FOOD AND NUTRITION

UNIT 3

CONTENTS

1. FOOD AND NUTRIENTS

- **Foods**: are the substances from other living things that are ingested.

- **Nutrients**: are the simplest biomolecules in foods. They are the molecules that make up the livings things and are called the proximate principles.

- **Feeding:** is a conscious, voluntary process by which foods are taken from the outside environment.

- **Nutrition.** Is a complex, unconscious and mostly involuntary process by which foods are transformed into nutrients. These nutrients reach and are used by all of the body's cells.

2. NUTRIENTS

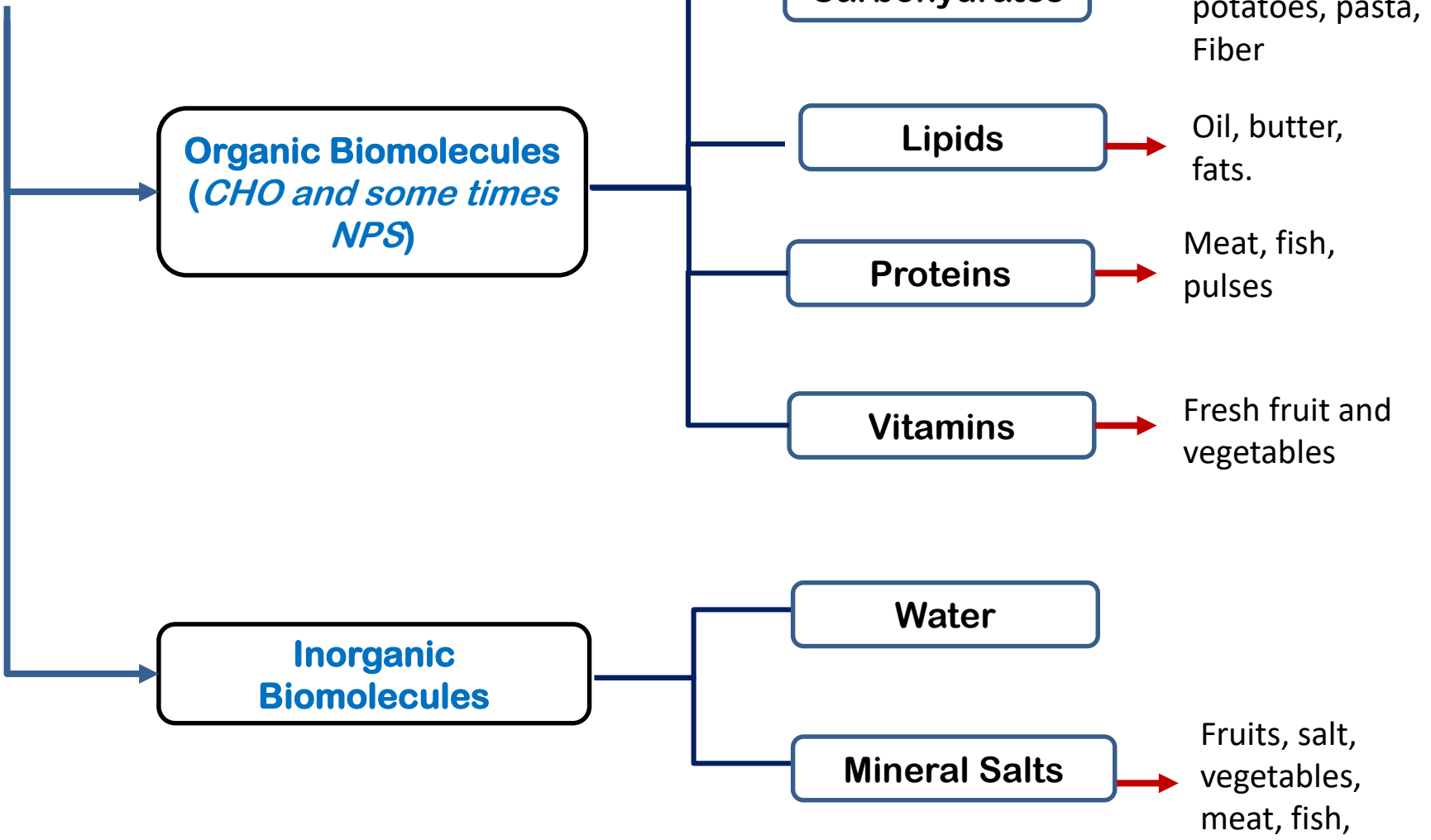
Nutrients: are the simplest biomolecules in foods

Biomolecules: Molecules that make up the living matter. Biomolecules are composed of bioelements.

Bioelements: elements that make up the living things.

