# COURSE TITLE: ENTREPRENEURSHIP IN MICROBIOLOGY

## Course Code: 24MICEPSC3

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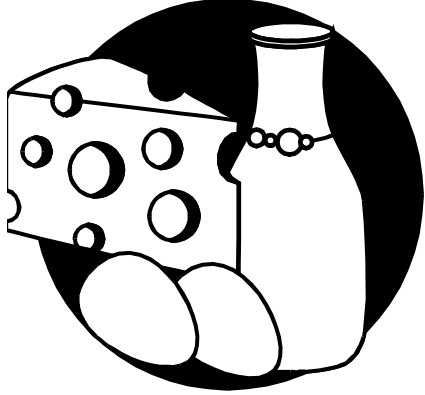
# CHEESE



+ One of the oldest human food
+ Important dairy product

**DEFINED**

Curds – coagulated proteins (casein) of milk

FDA – product made from curd

Whey – liquid remaining; some may be trapped in the curds

Milk can be curdled with enzymes /acid from microbial cultures

Ripened – allowed to cure in temperature-humidity-controlled atmosphere

Unripened – eaten fresh within a few weeks

# RIPENING

- Changes in physical and chemical properties
- Changes aroma, flavor, texture, composition
- Production of lactic acid
- Digestion of protein by enzymes
- Mold development
- Gas formation
- Improves cooking qualities

# STANDARDS OF IDENTITY

- Defines cheese type and quality of ingredients.
- Composition including moisture content and minimum per cent of fat.
- Requirements concerning pasteurization of milk/alternate minimum ripening period.
- Production/manufacturing process.
- Special requirement peculiar to a particular type of cheese.

# GRADES

USDA standard grades
For Swiss, Cheddar, Colby, and Monteray
USDA Quality Approved

# CLASSIFICATION

## VERY HARD RIPENED CHEESE

- Made principally from low fat cow's milk
- Fairly low moisture content
- Hard grating cheeses 22% fat content
- Sharp flavor
- Minimum cure time (6 months)
- Ex.: Parmesan and romano

# HARD RIPENED CHEESE

- From pasteurized milk
- Subject to action of LAB
- Cured from 2 months to 2 years
- Flavor increasingly sharp with longer cure
- Moisture content 39-45%
- Milkfat minimum 22-30%
- Ex.: Cheddar, colby, edam, gouda, provolone, swiss

# SEMISOFT RIPENED CHEESE

- Moisture content of 35-45%
- Milkfat minimum of 27-29%
- Manufacture similar to hard cheese; may not be cut /heated
- Ex.: Brick, muenster
- Subset: blue-vein cheeses: made with mold culture characteristic of each variety (Bleu, Roquefort)
- Ripening spreads mold throughout cheese→ hydrolyzes fat; causes flavor and texture changes

# SOFT UNRIPENED CHEESE

- Made from mixture of milk, skim milk, cream, concentrated skim milk
- Uses LAB with /without rennin
- Curd is pressed, chilled & seasoned (salt)
- Lower fat content (4-33%)
- High moisture content (55-83%)
- EX.: Cottage, cream and neufchatel

# SOFT RIPENED CHEESE

- Mold or bacteria culture used to effect cure and develop flavor
- Cure from outside to inside
- Moisture content 50%
- Milkfat minimum 25%
- Ex.:Brie, camembert, limburger

# PASTA FILATA

- Curds that are very elastic or stretch
- Moisture content 45-60%
- Milkfat minimum 14-15%
- Ex.: Mozzarella and provolone

# PROCESS CHEESE

- May be a single type of cheese or a blend of cheese from different stages of ripening
- Emulsifiers are added to keep fat in emulsion
- Emulsifiers makes cheeses easier to blend
- Longer shelf life because of added preservatives
- Pasteurized processed cheese, process cheese food, process cheese spread

# COLD-PACK CHEESE

- Grind and mix one or more varieties of cheese without heat
- Other additions – spices, salt, coloring
- May not exceed moisture content of original cheese

## LOW FAT CHEESE

Use low fat milk – harder texture, more waxy, chewy and springy Less meltable

# NUTRITIONAL VALUE

## NUTRIENTS

- Protein – highest quality
- Fat and water content determine energy value
- Cholesterol – depends on variety
- Calcium- highest in rennin formed curds; acid coagulation calcium lost in whey – commercial cottage cheese uses acid + rennet

# NUTRIENTS CONTINUED

- Lactose – generally left in whey during curd formation; residue amounts changed to lactic acid; added to creamed cottage cheese and process cheese
- Sodium – high because added during manufacturing
- Vitamin A and Riboflavin – if made from whole milk

# COOKING PRINCIPLES

## COOKING

- High protein/high fat food sensitive to heat
- Proteins coagulate and become tough and rubbery if overheated
- Fat will melt; overheated emulsion breaks → water loss → cheese shrinks, toughens
- High fat cheeses melt more rapidly
- High moisture cheeses are easily blended

# COOKING

- Emulsifiers → enhance blending, prevent separation of fat during heating
- Longer ripening time → superior cooking qualities
- Acid causes texture to become brittle as proteins curl up

# WHAT TO DO

- Minimize heat contact by increasing surface area of cheese or
- Melt in liquid with low boiling point like alcohol
- Modify texture with a white sauce to keep fat emulsified
- Adding acid causes cheese to separate and become stringy
- Process cheese better cooking qualities than natural - emulsifiers

# PICKLES

**General information**

Usually made from a mixture of vegetables & fruit. They are eaten as a savoury (salty), spicy accompaniment to a meal.

