Veterinary Public Health

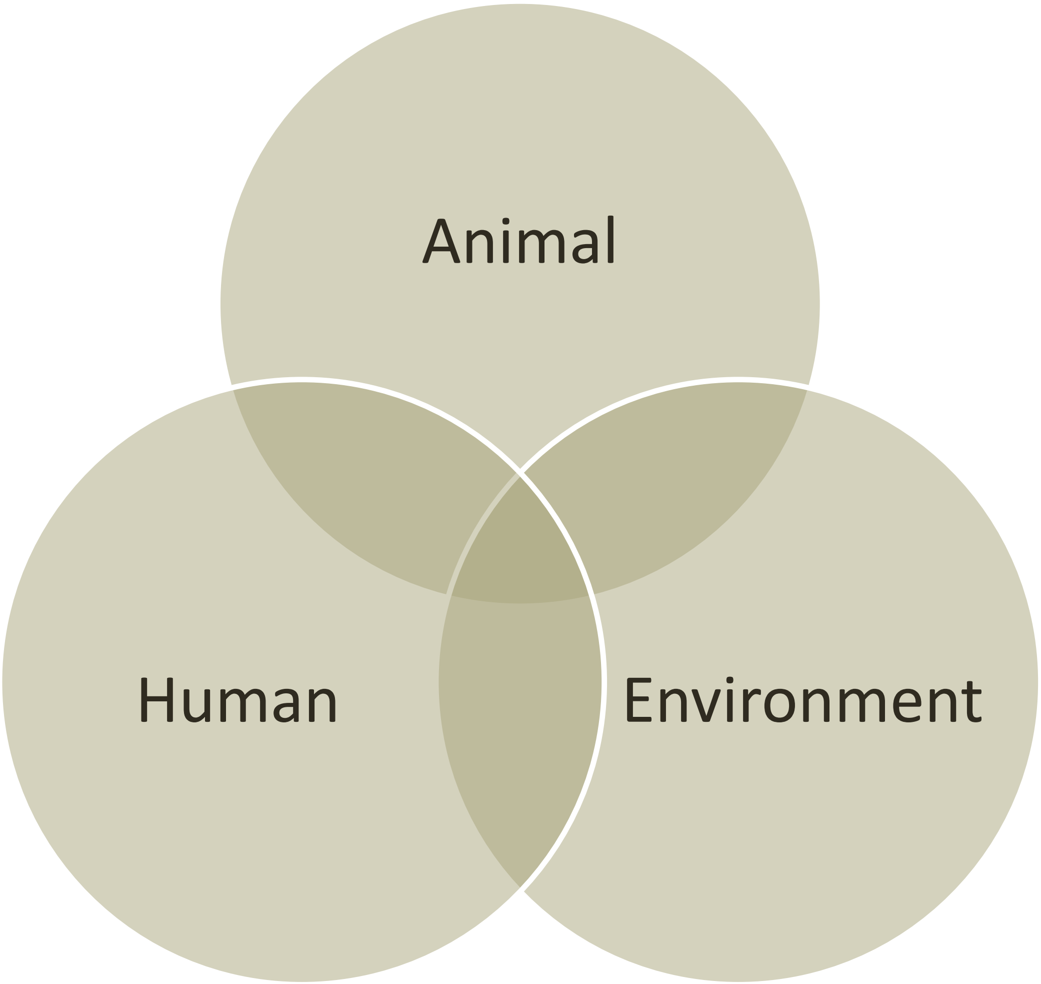
Lecture-1

Dr. Madhur

A. Aims and Scope of Veterinary Public Health

- **WHO (1999)**: VPH is defined as "the sum of all contributions to the physical, mental, and social well-being of humans through an understanding and application of veterinary science."

The Triad



1. ZOONOSES and Public Health

- **Human-Animal Health Link: during use of animals-transportation, draught,** fuel, clothing, and proteins.
- **Public Health Risks**: due to close connections
- **Zoonotic Diseases**: About 75% of new diseases in the past decade have originated from animals or animal products.
- **Global Spread**
- **Preventable Zoonoses**: rabies, brucellosis, leishmaniosis-disproportionately affecting the poorest populations.
- **Economic and Trade Impact**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B. Objectives of Veterinary Public Health

- **Primary Objectives**: **the diagnosis, surveillance, epidemiology, control, prevention, and elimination of zoonoses.**
- **Additional Activities**: managing domestic and wild animal populations
- **Integration with Public Health:** health triad

C. International Role in Zoonoses Management

- **WHO's Global Efforts**: to strengthen the surveillance of and response to all communicable diseases
- **WHO Regional Offices**
- **Collaborations**: with (FAO) and the World Organization for Animal Health (OIE)
- **Research and Information Dissemination**

D. International Organizations

- **World Organization for Animal Health (OIE)**: Established **on 25th January 1924** in **Paris.**
- **Food & Agriculture Organization (FAO)**: Established **in 1945 in Rome.**
- **World Health Organization (WHO):** Established on **17th April 1948 in Geneva.**

E. Veterinary Public Health in India

- Zoonoses Division: Established at **NCDC, New Delhi in 1964.**
- VPH Education: Master's degree in VPH initiated at Pantnagar in 1965 and at AIIMS in 1970.
- VPH Division at IVRI: Established in 1971.

1. Which of the following is the most recent definition of Veterinary Public Health (VPH) as per WHO (1999)?
a) "VPH is the application of veterinary skills, knowledge, and resources to protect and improve human health."
b) "VPH is a part of public health dedicated to veterinary contributions."
c) "VPH is the sum of all contributions to the physical, mental, and social well-being of humans through an understanding and application of veterinary science."
d) "VPH is the practice of controlling animal diseases to safeguard human health."