- **Primary**: constitute 96% of living matter: Carbon (C), hydrogen (H), Oxygen (O), Nitrogen (N), Phosphorus (P) and Sulphur (S)
- **Secondary**: They are important for carry out vital functions and make up 3,9% (Ca, Na, K, Mg, Cl)
- **Oligoelements**: appear in living things in amounts less than 0,1%. Fe, I, Mn, Co, Zn, Cu, F, Mo, Ti, V, Pb, Al, Li

BIOMOLECULES



CARBOHYDRATES

- Energetic function
- **Characteristics:** sweet, crystalline and water-soluble
- **Types of carbohydrates**:

SIMPLE

- Monosaccharides: are simple molecules (Glucose and fructose)
- Disaccharides: are formed by the bonding of two monosaccharides. (Lactose and sucrose found in milk and sugar respectively)

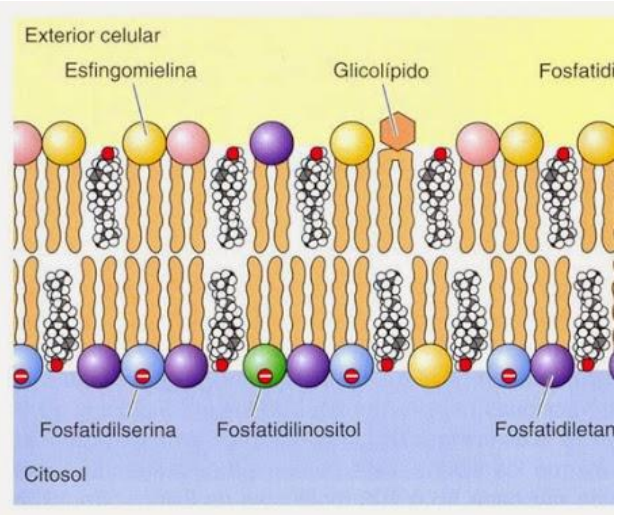
COMPLEX

- Polisaccharides: are not sweet or crystalline are formed by the bonding of many simple carbohydrates. They have structural function (cellulose contained in vegetable fibre) and energetic function (starch and glycogen)

LIPIDS

- Functions: energetic, structural and regulatory.
- **Types of lipids**:
  - Fats: energetic molecules. Depending on their chemical composition, fats can be saturated (animal fat) or unsaturated (plant origin = oils)

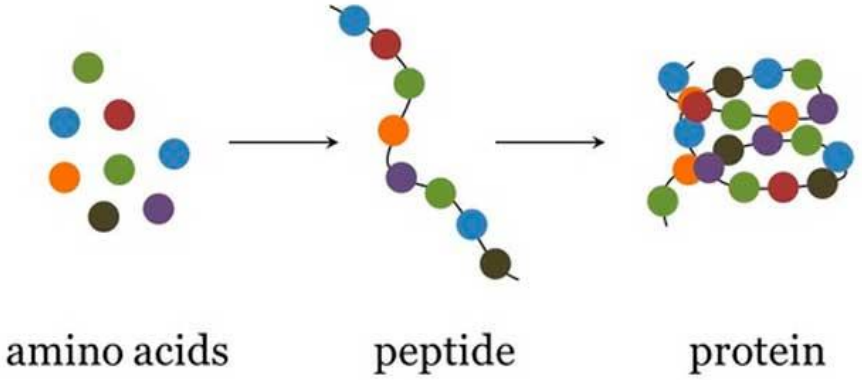
- <u>Membrane lipids</u>: these form the structures of cell membranes and also of cell organelles, such as phospholipids and cholesterol.



- <u>Lipids with regulatory functions</u>: such us some vitamins (vit A and D) and sexual hormones.

PROTEINS

Proteins are biomolecules made up by the bonding of small molecules called amino acids.



Functions:

- Structural (hair, nails and cell membranes)
- Transport oxygen in the blood from the lungs to the tissues.
- They are involved in the defence against infections.
- They are responsible for muscle contraction
- They regulate biological reactions.

PROTEINS

- Organisms make their own proteins by using the amino acids found in protein rich foods.

- There are 20 amino acids of which 9 cannot synthesised by the organism and have to be incorporated with the diet.

- All proteins of animal origin contain a balanced amount of all amino acids.

- Proteins of plant origin tend to be deficient in some amino acids.

