

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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رَبِّ زِدْنِي عِلْمًا

MY LORD! INCREASE ME IN KNOWLEDGE.

# FST- 311. FOOD BIOCHEMISTRY 3(2-1)

**Program:** B. Sc. (Hons). Food Science and Technology  
**Semester:** V (R + SS)  
**Academic Year:** Fall -2020  
**Session:** 2018-2022

**Course Teacher:**

**Dr. Shahid Mahmood Rana**  
**Associate Professor**



**INSTITUTE OF FOOD SCIENCE AND NUTRITION (IFSN)**  
**UNIVERSITY OF SARGODHA, SARGODHA-PAKISTAN**



# CONTENTS: THEORY

1. **Water** and its **Relation** to Food
2. **Carbohydrates**: structure and functions, classification, monosaccharide, disaccharides, polysaccharides, **caramelisation**.
3. **Proteins**: structure and functions, amino acids, peptides, chemical groups in proteins, covalent structure of protein, three dimensional structure of protein, protein **denaturation** and folding protein synthesis, **Maillard reaction, applications of functional properties**
4. **Lipids**: structure and functions, storage lipids, structural lipids, **biological and lipid oxidation in foods, hydrogenation, rendering, frying and antioxidants uses**
5. **Enzymes: function, kinetics, classification and nomenclature of enzymes, enzymatic reactions.**
6. **Flavor Compounds in Foods.**
7. **Food Safety**

# CONTENTS: PRACTICAL

1. Basics of Lab Work (**safety, hygiene, sanitation** etc.)
2. Handling and Storage of **Chemicals/Glass ware/Items/Equipment/Apparatuses**
3. Assessment of **Accuracy** and **Precision** of Equipment/Apparatuses (**Standardization/Calibration/Validation**)
4. Solutions: preparation and standardization (**Sample Preparation**)
5. Determination of **moisture** content, **crude fat, crude protein, crude fiber, ash content, NFE (Proximates/Proximate Analyses)**
6. **Chromatography** Techniques (basics):  
Spectrophotometer/Flame photometer/ HPLC

# FST-311. L # 16: FOOD SAFETY

- **FOOD**
- **SAFE FOOD**
- **SPOILED FOOD**
- **HEALTH HAZARDS**
- **FOOD SECURITY**

**FOOD**

**?**

**SAFE FOOD**

**?**

**SPOILED FOOD**

**?**

**FOOD SAFETY**

**?**

**FOOD SECURITY**

**?**

# FOOD

“FOOD IS A **SUBSTANCE** THAT AFTER **INGESTION** AND **DIGESTION** MAY PROVIDE MATERIALS FOR **ENERGY, GROWTH, DEVELOPMENT, MAINTENANCE** AND/OR **REPAIR OF CELLS/ TISSUES/ ORGANS/ SYSTEMS/ ORGANISM**”.

- IT IS USUALLY OF **PLANT** OR **ANIMAL ORIGIN**, AND CONTAINS ESSENTIAL NUTRIENTS, SUCH AS **CARBOHYDRATES, FATS, PROTEINS, VITAMINS,** OR **MINERALS AND/OR WATER**

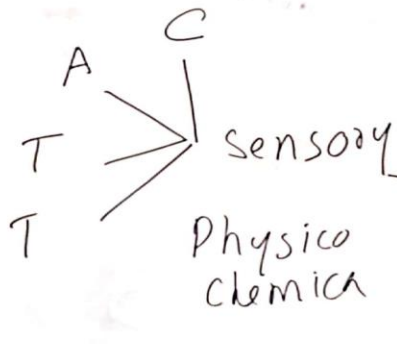
(Robert A. Ronzio. 2003. The Encyclopedia of Nutrition and Good Health. 2<sup>nd</sup> Ed. Facts on File, Inc. 132 West 31st Street, New York NY 1000)

Approximates

Moss!

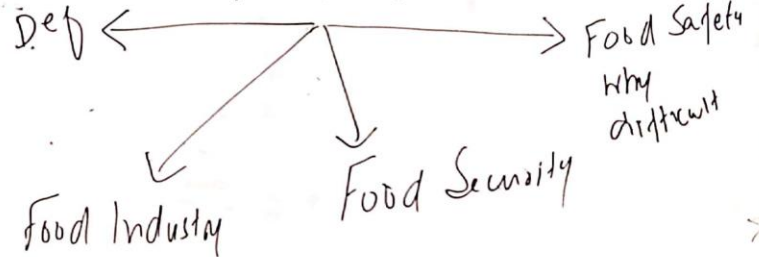
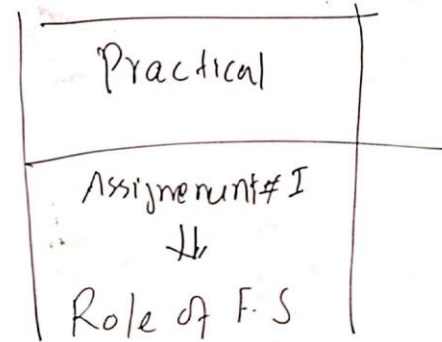
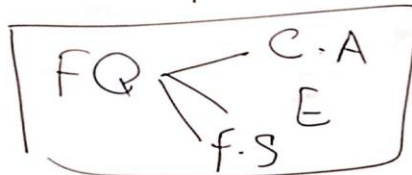
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Food ?  
Safe Food ?  
Spoiled Food ?  
Food Safety ?  
Food Security ?

health hazards



Class Test - I (25/9/19)



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# SAFE FOOD

# SPOILED FOOD

# FOOD SAFETY

**“Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness”.**

# FOOD SECURITY

“FOOD SECURITY **EXISTS** WHEN ALL PEOPLE, AT ALL TIMES, HAVE PHYSICAL, SOCIAL AND ECONOMIC ACCESS TO SUFFICIENT, SAFE AND NUTRITIOUS FOOD WHICH MEETS THEIR DIETARY NEEDS AND FOOD PREFERENCES FOR AN ACTIVE HEALTHY LIFE.”

