HACCP for Food Safety:

Asia-Pacific Economic Cooperation

Partnership Training Institute Network

Warren Stone, MBA

Grocery Manufacturers Association
Washington, DC

November 6, 2010

GMA
The Association of Food, Beverage and Consumer Products Companies

Workshop Objectives

- Introduce HACCP as a food safety management tool
  - Codex requirements for HACCP.
- Working Group Exercises
- Present an example for HACCP application in seafood production

GMA
The Association of Food, Beverage and Consumer Products Companies

H A C C P

GMA
The Association of Food, Beverage and Consumer Products Companies

Hard

Agonizing

Complicated

Confusing

Paperwork

GMA
The Association of Food, Beverage and Consumer Products Companies

Have

A

Cup of

Coffee and

Pray

GMA

The Association of Food, Beverage and Consumer Products Companies

Hazard Analysis and Critical Control Points

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Concept

- Preventive system for assuring safe production of foods
- A management tool

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP - A Management System

- Focuses on the prevention of problems that could lead to foodborne illness or injury.
- Can be applied throughout the food chain (*from harvest to table*).
- Commonly applied in manufacturing settings.

GMA
The Association of Food, Beverage and Consumer Products Companies

Mandatory HACCP by Worldwide Regulatory Agencies

EU: 

All food business operators (852/2004/EC)

US: 

Seafood, juice (FDA), meat & poultry (USDA)

Canada: 

Mandatory: Meat & poultry

Recognition process: Dairy, processed fruits and vegetables, shell eggs, processed eggs, honey, maple, and hatcheries.

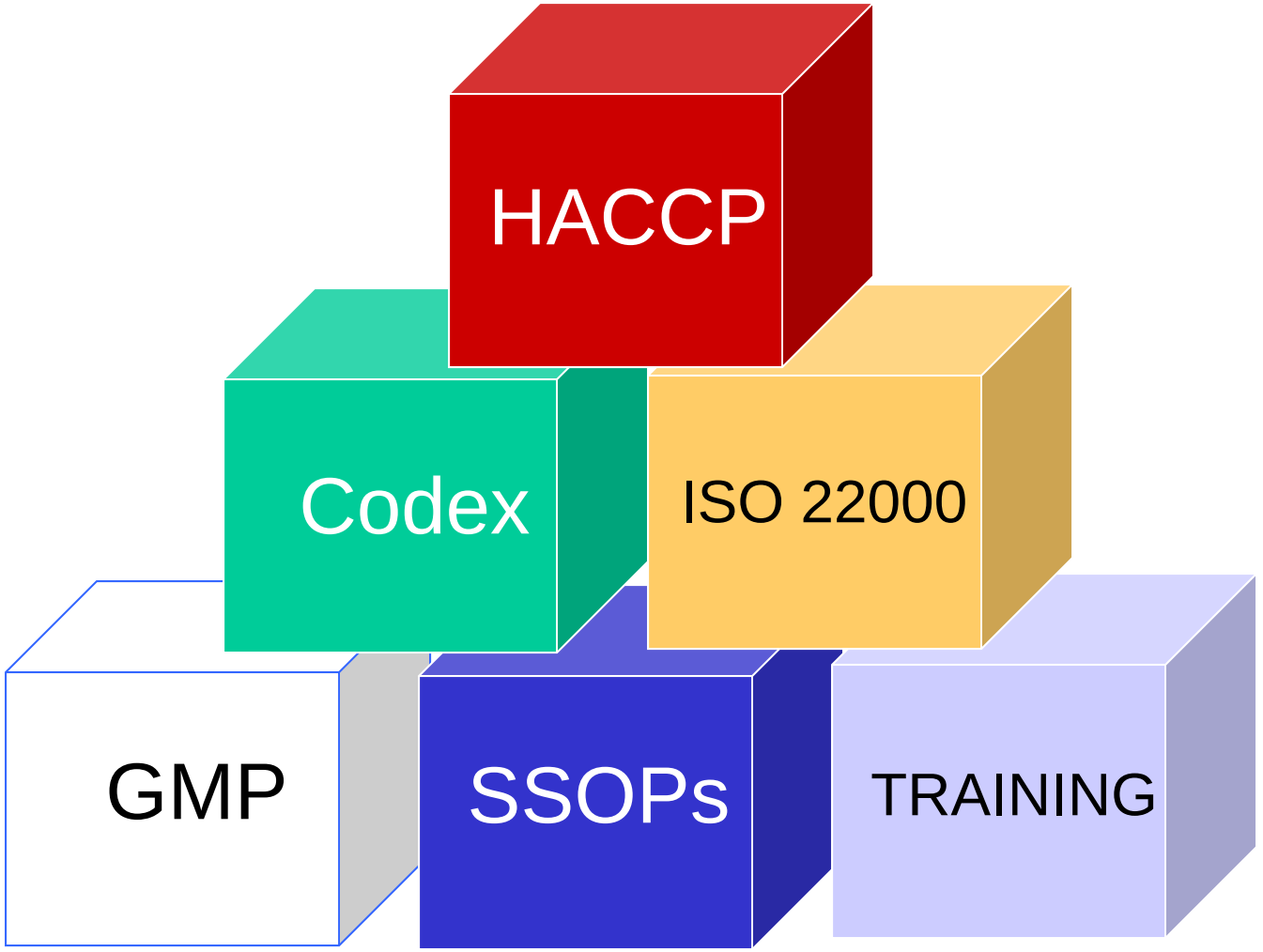
GMA
The Association of Food, Beverage and Consumer Products Companies