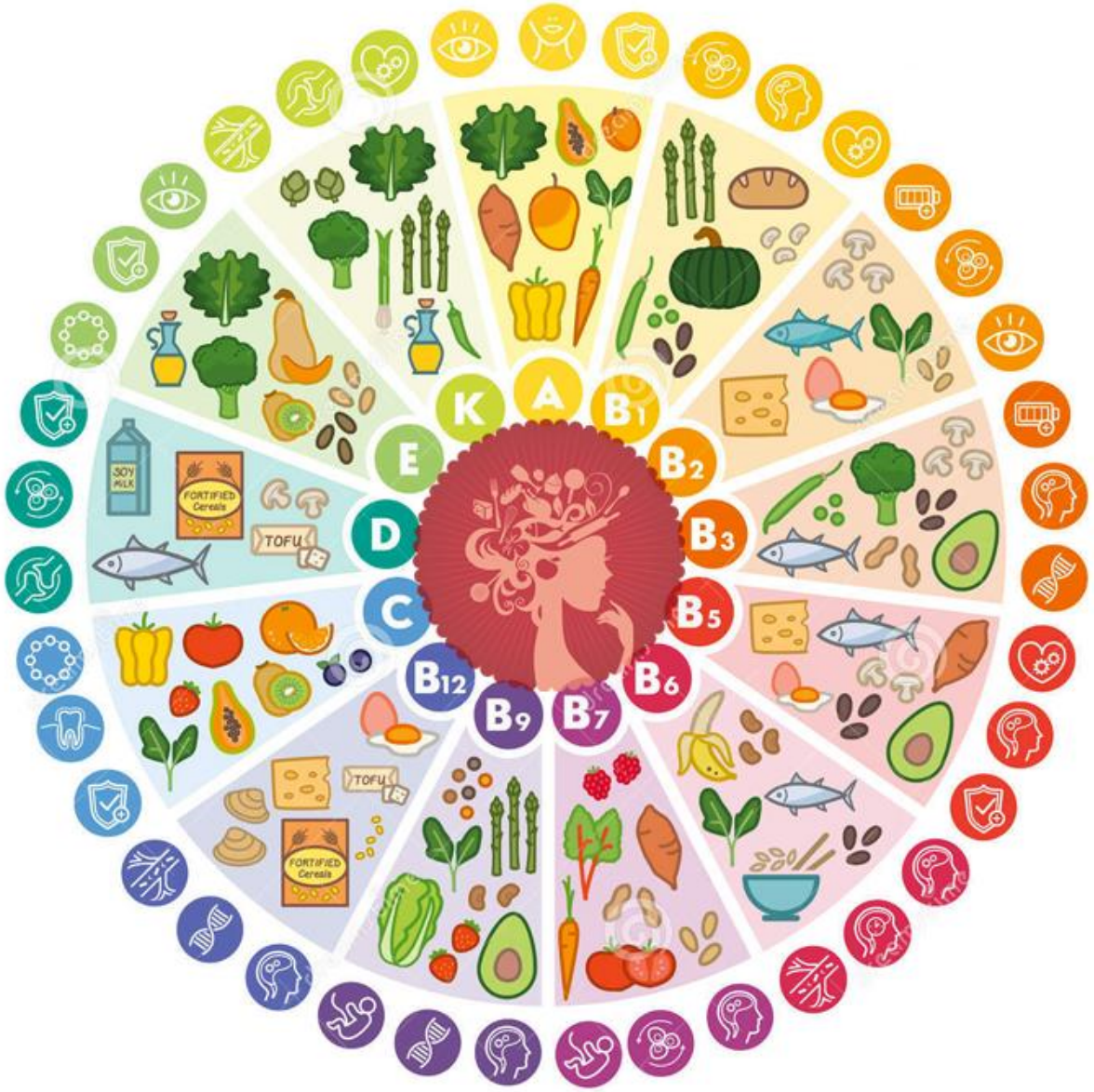
VITAMINS

- Substances with a varied chemical composition.
- They are needed in a small quantities.
- They are easily destroyed by heat, so they can only be found in raw or very lightly cooked foods. Light and oxygen can also destroy vitamins.
- The absence of vitamins causes several diseases.
- The excess of water soluble vitamins can be eliminated through the urine, but fat soluble vitamins cannot be eliminated so they are stored in the body with harmful effects.

VITAMINS

Classification:

- Fat-soluble: they can be dissolve in fat but not in water. They are kept in the liver. The most well-known are vitamins A and D
- Water-soluble: are soluble in water but not in fats. Some of them are Vitamins B_1, B_2, B_{12} and C.


K
A
B1
E
B2
D
B3
C
B5
B12
B6
B9
B7
SOY MILK
FORTIFIED Cereals
TOFU
TOFU
FORTIFIED Cereals

FAT SOLUBLE VITAMINS

Vitamin	RDA/ AI		Best Sources	Functions
	Men	Women		
Vitamin A (carotene)	900ug	700ug	Yellow or orange fruits and vegetables, green leafy vegetables, fortified oatmeal, liver, dairy products	Formation and maintenance of skin, hair, and mucous membranes; helps people see in dim light; bone and tooth growth
Vitamin D	5ug	5ug	Fortified milk, sunlight, fish, eggs, butter, fortified margarine	Aids in bone and tooth formation; helps maintain heart action and nervous system function
Vitamin E	15mg	15mg	Fortified and multigrain cereals, nuts, wheat germ, vegetable oils, green leafy vegetables	Protects blood cells, body tissue, and essential fatty acids from harmful destruction in the body
Vitamin K	120ug	90ug	Green leafy vegetables, fruit, dairy, grain products	Essential for blood-clotting functions