(World Food Summit, 1996)

# NUTRITIOUS / HEALTHY FOOD

- PROVIDING **NOURISHMENT**, ESPECIALLY TO A HIGH DEGREE; NOURISHING; **HEALTHFUL**
  - **FIRSTLY, HEALTHY FOOD** CONSISTS OF ALL THE **ESSENTIAL** NUTRIENTS LIKE **PROTEINS, CARBOHYDRATES, LIPIDS, MINERALS VITAMINS** AND **WATER**
  - **SECONDLY**, IT IS **HYGIENIC** AND **DOESN'T** CONTAIN ANY **GERMS / TOXINS**
  - **THIRDLY**, IT SHOULD INCLUDE ALL **SORTS (VARIETY)** OF EATABLES LIKE VEGGIES, FRUITS, MEAT, DAIRY, SWEETS ETC. IN RIGHT PROPORTION
  - IN A **NUTSHELL**, **HEALTHY** FOOD KEEPS THE **BODY FIT** AND AT ITS **TOP**

(Ronzio, R A. 2003. The Encyclopedia of Nutrition and Good Health. 2<sup>nd</sup> Ed. Facts on File, Inc. 132 West 31st Street, New York NY 1000)

# FOOD INSECURITY

“A SITUATION THAT EXISTS WHEN PEOPLE LACK  
SECURE ACCESS TO SUFFICIENT AMOUNTS OF SAFE  
AND NUTRITIOUS FOOD FOR NORMAL GROWTH  
AND DEVELOPMENT AND AN ACTIVE AND HEALTHY  
LIFE.”

(FAO )

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MY LORD! INCREASE ME IN KNOWLEDGE.

# **FST-311. L # 17: FOOD SAFETY: WHO: KEY PRINCIPLES OF FOOD HYGIENE**

- **FOOD SPOILAGE**
- **FOOD SAFETY**
- **FOOD SAFETY: INDUSTRY TO MARKET**
- **FOOD SAFETY: MARKET TO CONSUMER**
- **WHO: KEY PRINCIPLES OF FOOD HYGIENE**
- **FOOD RISK MATRIX**



# MICROBIAL FOOD SPOILAGE

**Food Poisoning**

?

**Food Intoxication**

?

**Food Infection**

?

# FOOD SAFETY

**“Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness”.**

- This includes a number of routines that should be followed to **avoid potential health hazards**
- In this way food safety often overlaps with **food defense** to prevent harm to consumers
- The tracks within this line of thought are **safety** between **industry** and the **market** and then between the **market** and the **consumer**

# FOOD SAFETY

- Food can **transmit** disease from person to person as well as serve as a **growth medium** for bacteria that can cause food poisoning
- In developed countries there are intricate standards for food preparation, whereas in lesser developed countries the main issue is simply the availability of adequate **SAFE WATER**, which is usually a **CRITICAL ITEM**
- In theory, **Food Poisoning** is **100 %** preventable

# FOOD SAFETY: INDUSTRY TO MARKET

- In considering **industry to market** practices, Food Safety considerations include the **origins** of food including the **practices** relating to food **labeling**, food **hygiene**, food **additives** and **pesticide** residues, as well as **policies on biotechnology** and **food** and **guidelines** for the management of **governmental import** and **export** inspection and certification systems for foods.

# FOOD SAFETY: MARKET TO CONSUMER

- In considering **market to consumer** practices, the usual thought is that food ought to be **safe** in the market and the concern is **safe delivery** and **preparation** of the food for the consumer.

# WHO: KEY PRINCIPLES OF FOOD HYGIENE

1. Prevent contaminating food with pathogens spreading from people, pets, and pests
2. Separate raw and cooked foods to prevent contaminating the cooked foods
3. Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens
4. Store food at the proper temperature
5. Do use safe water and safe raw materials

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MY LORD! INCREASE ME IN KNOWLEDGE.

# **FST-311. L # 18:**

## **FOOD SAFETY: FOOD RISK MATRIX**

- **FOOD RISK MATRIX**
- **FOOD PROTECTION RISK MATRIX**



## FOOD RISK MATRIX

<b>Consequence</b>	Gain: <b>economic</b>	Food Quality	Food Fraud
	Harm: <b>Public health,</b> economic, or terror	Food Safety	Food Defense
		Unintentional	Intentional
		<b>Action</b>	

Food Quality	Food Fraud	Motivation Gain: Economic
Food Safety	Food Defence	Harm: Public Health, Economic, or Terror
Unintentional	Intentional	
Action		

# FOOD PROTECTION RISK MATRIX

- **FOOD DEFENSE** IS THE PROTECTION OF FOOD PRODUCTS FROM **INTENTIONAL CONTAMINATION** OR **ADULTERATION** BY **BIOLOGICAL, CHEMICAL, PHYSICAL,** OR **RADIOLOGICAL** AGENTS INTRODUCED FOR THE PURPOSE OF CAUSING **HARM**.
- IT ADDRESSES ADDITIONAL CONCERNS INCLUDING **PHYSICAL, PERSONNEL** AND **OPERATIONAL** SECURITY.