Key Points

- Food Safety Only…Not Quality
- HACCP does not stand alone
  - Management commitments
  - GMPs
  - Sanitation Programs
  - Prerequisite Programs

GMA
The Association of Food, Beverage and Consumer Products Companies

Prerequisites Are the Building Blocks of a HACCP System



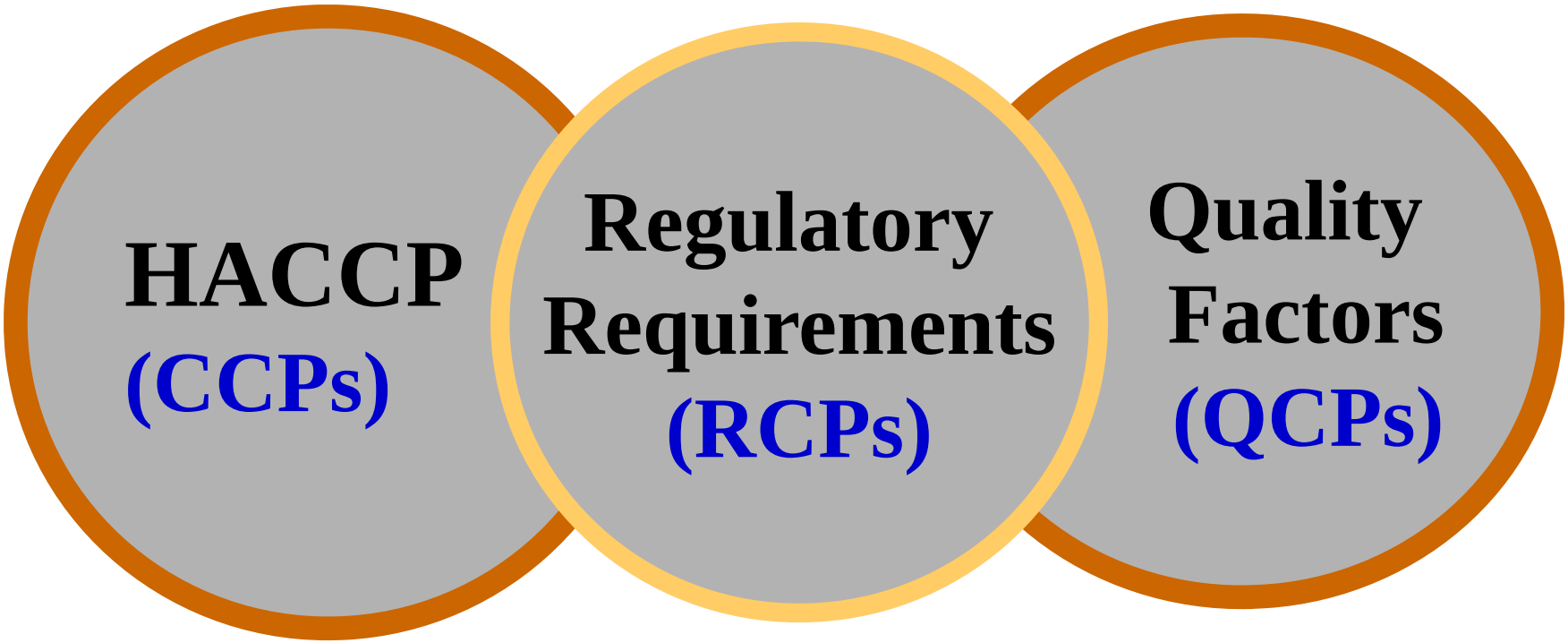
GMA
The Association of Food, Beverage and Consumer Products Companies

Foodborne Illnesses Associated with Seafood

- A total of 1194 outbreaks in the home, restaurants and delis have been associated with seafood in the US since 1997 (Center for Science in the Public Interest, 2010).
- Over 50,000 cases of ciguatera poisoning occur internationally every year (CDC, 2009).
- 425 cases of scombroid poisoning in the US since 1997 (Center for Science in the Public Interest, 2010).

GMA
The Association of Food, Beverage and Consumer Products Companies

Comprehensive System for Product Control



Safety

Hygiene (GMP)
Standards (Codex)

Plant
Specific

GMA
The Association of Food, Beverage and Consumer Products Companies

Codex International Code of Practice (Standards)

- General Principles of Food Hygiene (1)
- Lobsters (24)
- Smoked Fish (25)
- Crabs (28)
- Frog Legs (29)
- Fish and Fishery Products (52)

GMA
The Association of Food, Beverage and Consumer Products Companies

Origin of HACCP

Pillsbury - NASA “space foods”

GMA
The Association of Food, Beverage and Consumer Products Companies

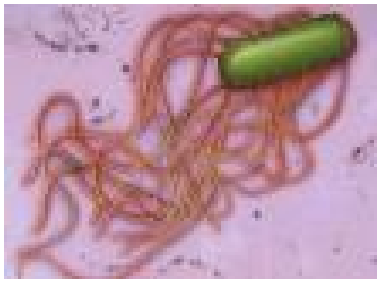
Origin of HACCP

- The Pillsbury Company, U.S. Army Natick Laboratories and NASA developed HACCP in response to the food safety requirements for production of foods for the space program.

GMA
The Association of Food, Beverage and Consumer Products Companies

End-product testing ineffective

- 1/1000 units contaminated with *Salmonella*



- 60 samples tested
- >94% probability of <u>acceptance</u> (all negative)

GMA
The Association of Food, Beverage and Consumer Products Companies

Original 3 HACCP Principles (1971)

- Identify/Assess hazards
- Determine critical control points
- Establish systems to monitor CCPs

GMA
The Association of Food, Beverage and Consumer Products Companies

Codex Alimentarius Commission

"Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application."

