creates new sites & source of nutrients
 - Human & equipment contacts contribute to the microflora



Raw and minimally processed vegetables

- Effect of washing, cutting & storage
 - Washed vegetables (sanitised water) have lower number of micro-organisms than unwashed – reduction 1-2 log cfu/g tissue
 - Tightly arranged vegetable, eg. Lettuce and cabbage – decreasing gradient of microbial contamination from outer to inner leaves (1-4 lg cfu/g tissue)
 - Slicing, dicing & shredding & temperature can increase the population and may lead to sources of spoilage bacteria (e.g. up to 10 fold increase in total bacteria)



Raw and minimally processed vegetables

- Specific spoilage organisms
 - Fresh-cut vegetables are more perishable than their whole counterparts – soft rot manifested by bacterial spoilage
 - Soft rot – *Bacillus*, *Clostridium*, *Erwinia* and *Pseudomonas* spp.
 - *Bacillus* – under warm condition -soft rot in garlic, potatoes, casicum and tomatoes
 - *Erwinia* – affects above vegetables through wound scars as well as carrots, onions, lettuce, celery & asparagus



Raw and minimally processed vegetables

- Specific spoilage organisms
 - *Clostridium* spp. – soft rot in potatoes
 - Psychrotrophic pseudomonas – leafy vegetables (lettuce, cabbage) and cauliflower in air at chill temperature.
 - *Pseudomonas* spp. – enzymatic degradation of plant tissue – *Ps. fluorescence* & *Ps. Marginalis* produce pectate or pectin lyase enzymes (pectin methyl esterase)
 - *Erwinia amylovora*, *Xanthomonas campestris* & *Ps solanacearum* – wilt in leafy vegetables through production of extra-cellular polysaccharides



Raw and minimally processed vegetables

- Quality control measures
 - Begins at the farm –
 - history of the land (rearing animals, exposed to polluted water or sewerage effluent increases risk of contamination),
 - use of raw animal manure and fertilisers, poor crop rotation & poor quality water,
 - human activity during harvesting,
 - environmental conditions
 - maturity of the plant
 - Hygienic conditions of the harvest equipment



Raw and minimally processed vegetables

- Quality control measures
 - Washing step –
 - quality of water (sanitised water can assist in reducing microbial population)
 - chlorine is common but with limitations: depleted under high organic loading, requires pH adjustment, OHS & environmental issues
 - Storage conditions
 - High humidity and low temp important to slow the rate of respiration



Frozen vegetables

- Steps: Blanching, cooling, conveying, cutting, slicing, filling and packing
- With the exception of capsicums and leeks, most vegetables are blanched (90-100°C for 1-5 min) prior to freezing – to inactivate plant enzymes, to reduce the bacterial load (reduction by 1000 fold)



Frozen vegetables

- Initial microflora, spoilage and control
 - Number of micro-organisms – 10^2 - 10^8 cfu/g
 - Number decrease or remain same
 - Handling post blanching affects the microflora – may get contaminated with coliform and lactic acid bacteria
 - Predominant bacteria - LAB such as *Leuconostoc* spp., enterococci and aerobic cocci
 - Microbial spoilage is rare (temp may affect)
 - Quality control post blanching important



Canned vegetables

- Most vegetables are low pH (<4.6) and given thermal treatment to make sterile (process based on heat treatment required to destroy spores of human pathogen *Clostridium botulinum* (at pH <4.6 it is not a problem))
- Process targets the inactivation of heat-resistant, spore-forming mesophilic micro-organisms



Canned vegetables



- Initial and spoilage bacteria
 - Commercial sterility may not imply absolute sterility – may still contain viable thermophilic spores
 - Spoilage results from under-processing (survival of mesophilic spore-formers), high temperature storage (flat sour spoilage by *Bacillus coagulans* and *Geobacillus streptothermophilus*, gas production by *Thermoanaerobacterium thermosaccharolyticum* and hydrogen sulphide by *Desulfotomaculum nigrificans*) and can leakage (allow entry and growth of vegetative cells and spores during cooling – lactobacilli, streptococci and micrococci)



Canned vegetables

- Quality control measures
 - Quality of raw vegetable products
 - Quality additives such as spices
 - Adequate cleaning, clean handling and processing
 - Appropriate thermal processing coupled with controlled cooling



Dried vegetables



- Dried via hot air oven (air temperature 80-100°C), some blanched prior to drying
- Some products are sun dried

