

# PHILIPPINE NATIONAL STANDARD

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## CODE OF HYGIENIC PRACTICES FOR CHILLED YOUNG COCONUT WATER



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## FOREWORD

Given the food safety issues surrounding coconut water/drink, its trade and their impact to the small and micro-producers, this standard is therefore developed to ensure that chilled young coconut water/drink produced in the Philippines are microbiologically safe and comply with regulatory requirements.

This Code addresses the essential principles of food safety applicable to primary production, postharvest, transport operations and primary processing of chilled young coconut water/drink. The Bureau of Agriculture and Fisheries Product Standards (BAFPS) developed the Philippine National Standard (PNS): Chilled young coconut water/drink - Specification (PNS/BAFPS 28:2006) in 2006. This Code, therefore, supplements the PNS/BAFPS 28:2006 or its latest revision and should be read in conjunction with it.

A Technical Working Group (TWG) for the development of the Code of Hygienic Practice for Chilled Young Coconut Water/Drink was organized and represented by Philippine Coconut Authority (PCA), Industrial Technology Development Institute (ITDI), Food and Drug Administration (FDA), United Coconut Associations of the Philippines (UCAP) and the Philippine Coconut Research and Development Foundation, Inc. (PCRDF).

The Bureau of Agriculture and Fisheries Standards in collaboration with the members of the TWG conducted a series of technical reviews for the drafting of the standard and public consultations participated by stakeholders from the National Capital Region (NCR) and Region IVA. Comments gathered from the consultations with the stakeholders were considered and deliberated prior to the finalization of the standard.

## INTRODUCTION

Coconut is an agricultural and livelihood crop for many people in Southeast Asia, the Pacific region, Africa and some countries in Latin America. In fact, it is considered as the “tree of life” in developing countries as they depend on it as a source of food, medicine, shelter, fuel and furniture among others (Magat, 2006). Based on 2013 Philippine Statistics Authority (PSA) data, Quezon has the largest area planted to coconut followed by Zamboanga del Norte, Leyte, Davao Oriental, and Zamboanga del Sur.

According to Philippine Coconut Authority (PCA), the coconut tree provides fruit throughout the year which is edible at any stage of maturity. The fruit also serves as the source of raw material in many food products such as coconut milk and cream, desiccated coconut, coconut chip, coconut water, nata de coco, coconut oil, etc. Aside from the use of coconut water as tropical beverage, it is also used as a microbiological growth medium (Prades, et al 2012).

Coconuts continue to respire after harvest. High temperature at harvest increases its respiration rate that leads to rapid physiological changes and eventual deterioration. Other factors that may negatively affect the quality of coconut water are pesticide residues, heavy metals and undesirable microorganisms. During production, these chemical contaminations can be absorbed through soil or water. And undesirable microorganisms enter the fruit during postharvest operations through improper handling and processing leading to rapid fermentation (Agriculture and Consumer Protection Department – FAO, 2007). Within the nut, coconut water is sterile and is free from microorganisms but when exposed to air or to the environment, the product is prone to microbial contamination and deterioration. On the other hand, proper handling and management throughout the postharvest and processing method are important to make sure that coconut water will retain its inherent qualities prior to processing (FAO, 2007).

Today, consumers demand for products that are of high quality, safe for consumption and nutritious. Coconut water, even in the domestic market is gaining popularity as a ‘healthy drink’. It is considered as an alternative beverage for rehydration after exercise-induced dehydration. With these market opportunities, extending the shelf life and ensuring the safety of the product are among the known challenges of the industry. Packaging is seen as the next frontier in ensuring consumer availability for coconut water.

Special Order No.600 series 2014 established the TWG tasked to conduct field validation studies; sample products for the purposes of various analyses; and draft and finalize the COHP. The members of the TWG include identified experts from the various government

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agencies such as Philippine Coconut Authority (PCA), Industrial Technology Development Institute (ITDI), Food and Drug Administration (FDA); and industry association such as United Coconut Association of the Philippines (UCAP) and Philippine Coconut Research and Development Foundation Inc. (PCRDF).