The primary objectives of Veterinary Public Health (VPH) include all of the following EXCEPT:
a) Diagnosis and control of zoonoses
b) Food protection
c) Animal breeding programs
d) Health education and extension

B. Role of Veterinarians in Public Health

- **1. Prevention and Control of Zoonotic Diseases**
- **Monitor and control**
- **Disease Diagnosis and Reporting**
- **Vaccination Programs**

2. Food Safety and Public Health

3. Public Health Education and Awareness

- educate the public
- train other health workers in zoonoses recognition and management

- **4. One Health Initiative**

- **5. Bioterrorism and Public Health Emergencies- design biosafety measure**

7. Animal Welfare and Its Impact on Public Health: reduce stress and humane slaughter

8. Research and Development: Vaccine and Drug Development, epidemiological studies to prevent future outbreaks

9. Policy Development and Implementation: work with government agencies to enforce laws and regulations

Which of the following best describes the role of veterinarians in public health education?

Educating the public on:

1)vaccination,
2)hygiene
3) animal breeding

Answer:

a) 1 and 3 only
b) 2 and 3 only
c) 1 and 2 only
d) all

Quiz

- 2. How do veterinarians contribute to food safety in public health?

1) **By inspecting food production facilities like slaughterhouses and dairy farms**

2) By conducting clinical trials on human patients

3) By developing antibiotics for human use

4) by monitoring residues of antibiotics

- Answer
- a) 1,2 and 3
- b) 1,2 and 4
- c) 1 and 4
- d) 1 only

- In the One Health initiative, veterinarians collaborate with which of the following professionals?
- a) Only animal health workers
- b) Government officials
- **c) Medical professionals, environmental scientists, and public health experts**
- d) Economists and data analysts

- In what way do veterinarians impact environmental health?
- 1) By only treating sick animals
- **2) Monitoring environmental factors like water quality and pollution that affect both animal and human health**
- 3) Maintaining plant species diversity

- Answer:
- A) 1 only
- B) 1 and 2 only
- C) 3 only
- D) 2 only

C. One Health Concept and Initiatives

- One Health is an integrative approach
- to improve health outcomes by fostering collaboration
- **Zoonotic Disease Surveillance:** Ebola, rabies, and avian influenza
- **AMR Monitoring:** GLASS by WHO and Stewardship program for Promoting responsible use of antibiotics

- **Food Safety: farm to table approach and HACCP**
- **Environmental Health: Pollution Control and Ecosystem Management**
- **Wildlife Health:** Tracking wildlife health and diseases that may impact human health or livestock and habitat protection to prevent disease spill over
- **Health Education and Promotion**
- **Policy Development and Advocacy**

Examples of One Health Initiatives

- **Global Health Security Agenda (GHSA):** An initiative aimed at strengthening global health security by improving disease detection, response, and prevention through a One Health approach.
- **One Health Commission:** A global organization that promotes the One Health concept by fostering collaboration and knowledge-sharing among stakeholders.
- **Ecosystem Approach to Health (EcoHealth):** An approach that integrates ecological and health sciences to address the relationships between ecosystems and health outcomes

Challenges and Opportunities

- **Challenges: coordination, funding, data integration**
- **Opportunities: Improved Health Outcomes and Innovation**

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Quiz

- What is the main focus of the One Health approach?
- 1) Human health only
- 2) Animal health exclusively
- **3) The interconnectedness of human, animal, and environmental health**
- 4) Environmental health independently

- Answer:
- A 3 only
- B 2 only
- C 2,3 and 4
- D 2 and 3

- Which of the following is an example of a zoonotic disease monitored by One Health initiatives?
- a) Malaria
- b) Tuberculosis
- c) rabies
- d) Diabetes

- What is the purpose of antimicrobial resistance (AMR) monitoring in the One Health framework?
- **1) To track the spread of antimicrobial-resistant pathogens in humans, animals, and the environment**
- 2) To limit the production of antibiotics in the medical field
- 3) To develop vaccines for antibiotic-resistant infections
- 4) To reduce antibiotic use in human healthcare only
- Answer:

- A 4 only
- B 3 and 4 only
- C 1 only
- D 2 only

- What are the reasons behind AMR:
- 1) Indiscriminate use of antibiotics
- 2) large public congregations
- 3) genetic diseases in some humans
- 4) affluent discharge from pharma plants

- Answer:

- A 1 and 3 only
- B 1 only
- C 1, 2 and 4 only
- D 1,2 and 3 only

D.Veterinary Public Health Administration

- **Definition and Scope**
- **Veterinary Public Health Administration:** The organization and management of veterinary public health programs, policies, and services to protect and improve public health by addressing animal-related health issues.
- **Scope:** Includes overseeing programs related to zoonotic disease control, food safety, animal welfare, and environmental health.

Key Responsibilities

- **Policy Development and Implementation:**
- **Program Management: Disease Surveillance and Control,** Overseeing food safety programs
- **Resource Allocation: Budget and staffing**
- **Coordination and Collaboration: Interagency Coordination and Interdisciplinary Collaboration**

Interdisciplinary Collaboration Key Functions and Activities

- **Surveillance and Monitoring: data collection and analysis**
- **Disease Prevention and Control: Vaccination Programs and outbreak response**
- **Food Safety Management: Inspection and Certification and Hygiene Standards**
- **Food Safety Management**
- **Education and Training**
- **Research and Development**

Challenges

- **Resource Limitations**
- **Coordination Issues**
- **Emerging Threats**

- **Examples of Veterinary Public Health Administration Systems**
- **United States: Centers for Disease Control and Prevention (CDC)** and the U.S. Department of Agriculture (USDA) oversee veterinary public health activities.
- **European Union**: European Food Safety Authority (EFSA) and national veterinary authorities manage public health and food safety programs.
- **India:** Veterinary Public Health Division at **the Indian Council of Agricultural Research (ICAR)** and state animal husbandry departments oversee public health activities.

- What is the primary focus of Veterinary Public Health Administration?
- a) Human health exclusively
- **b) Management of veterinary programs addressing animal-related health issues to protect and improve public health**
- c) Development of animal vaccines only
- d) Research on animal welfare practices

- Which activity is NOT typically part of Veterinary Public Health Administration's scope?
- 1) Zoonotic disease control
- **2) Urban infrastructure planning**
- 3) Food safety management
- 4) Animal welfare oversight

Answer

- A 1 and 2
- B 2 and 4
- C 2 only
- D 1,3 and 4 only

- Which function involves analyzing trends and identifying potential zoonotic disease outbreaks?
- a) Vaccination programs
- b) Policy development
- **c) Disease surveillance and monitoring**
- d) Food certification processes

E.Food Hygiene and Safety Principles

- **Principles of Food Hygiene**

1. **Preventing Contamination- physical, chemical and biological**

2. Temperature Control: Safe Temperature Ranges: keep hot foods above 60°C (140°F) and cold foods below 5°C (41°F).

3. Cooking Temperatures: Ensure food reaches **appropriate internal temperatures** to kill harmful pathogens. For example, poultry should be cooked to at least 75°C (165°F).