# FOOD PROTECTION RISK MATRIX

- **FOOD DEFENSE** IS ONE OF THE FOUR CATEGORIES OF THE **FOOD PROTECTION RISK MATRIX** WHICH INCLUDE: **FOOD SAFETY**, WHICH IS BASED ON UNINTENTIONAL OR ENVIRONMENTAL CONTAMINATION THAT CAN CAUSE HARM; **FOOD FRAUD**, WHICH IS BASED ON INTENTIONAL DECEPTION FOR ECONOMIC GAIN; AND **FOOD QUALITY**, WHICH MAY ALSO BE AFFECTED BY **PROFIT-DRIVEN** BEHAVIOR BUT WITHOUT INTENTION TO CAUSE HARM.

# FOOD PROTECTION RISK MATRIX

- OVERARCHING THESE FOUR CATEGORIES IS **FOOD SECURITY**, WHICH DEALS WITH INDIVIDUALS HAVING ACCESS TO ENOUGH FOOD FOR AN ACTIVE, HEALTHY LIFE. FOOD PROTECTION IS THE UMBRELLA TERM ENCOMPASSING BOTH FOOD DEFENSE AND FOOD SAFETY. THESE SIX TERMS ARE OFTEN CONFLATED.

# FOOD PROTECTION RISK MATRIX

- ALONG WITH PROTECTING THE **FOOD SYSTEM**, FOOD DEFENSE ALSO DEALS WITH PREVENTION, PROTECTION, MITIGATION, RESPONSE AND RECOVERY FROM INTENTIONAL ACTS OF ADULTERATION.

# CLASS TASK

- FOOD
- DIET
- HEALTHY FOOD
- SAFE FOOD
- FOOD DEFENSE
- FOOD SECURITY
- NUTRITION

## REFERENCES: FOOD PROTECTION RISK MATRIX

- Spink, John; Moyer, Douglas C. (2011-11-01). "Defining the Public Health Threat of Food Fraud". *Journal of Food Science*. 76 (9): R157–R163. doi:10.1111/j.1750-3841.2011.02417.x. ISSN 1750-3841. PMID 22416717.
- "Food Defense and Emergency Response". United States Department of Agriculture.
- "What Is Food Defense?". National Center for Food Protection and Defense. Archived from the original on 2016-03-03. Retrieved 2015-05-29.





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# FST- 311. L # 19. FOOD BORNE ILLNESS

- **FOOD BORNE ILLNESS**
  - **FOOD POISONING**
  - **FOOD INTOXICATION**
- **FOOD INFECTION**
- **VULNERABLE GROUPS**
- **MICROBES**

# WHAT IS A FOODBORNE ILLNESS?

- Sickness caused by eating food that contains a **harmful** substance.

- Commonly known as **food poisoning**,

it is caused by eating food that is contaminated by **bacteria** or other harmful substances



# VULNERABILITY: POPULATION AT RISK

- **EVERYONE** is potentially at risk for food-borne illness, but the following groups are at higher risk than others:
  - **Children**
  - **Pregnant** women
  - **Seniors**
  - Individuals with **compromised** immune systems
    - Medications that weaken natural immunity

# VULNERABILITY: POPULATION AT RISK

Groups with an increased risk include:

- **Young children**
- **Pregnant women**
- **Elderly men and women**
- **Individuals with autoimmune disorders, liver disease or decreased stomach acidity**
- **Alcoholics – because of possible liver damage/disease**
- **Individuals with reduced immune function due to chemotherapy or radiotherapy, and those taking steroids or antibiotics to treat immune deficiencies**
- **Individuals who are malnourished**
- **Individuals with viruses**
- **Individuals in institutionalized settings**

# SOME BACTERIA DISEASES

Bacteria / Disease	Common Sources
<i>Campylobacteriosis</i>	Contaminated water; unpasteurized milk; undercooked meat, poultry and seafood
<i>Botulism</i>	Improperly processed, home-canned and commercially canned foods; vacuum packed or tightly wrapped foods
<i>E. coli</i>	Un-chlorinated water, raw or rare ground beef; unwashed produce; unpasteurized milk
<i>Salmonella</i>	Raw or undercooked poultry, eggs, meat and seafood; unpasteurized milk
<i>Staphylococcus aureus</i>	Prepared foods left too long at room temperature. Meat, poultry, egg products and such mixtures as tuna, chicken, potato and egg salad, cream filled pastries

# CLASS TASK

- FOOD POISONING
- FOOD INTOXICATION
- PREVALANCE OF FOOD BORN ILLNESS





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# FST- 311. L # 20.

