MEAT PACKAGING

Dr Narendra Nayak
Department of LPT
College of Veterinary Sc. & A.H., Mhow
Food packaging is not only an art of enclosing or wrapping a food product but it also protects the food from deterioration in a limited manner.

It must ensure safe delivery of the product at the minimum cost.

The cost of packaging has to be reasonable.

Packaging may not improve the existing quality of a product but it should help in maintaining its keeping quality during storage, transport and deterioration.
TYPES OF PACKAGING MATERIALS

Depending on the hardness, the packaging materials are of three types:

i) Flexible packaging materials: Plastic films, Paper, Aluminium foil

ii) Semi-rigid packaging materials: Paperboard/cardboard/containers, PET and PVC containers, Aluminium containers, Moulded containers

iii) Rigid packaging containers: Glass containers, Metal cans, Fibre board containers, Wooden boxes/crates/barrels
FLEXIBLE PACKAGING MATERIALS

Plastic Films
- A film is very thin flexible plastic sheeting.

Cellophane
- Was first commercial flexible film.
- It is a natural plastic film derived from bleached pulp which is treated with acid and alkali and then plasticized to get cellophane.
- It can be suitably coated on one side to impart various functional properties.
- This is a low cost film.
Various types of this film bear letter designation on the basis of its properties e.g.

- C - coloured
- M - moisture proof
- S - heat sealable
- T - transparent
- D - demi (one side) coated

*Thus, MST cellophane refers to a film which is moisture proof, heat sealable and transparent.*
Polyethylene (PE)

- It is the most commonly used plastic film of these days due to low cost, easy availability and unique properties
- Low density polyethylene (LDPE) is prepared at a very high atmospheric pressure at about 150-200°C, whereas high density polyethylene (HDPE) is prepared at comparatively low atmospheric pressure and temperature
- Low density polyethylene (LDPE) film is transparent to translucent, highly flexible and has comparatively low permeability to water vapours, but it is fairly permeable to oxygen, carbon dioxide or odours
HDPE film is translucent to opaque and comparatively less permeable to water vapours and gases. It is fairly oil and grease resistant as compared to LDPE.

Polyethylene is a tasteless, odourless and non-toxic film.

It has the unique property of sealability of itself by the application of heat.
Polypropylene (PP)

- Is another plastic film which is also in general use.
- It has a good gloss, high flex strength and resistance.
- It softens at a temperature of 150°C, so it can be used to pack food products at moderately high temperature.
- It is also sometimes used for packaging those raw meat products which are subjected to heat treatment or cooked in the pack itself at a later stage.
- The film is readily heat sealable and has low water vapour permeability.
- It also shows a good resistance to oil and grease. It is used in making laminates also.
Polyamide

- Usually called Nylon film in the trade is inert, heat resistant and has excellent mechanical properties.
- Nylon-6 is a tasteless and odourless film and thus ideal for use in the packaging of fresh and processed foods.
- It can be sterilized by steam.
- It is used for making laminates of good inertness and low permeability.
Polyester film
- Is also inert and has excellent strength.
- It is widely used in lamination as outer, abrasion resistance layer for food pouches

Polyvinyl chloride
- Is a plasticized film for packaging.
- This film has low folding endurance.
- It has good seal property and resistance to oil as well as grease.
Aluminium Foil

- Plain aluminum foil is used for packaging food products.
- Thin gauge aluminum foil with pin holes are generally laminated to paper or plastic film with bonding agent to make suitable laminates.
- These laminates are used to package food products requiring protection against light, water vapour and gases especially dehydrated cooked meat.
- One distinct advantage of using aluminium foil as the outer layer of a laminate is that it provides a very good base for colourful and decorative printing.
Paper Glassine or parchment paper

- Have good grease resistance and high wet strength.
- A plasticizer may be added to make the paper still more soft and machinable.
- These opaque papers are sometimes used to wrapping bacon and other fatty cuts of meat.
SEMI-RIGID PACKAGING MATERIALS

Paper board
- Sheets are cut, folded into desired form and glued.
- Corners can be made stronger.
- The material can be made as set up paper board boxes or folding carton or tray as per the demand.
- It provides convenience, strength and good product protection.
PET (polyethylene terephthalate) and PVC plastic sheets

- Can be moulded in shape, size and colour to suit specific product requirements.
- PET bottles and containers are extremely clear, virtually unbreakable and very lightweight.
- They are ideal for the packaging of pickled meat products.
- They provide enhanced visual appeal to the products.
Plain aluminium foil of higher gauge

- Either alone or in combination with paper or plastic foils can be pressure formed into desired shapes to serve as semi-rigid containers for various types of food products.