- **Personal Hygiene: Handwashing and proper attire**
- **Sanitation: :** Regularly clean and sanitize food preparation areas, utensils, and equipment
- **Disinfection**
- **Cross-Contamination Prevention:** Separate raw foods from cooked foods and use different utensils
- **Storage**

Hazard Analysis and Critical Control Points (HACCP):

- **Principles:** A systematic approach to identifying, evaluating, and controlling food safety hazards.
- Key principles include
- **Conduct Hazard Analysis:** Identify potential hazards in the food production process.
- **Determine Critical Control Points (CCPs):** Identify points in the process where controls are essential to prevent or eliminate hazards.
- **Establish Critical Limits:** Set maximum or minimum values to ensure each CCP is under control.
- **Monitor CCPs:** Implement monitoring procedures to ensure critical limits are met.
- **Corrective Actions:** Establish procedures to address deviations from critical limits.
- **Verification:** Regularly verify that the HACCP system is functioning effectively
- **Documentation**

- **Good Manufacturing Practices (GMP):** Guidelines that outline the minimum sanitary and processing requirements for manufacturing food products.
- Include facility cleanliness, equipment maintenance, employee hygiene, and quality control

- **Good Agricultural Practices (GAP):** Practices that ensure the production of safe and high-quality food by focusing on the agricultural production process
- Components-

- **Food Safety Management Systems (FSMS):**
- **Definition:** Comprehensive systems that integrate policies, procedures, and practices to ensure food safety.
- **Examples:** Include ISO 22000, which integrates HACCP principles with other food safety management practices.

- **Traceability:**The ability to trace and track food products through all stages of production, processing, and distribution.
- **Importance:** Ensures that any issues can be traced back to their source, facilitating recall processes and improving food safety

- **Foodborne Illness Prevention:** Educate food handlers and consumers
- **Regulations and Standards: National and International Standards**
- **Food Safety Acts**

Sources of Contamination

- **Biological Contamination**
- **Bacteria:** Pathogenic bacteria such as Salmonella, E. coli, Listeria, and Campylobacter can contaminate food and cause illness.
- **Viruses:** Foodborne viruses like Norovirus and Hepatitis A can contaminate food through improper handling or sanitation.
- **Parasites:** Parasites such as Giardia, Toxoplasma, and Cryptosporidium can contaminate food and water.
- **Fungi:** Molds and yeasts can grow on food, producing toxins such as aflatoxins that can lead to health issues.
- **Sources:** Contamination can occur through contaminated water, soil, improper handling, and inadequate cooking or storage.

- **Chemical Contamination**
- **Pesticides:** Residues from agricultural chemicals used to control pests and diseases can contaminate food if not properly managed.
- **Food Additives:** Improper use or excessive amounts of food additives and preservatives can pose health risks.
- **Heavy Metals:** Contamination from heavy metals like lead, mercury, and cadmium can occur through polluted water or soil.
- **Cleaning Agents:** Residues from cleaning and sanitizing agents used in food processing facilities can contaminate food if not properly rinsed

- **Physical Contamination**
- **Foreign Objects:** Physical contaminants such as glass shards, metal fragments, wood splinters, and plastic pieces can enter food during processing or packaging.
- **Equipment Failure:** Malfunctions in machinery can result in physical contamination of food products.
- **Human Error:** Accidental introduction of foreign objects by food handlers or improper maintenance of equipment can lead to contamination

- **Environmental Contamination**
- **Water Supply:** Contaminated water used in food preparation or irrigation can introduce pathogens and chemicals into food.
- **Soil:** Soil contaminated with pesticides, heavy metals, or pathogens can lead to contamination of crops.
- **Air Quality:** Airborne contaminants, including dust, pollutants, and microorganisms, can settle on food during processing or storage

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- **Cross-Contamination:**
- **Raw to Cooked Foods:** Transfer of pathogens from raw foods (e.g., raw meat) to cooked foods.
- **Equipment and Utensils:** Shared equipment and utensils.
- **Hand Hygiene:** Inadequate handwashing by food handlers

Prevention and Control Measures

- **Good Agricultural and Manufacturing Practices (GAP/GMP)**
- **Sanitation and Hygiene**
- **Temperature Control**
- **Training and Education**

- What is the safe cooking temperature for poultry to kill harmful pathogens?
- a) 60°C (140°F)
- B)75°C(165°F)
- c) 85°C (185°F)
- d) 100°C (212°F)

- Which of the following is a key component of Good Agricultural Practices (GAP)?
- a) Use of artificial flavors

b) use of organic fertilisers only

c) Increased use of fertilizers

- d) sprinkler irrigation
- e) soil management
- f) monoculture
- Answer:
- 1. b and e only
- 2. d and e only
- 3. d,e and f only
- 4. c, e and f only

- **How can veterinarians contribute to food safety?**
- a) by inspecting food production facilities
- b) By marketing food products
- c) By promoting animal breeding
- d) By focusing on pet health

- **In which of the following areas do veterinarians provide critical input?**
- a) animal care
- b) Social media narrative development
- C) public health policy formulation
- d) Financial planning for farms
- E) monitoring implementation of rules
- Answer:
- 1. a and e only
- 2. a,c and e only
- 3. A,b and c only
- 4. a,c,d and e only

- **What is a significant challenge in implementing One Health initiatives?**
- a) Lack of interest from the public
- b) Overemphasis on agriculture
- C) cordination among diferrent players
- d) Excess funds
- E) data integration
- Answer:
- 1. a,c and e
- 2. b,c and d
- 3. C and e
- 4. b,c and e