Codex 22nd session, 1997
Updated in 2003

GMA
The Association of Food, Beverage and Consumer Products Companies

"Hazard Analysis and Critical Control Point Principles and Application Guidelines"

National Advisory Committee on Microbiological Criteria for Foods

J. Food Protection 61(9) 1998 pp. 1246-1259

GMA
The Association of Food, Beverage and Consumer Products Companies

Food Safety Hazard

A ***biological, chemical*** ***or*** ***physical*** agent that is **reasonably likely** to cause illness or injury in the absence of its control.

GMA
The Association of Food, Beverage and Consumer Products Companies

Classes of Food Safety Hazards

Biological:

- Bacterial Pathogens
- Parasites
- Viruses

GMA
The Association of Food, Beverage and Consumer Products Companies

Food*	Some Pathogens of Concern
General Seafood	*Salmonella, C. botulinum,* parasites, viruses
Molluscan Shellfish	*Vibrio* spp., Hepatitis A virus, Norwalk virus

*Likelihood of occurrence is often product specific

GMA
The Association of Food, Beverage and Consumer Products Companies

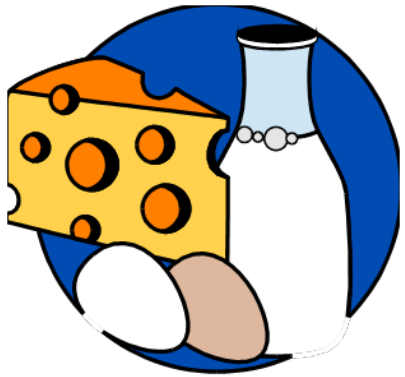
Classes of Food Safety Hazards

Chemical:

- Natural Toxins (Scombrotoxin/Histamine)
- Allergens
- Mercury
- Drugs (Aquaculture)

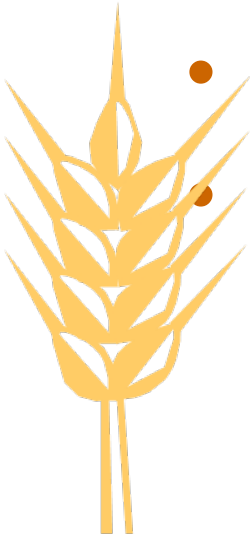
GMA
The Association of Food, Beverage and Consumer Products Companies

Common Food Allergens



- Peanuts
- Milk
- Eggs
- Fish
- Celery

- Crustaceans
- Soy
- Tree nuts
- Wheat
- Sesame
- Mustard



GMA
The Association of Food, Beverage and Consumer Products Companies

Classes of Food Safety Hazards

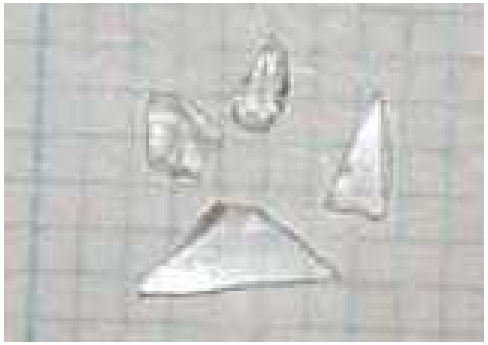
Physical:

- Metal
- Glass
- Hard or sharp foreign objects

GMA
The Association of Food, Beverage and Consumer Products Companies

Physical Hazards Are (Only) Those Capable of Causing Injuries

- Examples of what <u>are</u> physical hazards?



- Examples of what <u>are not</u> physical hazards?

GMA
The Association of Food, Beverage and Consumer Products Companies

Questions?