Dried vegetables

- Initial and spoilage microflora
 - Diversified microflora (up to 10^8 cfu/g), depends on degree of microbial destruction during blanching and contamination during handling prior to loading into drying tunnels
 - Drying process does not reduce microbial population – Lactic acid bacteria, *Enterococcus* spp., staphylococci, *Bacillus* spp., *Penicillium* spp. and *Aspergillus* spp. Commonly present
 - Generally stable due to low water activity – but become an issue when re-hydrated



Dried vegetables



- Quality control measures
 - Hygienic handling during processing

Fermented and acidified vegetables

- Cabbage, cucumber, cauliflowers, carrots, beans and capsicum
- Not blanched
- Placed in a large vat, salted (or brined) which draws out plant juice which contains fermentable sugars and other nutrients that help in fermentation
- Sometimes starter culture *Lactobacillus plantarum* and *Pediococcus cerevisiae* added (temp 20-25°C)



Fermented and acidified vegetables

- **Initial and spoilage microflora**
 - During initial fermentation, gram -ve facultative anaerobes like coliform rapidly multiply
 - Fermentation by LAB (first *Leuconostoc mesenteroides* then more acid tolerant species such as *Lb brevis*, *Ped. Acidilactici*, *Ped. Pentosaceus*, *Lb plantaum* - pH 3.5-3.8
 - Limited growth of contaminants - due to low pH, high salt and low dissolved oxygen
 - Spoilage may occur due to localised salt (growth of yeasts & lactobacilli - pink colour); low salt permit growth of coliform - softening of vegetables, oxidative yeast growth of high oxygen



Fermented and acidified vegetables

- Quality control measures
 - Even distribution of salt or brine,
 - Proper fermentation sequence including maintenance of fermentation temperature and
 - Inactivation or inhibition of oxidative yeasts

Food safety requirements in Australia

FSANZ Standard 3.2



FSANZ Standard 3.2.1

- Food Safety Programs
 - This Standard is based upon the principle that food safety is best ensured through the identification and control of hazards in the production, manufacturing and handling of food as described in the Hazard Analysis and Critical Control Point (HACCP) system, adopted by the joint WHO/FAO Codex Alimentarius Commission, rather than relying on end product standards alone.



FSANZ Standard 3.2.1

- The food safety program is to be implemented and reviewed by the food business, and is subject to periodic audit by a suitably qualified food safety auditor.

General food safety program requirements



- **A food business must:**
 - (a) systematically examine all of its food handling operations in order to identify the potential hazards that may reasonably be expected to occur;
 - (b) if one or more hazards are identified in accordance with paragraph (a), develop and implement a food safety program to control the hazard or hazards;
 - (c) set out the food safety program in a written document and retain that document at the food premises;
 - (d) comply with the food safety program; and
 - (e) conduct a review of the food safety program at least annually to ensure its adequacy.

Auditing of food safety programs

- A food business must:
 - (a) ensure that the food safety program is audited by a food safety auditor at the auditing frequency applicable to the food business;
 - (b) make the written document that sets out the food safety program, and the appropriate records referred to in paragraph 5(f), available to any food safety auditor who has been requested to conduct an audit of the food safety program; and
 - (c) retain copies of all written reports of the results of all audits of the food safety program conducted by a food safety auditor within the last four years, for inspection upon request by a food safety auditor who audits the food safety program or an authorised officer.



Content of food safety programs

- A food safety program must:
- (a) systematically identify the potential hazards that may be reasonably expected to occur in all food handling operations of the food business;
- (b) identify where, in a food handling operation, each hazard identified under paragraph (a) can be controlled and the means of control;
- (c) provide for the systematic monitoring of those controls;
- (d) provide for appropriate corrective action when that hazard, or each of those hazards, is found not to be under control;
- (e) provide for the regular review of the program by the food business to ensure its adequacy; and
- (f) provide for appropriate records to be made and kept by the food business demonstrating action taken in relation to, or in compliance with, the food safety program.



FSANZ Standard 3.2.2

Food Safety Practices and General Requirements

This Standard sets out specific requirements for food businesses and food handlers that, if complied with, will ensure food does not become unsafe or unsuitable

General requirements

- **Food handling - skills and knowledge**
- (1) A food business must ensure that persons undertaking or supervising food handling operations have:
 - (a) skills in food safety and food hygiene matters; and
 - (b) knowledge of food safety and food hygiene matters, commensurate with their work activities.
- (2) Subclause (1) does not apply to a food business in relation to persons undertaking food handling operations for fundraising events, that is, events:
 - (a) that raise funds solely for community or charitable causes and not for personal financial gain; and
 - (b) at which only food is sold that is not potentially hazardous or which is to be consumed immediately after thorough cooking.