Pickles are preserved by a combination of increased acidity (reduced pH), added salt, reduced moisture & added spices.

Pickles can be prepared using one of two main methods:

lactic acid fermentation of vegetables, either with/without addition of salt the preservation of vegetables in acetic acid (vinegar).

Vegetables such as cucumber, cabbage, olive, garlic, omla onion are fermented by lactic acid bacteria which can grow in low conc. of salt.

❖The amount of salt added - controls the type & rate of the fermentation. If 2-5% salt is used, the fermentation is carried out by a series of bacteria that produce lactic acid.

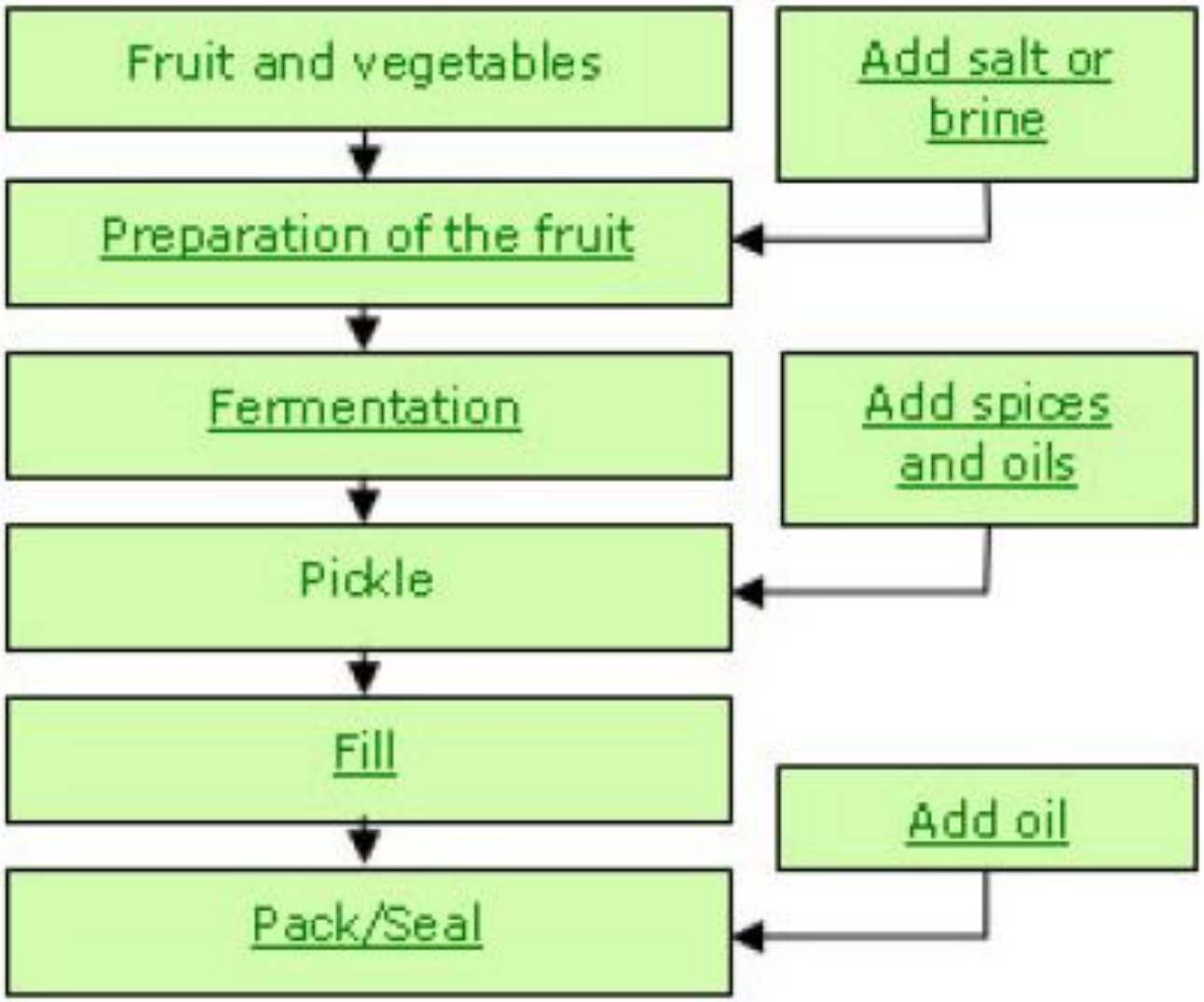
❖If higher levels of salt are used (up to 16%) the product is preserved by the high salt conc. rather than by fermentation and is known as a salt-stock pickle.