- **Which organization sets international food safety standards?**
- a) World Trade Organization
- b) United Nations
- C) codex alimentarious
- d) World Health Organization

- **What type of contamination can result from improper storage?**
- a) Only chemical contamination
- b) Only biological contamination
- c) Only physical contamination
- d) all

. Milk Hygiene in Relation to Public Health

- **Milk Hygiene** involves ensuring that milk and milk products are produced, handled, and consumed in a way that maintains their safety and quality from the udder of the milch animal to the consumer's table
- **Definition of Milk:**fresh, clear lacteal secretion obtained by milking one or more apparently healthy udders.It excludes milk obtained **within 15 days before or 5 days after calving.** Must contain the **minimum prescribed percentage of milk fat and milk solids-not-fat**

- **Milk Products:**Edible products prepared from liquid milk or powdered milk
- **Pasteurization:**63°C (145°F) for 30 minutes or 72°C (161°F) for 15 seconds.
- After pasteurization, milk must be rapidly cooled to 5°C (41°F) or below.
- **Quality Control:**Continuous testing

Microbiology of Milk and Milk Products

- **1. Contamination of Raw Milk**
- **Sources of Contamination:**
- **Interior of the Udder:**
    - Milk from healthy cows is generally low in pathogenic bacteria but can be contaminated by microorganisms from the udder or teat canal.
    - Bacterial count ranges from 500 to 1000/ml; higher counts may indicate contamination.
- Pathogens such as *Mycobacterium tuberculosis*, *Brucella spp.*, and *Streptococcus pyogenes* pose public health risks.

- **Environmental Contamination:**Pathogens such as coliforms from fecal matter can cause gastrointestinal issues like summer complaint or infantile diarrhea
- **Milker or Handler:**like typhoid or diphtheria through contaminated milk or utensils
- **Utensils**

- **Wholesaler, Retailer, and Vendor**
- **Storage and Transportation:** *Pseudomonas spp.* and *Bacillus spp.*.

2. Pasteurized Milk

- **Production Issues:** Presence of thermoduric and thermophilic bacteria indicates unhygienic practices or equipment issues.
    - Thermoduric bacteria (e.g**., *Bacillus spp*.**) survive pasteurization but do not grow.
- Thermophilic bacteria (e.g., *Bacillus thermophilus*) grow at high temperatures

- **What type of bacteria can survive pasteurization and indicates possible issues with hygiene?**
- A) Pathogenic bacteria
- B) thermoduric
- C) Coliforms
- D) Spoilage bacteria

- **What is a characteristic of Ultra High Temperature (UHT) treated milk?**
- A) It must be stored at room temperature
- B) generally sterile due to high temperature processing
- C) It contains more pathogens than pasteurized milk
- D) It cannot be stored for long periods

- **What type of bacteria is commonly associated with spoilage in UHT milk if not properly controlled?**
- A) Lactobacillus
- B) Escherichia coli
- C) Bacillus stearothermophilus
- D) Streptococcus thermophilus

Management Practices

Antibiotic	Withdrawal Period (Milk)
Penicillin	48 hours
Oxytetracycline	96 hours
Tylosin	72 hours
Sulfonamides	72 hours
Cephalosporins	72 hours
Florfenicol	96 hours
Ampicillin	96 hours
Chloramphenicol	30 days
Lincosamides	96 hours
Quinolones	48 hours

- **What is the recommended temperature range for chilling milk to inhibit microbial growth?**
- A) 5-10°C
- B) 0-4 °C
- C) 10-15°C
- D) -2 to 0°C

- **What is the recommended withdrawal period for Penicillin in milk?**
- A) 24 hours
- B) 48 hrs
- C) 72 hours
- D) 96 hours

3. Microbial Flora of Milk and Milk Products

- **Types of Microbial Flora**

- **1. Beneficial Microbes**
- **Lactic Acid Bacteria (LAB):**

  Lactobacillus species

  Lactococcus species

2. Spoilage Microbes:

Bacteria: *Pseudomonas species*

Bacillus species

- **Yeasts and Molds:**

  Candida species

  Penicillium species- both

3. Pathogenic Microbes

Bacteria: *Escherichia coli*

Salmonella species

Listeria monocytogenes

- **Viruses:** *Norovirus*
    - **Parasites:** *Cryptosporidium*

Spoilage Organism	Indicators of Spoilage	Common Effects
Lactobacillus spp.	Off-flavors, sour taste	Increased acidity, curdling
Pseudomonas spp.	Off-odors, slimy texture	Rancid flavors, spoilage in refrigerated products
Bacillus cereus	Off-flavors, bitter taste	Formation of toxic compounds, clumping
Staphylococcus aureus	Off-odors, changes in texture	Spoilage and potential food poisoning
Clostridium spp.	Foul odors, gas formation	Swelling of packaging, off-flavors
Micrococcus spp.	Off-flavors, yellowing	Changes in color and texture
Yeasts (e.g., Saccharomyces)	Off-odors, carbonation	Fermentation leading to sour flavors
Molds (e.g., Aspergillus)	Off-odors, fuzzy texture	Visible mold growth, off-flavors

Storage Method	Temperature Range	Duration	Notes
Refrigeration	0°C to 4°C (32°F to 39°F)	Up to 7 days (unopened)	Best for maintaining freshness; keep in original packaging.
Freezing	-18°C (0°F) or lower	Up to 3 months	Can affect texture; thaw in refrigerator before use.
Transportation	0°C to 4°C (32°F to 39°F)	During transit	Use refrigerated vehicles to maintain temperature.
Bulk Storage	1°C to 4°C (33°F to 39°F)	Varies (follow local guidelines)	Regularly monitor temperature; keep storage containers clean.
Room Temperature (short-term)	Up to 20°C (68°F)	No more than 2 hours	Avoid prolonged exposure to higher temperatures.
Hot Holding	60°C (140°F) or higher	As needed (for pasteurized milk)	Keep above this temperature to prevent bacterial growth.