WATER SOLUBLE VITAMINS

Vitamin	RDA/ AI		Best Sources	Functions
	Men	Women		
Thiamin (B1)	1.2mg	1.1mg	Fortified cereals and oatmeals, meats, rice and pasta, whole grains, liver	Helps the body release energy from carbohydrates during metabolism; growth and muscle tone
Riboflavin	1.3mg	1.1mg	Whole grains, green leafy vegetables, organ meats, milk, eggs	Helps the body release energy from protein, fat, and carbohydrates during metabolism
Niacin	16mg	14mg	Meat, poultry, fish, enriched cereals, peanuts, potatoes, dairy products, eggs	Involved in carbohydrate, protein, and fat metabolism
Pantothenic acid	5mg	5mg	Lean meats, whole grains, legumes	Helps release energy from fats and vegetables
Folate	400ug	400ug	Green leafy vegetables, organ meats, dried peas, beans, lentils	Aids in genetic material development; involved in red blood cell production
B6	1.3mg	1.3mg	Fish, poultry, lean meats, bananas, prunes, dried beans, whole grains, avocados	Helps build body tissue and aids in metabolism of protein
B12	2.4ug	2.4ug	Meats, milk products, seafood	Aids cell development, functioning of the nervous system, and the metabolism of protein and fat
Biotin	30ug	30ug	Cereal/grain products, yeast, legumes, liver	Involved in metabolism of protein, fats, and carbohydrates
Vitamin C	90mg	75mg	Citrus fruits, berries, and vegetables- especially peppers	Essential for structure of bones, cartilage, muscles, and blood vessels; helps maintain capillaries and gums and aids in absorption of iron.

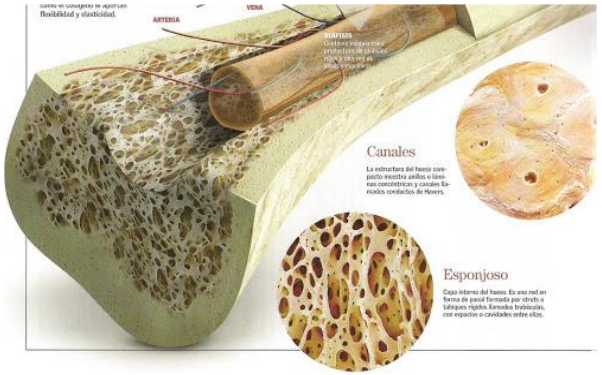
MINERAL SALTS

- They are inorganic substances that have different functions in the body (structural, functional and regulatory functions).
- **Macro minerals** are present at larger levels in the animal body or required in larger amounts in the diet (more than 100mg/day). Macro minerals include calcium, chlorine, magnesium, phosphorus, potassium, sodium, and sulfur.
- **Micro minerals** are often referred to as trace minerals, meaning they are present at low levels in the body or required in smaller amounts in the animals diet. Micro minerals include chromium, cobalt, copper, fluorine, iodine, iron, manganese, molybdenum, selenium, and zinc.

MINERAL SALTS

Precipitated mineral salts

- Structural function
- Mineral matrix that compound bones



Solved mineral salts

- Physiological and regulatory function
- Cations and anions

Part of other biomolecules

- Example iron in the hemoglobine

MINERAL SALTS

IONS ASSOCIATED TO ORGANIC MOLECULES	
IRON	Hemoglobin
MAGNESIUM	Chlorophyll
PHOSPHORUS	Nucleic acid, ATP
COBALT	Vitamin B12
IODINE	Thyroid hormones
SULFUR	Aminoacids (Cystein, Metionin)

FUNCTIONS OF SOME MINERAL SALTS	
SODIUM	Transmission of the nervous impulse
POTASIUM	
CHLORINE	
CALCIUM	Muscle contraction and coagulation
IRON	Transport of oxygen
MANGANESE	Photosynthesis

3. NUTRITIONAL NEEDS

3.2 How Much Energy Do We Need?

Basal metabolic rate (BMR):

- Minimum amount of energy that an organism needs to perform vital processes.
- It is measured in kcal
- It varies from individual to individual.
- The general formulae is:

Men: 66,5 + (13,7 x mass-kg) + (5 x height-cm) – (6,7 x age)

Woman: 55 + (9,5 x mass-kg) + (4,8 x height-cm) – (4,7 x age)

Energy use:

- Total amount of energy that every organisms need to live.
- It includes the BMR and other energy needs related to the daily activity

3. NUTRITIONAL NEEDS

3.A How Much Energy Do We Need?