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP- Getting Started

Assemble the HACCP Team

Describe the Food and its Distribution

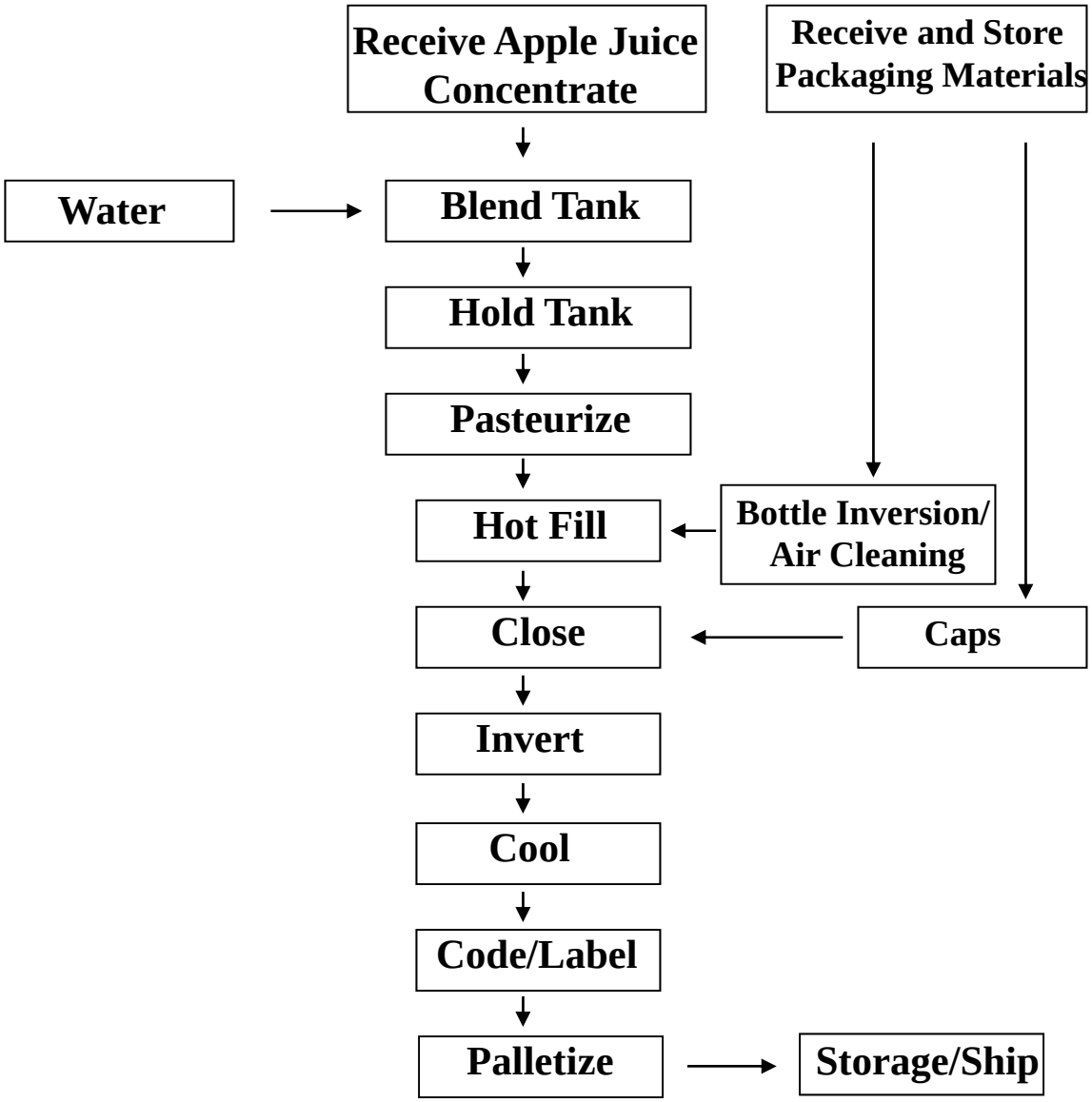
Describe the Intended Use and Consumers of the Food

Develop a Flow Diagram Which Describes the Process

Verify the Flow Diagram

GMA
The Association of Food, Beverage and Consumer Products Companies

Example: Apple Juice in Glass Bottle, Shelf Stable



GMA
The Association of Food, Beverage and Consumer Products Companies

7 HACCP Principles

1. Conduct a hazard analysis
2. Determine the CCPs
3. Establish critical limits
4. Establish monitoring procedures
5. Establish corrective actions
6. Establish verification procedures
7. Establish record keeping and documentation

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 1

Conduct a Hazard Analysis

GMA
The Association of Food, Beverage and Consumer Products Companies

Hazard Analysis

The process of collecting and evaluating information on hazards associated with the food under consideration to decide which are significant and must be addressed in the HACCP plan.

GMA
The Association of Food, Beverage and Consumer Products Companies

Evaluation for Hazards to Include:

1. Microbiological contamination
2. Parasites
3. Chemical contamination
4. Unlawful pesticide residues
5. Decomposition (if a food hazard exists)

GMA
The Association of Food, Beverage and Consumer Products Companies

Hazards (continued)

6. Natural Toxins
7. Unapproved use of food or color additives
8. Presence of undeclared ingredients that may be allergens
9. Physical hazards

GMA
The Association of Food, Beverage and Consumer Products Companies

Hazard Analysis

Two Stages:

1. Hazard identification
   - list of potential hazards
2. Hazard evaluation
   - select based on severity and likelihood of occurrence

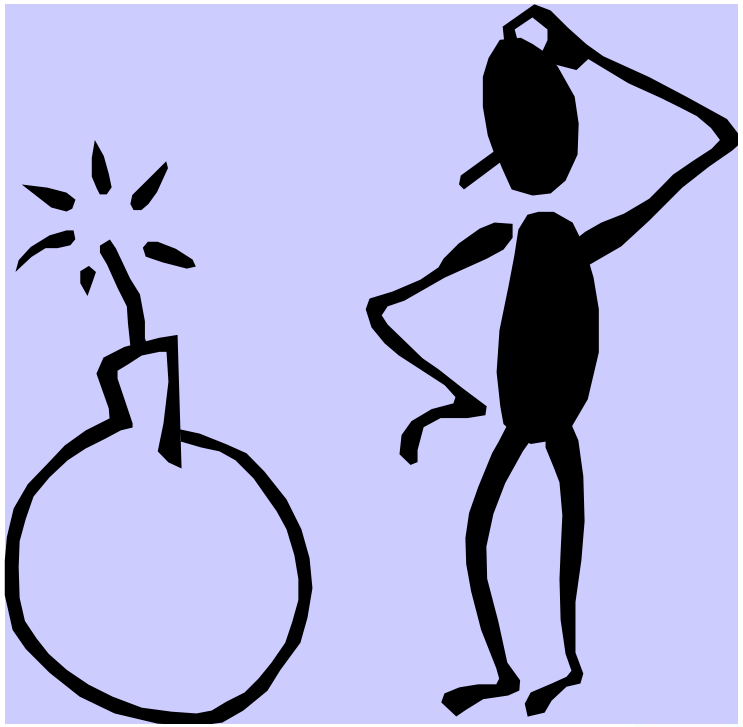
GMA
The Association of Food, Beverage and Consumer Products Companies

Is It Significant ?