Method	Temperature	Time	Purpose	Common Applications
High-Temperature Short-Time (HTST)	72°C (161°F)	15 seconds	Kills most pathogens while preserving flavor and nutrients	Milk, cream, fruit juices
Ultra-High Temperature (UHT)	135-150°C (275-302°F)	2-5 seconds	Extends shelf life without refrigeration; sterilizes	Shelf-stable milk, cream
Low-Temperature Long-Time (LTLT)	63°C (145°F)	30 minutes	Traditional method, preserves flavor; less common now	Some artisanal dairy products
Flash Pasteurization	85-90°C (185-194°F)	1-2 seconds	Quickly pasteurizes while maintaining quality	Some juices, dairy products
Batch Pasteurization	63°C (145°F)	30 minutes	Used for small batches, less efficient	Cheese, ice cream
Steam Pasteurization	Varies (usually > 85°C)	Varies (depends on product)	Effective for solid foods; steam exposure	Certain dairy and non-dairy products
Vacreation (Vacuum Pasteurization)	Reduced pressure (typically below	Varies (depends on product)	Pasteurizes under reduced pressure using direct steam; preserves flavor and nutrients	Milk, cream

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Quality Control of Cream

- **1. Factors Affecting Microbiological Quality**
- **a) Quality of Raw Milk:**
- **b) Separation Process:** Modern separators operate at 25-30°C, which is better than the 35-45°C of conventional separators
- **c) Holding of Cream Before Processing:**inappropriate temperatures - high counts-thermodurics and psychrotrophs

- **d) Processing of Cream:**

  1) Standardization:

  2) Homogenization

  3) Heat Treatment (Pasteurization/Sterilization)

  4) Freezing:

  5) Packaging/Canning:

  6)Storage and Distribution:

Quality Control of Butter

- **1. Factors Affecting Microbiological Quality**
- **a) Raw Material (Milk/Cream):** High levels of thermoduric lipase from psychrotrophic bacteria can lead to increased free fatty acids, affecting butter quality.

Control Measures: Ensure clean milk and cream, Check the microbial load and Avoid storing cream at high temperatures

- **b) Equipment:** butter churns can be significant sources of contamination

Control Measures: Prefer metal drums over wooden

- **c) Water Supplies:** *Achromobacter putrescens* and *Pseudomonas sp.* can contaminate butter if unchlorinated water is used
- **Control Measures**: 1-5 mg/lit residual chlorine
- **d) Air:**
- **e) Personnel:**

- **f) Butter Color: annato**
- **g) Packing Materials:**
- **Control Measures**: combined treatment of hot brine and sorbic acid for protection.

Cheese

- **a) During Manufacture:**

  Raw Milk Quality:

  Ineffective Starter Cultures: *Bacillus* sp. and *Clostridia* to proliferate--gassiness, off-flavors, and textural changes

  Control Measures:

  b) During Ripening

  Microbial Growth:

  late Gas Formation:due to lactate-fermenting clostridia

- **Control Measures**: Reduce moisture and increase salt
- Use starter bacteria to lower lactose levels

- **c) Finished Product**
- **Moisture Content**: High moisture content in cheeses like Limburger and Bire increases perishability.

- **What type of microorganism is primarily responsible for spoilage in refrigerated milk?**
- **A) Pseudomonas species**
- **B) Lactococcus species**
- **C) Streptococcus species**
- **D) Salmonella species**

- **Which pathogenic microbe can grow at refrigeration temperatures and is a concern in ready-to-eat dairy products?**
- **A) Bacillus cereus**
- **B) Listeria monocytogenes**
- **C) Norovirus**
- **D) Candida species**

- **Which spoilage organism is known to produce off-flavors and sour taste in dairy products?**
- **A) Pseudomonas spp.**
- **B) Staphylococcus aureus**
- **C) Lactobacillus spp.**
- **D) Clostridium spp.**

- **In the production of cheese, what can lead to undesirable textures and off-flavors?**
- **A) High-quality starter cultures**
- **B) Ineffective starter cultures**
- **C) Proper pasteurization**
- **D) Good hygiene practices**

- **Which of the following is a common indicator of spoilage in yogurt?**
- **A) High acidity**
- **B) Yeast and mold presence**
- **C) Low pH**
- **D) Presence of beneficial bacteria**

- What are the objections to pasteurisation?

- 1. reduce cream line
- 2. pasteurised milk will not clot
- 3. beneficial for safety
- 4. encourages slackening of efforts for clean milk production
- 5. reduce nutritional quality significantly
- 6. improve shelf life

Answer :

A . 1,2 and 5 only
B . 3 and 6 only
C. 1,2,4 and 5 only
D . 2,3 and 6 only

4: Milk Plant and Dairy Equipment Hygiene

- **Ideal Properties of Detergents**
- **Wetting and Penetrating Power**: Effective soil removal.
- **Emulsifying and Saponifying Power**: Break down fats and proteins.
- **Deflocculating Power**: Prevents formation of soil particles.

- **Deflocculating Power**: Prevents formation of soil particles.
- **Sequestering and Chelating Power**: Removes metal ions.
- **Solubility**: Quick and complete.
- **Non-Corrosive**: Safe for metal surfaces.
- **Free Rinsing**: Easy to rinse away.
- **Economical and Mild**: Cost-effective and gentle on hands.
- **Germicidal Action**: Ability to kill microorganisms

Types of Dairy Detergents

- **Alkalies**: NaOH, Na_2CO_3, Sodium phosphate, Sodium bicarbonate, Sodium silicate.

- **Acids**: Tartaric, Phosphoric, Citric, Gluconic, Nitric acids

- **Polyphosphates and Chelating Agents**: Tetraphosphate, Hexametaphosphate, Tripolyphosphate, Pyrophosphate.

- **Surface Active Agents**: Teepol, Acenol-N, Idet-10, Common soap.

Common Sanitizers and Their Modes of Action

- **Chlorine Compounds**: e.g., Chlorine gas, Hypochlorites; bactericidal through halogenation.
- **Iodophors**: Iodine-based; acts through halogenation and oxidation.
- **Quaternary Ammonium Compounds**: Disintegrate cell membranes and inactivate essential enzymes

Clean-In-Place (CIP) System

- **Process**:
  - **Pre-Rinse**: With cold water.
  - **Acid Rinse**: With phosphoric acid solution (0.15-0.60%) at 65-71°C.
  - **Hot Water Rinse**: At 65-71°C.
  - **Alkali Rinse**: With alkaline detergent solution (0.15-0.60%) at 65-71°C.
  - **Final Hot Water Rinse**: At 71-82°C.