Activities

1. Calculate your basal metabolic rate

2. Calculate your energetic expenditure

3. NUTRITIONAL NEEDS

2 weekdays			
Day1		Day 2	
Activity	Kcal/METs	Activity	Kcal/Mets

weekend			
Saturday		Sunday	
Activity	Kcal/METs	Activity	Kcal/METs

3. NUTRITIONAL NEEDS

	Weekdays			
	Day1		Day 2	
	Food	Kcal	Food	Kcal
Breakfast				
Mid-morning snack				
Lunch				
Mid-afternoon snack				
Dinner				

	Weekend			
	Saturday		Sunday	
	Food	Kcal	Food	Kcal
Breakfast				
Mid-morning snack				
Lunch				
Mid-afternoon snack				
Dinner				

3. NUTRITIONAL NEEDS

3.B. Structural, energetic and Functional- Regulatory needs

Structural needs:

- Food needed for building and repairing biological structures.
- The most important structural nutrients are proteins, although some lipids (lipids of membrane) and salt minerals (skeleton).

Energetic needs:

- Food needed for maintaining the cell activity, keeping the body temperature and performing any physical activity.
- Energetic food: the most important are carbohydrates and fats but when they are not enough, proteins can be used instead.

1 g of fat= 9kcal
1g of carbohydrate= 3,75 kcal
1 g of protein= 4 kcal

Regulatory and functional needs:

- Food needed for regulating the metabolic reactions and ensuring that all the vital processes take place properly.
- Regulatory and functional food: mineral salts and vitamins.

MET Levels of Common Recreational Activities

What is a MET?

MET stands for Metabolic EquivalenT

One MET is the amount of energy (calories) your body uses each minute while resting quietly. On average, a man sitting quietly burns 70 calories per hour, and a woman sitting quietly burns about 60 calories per hour.

The MET level is higher as the intensity of your activity increases. For example, 2.5 METs is the amount of energy used each minute to walk leisurely, but that goes up to 5 METs when walking very briskly at 4 mph. You are burning 5 times as many calories per minute when walking briskly as when sitting quietly.

This handout lists the intensity – the MET level – of various physical activities. What level is right for you?

- **Light activities (< 3 METs)** are good for elderly persons and those who may have physical limitations, or someone recovering from an illness who needs to gradually increase their activity level. A good example is slow walking or light gardening.
- **Moderate activities (3-6 METs)** are best for most people wanting a moderate exercise program. A good example is brisk walking 3-4 mph. These activities are safe for most people and do not usually require medical clearance before starting to exercise. If you have a serious health problem, such as diabetes or a heart condition, check with your doctor.
- **Vigorous activities (> 6 METs)** require a higher energy output and are best for persons who already have a high fitness level and are in good health. Examples of vigorous activities are jogging and competitive sports.

Measuring Exercise Intensity

Activity Description	Intensity on a "0–10" Scale*	MET level (Sitting = 1 MET)	Breathing & Heart Rate	How it feels; example
EASY	3–4	Less than 3.0 METs	Minimal increase	Feels easy (e.g., easy walking)
MODERATE	5–6	3.0–6.0 METs	Noticeable increase	Feels fairly easy to somewhat hard (e.g., brisk walking)
VIGOROUS	7–8	Greater than 6.0 METs	Large increase in breathing & heart rate but not out-of-breath	Feels somewhat hard to hard (e.g., jogging, vigorous sports)

**Intensity scale: On a scale of 0–10 where 0 = sitting and 10 = all-out effort*

3. NUTRITIONAL NEEDS

MET Levels

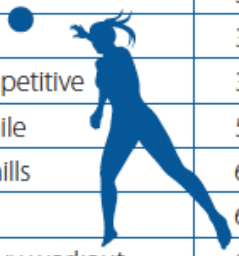
Listed alphabetically by category of intensity

Light activities (<3 METs)*	METs
Canoeing leisurely	2.5
Croquet	2.5
Dancing, ballroom, slow	2.9
Fishing, standing	2.5
Golf with a cart	2.5
Housework, light	2.5
Playing catch	2.5
Playing a piano	2.5
Sitting quietly	1.0
Stretching exercises, yoga	2.5
Walking, 2 mph	2.5

**Calories burned = up to 215/hour*

Moderate activities (3-6 METs)*	METs
Aerobic dance, low impact	5.0
Archery	3.5
Badminton	4.5
Baseball or softball	5.0
Basketball, shooting baskets	4.5
Bicycling, leisurely	3.5
Bowling	3.0
Calisthenics, light to moderate	3.5
Canoeing, 3 mph	3.0
Chopping wood	6.0
Dancing, aerobic or ballet	6.0
Dancing, modern, fast	4.8
Fencing	6.0
Fishing, walking and standing	3.5
Foot bag, hacky sack	4.0
Gardening, active	4.0
Golf, walking	4.4
Gymnastics	4.0
Hiking cross country	6.0
Horseback riding	4.0
Ice skating	5.5