This Code of Hygienic Practice (COHP) addresses the essential principles of food safety applicable to primary production through processing, packing, and distribution of coconut water/drink. It encompasses Good Agricultural Practices (GAP), Good Hygienic Practices (GHP) and Good Manufacturing Practices (GMP) that will help minimize microbiological hazards associated with all stages of production to processing.

This Code provides general recommendations to allow flexible and uniform adoption even when production practices and environmental conditions are diverse. Therefore, this Code is also applicable to micro and small-scale producers.

**SECTION 1 - OBJECTIVES**

The objective of this Code is to provide specific guidance to chilled young coconut water/drink or “buko juice” producers by applying relevant recommendations of the Codex Recommended International Code of Practice-General Principles of Food Hygiene (CAC/RCP 1-1969, Rev 4:2003) and the Revised Guidelines on Current Good Manufacturing Practice in Manufacturing, Packing, Repacking, or Holding Food (Department of Health Administrative Order No. 153 S. 2004) or its latest issuance. Specific guidance is provided to minimize microbiological hazards from primary production through processing, packing and distribution of coconut water/drink.

The Philippine National Standard (PNS) Code of Good Agricultural Practices for Fresh Fruits and Vegetables (GAP) and Codex Code of Hygienic Practice for Fresh Fruits and Vegetables (CAC/RCP 53-2003) already provide the relevant general hygienic recommendations for the primary production of fresh agricultural commodities.

**SECTION 2 – SCOPE, USE OF DOCUMENT AND DEFINITIONS****2.1 Scope**

This Code covers food safety principles for the primary production, postharvest operations, transport, and minimal processing of chilled young coconut water/drink as defined in this Code, derived from young coconut, with or without the addition of tender young coconut solid endosperm, potable water, and permitted sweeteners. Emphasis is made on how to minimize contamination from microbiological hazards as they relate to

Good Agricultural Practice (GAP), Good Hygienic Practice (GHP) and Good Manufacturing Practice (GMP).

## 2.2 Use of the document

The provisions of this document are supplemental to and must be used in conjunction with, the Codex Recommended International Code of Practice-General Principles of Food Hygiene (CAC/RCP 1-1969, Rev 4:2003), Revised Guidelines on Current Good Manufacturing Practice in Manufacturing, Packing, Repacking, or Holding Food (Department of Health Administrative Order No. 153 S. 2004) or its latest issuance and Chilled young coconut water/drink – specifications (PNS/BAFPS 28:2006).

## 2.3 Definitions

### 2.3.1

#### **brix**

refers to concentration of sugar in syrup corresponding approximately to concentration of solutes expressed in percentage as measured with a refractometer or hydrometer and expressed in °Brix units

### 2.3.2

#### **chilling**

food preservation method in which the temperature is controlled at approximately 0-5°C

### 2.3.3

#### **coconut meat**

tender solid endosperm obtained from young coconut

### 2.3.4

#### **contaminant**

refers to any substance not intentionally added to food which is present in such food as a result of the production, postharvest handling, manufacturing, processing, preparation, packaging, transport or holding of such food as a result of environmental contamination

### 2.3.5

#### **food additives**

any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the addition of which to the food is intended for technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or

holding of such food results, or may be reasonably expected to result, (directly or indirectly) in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods. The term does not include contaminants, or substances added to food for maintaining or improving nutritional qualities.

### **2.3.6**

#### **good hygienic practices**

refer to all practices regarding the conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain

### **2.3.7**

#### **growers/agricultural workers**

person responsible for the growing and management of the \*primary production of coconut

### **2.3.8**

#### **primary production**

steps involved in the growing and harvesting of coconut for example planting, irrigation, application of fertilizers and application of agricultural chemicals.