- **What is the primary purpose of cleaning in dairy equipment maintenance?**
- **A) To destroy pathogens**
- **B) To remove soil and residues**
- Answer
- 1 a only
- 2 b only
- 3 both
- 4 none

- **Which of the following is a common type of detergent used in dairy cleaning?**
- **A) Sodium hydroxide**
- **B) Ethanol**
- **C) Acetic acid**
- **D) Hydrogen peroxide**

- **What is the most reliable method of sanitization for dairy equipment?**
- **A) Chemical sanitizers**
- **B) Hand washing**
- **C) Heat sanitization**
- **D) Cold water rinsing**

- **Which property of detergents helps break down fats and proteins?**
- **A) Sequestering power**
- **B) Solubility**
- **C) Emulsifying power**
- **D) Germicidal action**

- **Which of the following sanitizers acts by disintegrating cell membranes?**
- **A) Quaternary ammonium compounds**
- **B) Iodophors**
- C) Chlorine compounds
- **D) Alcohols**
-

5. Milk Hygiene Practices in India and World

- **General Practices:**
- **Milking Frequency**
- **Challenges:** Tropical climate, inadequate cooling facilities, widespread adulteration, lack of quality consciousness, and small-scale, scattered production affect milk hygiene

- **Production and Distribution:** unorganized sector and organised

- What regulation was implemented in June 1992 to ensure the quality and safety of dairy processing in India?
- **A) Dairy Quality Act**
- **B) Milk and Milk Products Order (MMPO)**
- **C) Animal Welfare Act**
- **D) Food Safety and Standards Act**

- **Which of the following pathogens is commonly associated with milk?**
- **A) Salmonella**
- **B) E. coli (O157)**
- **C) Listeria monocytogenes**
- **D) All of the above**

- Find out the correct pair
- A. HTST FDV
- B. LTLT BATCH METHOD
- C. STERLISATION PUNCTURING TEST
- D. UHT TEARING TEST
- answer
- 1. a and b
- 2. c and d
- 3. all
- 4. NOTA

- **What is the predominant bacterial flora found in raw milk?**
- **A) Lactic acid bacteria**
- **B) Psychrotrophic bacteria**
- **C) Pathogenic bacteria**
- **D) Yeasts**

- **How often should dairy equipment be sanitized?**
- **A) Weekly**
- **B) Monthly**
- **C) After every use**
- **D) daily**

- Match the followings: **JKPSC – 2020**

Disease

- i) Infection of milk directly from cow 1) Malta fever
- ii) Infection from man to cow and then to milk 2 Diphtheria
- iii) Direct contamination of milk by human being 3Gastroenteritis
- iv) Indirect contamination of milk by human being 4) 'Typhoid fever

- A) i-1 ii-2 iii-3 iv-4
- B) i-2 ii-1 iii-3 iv-4
- C) i-1 ii-3 iii-2 iv-4
- D) i-3 ii-4 ili-1 iv-2

- **The SPC in pasteurized milk per mi should not exceed**
- a) 3,000
- b) 50,000
- c) 30,000
- d) 1,00,00

Slaughter house/abattoir and hygiene management in abattoirs

- **General Guidelines :**Pigs require separate slaughter facilities from cattle and sheep **due to moisture** from pig scalding
- **Pig Slaughter Process:**

  Scalding and Dehairing:

  Scalding

  Dehairing efficiency

  Bacterial contamination: **Salmonella paratyphi and S. typhimurium.**

Parasites and fungi:

- **Vertical Scalding Process:** reduces bacterial contamination and muscular degeneration in pigs

  Reduced PSE incidence: temp below 41

Chilling Hall: Carcasses are chilled immediately after postmortem inspection, stored at ≤7°C for meat and ≤3°C for offal

- **Other Abattoir Facilities:**
- **Hide Store**
- **Manure House**
- **Detention Room**
- **Condemned Meat Room**

Treatment of Abattoir Effluent

- **Effluent Treatment Process**
- **Preliminary/Primary Treatment:**

Screening: Removal of coarse solids and fats

Dissolved Air Flotation

Secondary Treatment:

- **Why must pigs be slaughtered in separate facilities from cattle and sheep?**
- A) Pigs require more space.
- B) Moisture from pig scalding affects beef and mutton drying**.**
- C) Pigs are more susceptible to disease.
- D) Pigs are larger in size than cattle and sheep

VETERINARY PUBLIC HEALTH

- LECTURE- 5
- BY- Dr. Madhur

Hygienic Disposal of Unsound Meat

- **Unsound meat:** unfit for human consumption
- **Rendering: fat and cardass meal**

Disposal Methods

- **Burial Method**
- **Advantages**:
  - Inexpensive **if land is available**.
- **Disadvantages**:
  - **Risk** of disease transmission and pollution.
  - Does **not destroy prions** or other pathogens.
- Requires **a large amount of land** and earth-moving equipment

- **Incineration:** Destroys most pathogens and **inactivates prion particles** at high temperatures (up to 1000°C).
- **Reduces the volume of waste**.
- Heat generated during incineration **can be recycled**

Disadvantages:

air pollution

Expensive equipment and operation costs.