Moderate activities (3-6 METs)*	METs
Jumping on mini tramp	4.5
Kayaking	5.0
Mowing lawn, walking	5.5
Raking the lawn	4.0
Shoveling snow	6.0
Skateboarding	5.0
Skiing downhill, moderate	6.0
Snorkeling	5.0
Snowmobiling	3.5
Surfing	6.0
Swimming, moderate pace	4.5
Table tennis	4.0
Tai chi	4.0
Tennis, doubles	5.0
Trampoline	3.5
Volleyball, noncompetitive	3.0
Walking, 15 min/mile	5.0
Walking, brisk up hills	6.0
Water skiing	6.0
Weight lifting, heavy workout	6.0
Wrestling	6.0



**Calories burned = 215–430/hour*

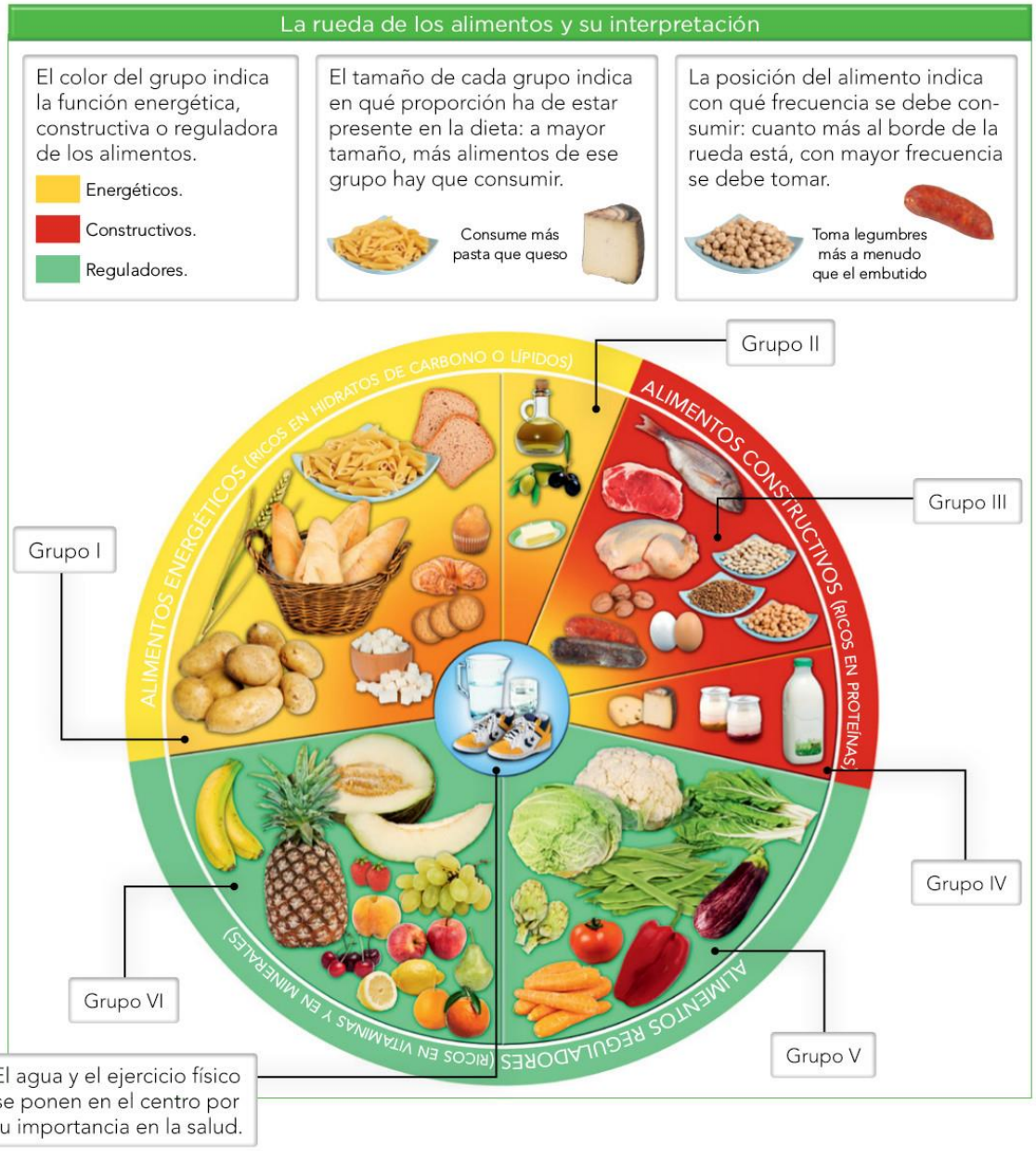
4. DIET

4.A. A BALANCED DIET

- The correct amount of each nutrient is consumed
- Individual's energy requirements are satisfied: These requirements vary between individuals