## FOOD SAFETY: FOUR STEPS

- **FOOD SAFETY**
- **HOME FOOD SAFETY**
- **FOUR STEPS TO FOOD SAFETY**
  - **CLEAN**
  - **SEPARATE**
  - **COOK**
  - **CHILL**

# FOOD SAFETY

Food safety means keeping **food safe** to eat by following proper food handling and cooking practices.



# SOME BACTERIA DISEASES

Home Food Safety

3

## Common Foodborne Illnesses

Illness	Potential Sources
Salmonella Campylobacter	Poultry Meat Eggs Unpasteurized milk/dairy products Raw produce
Listeria	Raw milk Soft cheese Luncheon meats/hot dogs Raw produce
E. Coli	Raw/undercooked meat Raw produce Unpasteurized milk

# FOUR STEPS TO FOOD SAFETY

- Clean
- Separate
- Cook
- Chill

## FIGHT BAC!



**Keep Food Safe From Bacteria™**



# CLEAN

## Personal Hygiene

- Wash hands in warm, soapy water
  - 20-second scrub
- Wash before and after preparing food in the kitchen.
- Cover coughs and sneezes



## Kitchen

- Clean and sanitize all surfaces and utensils in hot, sudsy water.
- Change dish towels often
- Dispose of garbage promptly



# SEPARATE



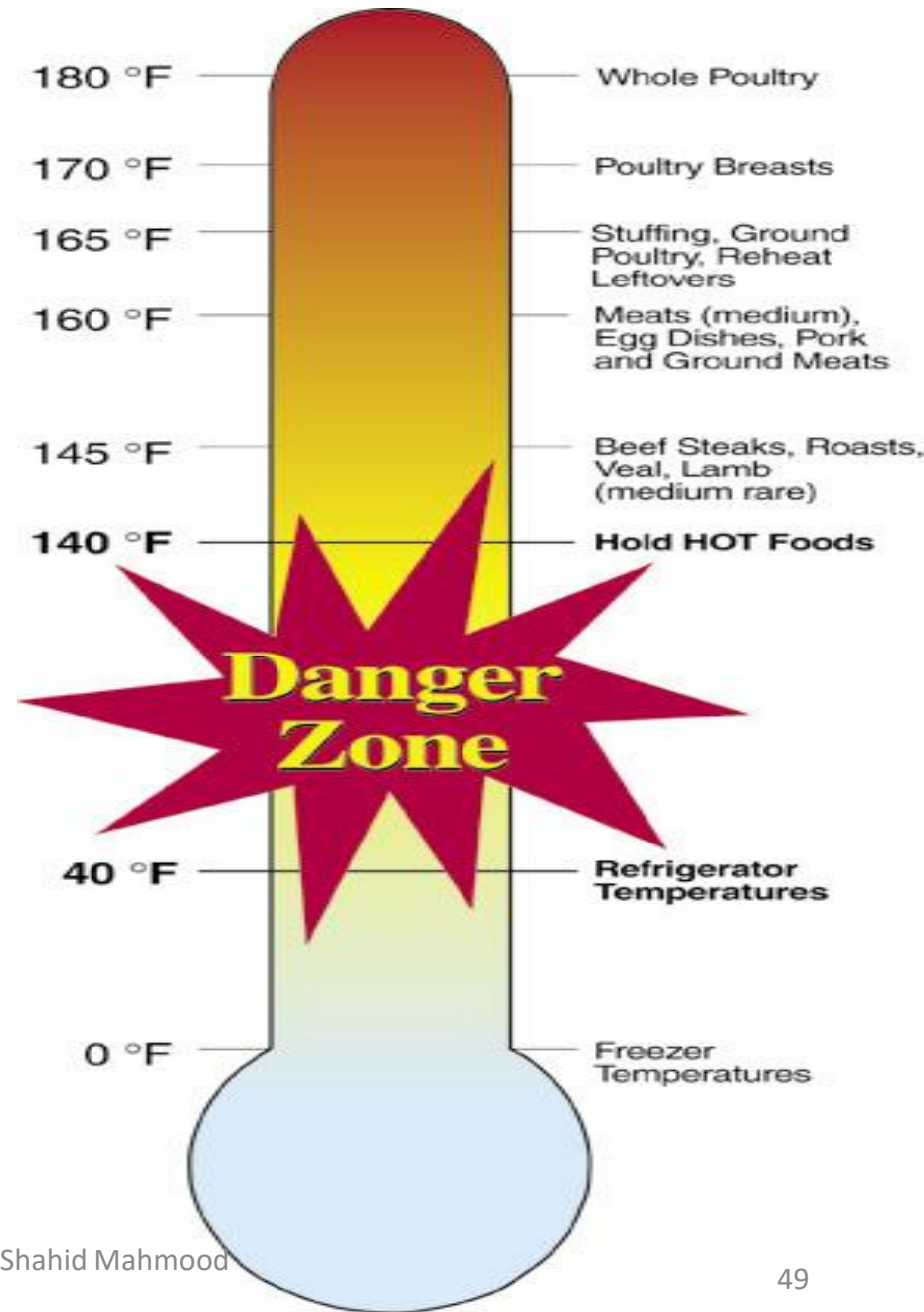
- **Separate cooked and ready-to-eat foods from raw foods.**
- **Do not taste and cook with the same spoon.**
- **Never use the same utensil, cutting board, or plate for raw and cooked foods.**
  - **This step prevents cross-contamination which occurs when harmful bacteria spread from one food to another.**



# COOK

Cooking raw meat, poultry, seafood, and eggs to a safe internal temperature can kill harmful bacteria.