Disposal of ash = challenge

Loss of organic nutrients

Toxic Residues in Meat

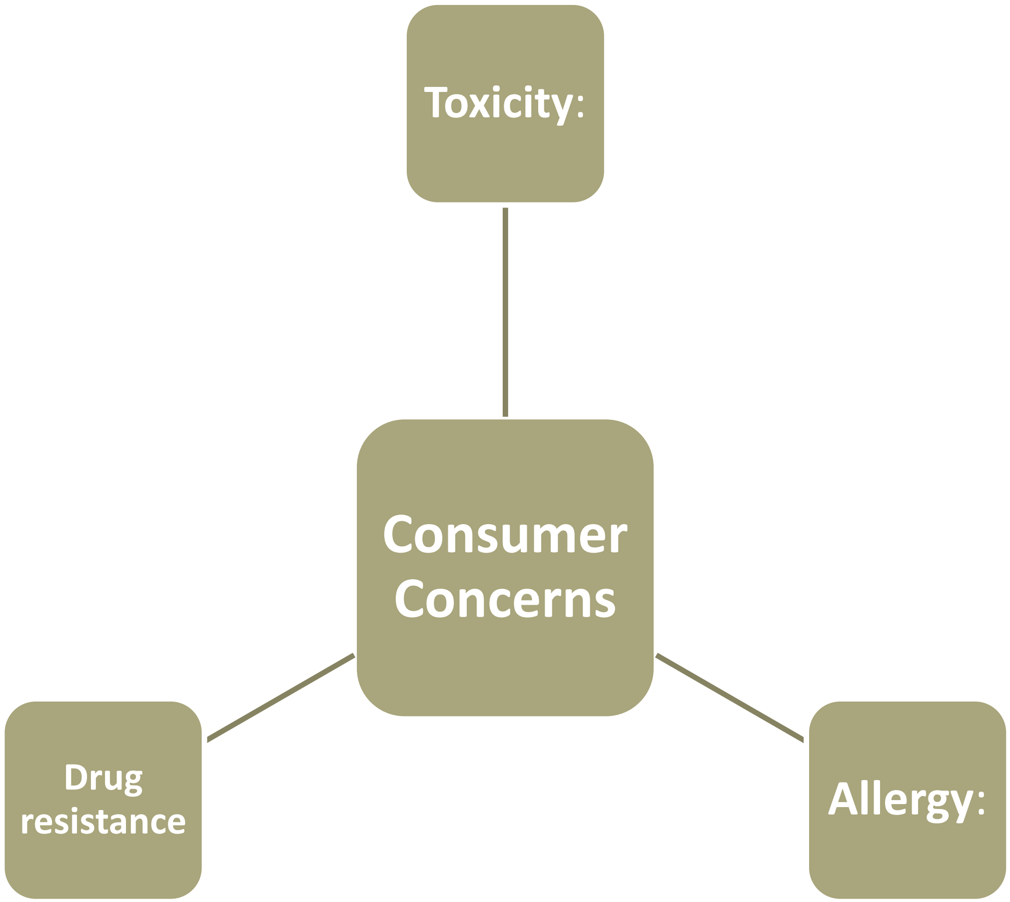
Drugs are used to:

Control or prevent infections

Promote growth

Delay deterioration of meat products

Maximize nutrient utilization in animals


Toxicity:
Consumer Concerns
Drug resistance
Allergy:

Factors Leading to Residues in Meat

- **Clearance Rate**: disease, age

  prolong the clearance rate of drugs

  - **Withholding Time**: time required for drugs to clear from the animal's body.
- **Formulation**: Slow-release drug formulations may prolong therapeutic concentrations, which can affect how long residues persist in the tissues

- **ADI**: Refers to the amount of a substance (e.g., food additive or drug residue) that can be ingested daily over a lifetime without posing a health risk.
- **MRLs**: Standards set for acceptable residue levels in food products, determined based on a safety factor that accounts for toxicological studies, ensuring that human intake remains within safe limits

Antimicrobial Substances and Maximum Residue Levels (MRLs) for Bovine

Compound	Target Tissue	Concentration (µg/g)
Sulphonamides	Muscle, liver, kidney, fat	100
Benzylpenicillin	Muscle, liver, kidney, fat	50
Erythromycin	Muscle, liver, kidney, fat	400
Tetracycline	Kidney, liver, muscle, milk	600, 300, 100, 100
Streptomycin	Kidney, liver, muscle, milk	1000, 500, 200

Hormones and β-Agonists

- **Hormones**: Used for therapeutic purposes and to modify growth in animals, but they may lead to neoplasia.
- **β-Agonists**: These compounds influence energy repartitioning, shifting energy from fat to lean muscle. They are sometimes used in cattle to reduce fat content but pose residue risks if used in large doses

Pesticides and Insecticides

- **Pesticides**: Control pests but bioaccumulation. For example, **DDT**
- **Organophosphates**: These pesticides are more toxic but break down more quickly than organochlorines like **DDT**

Anthelmintics (for controlling parasites)

Anthelmintic	Species	Target Tissues	MRL (µg/kg)
Levamisole	Bovine, Ovine, Porcine	Muscle, kidney, fat	10
Ivermectin	Bovine, Ovine, Porcine	Liver, fat	100, 40
Thiabendazole	Bovine, Ovine, Caprine	Muscle, liver	100

- **What is the primary purpose of using drugs in modern animal production systems?**
  a) To enhance flavor
  b) To control or prevent infections
  c) To increase the fat content in animals
  d) To shorten the growth cycle of animals

- **Which substance is banned and has no permitted residue limit?**
  a) Sulphonamides
  b) Diethylstilboestrol
  c) Benzylpenicillin
  d) Erythromycin

- **Which antimicrobial substance has the highest Maximum Residue Level (MRL) for bovine kidneys?**
  a) Benzylpenicillin
  b) Tetracycline
  c) Streptomycin
  d) Sulphonamides

