**Microbiology of Bread and Pastry**

**Breads**: Bread is processed as either rich bread [sweet roll] which has sugar, eggs and milk/flavouring added to flour and raising agent while yeast bread is processed from flour, fat, liquid, yeast, milk and salt

During baking, the internal temperature of the loaf closely approaches l00◦C , the optimal baking time has been reached. All vegetative microbial cells have been destroyed during this process. Subsequent fungal spoilage problems arise from aerial contamination after baking, from the slicing machine and from cooling and wrapping equipment

**Microbial spoilage of Breads**

The Aw of breads is normally low enough (0.75 to 0.9) to prevent growth of bacteria However, some molds (bread molds: *Rhizopus stolonifer*) can grow, especially if moisture is released because of starch crystallization during storage.

**1-** Molds are killed during baking; however, spores can get in from air and equipment following baking. When breads are frozen, they may contain ice crystals in the bags. Following thawing, some portions can absorb enough moisture for yeasts and bacteria to grow and cause spoilage (sour taste, off-flavor).

1*-Rhizopus nigrificans* White cotton growth

2-*Penicillium expansum,Penicillium stolonifer* Green growth

3-*Aspergillus niger* Brown or black growth

4*-Monilia sitophilia* Red or bloody bread

5-*Mucor*  Fuzzy growth

**2-**A specific type of bread spoilage, designated as ropiness and characterized by a soft, stringy, brown mass with fruity odor, is caused by the growth of some mucoid variants of *Bacillus subtilis*. The spores, coming from flour or equipment, survive baking and then germinate and grow inside within 1 to 2 d.

Spores that have retained their viability during baking can germinate and cause rope spoilage of bread if they are exposed to a warm and moist environment The water activity, pH and temperature during storage may also play important roles in spore germination and growth of vegetative cells of Bacillus species

They also produce extracellular amylases and proteases and break down the bread structure. High moisture inside the bread, slow cooling, and pH above 5.0 favor ropiness.

There are other types of spoilage but they are unique such as growth **-3** *Serratia marcescens* and growth of *Monilia sitophila* that causes red or bloody bread also yeast like fungi such as *Trichosporon variable* and *Endomycopsis fibulger* that cause chalky bread.

**Pastries**

Pastries include cakes and baked shells filled with custard, cream, or sauces. They can be spoiled by microorganisms coming with the ingredients that are added after baking, such as icing, nuts, toppings, and cream. Most products, because of low Aw allow only molds to grow

However, some materials used as fillings may have high Aw, which allows for bacterial growth.

Cream- and custard-filled pastries can cause foodborne disease, eg. Salmonellae, Staph. aureus, and B. cereus. Salmonellae have been reported in many bakery ingredients, such as flour, milk, eggs, butter, cream, cheese, nuts, coconut and dried fruit. Listeria monocytogenes is sometimes present in the raw materials used in pastry manufacture, including milk and milk products, unpasteurized egg and egg products

**Microbiological Method of Analysis of Bread Samples**

**1-**One gram of each bread sample was weighed out and blended aseptically in the sterile mortar 9mls of distilled water

was added.

**2-** Ten fold serial dilution was carried out. The dilution was serially made up to 1: 10,000 [105].

**3-**With the aid of wax pencil the bottom of the petri dishes were properly labeled with the sample code, dilution factor, media used and date.

**4-**With the use of sterile pipette 1ml of the aliquots prepared from each of the bread was aseptically transferred from dilution 1: 1000 [103] into petri dishes in triplicates .

**5-**Sterilely prepared nutrient agar and Potatoe Dextrose Agar [PDA] were used for the pour plate method. About 25mls N.A were poured into each of the plate labeled for total bacterial count, while about 25mls PDA were poured into each of the plate labeled total

fungi count.

**6-**These media were aseptically poured at about 45oC to avoid killing the organisms present in the samples

**7-**The plates of N.A were incubated for 24hours while the plates of PDA were incubated at room temperature for 6 days

**Examination the probability of the presence of the Salmonella**

 The examination of possibility existence of Salmonella in the pastry mixing 25gm of pastry with 225ml Tetra thionate broth base in an electric mixer for 5 minutes then put the emulsion resulting in a sterilized beaker and incubate at 37 ºC for 24 hours and then transferred 1ml of above media by Streak method on the surface of Petri dishes containing Brilliant green agar, then incubate at 37 ºC for 24-48 hours and note the appearance of colonies of Salmonella

Typically, Salmonella spp. appear as red to pink-white colonies surrounded by brilliant red zones in the medium

Isolation of *Bacillus subtilus*

**1-** suspend 1gm bread in 9 ml distilled water

**2-**Mix well & incubate in an 80C water bath or heating block for 10 minutes

**3-**Use an innoculating loop to streak a sample of this heat-treated bread onto a peptone-yeast extract-dextrose plate(white colony)

**PYD plates:**

Add to 1 liter of distilled water

2g peptone

2g yeast extract

5g dextrose

15g agar

Mix & autoclave. Cool to about 50C & pour into plates

**4-**Incubate at 30C for 1-2 days

**5-**Examine samples of various colonies microscopically. Look for rod-shaped organisms.