General requirements

- **Notification**

- (1) A food business must, before the food business commences any food handling operations, notify the appropriate enforcement agency of the following information:
 - (a) contact details for the food business
 - (b) the nature of the food business; and
 - (c) the location of all food premises of the food business
- (2) When complying with subclause (1), the proprietor of the food business must answer all questions asked by the appropriate enforcement agency in relation to the matters listed in subclause (1) in the form approved from time to time by the relevant authority under the Act.
- (3) The food business must notify the appropriate enforcement agency of any proposed change to the information specified in subclause (1) before the change occurs.
- (4) A food business that exists at the time of the commencement of this clause must provide the appropriate enforcement agency with the information specified in subclause (1) within three months of the commencement of this clause.



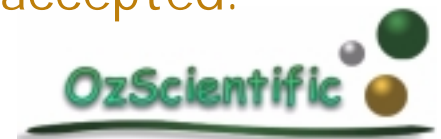
Food handling controls

- **Food receipt**
- (1) A food business must take all practicable measures to ensure it only accepts food that is protected from the likelihood of contamination.
- (2) A food business must provide, to the reasonable satisfaction of an authorised officer upon request, the following information relating to food on the food premises:
 - (a) the name and business address in Australia of the vendor, manufacturer or packer or, in the case of food imported into Australia, the name and business address in Australia of the importer; and
 - (b) the prescribed name or, if there is no prescribed name, an appropriate designation of the food.



Food handling controls

- (3) A food business must, when receiving potentially hazardous food, take all practicable measures to ensure it only accepts potentially hazardous food that is at a temperature of:
 - (a) 5°C or below; or (b) 60°C or above,
- unless the food business transporting the food demonstrates that the temperature of the food, having regard to the time taken to transport the food, will not adversely affect the microbiological safety of the food.
- (4) A food business must, when receiving potentially hazardous food, take all practicable measures to ensure that food which is intended to be received frozen, is frozen when it is accepted.



Food handling controls

- **Food storage**
- (1) A food business must, when storing food, store the food in such a way that:
 - (a) it is protected from the likelihood of contamination; and
 - (b) the environmental conditions under which it is stored will not adversely affect the safety and suitability of the food.
- (2) A food business must, when storing potentially hazardous food:
 - (a) store it under temperature control; and
 - (b) if it is food that is intended to be stored frozen, ensure the food remains frozen during storage.



Food handling controls

- **Food processing**
- (1) A food business must:
 - (a) take all practicable measures to process only safe and suitable food; and
 - (b) when processing food:
 - (i) take all necessary steps to prevent the likelihood of food being contaminated; and
 - (ii) where a process step is needed to reduce to safe levels any pathogens that may be present in the food — use a process step that is reasonably known to achieve the microbiological safety of the food.
- (2) A food business must, when processing potentially hazardous food that is not undergoing a pathogen control step, ensure that the time the food remains at temperatures that permit the growth of infectious or toxigenic micro-organisms in the food is minimised.



Food handling controls

- (3) A food business must, when cooling cooked potentially hazardous food, cool the food:
 - (a) within two hours — from 60°C to 21°C; and
 - (b) within a further four hours — from 21°C to 5°C; unless the food business demonstrates that the cooling process used will not adversely affect the microbiological safety of the food.
- (4) A food business must, when reheating previously cooked and cooled potentially hazardous food to hold it hot, use a heat process that rapidly heats the food to a temperature of 60°C or above, unless the food business demonstrates that the heating process used will not adversely affect the microbiological safety of the food.



Food handling controls

- **Food display**
- (1) A food business must, when displaying food, take all practicable measures to protect the food from the likelihood of contamination.
- (2) A food business must, when displaying unpackaged ready-to-eat food for self service -
 - (a) ensure the display of the food is effectively supervised so that any food that is contaminated by a customer or is likely to have been so contaminated is removed from display without delay;
 - (b) provide separate serving utensils for each food or other dispensing methods that minimise the likelihood of the food being contaminated; and
 - (c) provide protective barriers that minimise the likelihood of contamination by customers.
- (3) Subclause (2) does not apply to food in tamper resistant equipment or containers.



Food handling controls

- (4) A food business must not display for sale on any counter or bar, any ready-to-eat food that is not intended for self-service unless it is enclosed, contained or wrapped so that the food is protected from likely contamination.
- (5) A food business must, when displaying potentially hazardous food -
 - (a) display it under temperature control; and
 - (b) if it is food that is intended to be displayed frozen, ensure the food remains frozen when displayed.

Food handling controls

- **Food packaging**
- A food business must, when packaging food -
 - (a) only use packaging material that is fit for its intended use;
 - (b) only use material that is not likely to cause food contamination; and
 - (c) ensure that there is no likelihood that the food may become contaminated during the packaging process.