Moulded pulp

- Containers are the cheapest packaging for the shell eggs.
- They allow wholesale trading of eggs along with the tray.
RIGID PACKAGING MATERIALS

Glass containers

- Are very old and versatile packages for food packaging.
- It is chemically inert and is an excellent barrier to solids, liquids and gases.
- It can be moulded in various shapes and sizes and also allows excellent product visibility.
- Glass bottles are used for packaging meat pickles etc.
- The main drawbacks of glass containers are the risk of breakage and comparatively heavy weight.
Metal cans

- Are primarily used for commercially sterilized food products.
- Iron sheet used for making can has very thin tin coating on either side.
- It is generally applied to check rusting and corrosion of metal cans on long term storage.
- To make the metal can more suitable for food application, a further very very thin coating of enamel or lacquer is applied to the tin.
- For canning of meat products, a sulphur-resistant lacquer is preferred.
- Can bodies are soldered or welded. The product is hermatically (air tight) sealed in the can.
RETAIL PACKAGING

- In retail packaging, the size of the package is such that the food contents can suffice the requirement of an individual or a family.
- It does not involve any packaging exercise at the retail store.
- Retail packaging of food products mostly involves the use of flexible packaging materials - plastic films, aluminum foil, paper etc. or their laminates.
- Sample food pouches are also subjected to drop test. In this test, the pouch is made to fall on a platform from a height of 105 cm at the bottom, by the corner sides and edges.
BULK PACKAGING

- Bulk or wholesale packaging is done for safe transport of a product from the point of production to wholesale dealer and from there to the retailer.
- Bulk packaging should make an efficient use of transit space.
- The packages should be easy to load or move from one place to the other at transit point either manually or by trolley.
They should be stackable one over the other to save the space during transit as well as storage.

Bulk packaging is done in rigid packaging materials.

Solid or corrugated cardboard boxes are extensively used for food products.

These are not usually used as direct containers but employed as outer packages for a number of retail packages.
THE FOLLOWING PERFORMANCE EVALUATION TESTS ARE CALLED OUT ON BULK PACKAGES:

Drop Test:
- This is most important test especially for fibre board or corrugated fibre board boxes, shipping containers etc.
- The filled-in package is allowed to fall on the bottom by the corner sides and edges.
- The fall should be at least 60 cm.
Rolling Test:
- Bulk packages may have to be rolled at certain points.

Stack Load Test:
- Bulk containers are tested for the load they can bear by stacking them one over the other up to a height of 2 meters.
- The packages should not suffer any damage during this exercise.
Vibration Test:

- It is conducted to test the bulk packages which are to be transported by train.
- The packages are put on a vibration table which vibrates with the speed of 120 cycles/minute for a known time.
- An hour of vibration on this table represents 1000 km transit by train.
- All these tests are not done on all packages or containers.
ASEPTIC PACKAGING

- Aseptic packaging refers to the process of packaging pre-sterilized food product in the pre-sterilized packages under sterile environment.
- In this process, the product is sterilized by heating at a very high temperature (ultra high temperature) or at high temperature for a short time (HTST) or directly by steam injection.
- There are various aseptic packaging systems which are successfully operating in different parts of the world.
- In India, ‘Tetrapak’ system is being followed for the aseptic packaging of milk and fruit juices at several places
VACUUM PACKAGING

- Colour is the most important characteristic of fresh meat from the marketing point of view.
- In cured meat also, cured meat colour is highly desired.
- Long term storage of these meats in permeable plastic films will alter their colour to undesirable dark brown.
- So these meats are stored for extended period in impermeable film laminates under vacuum.
- It will ensure retention of meat quality for a period of at least 8 weeks in fresh meat and 10 weeks in case of cured meat at a refrigerated storage of 0°C.
Vacuum packaging machine is used to create vacuum in the filled-in package.
The aerobic bacteria are inactivated.
The lipid oxidation and consequent rancidity development is checked.
There is saving in the space during transport.
The laminate pouches should have a good mechanical strength and allow perfect seals.
The polyethylene (PE) layer is invariably used on the inner side.
Some of the commonly used laminates are -

- Polyester/PE film laminate
- Polyamide/PE film laminate
- Aluminium foil/PE laminate
- PVDC/PE laminate