Severity

The seriousness of the effect(s) of a hazard and…

Likelihood of Occurrence



GMA
The Association of Food, Beverage and Consumer Products Companies

Example - evaluation for refrigerated raw shellfish

Stage 1: hazard identification

Determine potential hazards associated with product

Vibrio spp. in incoming raw shellfish

GMA
The Association of Food, Beverage and Consumer Products Companies

Stage 2: Hazard evaluation

Step (1): Assess severity of health consequences if potential hazard is not properly controlled

Vibrio spp. in raw shellfish may result in an infection with moderate to severe consequences.

GMA
The Association of Food, Beverage and Consumer Products Companies

Stage 2: Hazard evaluation

Step (2): Determine likely occurrence of potential hazard.

Raw shellfish have been known to contain *Vibrio* spp.

GMA
The Association of Food, Beverage and Consumer Products Companies

Stage 2: Hazard evaluation

Step (3): Decide if this potential hazard is to be addressed in the HACCP plan.

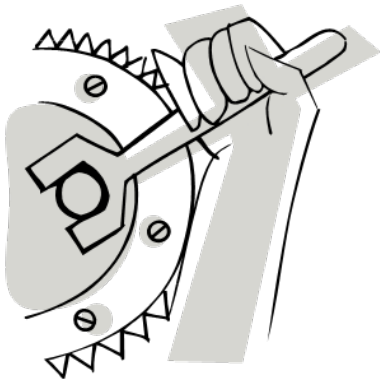
Yes;

If *Vibrio* spp from raw shellfish is not properly controlled, consuming this product presents a significant risk.

GMA
The Association of Food, Beverage and Consumer Products Companies

Working Group Exercise

Given a product and process, determine **potential hazards** and their **sources.**



GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 2

Determine the Critical Control Points (CCPs)

GMA
The Association of Food, Beverage and Consumer Products Companies

Definitions

CCP

A point or step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

GMA
The Association of Food, Beverage and Consumer Products Companies

Definitions

Control Measure

Any action or activity that can be used to ***prevent, eliminate or reduce*** a significant hazard.

GMA
The Association of Food, Beverage and Consumer Products Companies

Examples:

Point of Occurrence	Hazard	CCP
Raw fish	*Salmonella*	Heat Treatment
Ingredients	Sulfites	Labeling
Equipment	Metal fragments	Metal detectors

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 3

Establish Critical Limits

GMA
The Association of Food, Beverage and Consumer Products Companies

Critical Limit

Codex Definition

"A criterion which separates acceptability from unacceptability."

GMA
The Association of Food, Beverage and Consumer Products Companies

Basis for Critical Limits

- Biological hazards
  - Inactivation of microbes, toxins prevention/ destruction, growth prevention
- Chemical hazards
  - Toxicity, allergen, safety limits
- Physical hazards
  - Criteria related to potential for injury (object size)

GMA
The Association of Food, Beverage and Consumer Products Companies

Examples of parameters that may be CLs

- “on and functioning”
- “in place and intact”
- “presence of supplier guarantee”

GMA
The Association of Food, Beverage and Consumer Products Companies

Critical limit

is a

maximum or minimum value,

not an average value.

GMA
The Association of Food, Beverage and Consumer Products Companies

Not Meeting CL Indicates

Existence of a direct health hazard.

A direct health hazard could develop.

Product was not produced under conditions assuring safety.

GMA
The Association of Food, Beverage and Consumer Products Companies

Working Group Exercise

Now that you have determined the hazards, select the **control measures** that can be used to control the hazard and the **critical limits** for those control measures.

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 4

Establish Monitoring Procedures

GMA
The Association of Food, Beverage and Consumer Products Companies

Monitoring is:

“The act of conducting a planned sequence of observations or measurements of control parameters to assess whether a CCP is under control .”

GMA
The Association of Food, Beverage and Consumer Products Companies

Monitoring Provides:

- **Data to track control (Trend)**
- **Used to make adjustments and detect deviations**
- **Written documentation for use in verification**

GMA
The Association of Food, Beverage and Consumer Products Companies

Types of Monitoring

- **Observations**
- **Measurements**
- **Continuous or Discontinuous**

GMA
The Association of Food, Beverage and Consumer Products Companies

Monitoring activities

- **Identify who (job position)**
- **What is to be monitored**
- **How it is to be monitored**
- **When, how often (frequency)**
- **Documents that CLs are met**

GMA
The Association of Food, Beverage and Consumer Products Companies

Working Group Exercise

Now that you have determined the control measures and critical limits choose the **monitoring procedures** for you critical limits.

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 5

Establish Corrective Actions

GMA
The Association of Food, Beverage and Consumer Products Companies

Corrective Action

"Any action to be taken when the results of monitoring at the CCP indicate a loss of control"

Codex

GMA
The Association of Food, Beverage and Consumer Products Companies

Corrective actions must be developed for possible deviations at <u>each</u> CCP.

GMA
The Association of Food, Beverage and Consumer Products Companies

Corrective Actions

Should include the following:

- Ensure the CCP is under control
- Determine and correct the deviation cause
- Determine disposition of non-compliant product
- Record the corrective actions taken

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 6

Establish Verification Procedures

GMA
The Association of Food, Beverage and Consumer Products Companies

VERIFICATION

"The application of methods, procedures, tests and other evaluations, in addition to monitoring, to determine compliance with the HACCP plan."

