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Popular Article

Microbial Spoilage of Meat and Meat Products

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Spoilage?

The process which deteriorates the food to the extent that the food is rendered inedible or inappropriate for consumption.

- Spoilage of meat and meat products occurs due to;

- Autolysis (souring)-

By enzymes present in meat especially lysozymes-

- Oxidation or hydrolysis of fat.

- Microbial action.

Microbial Spoilage?

- Fresh meat contains nutrients such as sugars, amino acids, vitamins, fats, minerals and water which act as source of nutrients for microbes.
- When microbes multiply and break down the nutrients present in meat they produce spores, toxins, acids and various other waste products.
- Even if the microbes are not pathogenic/harmful, the waste products and toxins maybe harmful and they may leave an unpleasant smell, colour and taste.

Source of Microbial Contamination-

- The healthy meat contains few or no micro-organisms.
- Lymph nodes- Staphylococci, Streptococci, Clostridium And Salmonella.
- Skin and gut.
- Air, water and floor
- Knives, clothes, containers, etc.
- Personnel.
- Post-slaughter handling of meat.



Microbial Counts in Sources of Microbial Contamination In An Abattoir (Lawrie And Ledward, 2006)

Sources	Bacteria	Yeasts	Moulds
Hides (cfu/g)	3.3×10^6	580	850
Surface soils (cfu/g)	1.1×10^5	5×10^4	1.2×10^5
Gastrointestinal contents: Faeces (cfu/g)	9.0×10^7	2.0×10^5	6.0×10^4
Gastrointestinal contents: Rumen (cfu/g)	5.3×10^7	1.8×10^5	1600
Airborne contamination (no. deposited from air / cm ² /hr) - cfu	140	-	2
Water used on slaughter floors (cfu/ml)	1.6×10^5	30	480

Factors Affecting Growth of Micro-organisms-

- Type of microbes and microbial load.
- Physical (exposed surface area) and chemical (nutrient and moisture content) properties of meat.
- Availability of oxygen – favorable for growth of yeasts, moulds and aerobic bacteria.
- Temperature;
- Psychrophiles; 2°C to 7°C (e.g. Moraxella, Psychrobacter, Flavobacterium etc.)
- Mesophiles; 10°C to 40°C
- Thermophiles; 43°C to 66°C (e.g. Bifidobacter, *Streptococcus thermophilus*, etc.)

Meat Spoilage Under Aerobic Condition

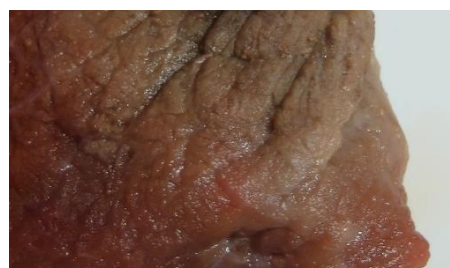
1. Surface slime-

- Early indication of spoilage, often observed before expiry date.
- Caused by; Pseudomonas, Acinetobacter, Moraxella, Streptococcus, Leuconostoc, Bacillus, Micrococcus etc.



2. Changes in Colour of Meat

- The red colour of meat, called as ‘bloom’, may be changed to shades of green, brown, or grey.
- It is due to the production of oxidizing compounds like Peroxides and Hydrogen Sulphide mostly by Lactobacillus and Leuconostoc (causes green discoloration in sausages).



Changes in Fat-

- Bacteria like **Pseudomonas**, **Achromobacter** and yeasts cause lipolysis leading to production of acids and aldehydes resulting in off-flavoured meat.



3. Phosphorescence

- Caused by luminous bacteria e.g; **Photobacterium** spp.
- Uncommon defect

4. Various Surface Colours Due to Pigmented Bacteria

- **Red spot** – Serratia marcescens.
- **Blue colour** - Pseudomonas synchyanea
- Yellow colour- Micrococcus or Flavobacterium
- **Greenish** blue or brownish black spot- Chromobacterium lividum
- **Purple** (stamping ink)- discoloration of fat.



5. Off Odours and Off Taste

- **Souring** term is applied to any defect leading to sour taste due to production of VFA's.
- **Taints** or undesirable taste and odour is due to microbial growth.
- Earthy flavour – Actinomycetes.

Aerobic Growth of Moulds and yeast Causes-

- Stickiness
- Whiskers- even in cold storage mycelial growth may occur without sporulation.
- Black spot- Cladosporium herbarum.
- White spot- Sporotrichum carnis.
- Green patches- Penicillium spp.
 - Hydrolysis of fat by lipases.
 - Off odour and off tastes



Spoilage under anaerobic condition-

- Changes;
- Souring
- Putrefaction
- Taint

Souring-

- Implies sour odour and taste.
- Caused by – Formic, Acetic, Butyric, Propionic, Lactic and other fatty acids by the growth of LAB, Clostridium and Coliform bacteria.
- Souring can result from;
 1. Own enzymes.
 2. LA production.
 3. Proteolysis caused by anaerobes, called as stinking sour fermentation.

Putrefaction

- Anaerobic decomposition of protein with the production of foul-smelling compounds like hydrogen sulphide, indole, ammonia, amines etc.
- Usually caused by Clostridium spp., but Pseudomonas and Alkaligenes may also be involved.

Prevention Of Microbial Spoilage of Meat and Meat Products

- Good hygiene practices during slaughter, handling and cooking of meat.
- Thorough cooking before consumption.
- Use of clean utensils, knives, cutting boards.
- Preservation techniques like; Freezing, Chilling, Canning, Drying, Salting, Irradiation, Dehydration and Smoking



References

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