❖Sometimes sugar is added to increase the rate of fermentation or to make the product sweeter.

❖Pickles prepared by fermentation are not heated, therefore *strict attention must be paid to cleanliness and hygiene.*

❖The conc. of salt, pH and temperature of fermentation must be controlled to ensure a good fermentation and to prevent the growth of undesirable bacteria.

# - Fermented Pickles -



## A.-Preparation of the fruit

Fruit should be washed in clean water, peeled and the stones removed.

Stainless steel knives should be used to cut the fruit into uniform-sized pieces. Most fruits are cut into small strips.

Fruit should be as fresh as possible and slightly under-ripe. Damaged, bruised or infected fruits should not be used.

Accurate scales are needed to make sure that the correct amounts of ingredients are used each time. Two sets of scales are needed - one with a large capacity for sugar and fruit and a smaller set for the spices. For fermented pickles, the peeled fruit and vegetable pieces should be held in a 2-3% salt solution to prevent browning of the surfaces.

For non-fermented pickles, vinegar, spices and sugar are added before the mixture is heated. Oil is sometimes added to the mixture.

## B.-Fermentation

Prepared vegetables are placed in the fermentation container and salt or brine is added. The vegetable pieces are weighted down so that they are submerged in the brine. The vegetables and salt are placed in alternate layers until the container is three quarters full. As a guide, 3kg salt are required for every 100kg vegetables. A container with a lid should be used for fermentation. This is to maintain the temperature at the optimum level and to prevent contamination from dust and insects. If brine is being used, a 15-20% brine solution is prepared by dissolving salt in water. This is measured using a salometer or brine hydrometer.

A starter culture of juice from a previous fermentation may be added to speed up the fermentation. The temperature and time of fermentation must be carefully controlled.

The optimum temperature is 21°C. Fermentation begins as soon as a brine is formed. It can be seen by bubbles of carbon dioxide gas that are given off by the bacteria.

Fermentation takes between one and four weeks depending upon the temperature, pH and strength of the salt solution. It is completed when no more bubbles appear.

## C.- Filling

Heated pickles are hot-filled (above 80°C) into clean sterile glass jars. The jars should be warm to prevent them cracking.

If polythene pouches are used, the pickle should be cooled to room temperature before filling. Femented pickles are filled into clean, sterile jars or containers. Since these pickles are not further processed, it is important to ensure good hygiene during filling.

It is important to ensure that there are no air bubbles trapped in the pickle during filling. A layer of good quality vegetable oil should be poured on the top of fermented pickles. This acts as a seal and helps to prolong the shelf life.

## D.- Add Salt

For pickling, any type of common salt is suitable as long as it is pure. Salt that contains chemicals to reduce caking should be avoided as the chemicals will make the brine cloudy. Salt with lime impurities can reduce the acidity and shelf life of the product. Salt with iron impurities can cause blackening of the vegetables. Salt with magnesium gives a bitter taste to the pickles. Salt containing carbonates can result in pickles with a soft texture. (Ref. Lal et al, 1986)

Salt provides a suitable environment for lactic acid bacteria to grow. The lactic acid that they produce gives the pickle the characteristic flavour and preserves the vegetables.

Salt can either be added to the vegetables as dry salt or made into a brine that the vegetables are soaked in.

## E.-Added Ingredients

### - Spices

Spices used should be good quality, clean and free of mould and insects. They are either roasted or fried before adding to the pickle mixture. The amount and type of spices added depends on personal taste.

### - Oil

Vegetable oil is added to the pickle. It is often mixed with the spices to make a paste. Oil is also poured onto the top of pickles to form a barrier against oxygen. Top quality vegetable oil should be used.

### - Starter culture

Starter cultures are used to speed up the fermentation and to ensure consistency between different batches of pickle. Because they are acidic, the starter cultures inhibit the growth of undesirable organisms. It is possible to use fermented pickle juice that has been saved from a previous fermentation as the starter culture. It is important to ensure that the acidity of the starter juice is not too acidic as this will inhibit the activity of the Leuconostoc bacteria. Starter cultures of Lactobacillus species can be purchased from ingredient suppliers, but they may not be readily available in all countries.

## F.-Packaging

Clean glass jars with lids are the preferred type of packaging for pickles. Small quantities of pickles can be packaged in polythene pouches that are sealed with a heat sealer. These pickles tend to have a shorter shelf life.

## General

All equipment must be thoroughly cleaned each day to prevent contamination by insects and micro-organisms.