### **2.3.9**

#### **hazard**

refers to a biological, chemical or physical agent in food with a potential to cause adverse effect on health

### **2.3.10**

#### **labeling**

includes any written, printed or graphic matter that is present on the label, accompanies the food, including that for the purpose of promoting its sale or disposal

### **2.3.11**

#### **potable water**

water fit for human consumption and potability determined by health authorities cited in Philippine National Standards for drinking water (Department of Health A.O. No. 2007-2013. Philippine National Standards for Drinking Water 2007)

### **2.3.12**

#### **rancid odor**

off odor due to lipid oxidation (oxidative rancidity) and/or release of free fatty acids by lipolysis (hydrolytic rancidity)

**2.3.13****sweeteners**

food additive that is used to impart a sweet taste to food or food products

**2.3.14****whole young coconuts**

young coconut with husk

**2.3.15****young coconut**

refers to 6-9 month old coconut (*Cocos nucifera* L.) from the time of flowering

## **SECTION 3 - PRIMARY PRODUCTION**

These principles and guidelines supplement those contained in Section 3 of the Codex Recommended International Code of Practice-General Principles of Food Hygiene (CAC/RCP 1-1969, Rev 4:2003), Revised Guidelines on Current Good Manufacturing Practice in Manufacturing, Packing, Repacking, or Holding Food (Department of Health Administrative Order No. 153 S. 2004) or its latest issuance and Chilled young coconut water/drink – specifications (PNS/BAFPS 28:2006).

### **PRINCIPLES APPLYING TO THE PRIMARY PRODUCTION OF COCONUT**

Coconut water should not contain any contaminant at a level that compromises the appropriate level of public health protection, when presented to the consumer. The influence of primary production activities on the safety of coconut water/drink, potential microbiological contamination from all sources should be minimized to the greatest extent practicable. Microbiological hazards can be introduced from the farm environment and farming practices, thus, relevant provisions of Good Agricultural Practices (GAP) should be followed to assure food safety and prevent inappropriate practices that may lead to unacceptable levels of contamination during primary production.

#### **3.1 Environmental Hygiene**

Wherever possible, potential sources of contamination from the environment should be identified. In particular, primary production should not be carried out in areas where the presence of potentially harmful substances would lead to an unacceptable level of such substances in or on coconut after harvest. For existing coconut production sites that have shown potential for food safety risk, measures should be implemented to minimize contamination.

Control measures involving treatment with chemical, physical or biological agents should be undertaken with a thorough understanding of the potential hazards to health and the environment. Such measures should be carried out in accordance with the regular rules and recommendations of Fertilizer and Pesticide Authority (FPA).

##### **3.1.1 Location of Coconut Production Site**

For existing production sites that have shown potential for food safety risk, measures should be implemented to minimize contamination. Wherever possible, potential sources of contamination from the environment should be identified.



Fields should be regularly cleaned to minimize the spread of pests and diseases. Diseased, senescent and dried part of the trees should be frequently removed, buried or burned as these may harbor pests and diseases.

### **3.2 Hygienic production of coconut**

#### **3.2.1 Pre-harvest selection of coconut and harvesting technique**

Only whole young coconuts shall be used for the product. Coconuts must be harvested at 6-9 months of maturity to obtain maximum volume of water and ensure product consistency. Harvest time is preferably during the cooler part of the day to minimize deterioration at postharvest phase. High temperature at harvest will lead to more rapid physiological changes and deterioration.

Harvesting operations and methods should be conducted with consideration on the possible sources of contamination. Coconuts should not be allowed to fall to the ground to prevent mechanical injury, as this will facilitate the entry of microorganisms, which may cause spoilage of the coconut water within the coconut. As a common practice, coconut bunches are lowered to the ground using a rope.

#### **3.2.2 Equipment Associated with Growing and Harvesting**

Standard Operating Procedures (SOPs) should be developed for the maintenance, cleaning and disinfecting operations of growing and harvesting equipment. The following are recommended:

- Cutting tools, implements, and equipment used to harvest coconuts should be thoroughly cleaned before use and cutting edges should be kept smooth and sharp; and
- Growers/agricultural workers should be trained to follow the SOPs.

Harvesting tools, collecting containers and other implements should be so designed and constructed to ensure that they can be cleaned and maintained to avoid contamination.

### **3.3 Handling and Storage**

Harvested coconuts should not come in direct contact with extraneous matter like dirt, soil and chemical substances. If not properly washed off, these materials will introduce chemical and microbiological contamination during coconut water collection.

At all times, harvested coconuts should be stored in a clean, well-ventilated area, off the ground and away from direct sunlight. Likewise, coconuts should be stored in a way which prevents them from rolling and cracking.

