

# Domain I

## FOOD AND NUTRITION SCIENCES (8%)

Food Science – Physical and Chemical Properties of Food

### Meats, fish, poultry, meat alternatives

#### Physical Properties of Meats

Meat Composition

- Connective tissue – **Collagen**- white connective tissue which softens when heated; increased with age and exercise. **Elastin** - yellow connective tissue, unaffected by heat.
- Fat – may be under skin or around organs; fat layered between tissues or muscles is known as **marbling**.
- Pigments – Color primarily due to **myoglobin** and to a lesser extent **hemoglobin**; color varies with species and age.

Meat Quality

Quality grading is voluntary and includes:

- **U.S. Prime** – highest quality grade; highest in fat and most expensive but also tends to be the most tender and flavor rich.
- **U.S. Choice** – follows prime in quality; tends to have less marbling than prime but still good quality
- **U.S. Select** – lacks some juiciness and quality of higher grades

Inspection

- The **Federal Meat Inspection Act of 1906** requires all meat is inspected interstate.
- The **Wholesome Meat Act of 1967** requires all meat is inspected, both interstate or intrastate.

Factors affecting tenderness

- **Cut of meat - amount of connective tissue** – cuts of meat in the rib and loin area contain less connective tissue and are more tender
- **Fat and marbling**

- **Heredity and aging** - as animals become older connective tissue increases causing meats to be less tender

## Chemical Properties of Meats

### Meat Cookery

- **Dry Heat** – used for tender cuts of meat; includes baking, broiling, pan-broiling, grilling, frying, roasting and stir-frying
- **Moist Heat** – used for tougher, less tender cuts of meat; includes braising, stewing or cooking in water, and pressure cooking

## Physical Composition of Seafood

Seafood can be broken down into two classes - fin fish and shellfish.

- There are two categories of shellfish. **Mollusks**-soft in structure and enclosed with hard shell (oysters, clams, and scallops). **Crustaceans**- crust like shell and segmented body (lobster, shrimp).

### Seafood Grading

Inspection and grading is voluntary. Quality grades are based on appearance, uniformity, flavor, and odor.

## Chemical composition of Seafood

Seafood Cookery: No tenderization is required when preparing seafood due to little connective tissue. Fin fish is quickly cooked and will flake easily and become opaque when done.

Nutritive Value of Seafood: Most fish is low in fat – light flesh fish tend to be lower in fat in comparison to dark flesh fish. Fish is rich in omega-3 polyunsaturated fatty acids including eicosapentaenoic acid (EPA) which offers several health benefits such as protection of heart health.

## Physical Properties of Poultry

Fat is deposited in muscle tissue, under skin, and the abdominal area. White meat is lower in fat content compared to dark meat.

Inspection: In 1968, the **Wholesome Poultry Products Act** was passed and requires all poultry sold in the U.S. be inspected for wholesomeness (sanitary processing and free of disease).

## Chemical Properties of Poultry

Poultry Cookery: Because most poultry is tender, either dry or moist heat methods can be used. Stewing hens should be prepared using moist heat methods as they tend to be less tender.

Nutritive Value of Poultry: General composition does not differ from other meats. Poultry breasts are lower in fat and cholesterol in comparison. Dark poultry meats tend to be higher in fat compared to white meat.

## Meat Alternatives

- **Meat Alternatives** aka meat analogs are foods made with soy and other ingredients to imitate meat products.
- Often found frozen or canned. These items are usually fully prepared and only require heating (i.e.: imitation burgers, sausage, etc.). Other alternatives are packaged dried and require some addition of liquid and heating (i.e.: chili mixes, etc.).
- Nutritional content of meat alternatives differ depending on brand, type, etc. Generally, such alternatives are good sources of protein and iron. Some products are also fortified with vitamin B12.

## Eggs

### Physical Properties of Eggs

**Grading** : Grading of eggs is conducted via a process known as **candling**. The egg is held up to a source of light. When the light passes through the egg, it reveals quality of shell, the size of the air cell, position of the yolk. U.S. grades include AA, A, B, and C.

- **Grade AA** – yolk is firm, white is clear and firm, large proportion of thick white to thin white
- **Grade A** – yolk is firm and upstanding; white reasonably firm and stands fairly well around yolk; large in proportion of thick to thin white
- **Grade B** – yolk is enlarged and flattened; white is equal parts thick and thin white

### Variations of Eggs