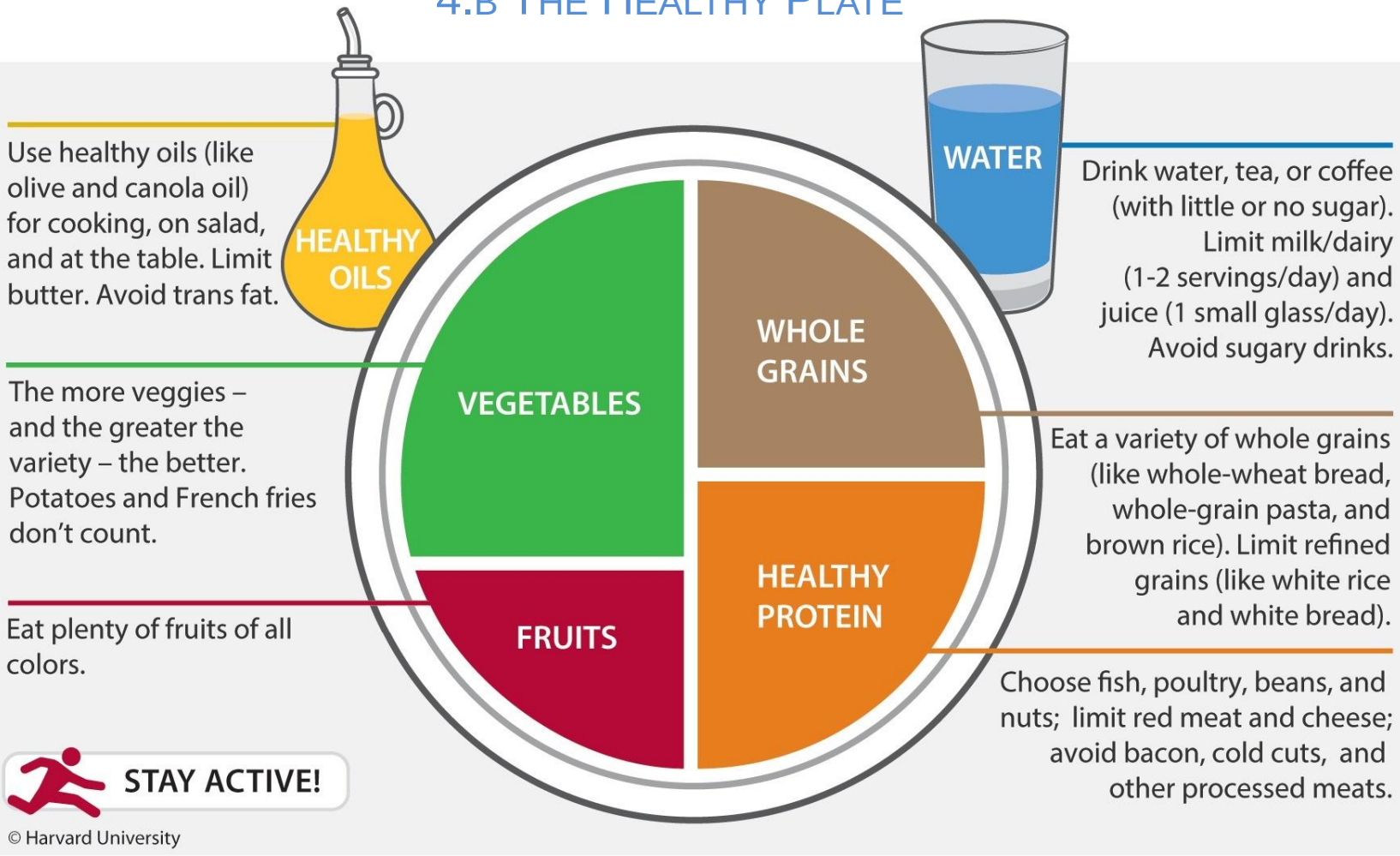
4. DIETS

4.B THE FOOD WHEEL



4. DIETS

4.B The Healthy Plate



Harvard T.H. Chan School of Public Health
The Nutrition Source
www.hsph.harvard.edu/nutritionsource

Harvard Medical School
Harvard Health Publications
www.health.harvard.edu

4. DIETS

4.C MEDITERRANEAN DIET

The Mediterranean diet emphasizes:

- Eating primarily plant-based foods, such as fruits and vegetables, whole grains, legumes and nuts
- Use healthy fats such as olive instead of butter or other animal fats
- Using herbs and spices instead of salt to flavor foods
- Limiting red meat to no more than a few times a month
- Eating fish and poultry at least twice a week
- Enjoying meals with family and friends
- Getting plenty of exercise

