



## UNIT 5 ROLE OF TECHNOLOGIES



### Pulsed Electric Field (PEF) Processing

#### Principles:

**Mechanism:** PEF processing involves the application of short bursts of high voltage electric fields to food products placed between two electrodes. The electric field strength typically ranges from 10 to 80 kV/cm, with pulses lasting from microseconds to milliseconds.

**Cell Membrane Disruption:** The electric field induces the formation of pores in cell membranes (electroporation). This increases the permeability of the cell membrane, which can lead to cell death in microorganisms and facilitate the extraction of intracellular contents.

**Non-thermal Process:** PEF is considered a non-thermal or minimally thermal process, as it does not significantly raise the temperature of the food product, preserving its sensory and nutritional qualities.

**Microbial Inactivation:** PEF effectively inactivates a wide range of microorganisms (bacteria, yeast, molds) without the need for high temperatures, making it suitable for pasteurization.

**Application:** PEF is used for pasteurizing liquid foods like juices, milk, and liquid egg products, as well as for enhancing the extraction of bioactive compounds and improving mass transfer processes in food processing.

## Ohmic Heating

### Principles:

**Mechanism:** Ohmic heating, also known as Joule heating, involves passing an electric current directly through food, which acts as an electrical resistor. The resistance of the food generates heat internally.

**Uniform Heating:** Ohmic heating provides uniform heating throughout the food product, reducing the risk of over-processing or under-processing compared to conventional heating methods.

**Rapid Heating:** The process is rapid, leading to shorter processing times and better retention of heat-sensitive nutrients and sensory attributes.

**Electrodes and Conductivity:** Electrodes are placed in contact with the food, and the food's electrical conductivity plays a crucial role in the efficiency of heating. Conductivity can vary with temperature, composition, and physical state.

**Applications:** Ohmic heating is used for pasteurizing and sterilizing liquid and semi-liquid foods, cooking solid foods, thawing frozen foods, and enzyme inactivation. It's particularly useful for particulate foods, where uniform heating is crucial.

### Comparison and Synergies:

**PEF vs. Ohmic Heating:** PEF is primarily non-thermal and used for microbial inactivation and cell disruption, whereas ohmic heating is a thermal process used for cooking, pasteurization, and sterilization.

**Combined Use:** In some cases, PEF and ohmic heating can be used synergistically. PEF can enhance the extraction of intracellular contents, which can then be more efficiently heated using ohmic heating.

Understanding these principles allows food technologists to choose appropriate technologies based on the specific requirements of the food product and desired processing outcomes