Lesson 5

Food Science and technoligies

Basic Components of Food

- Water
- Fats
- Proteins
- Carbohydrates
- Acids and alkalis

Water

- Is the primary substance
- 95 percent of fruits and vegetables
- 65–80 percent of meats, poultry, fish
- Powerful solvent for many flavor compounds, vitamins and minerals
- Freezes at 32°F (0°C) and boils at 212°F (100°C)

Fats

- Some solid at room temperature, others, with less hydrogenation, liquid
- Dissolve certain flavor compounds, fat-soluble vitamins, and colors that water cannot dissolve
- Tenderize foods
- Fat smokes at 375°F (191°C) while oils smoke at 450°F (232°C).

oil begins to smoke when it gets very hot.

Proteins

- Determine the texture of food
- Proteins shaped like coils that react to certain items
- Heat, salt, and acids make coils unwind, producing a soft texture and loose bonds
- Tight bonds result in coagulation, forming a denser texture (like custard)
- Kneading proteins produces tight bonds (bread dough)
- Coagulation causes proteins to loose water

Figure 4-7 The Maillard reaction browns meats.

Carbohydrates

- Breads, pasta, grains, starchy vegetables, fruits
- Starch molecules soften in moisture
- Absorb moisture and swell, causing liquids to thicken
- Starch cells stick to one another and trap moisture
- Sugar attracts moisture by trapping
- Jams, jellies, fruit butters, and dried fruits are good examples

Acids/Alkalis

- pH range measures level of acid/alkali in food
- pH scale is 1–14, 1 being the most acidic
- 7 is neutral (water)
- 1–6 acid, 8–14 alkaline
- Foods being close to either end are not usually considered potentially hazardous

Heat Transfer

- Conduction, convection, radiation
- Conduction is the direct transfer of heat, pan on a burner or in an oven
- Convection is the transfer through gases or liquids (hot air, a fat or liquid)
- Radiation is the transfer of energy through electromagnetic energy
- Infrared radiation heats the surface of the food
- Microwave radiation uses high-frequency waves
- Induction energy uses coils that generate magnetic currents

How Cooking Affects Foods

- Changes colors
- Denatures proteins
- Improves flavor and texture if applied correctly
- Releases or destroys nutrients
- Caramelizes sugars, producing rich brown colors and flavors

The Maillard Reaction

- Protein food develops a brown color from heat application when proteins denature
- Occurs in dry-heat applications
- Caused by the amino acids in the food
- Produces a wonderful flavor (if not overdone)

Gelatinization

- Starch granules absorb water as they soften and cook
- Hold liquid in place
- Molecules join together
- Helps food hold shape
- Occurs at different temps for different types of starch
- Root-based starch breaks down faster in the presence of heat, sugar, and acids

Forming Emulsions

- Mixture of two substances not usually soluble
- Object is to suspend one ingredient in the other
- A vinaigrette is a perfect example of water/oil emulsion
- Shake to disburse vinegar to oil
- Butter is a water/oil emulsion

Permanent/Temporary Emulsion

- Mayonnaise is an example of a permanent emulsion
- Egg yolks stabilize the emulsion
- Other stable examples are hollandaise and forcemeats
- Temporary emulsion example is oil and vinegar dressing, must be mixed constantly
- Other common emulsifiers are mustard, glaçe de viande, butter (fat)