- Use a thermometer to check food temperatures.
- Do not taste uncooked or partially cooked dishes.
- Reheat foods thoroughly to 165 degrees F.



# CHILL

- Do not allow foods to sit out longer than **2 hours**.
  - Divide larger amounts of food into small portions to chill faster.
- Refrigerators should be kept at  **$\leq 40$  °F**
- Freezers should be kept at 0 degrees or below
- Thaw foods in refrigerator, cold water or the refrigerator
- When in doubt **“Throw it Out!”**



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# **FST- 311. L # 21.**

## **MAJOR FOODBORNE INFECTIONS**

- **INFECTIONS AND ITS SYMPTOMS**
- **RISKS TO CONTROL**
- **8 CRITICAL BUT SIMPLE STEPS TO ENSURE FOOD SAFETY AT HOME**
- **PROPER HAND WASHING TECHNIQUES**
- **NOT ONLY IS IMPORTANT TO WASH HANDS PROPERLY, BUT ALSO TO WASH THEM FREQUENTLY**
- **CROSS CONTAMINATION**

# MAJOR FOODBORNE INFECTIONS

- More than **250** different **infections** and **intoxications** are associated with foodborne illness
- By far, the majority of illness are caused by
  - *E. Coli*
  - *Salmonella*
  - *Listeria*
  - *Campylobacter*
  - *Staphylococcus aureus*

# INFECTIONS AND ITS SYMPTOMS

How does foodborne illness occur?

- Contaminated foods carry **microbes** into the body
- Some microbes can **overcome** the body's **defenses** and cause infections

What are its typical primary symptoms?

- **Nausea**
- **Vomiting**
- **Abdominal cramps**
- **Diarrhea**

# RISKS TO CONTROL

- Improper refrigeration and storage
- Poor personal hygiene
- Cross-contamination
- Contaminated food sources
- Undercooking
- Other time and temperature mistakes

# 8 CRITICAL BUT SIMPLE STEPS TO ENSURE FOOD SAFETY AT HOME

- Wash hands **often**
- Wash **raw** produce before cutting, cooking or eating
- Wash **utensils** and cutting boards after each use
- Keep kitchen surfaces **clean**
- Keep raw **meat** and ready-to-eat foods separate
- Cook food to proper **temperatures**
- Refrigerate food promptly to below **40°F**
- Pay close attention to **use-by dates**



# PROPER HAND WASHING TECHNIQUES

- Warm **soapy** water is necessary to kill the unseen germs that may be on hands.
- The primary function of soap is to remove **dirt** and **pathogens** from hands, but the **point** is that **scrub** to release them from hands, and then **rinse** to send them down the drain.
- It is important to wash all **surfaces** of hands, up to **wrists**, between **fingers** and especially under **fingernails**.

# PROPER HAND WASHING TECHNIQUES

- To estimate **20** seconds, clean hands through
- When rinsing, use the same **agitation** used for washing.
- It is very important not to re-contaminate hands by using a **dirty** cloth to dry them...even cloths that seem to be clean may **harbor** harmful bacteria. Always use a **paper** towel or clean cloth towel to dry your hands – or let them air dry.

# NOT ONLY IS IMPORTANT TO WASH HANDS PROPERLY, BUT ALSO TO WASH THEM FREQUENTLY

Always Wash Hands Before:

- **Prepare** food
- **Eat** meals
- **Feed** children

Always Wash Hands After:

- **Handle** raw foods (including meats, eggs, and fresh fruits and vegetables)
- **Switch** food-preparation tasks
- Use the **restroom** or change a diaper
- **Cough** or sneeze
- **Handle** garbage, dirty dishes or cigarettes
- **Use** the phone
- **Play** with a pet
- **Touch** a cut or sore

# CROSS CONTAMINATION

- **Cross-Contamination is the transfer of harmful substances or disease-causing micro-organisms to food by hands, food-contact surfaces, sponges, cloth towels and utensils that touch raw food and then touch ready-to-eat foods.**
- **Cross-contamination can also occur when raw food touches or drips onto cooked or ready-to-eat foods.**
- **Keeping raw and ready-to-eat foods separate helps reduce the risk of cross-contamination.**
- **Ready-to-eat foods do not require additional preparation or cooking. They include:**
  - **All food that has already been cooked**
  - **Raw, washed, cut fruits and vegetables**

# CLASS TASK

- 7 FOOD BORNE ILLNESS WITH MIROBES

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MY LORD! INCREASE ME IN KNOWLEDGE.