Food handling controls

- **Food transportation**
- A food business must, when transporting food
 - (a) protect all food from the likelihood of contamination;
 - (b) transport potentially hazardous food under temperature control; and
 - (c) ensure that potentially hazardous food which is intended to be transported frozen remains frozen during transportation.



Food handling controls

- **Food disposal**
- (1) A food business must ensure that food for disposal is held and kept separate until it is -
 - (a) destroyed or otherwise used or disposed of so that it cannot be used for human consumption;
 - (b) returned to its supplier;
 - (c) further processed in a way that ensures its safety and suitability; or
 - (d) ascertained to be safe and suitable.
- (2) In subclause (1), 'food for disposal' means food that -
 - (a) is subject to recall;
 - (b) has been returned;
 - (c) is not safe or suitable; or
 - (d) is reasonably suspected of not being safe or suitable.



Food handling controls



- (3) A food business must clearly identify any food that is held and kept separate in accordance with subclause (1) as returned food, recalled food, or food that is or may not be safe or suitable, as the case may be.
- (4) A food business must not sell food that has been already served to a person to another person unless the food was completely wrapped when served and has remained completely wrapped.

Food handling controls

- **Food recall**
- A food business engaged in the wholesale supply, manufacture or importation of food must -
 - (a) have in place a system to ensure the recall of unsafe food;
 - (b) set out this system in a written document and make this document available to an authorised officer upon request; and
 - (c) comply with this system when recalling unsafe food.



Health and hygiene requirements -food handlers

- **General requirement**

- A food handler must take all reasonable measures not to handle food or surfaces likely to come into contact with food in a way that is likely to compromise the safety and suitability of food.

Health and hygiene requirements -food handlers

- **Health of food handlers**
- (1) A food handler who has a symptom that indicates the handler may be suffering from a food-borne disease, or knows he or she is suffering from a food-borne disease, or is a carrier of a food-borne disease, must, if at work -
 - (a) report that he or she is or may be suffering from the disease, or knows that he or she is carrying the disease, to his or her supervisor, as the case may be;
 - (b) not engage in any handling of food where there is a reasonable likelihood of food contamination as a result of the disease; and
 - (c) if continuing to engage in other work on the food premises – take all practicable measures to prevent food from being contaminated as a result of the disease.



Health and hygiene requirements -food handlers

- (2) A food handler who suffers from a condition must, if at work -
 - (a) if there is a reasonable likelihood of food contamination as a result of suffering the condition – report that he or she is suffering from the condition to his or her supervisor; and
 - (b) if continuing to engage in the handling of food or other work – take all practicable measures to prevent food being contaminated as a result of the condition.
- (3) A food handler must notify his or her supervisor if the food handler knows or suspects that he or she may have contaminated food whilst handling food.



Health and hygiene requirements -food handlers

- **Hygiene of food handlers**
- (1) A food handler must, when engaging in any food handling operation
 -
 - (a) take all practicable measures to ensure his or her body, anything from his or her body, and anything he or she is wearing does not contaminate food or surfaces likely to come into contact with food;
 - (b) take all practicable measures to prevent unnecessary contact with ready-to-eat food;
 - (c) ensure outer clothing is of a level of cleanliness that is appropriate for the handling of food that is being conducted;
 - (d) only use on exposed parts of his or her body bandages and dressings that are completely covered with a waterproofed covering;
 - (e) not eat over unprotected food or surfaces likely to come into contact with food;
 - (f) not sneeze, blow or cough over unprotected food or surfaces likely to come into contact with food;
 - (g) not spit, smoke or use tobacco or similar preparations in areas in which food is handled; and
 - (h) not urinate or defecate except in a toilet.



Health and hygiene requirements -food handlers

- (2) A food handler must wash his or her hands in accordance with subclause (4) -
 - (a) whenever his or her hands are likely to be a source of contamination of food;
 - (b) immediately before working with ready-to-eat food after handling raw food; and
 - (c) immediately after using the toilet.
- (3) A food handler must, when engaging in a food handling operation that involves unprotected food or surfaces likely to come into contact with food, wash his or her hands in accordance with subclause (4) -
 - (a) before commencing or re-commencing handling food;
 - (b) immediately after smoking, coughing, sneezing, using a handkerchief or disposable tissue, eating, drinking or using tobacco or similar substances; and
 - (c) after touching his or her hair, scalp or a body opening.