GMA
The Association of Food, Beverage and Consumer Products Companies

Types of Verification

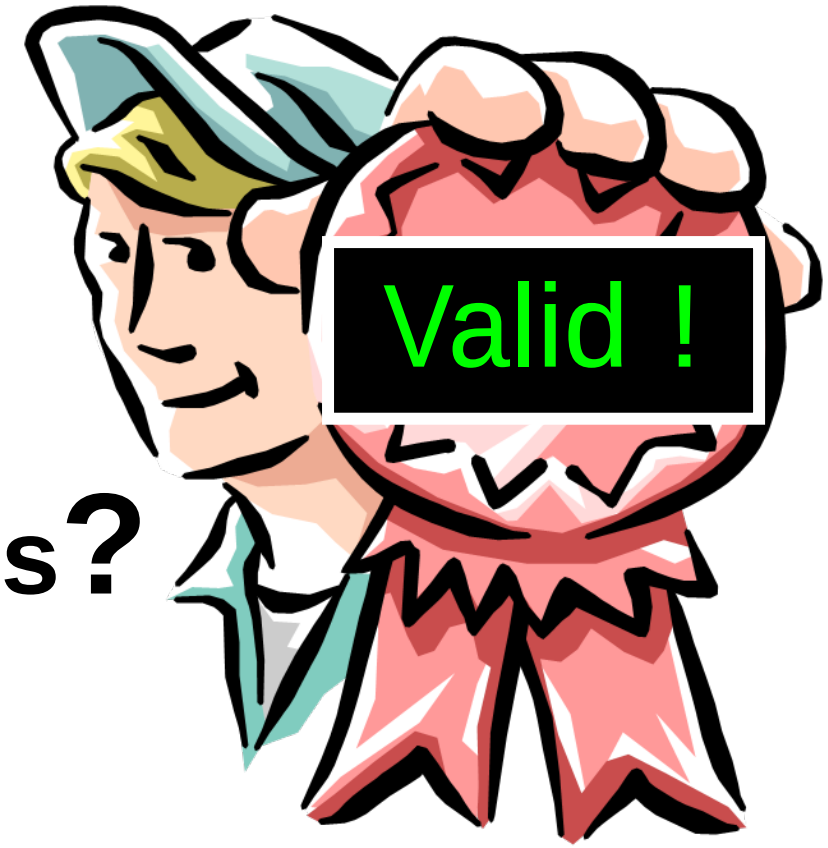
1. Validation that the HACCP plan (and its components) are adequate to control hazards.
2. “Routine” verification that the CCPs are in control and effective.
3. Verification that the HACCP system is operating according to the HACCP plan.
4. Regulatory verification.

GMA
The Association of Food, Beverage and Consumer Products Companies

Validation of HACCP Plan

Right CCPs?

Control Hazards?



GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Principle 7

Establish Record-Keeping and Documentation Procedures

GMA
The Association of Food, Beverage and Consumer Products Companies

Records established for the HACCP system

- Summary of Hazard Analysis
- Team members, Product Information, and Flow Diagrams
- The HACCP Plan
- Training Records
- *May* include Pre-requisite Program Details (if mentioned in HACCP plan)
- SSOP implementation records

GMA
The Association of Food, Beverage and Consumer Products Companies

Records maintained for the HACCP system

For steps in process that are CCPs:

Controlling hazards of concern within critical limits

Types of Records:

- Monitoring
- Verification procedures, schedules & records
- Corrective actions

GMA
The Association of Food, Beverage and Consumer Products Companies

Questions?

GMA
The Association of Food, Beverage and Consumer Products Companies

HACCP Plan Example

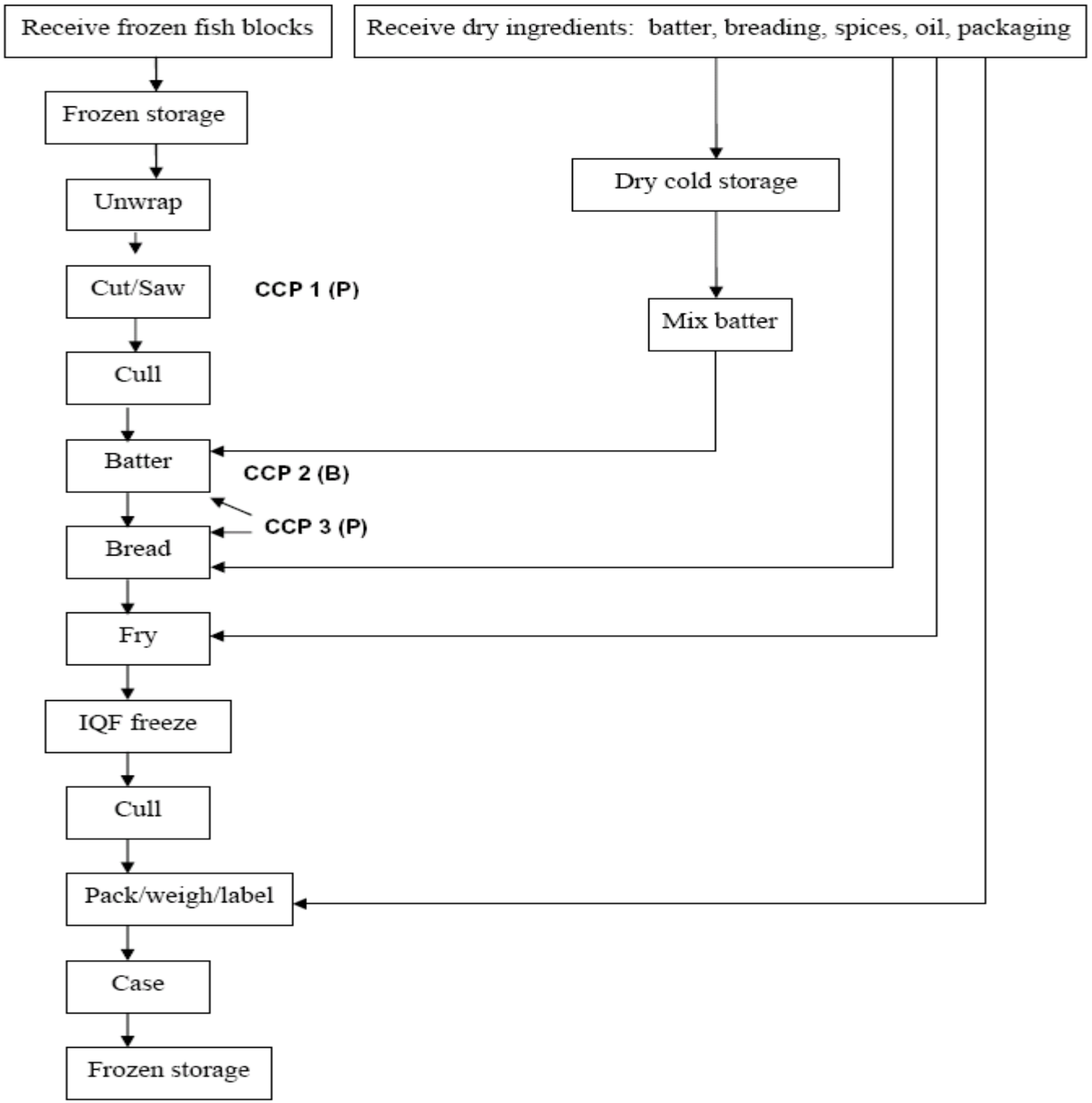
This generic HACCP plan was developed for training purposes only and is not intended to replace any processor's hazard analysis and HACCP plan development. This model may not reflect all concerns outlined in Codex guidelines.