International and Indian Standards for Food Safety

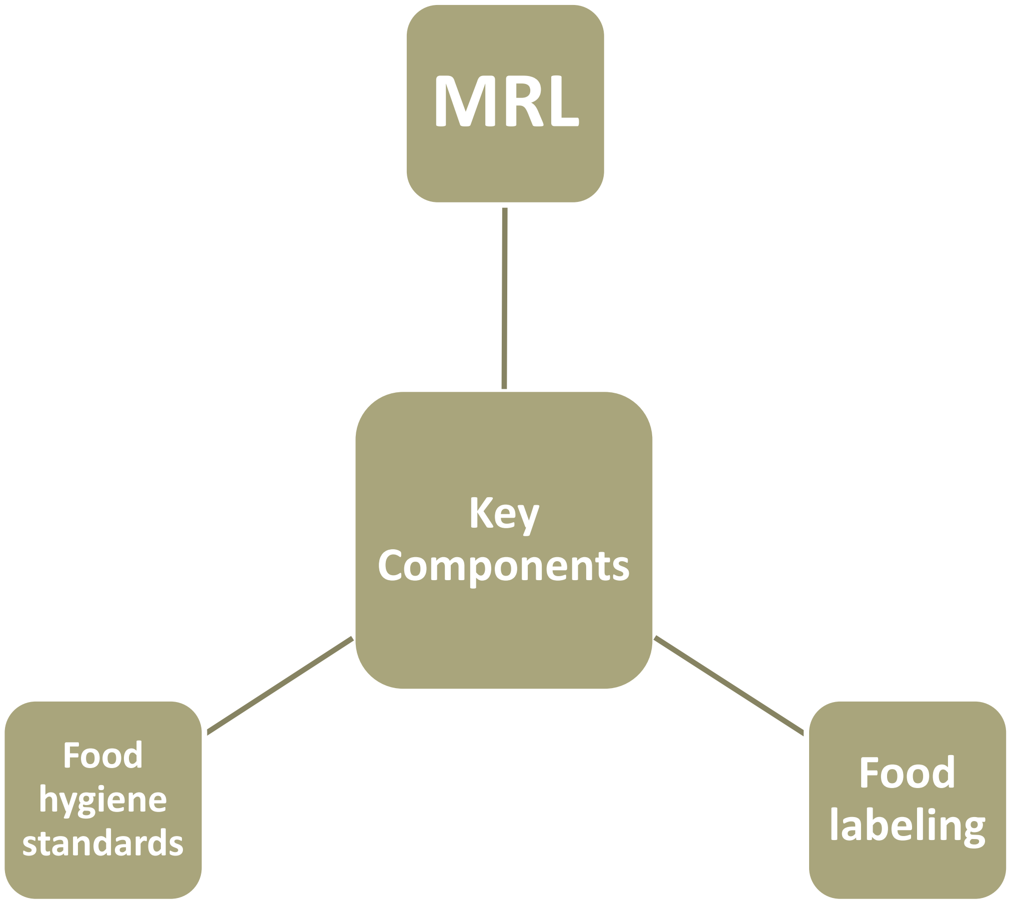
- **International Standards for Food Safety**
- **1. Codex Alimentarius (CAC):** 1962 by FAO and WHO

Key Objectives:

Protection of consumer health

Fair practices in food trade

Harmonization of standards


MRL
Key Components
Food hygiene standards
Food labeling

- **2. ISO 9000 and ISO 22000 Series**
- **ISO 9000 Series:** a set of internationally recognized quality management standards
- **ISO 9001:**
- **ISO 9001:2000** focuses on **customer satisfaction**, continual improvement, and the ability of firms to provide quality products and services
- **ISO 22000:**for food safety management systems. It applies to **all organizations in the food chain**, from primary production to consumption- **core element are-** HACCP, Interactive communication, System management.

- **3. Sanitary and Phytosanitary (SPS) Agreement**

The **SPS Agreement** under the **WTO** allows countries to set their own standards to protect human, animal, and plant health, provided the measures are based on scientific risk assessments.

- Countries can also set higher standards
- **International Organizations Involved:**
- **Codex Alimentarius Commission (CAC):** For food safety standards.
- **International Plant Protection Convention (IPPC):** For plant health standards.
- **World Organization for Animal Health (OIE):** For animal health standards.

Indian Standards for Food Safety

- **1. Food Safety and Standards Act (FSSA) 2006**

was introduced to consolidate various food safety laws in India into a single legislation

Key Features:

1. Establishment of FSSAI: was established to regulate and monitor the manufacturing, processing, storage, distribution, sale, and import of food products.

2. Harmonization with International Standards:

Codex Alimentarius serves as a reference for many of the standards laid down by FSSAI

3. Unification of Laws:

- **2. Milk and Milk Products Order (MMPO)**

was introduced to regulate the production, distribution, and supply of milk and milk products in India

promulgated on 9th June, 1992 under the provision of Section 3 of the Essential Commodities Act, 1955.

International and Indian Standards:

Aspect	International Standards (Codex, ISO)	Indian Standards (FSSA, MMPO)
Regulatory Body	CAC, OIE, IPPC, ISO	FSSAI
Scope	Global standards for food safety and trade facilitation	National food safety regulations with harmonization to Codex
Approach	Science-based, risk assessment, HACCP, and ISO quality standards	Risk-based, consolidated under FSSA with ISO and HACCP alignment
Licensing and Compliance	No mandatory certification (voluntary compliance encouraged)	Mandatory registration and licensing for food businesses
Focus	Global consumer protection and trade facilitation	Domestic food safety, consumer protection, and export facilitation
Standards for Dairy Products	Codex standards for milk and milk products	MMPO for milk hygiene and dairy product standards
Enforcement	Voluntary, but recognized in international trade agreements	Mandatory enforcement by FSSAI

- **What is the focus of the ISO 9001:2000 standard?**
  a) Reducing food waste
  b) Improving packaging techniques
  c) Customer satisfaction and continual improvement
  d) Promoting organic food production

- **What is the primary purpose of the Food Safety and Standards Act (FSSA) of 2006?**
  a) Promote international food trade
  b) Ensure the availability of safe and wholesome food for consumption
  c) Establish food packaging standards
  d) Regulate food imports only

- **Which of the following is not a key component of Codex standards?**
  a) MRLs for pesticides
  b) Food hygiene standards
  c) Production quotas for dairy products
  d) Food labeling requirements

- **What does ISO 9000 focus on?**
  a) Promoting international trade
  b) Regulating animal health
  c) Quality management systems
  d) Dairy product standards

- **What is the relationship between ISO 9001 and ISO 22000?**
a) ISO 22000 harmonizes with ISO 9001, making it easier for companies to implement both
b) ISO 9001 focuses on food safety while ISO 22000 focuses on quality management
c) ISO 9001 is limited to dairy standards
d) ISO 22000 deals only with food packaging

- **What is the main purpose of the Maximum Residue Limits (MRLs) established by Codex?**
  a) Promote the use of additives
  b) Ensure food safety by controlling residue levels
  c) Certify organic products
  d) Improve food packaging standards