Health and hygiene requirements -food handlers

- (4) A food handler must, whenever washing his or her hands -
 - (a) use the hand washing facilities provided;
 - (b) thoroughly clean his or her hands using soap or other effective means, and warm running water; and
 - (c) thoroughly dry his or her hands on a single use towel or in another way that is not likely to transfer pathogenic micro-organisms to the hands.
- (5) A food handler who handles food at temporary food premises does not have to clean his or her hands with warm running water, or comply with paragraph (4)(c), if the appropriate enforcement agency has provided the food business operating from the temporary food premises with approval in writing for this purpose.



Health and hygiene requirements -food business

- **Health of persons who handle food — duties of food businesses**
- (1) A food business must ensure the following persons do not engage in the handling of food for the food business where there is a reasonable likelihood of food contamination -
 - (a) a person known to be suffering from a food-borne disease, or who is a carrier of a food-borne disease; and
 - (b) a person known or reasonably suspected to have a symptom that may indicate he or she is suffering from a food-borne disease.
- (2) A food business must ensure that a person who is known or reasonably suspected to be suffering from a condition and who continues to engage in the handling of food for the food business takes all practicable measures to prevent food contamination.
- (3) A food business may permit a person excluded from handling food in accordance with paragraph (1)(a) to resume handling food only after receiving advice from a medical practitioner that the person no longer is suffering from, or is a carrier of, a food-borne disease.



Health and hygiene requirements -food business

- **Hygiene of food handlers — duties of food businesses**
- (1) Subject to subclause (2), a food business must, for each food premises -
 - (a) maintain easily accessible hand washing facilities;
 - (b) maintain, at or near each hand washing facility, a supply of -
 - (i) warm running water; and
 - (ii) soap; or
 - (iii) other items that may be used to thoroughly clean hands;
 - (c) ensure hand washing facilities are only used for the washing of hands, arms and face; and
 - (d) provide, at or near each hand washing facility -
 - (i) single use towels or other means of effectively drying hands that are not likely to transfer pathogenic micro-organisms to the hands; and
 - (ii) a container for used towels, if needed.



Health and hygiene requirements -food business

- (2) Paragraph (1)(c) does not apply in relation to handwashing facilities at food premises that are used principally as a private dwelling if the proprietor of the food business has the approval in writing of the appropriate enforcement agency.
- (3) With the approval in writing of the appropriate enforcement agency, a food business that operates from temporary food premises does not have to comply with any of the requirements of paragraphs (1)(b)(i) or (1)(d) that are specified in the written approval

Cleaning, sanitising and maintenance

- **Cleanliness**
- (1) A food business must maintain food premises to a standard of cleanliness where there is no accumulation of:
 - (a) garbage, except in garbage containers;
 - (b) recycled matter, except in containers;
 - (c) food waste;
 - (d) dirt;
 - (e) grease; or
 - (f) other visible matter.
- (2) A food business must maintain all fixtures, fittings and equipment, having regard to its use, and those parts of vehicles that are used to transport food, to a standard of cleanliness where there is no accumulation of:
 - (a) food waste;
 - (b) dirt;
 - (c) grease; or
 - (d) other visible matter.



Cleaning, sanitising and maintenance

- **Cleaning and sanitising of specific equipment**
- (1) A food business must ensure the following equipment is in a clean and sanitary condition in the circumstances set out below -
 - (a) eating and drinking utensils - immediately before each use; and
 - (b) the food contact surfaces of equipment - whenever food that will come into contact with the surface is likely to be contaminated.
- (2) In subclause (1), a 'clean and sanitary condition' means, in relation to a surface or utensil, the condition of a surface or utensil where it -
 - (a) is clean; and
 - (b) has had applied to it heat or chemicals, heat and chemicals, or other processes, so that the number of micro-organisms on the surface or utensil has been reduced to a level that:
 - (i) does not compromise the safety of the food with which it may come into contact; and
 - (ii) does not permit the transmission of infectious disease.



FSANZ Standard 3.2.3

- **Food Premises and Equipment**
 - The objective of this Standard is to ensure that, where possible, the layout of the premises minimizes opportunities for food contamination. Food businesses are required to ensure that their food premises, fixtures, fittings, equipment and transport vehicles are designed and constructed to be cleaned and, where necessary, sanitized. Businesses must ensure that the premises are provided with the necessary services of water, waste disposal, light, ventilation, cleaning and personal hygiene facilities, storage space and access to toilets



Further reading

- Spoilage of Processed Foods: Causes and Diagnosis, 2001 – AI FST publication
- Food Standards Australia and New Zealand (FSANZ) - <http://www.foodstandards.gov.au/foodstandardscode/>
- Fruit and Vegetable Processing, 1995 (by **M. E. Dauthy**) (<http://www.fao.org/docrep/V5030E/V5030E00.htm>)

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