GMA
The Association of Food, Beverage and Consumer Products Companies

Frozen, breaded fish sticks are prepared from blocks of frozen minced fish; batter and breading prepared from mixes of wheat and corn flour, modified corn starch, spices, seasonings, egg whites, and vegetable oil. The packaging materials used are PET trays, plastic shrink-wrap film, and corrugated shipping cartons for consumer packages; polyethylene film liners and corrugated cartons for foodservice packages; and package labels. The fish sticks are not fully cooked and require cooking prior to consumption. The fish sticks are distributed for retail sales or foodservice use. Each package is labeled with a “use by” date, cooking instructions and the phrase “keep frozen.”

GMA
The Association of Food, Beverage and Consumer Products Companies

Frozen Breaded Fish Sticks



GMA
The Association of Food, Beverage and Consumer Products Companies

Example: For Training Purposes Only

Hazard Analysis Worksheet[1]

FROZEN BREADED FISH STICKS

Ingredient or Processing Step	Potential hazards introduced, controlled or enhanced at this step.	Does this potential hazard need to be addressed in HACCP plan? (Yes/No)	WHY? (Justification for decision made in previous column)	What measures can be applied to prevent, eliminate or reduce the hazards being addressed in your HACCP plan?	Is this step a critical control point (CCP)?
Receive frozen fish blocks	BIOLOGICAL Pathogens such as *Vibrio* spp. Parasites such as nematodes	No	Product is not ready to eat. Product is intended to be fully cooked prior to consumption; freezing will kill the parasites.		
	CHEMICAL None				
	PHYSICAL Bones	No	This inherent defect is not reasonably likely to result in the food being unsafe for consumption.		
Frozen storage	BIOLOGICAL Pathogens such as *Vibrio* spp.	No	Product is frozen so opportunity for pathogen growth or contamination is not reasonably likely to occur.		
	CHEMICAL None				
	PHYSICAL None				
Cut/Saw	BIOLOGICAL Growth of pathogens such as *Vibrio* spp.	No	Period of time at this step is short; product remains frozen; opportunity for pathogen growth not reasonably likely to occur.		
	CHEMICAL None				
	PHYSICAL Metal fragments	Yes	Potential for saw blade to break and contaminate product is reasonably likely to occur. Metal fragments can cause moderate injury.	Periodic inspection of equipment.	Yes CCP1(P)

GMA
The Association of Food, Beverage and Consumer Products Companies

Mix batter	BIOLOGICAL Growth of pathogens such as *Vibrio* spp; contamination with pathogens such as *Cryptosporidium*	No	Risk is low due to short mixing time; potable water is used.		
	CHEMICAL None				
	PHYSICAL None				
Batter	BIOLOGICAL Growth of *Staphylococcus aureus* with toxin formation	Yes[2]	Potential for *S. aureus* growth if batter held too long at elevated temperature. Staph enterotoxin can cause moderate illness.	Keep temperature low.	Yes CCP2(B)
	CHEMICAL None				
	PHYSICAL Metal fragments	Yes	Potential for metal fragments from wire-mesh conveyor contaminating product. Metal fragments can cause moderate injury.	Periodic inspection of equipment.	Yes CCP3(P)
Bread	BIOLOGICAL Growth of pathogens such as *Vibrio* spp.	No	Application of dry breading does not promote pathogen growth due to short time period.		
	CHEMICAL None				
	PHYSICAL Metal fragments	Yes	Potential for metal fragments from wire-mesh conveyor contaminating product.	Periodic inspection of equipment.	Yes CCP3(P)
Fry	BIOLOGICAL None				
	CHEMICAL Rancid cooking oil	No	Potential for toxic compounds from cooking oil is not reasonably likely to occur.		
	PHYSICAL None				

Example: For Training Purposes Only

HACCP Plan Form[1]

