

## Tutorial 1: Food Groups

### 1. Impact of Major Food Components on Health and Disease Prevention (Presentation 1)

#### Introduction

Food consists of essential components: proteins, carbohydrates, lipids, vitamins, minerals, fibers, and water. Each has a specific role in human health and body functions.

A balanced and varied diet ensures the supply of these nutrients and helps prevent chronic diseases.

#### 1. Proteins

##### Role:

Proteins are essential for growth, tissue repair, maintaining muscle mass, and proper immune system function.

##### Food examples:

- Animal sources: lamb, chicken, Mediterranean fish, eggs, milk, and local cheeses.
- Plant sources: lentils, chickpeas, fava beans, sunflower seeds.

##### Positive effects:

- Supports muscle mass and physical strength.
- Enhances satiety and helps control weight.
- Strengthens the immune system.

##### Negative effects (if excessive or low quality):

- Excess animal proteins rich in saturated fat → increased cardiovascular risk.
- Protein deficiency → fatigue, muscle loss, frequent infections.

#### 2. Carbohydrates

##### Role:

Carbohydrates are the main energy source for the brain and muscles, regulate energy metabolism, and influence blood sugar levels.

##### Food examples:

- Simple: local fruits (oranges, dates, figs), honey.
- Complex: whole couscous, whole grain bread, lentils.

##### Positive effects:

- Provides quick or sustained energy depending on type.
- Fiber-rich complex carbs prevent constipation and digestive diseases.

**Negative effects:**

- Excess simple carbs → obesity, type 2 diabetes, cardiovascular diseases.
- Deficiency → fatigue, decreased physical and cognitive performance.

**3. Lipids****Role:**

Lipids provide concentrated energy, transport fat-soluble vitamins, contribute to cell structure, and regulate inflammation.

**Food examples:**

- Saturated: butter, fatty meats, palm oil.
- Unsaturated: olive oil, nuts, fatty fish (sardines, mackerel).

**Positive effects:**

- Unsaturated fatty acids protect the heart and reduce inflammation.
- Provide essential fatty acids required by the body.

**Negative effects:**

- Excess saturated fats → increased LDL cholesterol, obesity, cardiovascular diseases.
- Imbalance in omega-3/omega-6 ratio → inflammation and metabolic disorders.

**4. Dietary Fibers****Role:**

Regulate intestinal transit, improve digestion, control blood sugar, and reduce the risk of chronic diseases.

**Food examples:**

- Fruits: figs, pears, apples.
- Vegetables and whole grains: chickpeas, whole couscous.

**Positive effects:**

- Prevents diabetes and cardiovascular diseases.
- Helps maintain a healthy body weight.

**Negative effects:**

- Deficiency → constipation, digestive disorders, imbalanced gut microbiota.

## 5. Vitamins

### Role:

Cofactors for enzymatic reactions, support immunity, maintain bone and skin health, and protect cells.

### Food examples:

- Water-soluble: fresh fruits and vegetables (Vitamins C and B).
- Fat-soluble: oils, eggs, fatty fish (Vitamins A, D, E, K).

### Positive effects:

- Protects against infections and metabolic diseases.
- Maintains vision, bone health, and blood coagulation.

### Negative effects:

- Excess → toxicity, digestive or kidney disorders (especially fat-soluble).
- Deficiency → fatigue, immune deficiency, bone diseases.

## 6. Minerals

### Role:

Electrolyte balance, bone health, oxygen transport, enzymatic functions.

### Food examples:

- Calcium: milk, cheese, sardines.
- Iron: red meat, lentils, chickpeas.
- Magnesium: almonds, seeds, green vegetables.

### Positive effects:

- Strengthens bones and teeth, improves muscle and nerve function.

### Negative effects:

- Deficiency → fatigue, anemia, muscle weakness.
- Excess → digestive or kidney disorders (salt, iron).

## 7. Water

### **Role:**

Transports nutrients, eliminates waste, regulates temperature, and hydrates tissues.