### **3.3.1 Prevention of Cross-Contamination**

Coconuts are susceptible to damage during harvest and postharvest handling operations. The following should be considered for the manual harvesting and postharvest handling of coconuts:

- Evaluate the field for the presence of hazards or contamination prior to harvest;
- Train growers/agricultural workers to recognize and segregate damaged coconuts;
- Practice good personal hygiene particularly during harvesting and field packing operations;
- Provide harvest containers dedicated for coconuts;
- Avoid direct contact with the soil after harvest and before loading into a transport vehicle to avoid contaminating the coconuts with microbiological contaminants in the soil;
- Avoid mechanical damage such as cracks, as these may provide entry points for foodborne pathogens and sites for microbiological survival and multiplication; and
- Collect and dispose damaged coconuts immediately so that they will not attract animals and insect pests.

### **3.4 Transport from the Production Site to the Packing/Processing Facility**

Coconuts being actively respiring after harvest should be protected from direct sunlight during transport. Covers may be placed on open transport trailers if deemed necessary. Coconuts are also at risk to mechanical damage during loading, unloading and transportation. Care must be taken to avoid cracking during handling and transportation. Coconuts must be loaded in a manner that prevents them from cracking during transportation. Rolling of coconuts should be avoided.

The following should also be considered:

- Transportation of coconuts should be managed to reduce or control the risk of contamination.
- Separate coconuts from other agricultural products during transport.
- Vehicle for transporting the coconut should be adequate for the purpose and should be cleaned and maintained as not to constitute a source of contamination to the coconut.

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- When not in use, cleaned harvest containers and transport trailers should be covered and kept in a protected location.
- Replace damaged containers or transport trailers.

**SECTION 4 - ESTABLISHMENT: DESIGN AND FACILITIES****4.1 Plant Constructions and Layout****4.1.1 Location, size and sanitary design**

The buildings and surrounding area:

- should be located in a flood-free area and of considerable distance from possible source of contamination;
- should be kept reasonably free from objectionable odours, smoke, dust, or other contamination;
- should be of sufficient size for the purpose intended without crowding of equipment or personnel;
- should be of sound construction and kept in good repair;
- should be of such construction as to protect against the entrance and harbouring of insects, birds or vermin and environmental contaminants such as dust, smoke and the like;
- should be designed as to permit easy and adequate cleaning; and
- should be designed to provide separation, by partition, location or other effective means between operations, which may cause cross contamination.

Floors should be constructed of material, which is not capable of supporting microbial growth, and should be hard surfaced. They should be designed to facilitate effective cleaning.

Walls and ceiling should be so designed, constructed and finished as to prevent the accumulation of dirt and minimize condensation, mold development and flaking and should be easy to clean.

Doors should be self-closing and close fitting.

**4.1.2 Sanitary facilities and control**

The following are the considerations:

- The water supply should be of potable quality.

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- Disposal of waste should be effected in such a manner so as to prevent contamination of potable water supplies.
- Premises should be well lit and ventilated. Good ventilation is important to prevent mould growth.
- Light bulbs and fixtures suspended over food in any step of preparation should be of the safety type or otherwise protected to prevent food contamination in the case of breakage.
- Toilet rooms should be well lit and ventilated and should not open directly into a food processing area. They should be kept in a sanitary condition at all times. There should be hand washing facilities in the toilet area with signages requiring personnel to wash their hands properly.

**SECTION 5 - CONTROL OF OPERATION**

These principles and guidelines are supplemental to those contained in Section 5 of the General Principles of Food Hygiene (CAC/RCP 1-1969) including the Annex on Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application.

**5.1 Key aspects of hygiene control systems****5.1.1 Temperature and time controls**

Coconut water/drink should be cooled immediately after collection to slow down the onset of degradation. Coconut water/drink retains its quality characteristic under conditions of low temperature at about 4°C. Coconut water/drink undergoes spoilage on storage at higher temperature over extended period of time.