## **FST- 311. L # 22.**

# **PREVENTATIVE MEASURES FOR FOOD SAFETY**

- **Good Personal Hygiene**
- **No Bare Hand Contact With Food**
- **Purchase Safe Food**
- **Store Food Properly**
- **Prepare and Cook Food Adequately**
- **Clean and Sanitize**

# GOOD PERSONAL HYGIENE

The most important tool you have to prevent

- **Food borne illness is good personal hygiene**
- Bacteria like *Staphylococci* are found on the **hair, skin, mouth, nose** and in the **throat** of healthy people.
- According to one estimate, nearly **50 %** of healthy food handlers carry disease agents that can be transmitted by food.
- **Food preparers, food servers (anyone involved with food service to children)**
- **Do not allow people with infected cuts/sores, colds, or other communicable diseases to prepare or serve food**



# GOOD PERSONAL HYGIENE

## Hand Washing

- **The single most important means of preventing the spread of infection and illness, and cross-contamination**

## Proper Hand Washing Procedure:

- **Wet your hands with running water as hot as you can comfortably stand**
- **Apply Soap**
- **Vigorously scrub hands and arms for ten to fifteen seconds**
- **Rinse** thoroughly under running water
- **Dry** hands and arms with a single-use paper towel or warm-air hand dryer

# GOOD PERSONAL HYGIENE

Hands should be washed

- Before **preparing** food
- After using the **toilet**
- After **sneezing, coughing** or **blowing** your **nose**,
- After touching foods or other items that may be contaminated with **bacteria** or other harmful substances

# NO BARE HAND CONTACT WITH FOOD

## Food Preparers

- **SINGLE-USE** gloves shall be used when working with
  - Ready-to-eat food items (bread, fruits/vegetables, deli meats and cheeses, tuna fish)
  - Raw animal food (chicken, beef)
- **SINGLE-USE Gloves**
  - One pair of gloves may not be used for multiple tasks. When interruptions occur in the operation (ex. food preparer needs to get something from refrigerator/storage room) gloves need to be replaced because they become contaminated with touching door handles, packaging, etc.

# NO BARE HAND CONTACT WITH FOOD

## **Food Servers** (food preparer, teacher, helper)

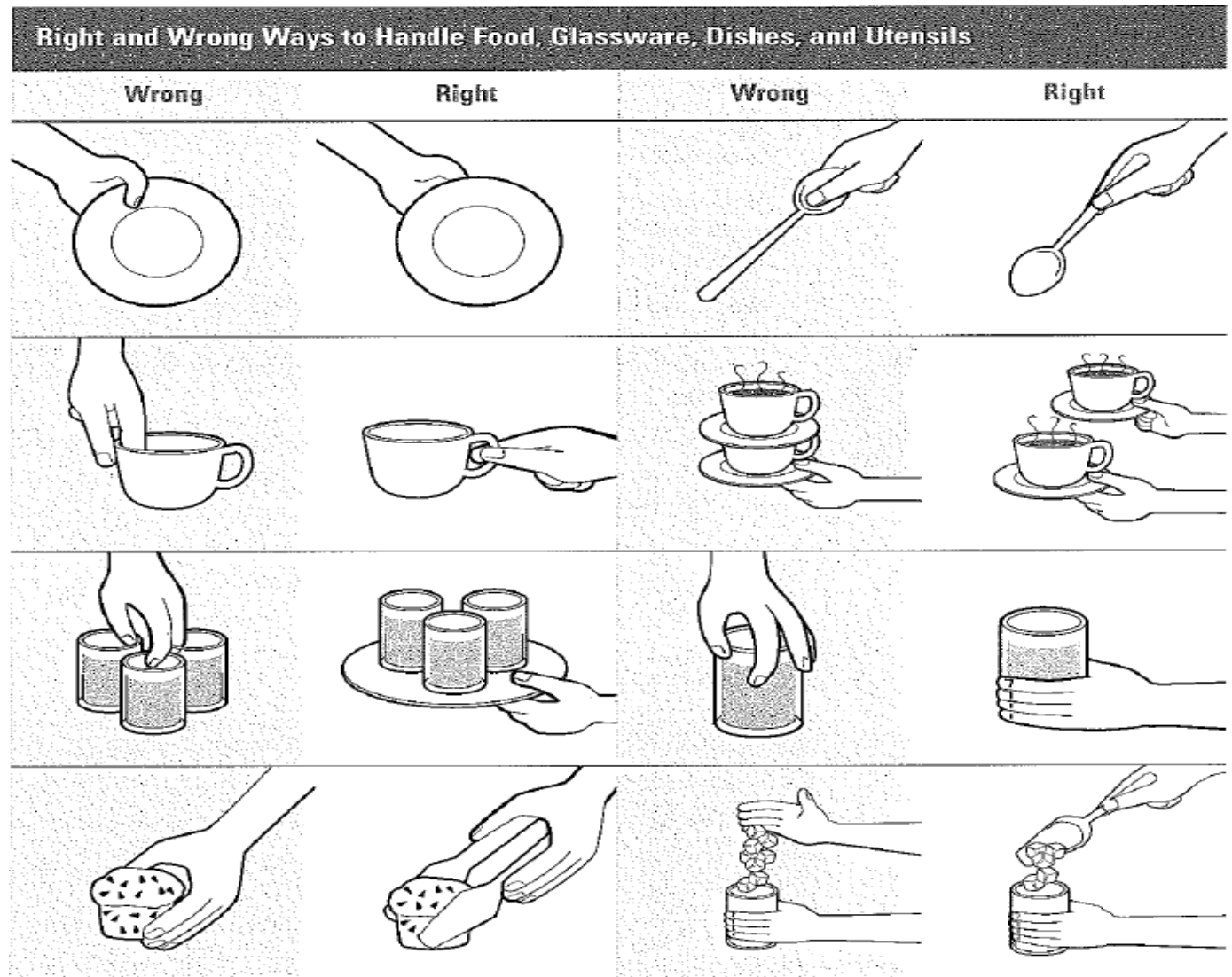
- Use utensils (tongs, serving spoons, spatulas) when **servicing** or handling food
- Use **SINGLE-USE** gloves
- Have children serve themselves family style with utensils. Kids can also grab food themselves – opportunity to teach