In the vacuum packaging, superficial spoilage of fresh meat caused mainly by *Pseudomonas* sp. is inhibited. However, lactic acid producing bacteria continue to grow at a slow pace for several weeks without immediately spoiling the meat.
MODIFIED ATMOSPHERE PACKAGING (MAP)

- The gases and their proportion to be used in modifying the atmosphere inside the package is carefully selected for a particular type of meat product.
- Nitrogen, carbon dioxide and oxygen are the three most important gases.
- Nitrogen is an inert gas and does not react with the various constituents of a meat product.
- Oxygen is used when the development of a desirable colour becomes imperative.
Carbon dioxide is used to create anaerobic environment inside the package.

Modified atmosphere packaging is also done with the help of vacuum packaging machine as a second step.

In modified atmosphere packaging, we do not disturb the package environment at a later stage.
PACKAGING OF FRESH MEAT

- For short term storage, most learned people in India wrap fresh meat in polyethylene pouches or bag.
- The polyethylene should be food grade, transparent and fairly thick (150-200 gauge).
- In developed countries, fresh meat chunks are kept in a rigid plastic tray and overwrapped with polyethylene.
- Besides this popular film can also use polypropylene, polyvinylidene chloride or cellophane films for wrapping fresh meat cuts.
This is another type of film called shrink film which is used for wrapping large and uneven cuts of fresh meat and dressed poultry.

The carcass cuts or dressed poultry are first wrapped in shrink film which is then immersed in hot water (90°C) for a few seconds.

For long term storage, vacuum packaging of fresh meat and storage in refrigerator is ideal.
Pork is usually not vacuum packaged because it has higher load of bacteria and keeps well for only 2 weeks.

The laminate for this packaging should have a good strength and proper sealing is necessary.

The gaseous mixture in MAP differs for various species. For mutton, a mixture of 70% oxygen, 20% carbon dioxide and 10% nitrogen is generally used, whereas for pork, 70% carbon dioxide, 20% nitrogen and only 10% oxygen is recommended.

For dressed poultry a mixture of 50% carbon dioxide and 50% nitrogen is considered ideal.
PACKAGING OF FROZEN MEAT

- The meat to be stored in frozen condition must be properly packaged, otherwise it develops “freezer burn’
- For frozen storage of meat, the packaging material should have good strength even at freezer temperature.
- It should have very little permeability to water vapours
- It should also have very good grease resistance.
- Low density polyethylene (150-200 gauge) is the least cost protective film which can withstand low temperature and maintain clarity.
- Polyester or nylon/ PE laminate can also serve as ideal over-wrap.
- Heat shrinkable low density polyethylene also provides all the required functional properties for this purpose.
PACKAGING OF CURED MEAT

- Cured meat products like ham, bacon, luncheon meat and frankfurters are prepared after treating meat with table salt (sodium chloride) and salt petre (sodium nitrite) along with other additives.
- Curing develops a very desirable pink colour and a much sought after cured flavour.
- These two specific characteristics need to be protected in the packaging of cured meat products.
The packaging techniques for short term storage are overwrapping in polyethylene or shrink packaging for irregular cuts like hams.

For long term storage of blocks, luncheon meat etc., vacuum packaging in laminates is ideal.

Modified atmosphere packaging in gaseous mixture of 85-90% nitrogen and 10-15% carbon dioxide also keeps the cured meat well for about 12 weeks at 0-4°C. MAP
PACKAGING OF COOKED MEAT PRODUCTS

- Most meat products like meat patties, sausages, nuggets, meat balls etc. are cooked to an internal temperature of 75°C to kill most of the microorganisms.
- These meat products can be packaged in pouches of polyethylene, polypropylene, PVDC (polyvinylidene chloride) etc. for short term storage lasting 10-12 days in a refrigerator (0-4°C).
Cooking in hermetically (air tight) sealed metal cans makes the products commercially sterile.

These canned products are shelf stable at ambient temperature for a period of 2 years

Retort pouches are also available in some markets.
PACKAGING OF DEHYDRATED MEAT

- All the dried meat products are susceptible to ingress of moisture and rancidity development.
- So, the packaging material should not allow any moisture or oxygen inside the product.
- Aluminium foil/polyethylene laminate is ideally suited for this purpose.
- If nitrogen is also filled in the package of a crisp product, it will protect the product against breakage by providing cushioning from all the sides.