**5.1.2 Specific Process Steps****5.1.2.1 Removal of unfit coconut**

Coconuts characterized by the following must be rejected and must not be included as raw source of coconut water/drink:

- Coconuts with presence of cracks;
- Coconuts with pedicels not intact;
- Any degree of pest infestation;
- Coconuts that are either pre-mature or over-mature;
- Coconuts with contents that are cloudy; and
- Coconuts with contents having a rancid odor

### 5.1.2.2 Coconut sanitation

Coconuts should be washed thoroughly to remove adhering extraneous matter using manual cleaning or by using brushes and abrasive pads. Washed coconuts should be sanitized in dilute bleach solution (1 tablespoon bleach per 4.5 liters of water) to reduce the number of microorganisms on the surface of coconut. Sanitized coconuts should be transferred to a clean surface off the ground and allowed to air dry.

If using a basin, water used during washing should be frequently changed especially when there is high level of soil contamination.

Washed coconuts should be processed immediately after washing.

### 5.1.2.3 Coconut water collection, filtration and cooling

Coconuts should be cut on a cutting board using a sanitized cutlass or similar tool. Equipment, containers or any other collecting vessels used should be made from non-toxic materials. They should be designed and constructed to ensure that, they can be cleaned, disinfected and maintained to avoid the contamination. They should be kept sanitary through regular cleaning. Containers previously used for toxic materials shall not be used for holding extracted coconut water.

Coconut water should be filtered using appropriate filtering material like cheese cloth and strainer. Collected coconut water may be filtered by decanting it into a sanitized container with a strainer lined with sanitized silkscreen cloth or cheesecloth. The filter cloth should be changed as deemed necessary.

Filtered coconut water should be immediately cooled to 4°C temperature or processed, packed and stored at about 4°C temperature.

Coconut water that are cloudy and exhibiting a rancid odor should be disposed properly and should not be mixed with the other coconut water.

### 5.1.2.4 Formulation of coconut water/drink

According to PNS/BAFPS 28-2006: specification for chilled young coconut water/drink, the products is classified as follows:

**Table 1 – Specification for chilled young coconut water/drink**

<b>Classification</b>	<b>Description</b>
100% buko juice	Unmodified natural aqueous liquid of 6-9 month-old coconut, the appearance of which ranges from clear to slightly turbid
Buko juice with tender solid endosperm	Buko juice with the addition of tender solid endosperm from 6 to 8 month-old coconut
Buko juice drink – buko juice with water, with or without sweetener, without tender solid endosperm	Buko juice with the addition of potable water, with or without permitted sweeteners and without tender solid endosperm. Addition of potable water is no more than 20%
Buko juice drink – buko juice with water, with or without sweetener and with tender solid endosperm	Buko juice with the addition of potable water, with or without permitted sweetener and with tender solid endosperm from 6 to 8 month-old coconuts. Addition of potable water is no more than 20%

#### 5.1.2.5 Packaging

Chilled young coconut water/drink, with or without addition of water, sweetener and/or tender solid endosperm, should be immediately packed in a food grade container that will adequately protect the product from contamination and hazards of transportation and handling. Packed coconut water/drink should be sealed and transferred rapidly to a chiller or similar container maintained at 4°C.

Packaging materials shall be food grade and suitable for intended use. This should be stored in a clean and sanitary manner. Packaging activities should be done in a separate room under conditions that preclude the introduction of contaminants into the product. All workers and food handlers should follow practices as in the appropriate sections of the Codex Recommended International Code of Practice-General Principles of Food Hygiene (CAC/RCP 1-1969, Rev 4:2003) to avoid contamination.

## 5.2 Handling, Storage and Transport

Packaged coconut water/drink should be stored away from direct light. Temperature should be maintained at a maximum of 4°C during storage, transport and distribution.

## 5.3 Processing environment

The processing environment for coconut water must be clean and free of animals, insect, dusts and garbage. All surfaces coming in direct contact with coconut water/drink must be properly cleaned and sanitized. Waste material (e.g. coconut husk) must be removed and disposed immediately.

## 5.4 Management of products within the facility

The principle of “first in, first out (FIFO)” should apply. The flow of product within the equipment and through the processing facility should maintain a forward progression from the raw material to coconut water/drink packaging so as to avoid cross contamination.

## 5.5 Documentation and record keeping

Where appropriate, records should be maintained to adequately reflect product information. Maintaining adequate documentation and records of processing information is important in the event of recall of chilled young coconut water/drink. Records should be kept long enough to facilitate recalls and foodborne illness investigations.