FROZEN BREADED FISH STICKS

Critical Control Point (CCP)	Hazard(s) to be Addressed in HACCP Plan	Critical Limits for Each Control Measure	Monitoring				Corrective Action	Verification Activities	Record-keeping Procedures
			What	How	Frequency	Who			
CCP1(P) Cut/Saw	Metal fragments	No broken or missing metal parts from sawblade	Presence of broken or missing metal parts from sawblade	Visually check sawblade for broken or missing parts	Prior to start-up End of operations After sawblade malfunction	Saw operator	Stop production Adjust or modify equipment to reduce risk of recurrence Hold product from last acceptable check Run product through calibrated operable metal detector	QA to inspect sawblade once per personnel shift QA supervisor or designated employee to review monitoring and corrective action records daily Review of metal detector calibration records	Sawblade inspection log Corrective Action log QA verification log Metal detector calibration log

GMA
The Association of Food, Beverage and Consumer Products Companies

Critical Control Point (CCP)	Hazard(s) to be Addressed in HACCP Plan	Critical Limits for Each Control Measure	Monitoring				Corrective Action	Verification Activities	Record-keeping Procedures
			What	How	Frequency	Who			
CCP2(B) Batter	*Staphylococcus aureus* toxin formation	Hydrated batter temperature should not exceed 50°F for more than 12 hours And should not exceed 70°F for more than 3 hours[2]	Temperature of hydrated batter (exposure time will be monitored by frequency of checks)	Manually check temperature in hold tank with digital indicating thermometer	Approximately every hour	Batter operator	Dump batter and clean batter storage tank if temperature is over 50°F for more than 12 hours or over 70°F for more than 3 hours Make repairs to and/or adjust batter refrigeration equipment Hold product involved since last good check to evaluate the total time/temperature exposure	QA personnel verify batter temperature once per personnel shift QA supervisor or designated employee to review monitoring and corrective action records daily Calibrate digital indicating thermometer daily	Batter/breading inspection log Corrective Action log Thermometer calibration log QA verification log
CCP3(P) Batter/Bread	Metal fragments	No broken or missing metal parts from mesh conveyor belt	Presence of broken or missing metal parts from conveyor belt	Visually check conveyor belt for broken or missing parts	Prior to start-up End of operations After conveyor belt malfunction	Batter/bread operator	Stop production Adjust or modify equipment to reduce risk of recurrence Hold product from last acceptable check Run product through operable metal detector	QA to inspect conveyor belt once per personnel shift QA supervisor or designated employee to review monitoring and corrective action records daily	Batter/breading inspection log Corrective Action log QA verification log

[2]Note: The SOP requires operator to cool batter if temperature exceeds 50°F and determine exposure time should batter temperature exceed 70°F.

GMA
The Association of Food, Beverage and Consumer Products Companies

GMA HACCP Courses

Workshop	Descriptions
HACCP Online course*	This online workshop provides flexible, affordable and effective training for food safety personnel who need to learn and apply the principles of HACCP in plan development and implementation.
GMA Online HACCP Follow-up Workshop	This course complements the online HACCP training by providing hands-on experience with the development of a "mock" HACCP plan to facilitate understanding of the online material. Completion of the online course is prerequisite to this 1-day certificate workshop. The online course plus this 1-day follow-up workshop meet the educational requirements cited in the FDA & USDA HACCP regulations.
Advanced HACCP, Verification &Validation	This workshop, accredited by the International HACCP Alliance, concentrates on verification activities included in the sixth principle of HACCP. It explores activities in-depth and how to implement them in a successful HACCP system.
HACCP Train the trainer	The HACCP Train the Trainer workshop is designed to prepare and qualify candidates as International HACCP Alliance Lead Instructors. In addition to providing a greater understanding of the 7 HACCP principles, the workshop covers adult learning styles and delivery techniques to more effectively present HACCP course material. Hands-on working group exercises facilitate the learning process.
Basic HACCP (Meat, Poultry, Juice, Seafood and Other Products as needed)	This introductory workshop, accredited by the International HACCP Alliance, is composed of lectures and group exercises.. Each of the seven HACCP principles is discussed. The workshop focuses on strategies for HACCP plan development and implementation. GMA instructors can accommodate and provide lectures for specific areas of interest based upon the participants' needs.

*http://www.gmatraining.com/HACCP_Purchase_Info.html

GMA
The Association of Food, Beverage and Consumer Products Companies

GMA HACCP Resources

HACCP Materials:

- **HACCP: A Systematic Approach to Food Safety - English** http://www.fpa-food.org/store_product.asp?inve_id=221
- **HACCP: A Systematic Approach to Food Safety - Spanish** http://www.fpa-food.org/store_product.asp?inve_id=66
- **PowerPoint slide sets to accompany the above HACCP manuals:**
  - **English:** http://www.fpa-food.org/store_product.asp?inve_id=64
  - **Spanish:** http://www.fpa-food.org/store_product.asp?inve_id=196
- **HACCP Verification and Validation: An Advanced HACCP Workshop**
  - **English:** http://www.fpa-food.org/store_product.asp?inve_id=118
  - **Spanish:** http://www.fpa-food.org/store_product.asp?inve_id=69

GMA
The Association of Food, Beverage and Consumer Products Companies

Other Courses Offered by GMA

- **Thermal Process Development**
- **Thermal Process Deviations**
- **Better Process Control School**
- **Aseptic Better Process Control School**
- **Food Labeling**

- Contact Sherri Frye at: sfrye@gmaonline.org

GMA
The Association of Food, Beverage and Consumer Products Companies

Questions?

GMA
The Association of Food, Beverage and Consumer Products Companies