## **SINGLE-USE gloves**

- one pair of gloves may not be used for multiple tasks. When interruptions occur during food service (ex. food server needs to pick up a fork that fell on the floor, help a child push in a chair, touching anything but the prepared food) gloves need to be changed

# NO BARE HAND CONTACT WITH FOOD

**When handling glassware, dishes and utensils do not touch food contact areas with bare hands**



# PURCHASE SAFE FOOD

## VENDORS

- Buy only from **reputable** suppliers
- Inspect **deliveries** carefully
- Sample **temperatures** of received food items
- Put **refrigerated** and **frozen** items away immediately



# PURCHASE SAFE FOOD

## GROCERY STORE

- Read the label – do not buy food that is past the “sell-by,” “use-by,” or other expiration dates
- Purchase **meat**, **poultry** and **dairy** products last
  - Ground beef should be **cherry-red** or **purple-red** if in vacuum packaging
  - Place meat, poultry and seafood in **plastic** bags to prevent juices from dripping on other foods in the cart
  - Keep raw **meat**, poultry and seafood **separate** from other food items
- Check that all food packages are **intact**
- Select produce that is **fresh**, not **bruised** or **damaged**

# STORE FOOD PROPERLY

- **Keep out of temperature danger zone**

- Refrigerator **40°F** or lower
- Freezer **0°F** or lower



- **Label and date food**

- Leftover prepared food which was not served must be labeled and dated, refrigerated promptly and **used within 36 hours**, or **frozen** immediately for later use
- Commercially-prepared, ready-to-serve opened food items can be kept up to **7 days** when they are properly **stored/refrigerated**







# STORE FOOD PROPERLY

## Dry Storage

- Dry food should be stored in **sealed** containers (zip-type bags, metal, glass or food-grade plastic containers with tight-fitting covers) and shall be **labeled**
- **Clean, dry, ventilated** and **lighted storerooms** or areas protected from contamination by **sewage, wastewater** backflow, **condensation, leakage** or vermin

# PREPARE AND COOK FOOD ADEQUATELY

## Thaw Foods Properly

<p>In Refrigerator</p> 	<p><b><math>\leq 40^{\circ}\text{F}</math></b></p>
<p>Under Cold Running Water</p> 	<p><b>Water must be <math>\leq 70^{\circ}\text{F}</math></b></p>
<p>Microwave</p> 	<p><b>Food must be cooked immediately after thawing</b></p>
<p>Part of Cooking Process</p> 	<p><b>Food must meet the required minimum internal cooking temperature</b></p>

# PREPARE AND COOK FOOD ADEQUATELY

## Cook to Minimum Temperatures

Sample:

**165° F**

- Poultry
- Stuffing / Casserole
- Hazardous food cooked in microwave (eggs, poultry, meat, fish)



# PREPARE AND COOK FOOD ADEQUATELY

## Doneness versus Safety

- Doneness is subjective. It is the **appearance**, **texture**, **color**, smell and **flavor** of food
- Safety is cooking to the **required** minimum **temperature** to destroy **bacteria**. Use a food thermometer to accurately measure

# PREPARE AND COOK FOOD ADEQUATELY

## Leftovers

- Heat to **165°F** and bring gravies and sauces to a rolling boil before serving
- In **microwave**, beware of **cold** spots and use a food **thermometer** to check the temperature in several places

# PREPARE AND COOK FOOD ADEQUATELY

## AVOID THE DANGER ZONE

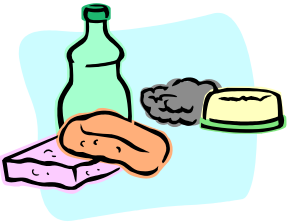
- When **cold** food goes above **40° F**
- When **hot** food falls below **135° F**
- **Bacteria** can multiply rapidly in **perishable** food left in the danger zone for **more than 2 hours**
- Throw away perishable food that has been left at room temperature for more **than 2 hours**

# AVOID THE DANGER ZONE

## Food Safety Basics



# CLEAN AND SANITIZE



Any surface that comes in contact with food must be **cleaned and sanitized**

- **Clean:** Remove food and other types of **soil** from a surface
- **Sanitize:** Reduce the number of **microorganisms** on a clean surface to safe levels
  - **Bleach Solution:** *One capful bleach (1 ½ tsp) to one gallon of water*
  - **Other approved sanitizers**