Records should be kept on the:

- Use of agricultural chemicals;
- Date and time of harvest of coconut;
- Volume of coconut water collected;
- Date and time of processing;
- Amount of water, sweetener and solid endosperm added (if applicable);
- Volume of production, and;
- Storage condition

## 5.6 Recall procedures

In the event of a foodborne illness outbreak associated with coconuts, maintaining appropriate records of production, processing, packaging and distribution may help to

identify the source of contamination in chilled young coconut water/drink food chain and facilitate product recalls. Growers/processors/distributors should consider developing and maintaining a traceability/product tracing system. The traceability/product tracing system should be designed and implemented according to the principles for Traceability/Product Tracing as a Tool with Food Inspection and Certification System (CAC/GL 60-2006).

Detailed records should be kept that will link each supplier of the product with the immediate subsequent recipient of the product throughout the food chain.

## **SECTION 6 – ESTABLISHMENT: MAINTENANCE AND SANITATION**

### **6.1 Maintenance and Cleaning**

#### **6.1.1 General**

All food contact surfaces should be smooth; free from pits, crevices and loose scale; non-toxic; resistant to corrosion and capable of withstanding repeated exposure to normal cleaning and disinfection; and non-absorbent unless the nature of a particular and otherwise acceptable process renders the use of a surface, such as wood, necessary.

All equipment coming in direct contact with coconut water should be cleaned and sanitized before and after use. There should be regular cleaning schedule for all equipment and food contact materials used during processing.

#### **6.1.2 Pests Control Systems**

Pests should be controlled in a way that does not contribute to the contamination of the raw materials, finished produce or the processing area with chemical residues. Suitable precautions should be taken to protect product from being contaminated by pests or by pest control agents.

#### **6.1.3 Drainage and Waste Disposal**

Adequate drainage is important in the processing and sanitary facilities to avoid the risk of contaminating the coconut water/drink. Drains should be cleaned periodically to prevent build-up of biofilms that may contain pathogenic microorganisms. Standing water should be removed or pushed to the drains.



Areas for garbage recyclables and compostable waste should be identified and all waste should be stored and disposed in a manner to minimize contamination.

## **6.2 Sanitary Audit**

Regular environmental and hygiene assessment as well as sanitary inspection of facilities should be conducted to serve as basis for corrective and preventive actions.

## **SECTION 7 - PERSONAL HYGIENE**

All workers and food handlers should act in accordance with the appropriate sections of the Recommended International Code of Practice – General Principles of Food Hygiene (CAC/RCP 1 – 1969) to maintain an appropriate degree of personal cleanliness; and operate in an appropriate manner.

Contamination of coconut water/drink by human must be avoided at all times. All individuals involved in the primary processing must be in good health and must observe Good Hygienic Practices (GHP) in order to prevent contamination of the product during coconut water collection and packaging.

## **SECTION 8 - END PRODUCT SPECIFICATION**

Coconut water/drink should be clean, sound, wholesome product derived from young coconut, with or without addition of tender young coconut solid endosperm, potable water, and permitted sweeteners. To the extent possible in good manufacturing practice (GMP), the product should be free from extraneous matter.

The product should conform with heavy metals in an amount not hazardous to human health. The product should not contain pathogenic microorganisms such as Salmonellae and E. coli and should conform to the microbiological characteristics specified in Philippine National Standard for Chilled young coconut water/drink (PNS/BAFPS 28:2006).

## **SECTION 9 - PRODUCT INFORMATION AND CONSUMER AWARENESS**

### **9.1 Labeling**

Coconut water/drink should be labeled in accordance with the Current FDA labeling requirements for Pre-packaged Food Products. Labels must be printed legibly in

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accordance to the FDA labeling guidelines in order to assure their adherence to the product during storage on ice or refrigeration.

**SECTION 10 - TRAINING**

Training should be conducted regularly and in accordance to hygienic practices. Training should be delivered in a language and manner to facilitate understanding of what is expected of them and why should training be done with emphasis on the importance of using hygienic practices.

**REFERENCES:**

CAC/RCP 57-2004. Code of hygienic practice for milk and milk products.

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