### **Positive effects:**

- Maintains hydration and optimal physical and mental performance.

### **Negative effects (if deficient):**

- Dehydration → fatigue, cognitive disturbances, reduced performance.

## **Conclusion**

Each food component has a specific role and positive or negative effects depending on quantity and quality consumed.

A varied, balanced, and moderate diet is essential for preventing diseases, improving overall health, and maintaining an active lifestyle.

## **Tutorial 1: Food and Food Groups**

### **Impact of Food Constituents on Food Quality and Technological Properties (Presentation 2)**

#### **Introduction**

Food constituents such as proteins, carbohydrates, lipids, vitamins, minerals, water, and dietary fiber are not only essential nutrients for human health but also play a fundamental role in the technological, structural, and sensory properties of foods. These components influence texture, stability, preservation, flavor, and overall quality of food products. Understanding their functions is essential for food processing, quality control, and product development in the agri-food industry.

#### **1. Proteins and Their Technological Role in Foods**

Proteins contribute significantly to the structure and texture of foods due to their functional properties such as gel formation, emulsification, foaming, and water-binding capacity.

For example, gluten proteins in wheat provide elasticity to dough, enabling the production of bread and bakery products. In dairy processing, casein proteins allow milk coagulation during cheese and yogurt manufacture. Proteins are also widely used in processed foods to stabilize emulsions such as sauces, dairy desserts, and meat products.

#### **2. Carbohydrates and Their Role in Food Structure and Preservation**

Carbohydrates influence taste, viscosity, texture, and shelf life of foods. Sugars provide sweetness but also act as preservatives by reducing water activity, which limits microbial growth.

Starch is commonly used as a thickening and stabilizing agent in soups, sauces, and desserts. In confectionery and jam production, sugars improve preservation while contributing to flavor and texture. Caramelization and Maillard reactions involving carbohydrates are also responsible for color and aroma development during cooking.

#### **3. Lipids and Their Contribution to Food Quality**

Lipids enhance flavor, mouthfeel, and texture of foods. They also act as carriers for fat-soluble vitamins and aromatic compounds.

In food industries, fats are essential in products such as margarine, chocolate, pastries, and fried foods, where they improve texture, stability, and sensory quality. Olive oil, for example, contributes to flavor and nutritional value while improving oxidative stability in certain food preparations.

#### **4. Vitamins and Their Influence on Food Stability**

Although vitamins are mainly known for their nutritional importance, they also affect food stability and quality. Some vitamins act as natural antioxidants that protect foods from oxidation.

Vitamin C, for example, is often used to prevent browning in fruit juices and processed fruits. Food fortification with vitamins, such as enriched milk, cereals, and beverages, is also common to enhance nutritional value.

## **5. Minerals and Their Technological Applications in Foods**

Minerals influence texture, preservation, color, and chemical stability of food products.

Calcium plays an important role in milk coagulation during cheese production and contributes to the firmness of certain processed foods. Sodium chloride (table salt) is widely used as a preservative in cheeses, canned foods, olives, and processed meats due to its antimicrobial effect. Iron may influence color and oxidation reactions in cereals and date-based products, while phosphates are used in processed foods to improve water retention, texture, and stability.

## **6. Water as a Key Factor in Food Stability**

Water content strongly affects microbial growth, enzymatic reactions, and food shelf life. High water activity promotes spoilage, whereas reducing water content improves preservation.

Technological processes such as drying, freezing, concentration, and pasteurization are widely used to control water activity and extend food shelf life.

## **7. Dietary Fiber and Its Technological Importance**

Dietary fiber improves texture, viscosity, and water retention in foods. It is increasingly used in functional foods and dietary products.

Fibers from cereals, fruits, and vegetables are incorporated into bakery products, dairy products, and nutritional foods to enhance both technological properties and nutritional value.

## **Conclusion**

Food constituents play a dual role: nutritional for human health and technological within foods themselves. Their proper balance determines food quality, stability, sensory characteristics, and shelf life. Understanding these roles is essential for improving food processing, preservation, and innovation in the food industry