# CLEAN AND SANITIZE

## What surfaces?



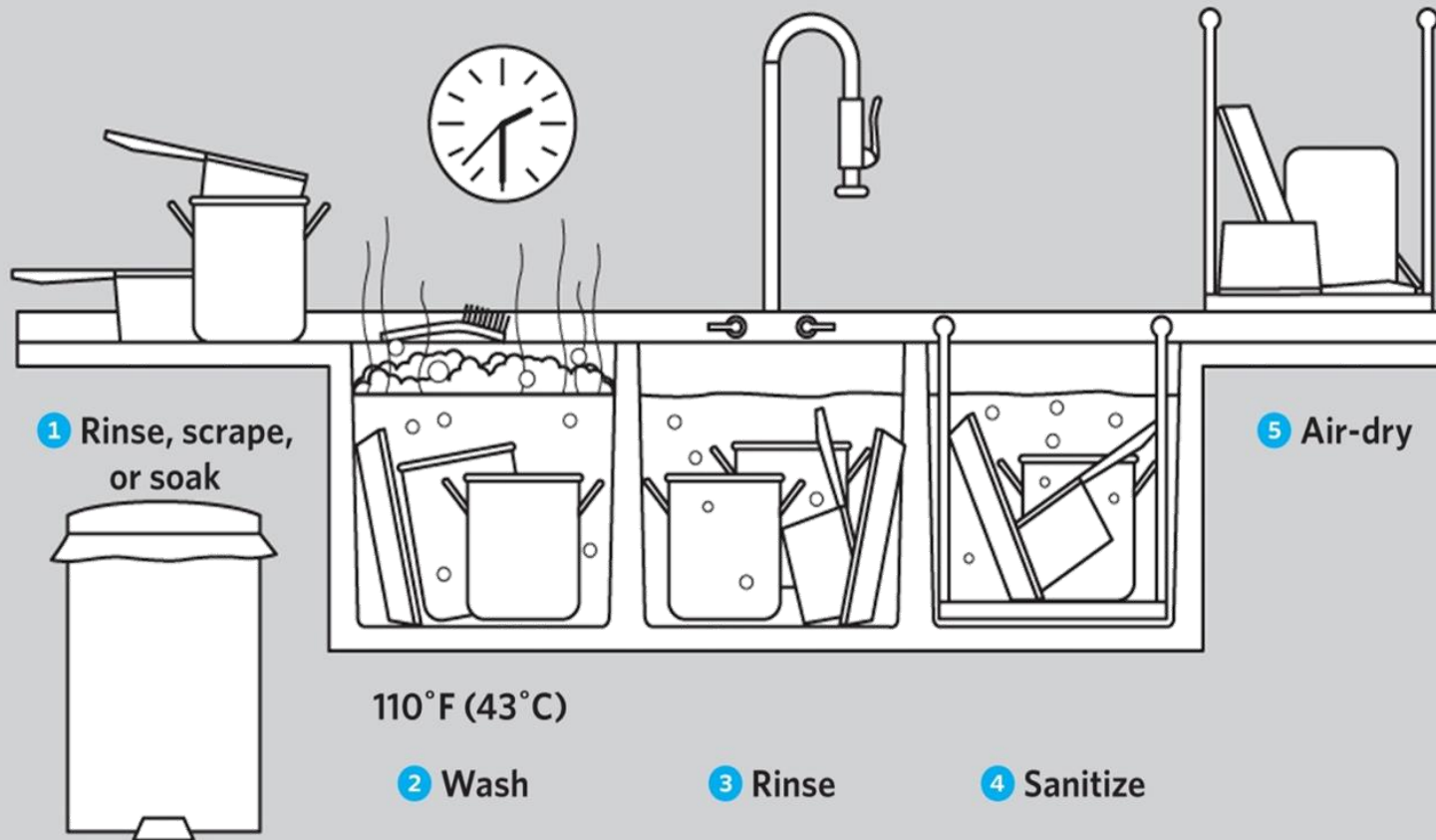
- Kitchen counters
- Knives, mixing spoons and other utensils
- Mixing bowls and other food preparation containers
- Cutting boards
- Tables children eat on



# CLEAN AND SANITIZE

## Dishwashing Procedures- Manual (3-compartment sink)

- **Rinse, scrape or soak** items before washing
- **Wash** in **110° - 125°F** water, using soap/detergent
- **Rinse** by immersing in clean, hot water to remove soap/detergent or by spraying soap/detergent off, removing all traces of food and detergent. If dipping the items, change the rinse water when it becomes dirty or full of suds.
- **Sanitize** for minimum **2 minutes in 1 ½** teaspoons of bleach per gallon of water (or other Department of Health Services approved sanitizer)
- **Air-dry Items** – upside down so they will drain



# CLEAN AND SANITIZE

- If your center has a **two compartment sink**, you must arrange for all three steps: Wash, rise and sanitize:
  - Purchase a bucket/tub to put your sanitizing solution in and sanitize your dishes in the tub (1 ½ teaspoons of bleach per gallon of water or other Department of Health Services approved sanitizer)

OR

- Wash and rinse dishes in the two sinks, drain the rinse sink, make a sanitizing solution and sanitize the dishes after

# CLEAN AND SANITIZE

## Dishwashing Procedures

### Commercial

- Dishwasher shall have a visible temperature gauge
- Wash at **130°-150°F** for **20** seconds, rinse and sanitize at **180°F for 10 seconds** or more OR use chemical sanitizer
- All dishes/utensils must be **Air Dry**

### Home Type Dish Washer

- After dishwasher is done, sanitize dishes/utensils by **submerging for minimum 2 minutes in 1 ½** teaspoons of bleach per gallon of water (or other Department of Health Services approved sanitizer)
- All dishes/utensils must be **Air Dry**