4.D Special Diets

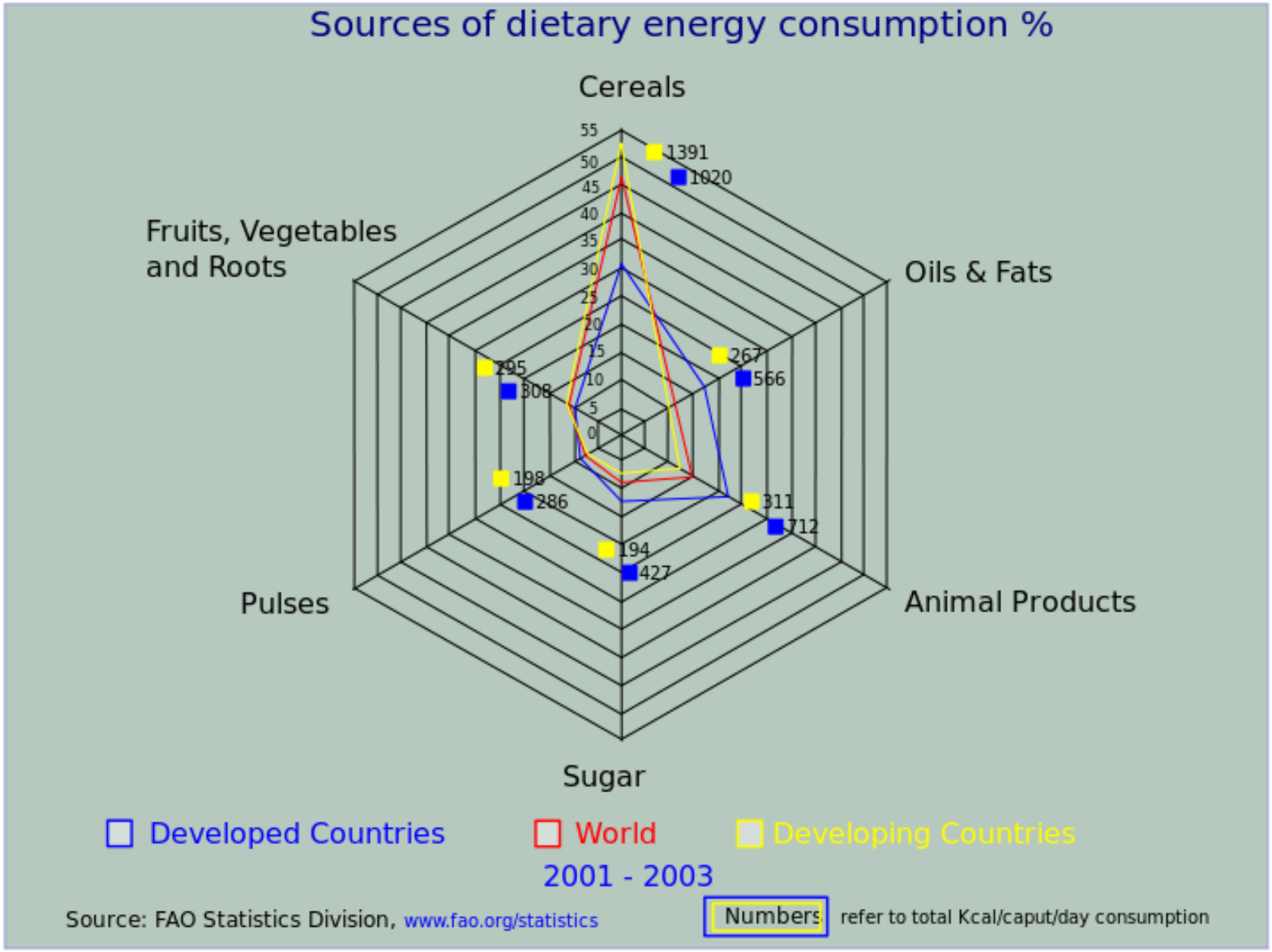
Vegetarian diet

Vegetarian diets vary in what foods they include and exclude:

- **Lacto-vegetarian** diets exclude meat, fish, poultry and eggs, as well as foods that contain them. Dairy products, such as milk, cheese, yogurt and butter, are included.
- **Ovo-vegetarian** diets exclude meat, poultry, seafood and dairy products, but allow eggs.
- **Lacto-ovo vegetarian** diets exclude meat, fish and poultry, but allow dairy products and eggs.
- **Pescatarian** diets exclude meat and poultry, dairy, and eggs, but allow fish.
- **Vegan** diets exclude meat, poultry, fish, eggs and dairy products — and foods that contain these products.

4.D Special Diets

- **Low Cholesterol diet:** This diet avoid food rich in saturaded fats like red meat and pastries.
- **Low salt diet:** avoid salt and salty foods
- **Gluten free diet:** avoid grains like wheat and other cereals that contains gluten (protein)
- **Diabetes diet:** avoid simple carbohydrates but allows complex ones.
- **High or lower calories diet:** balanced diet with a specific intake of calories.


Sources of dietary energy consumption %
Cereals
Oils & Fats
Animal Products
Sugar
Pulses
Fruits, Vegetables and Roots
55
50
45
40
35
30
25
20
15
10
5
0
1391
1020
267
566
311
712
194
427
198
286
295
308
Developed Countries
World
Developing Countries
2001 - 2003
Source: FAO Statistics Division, www.fao.org/statistics
Numbers refer to total Kcal/caput/day consumption

Sources of dietary energy consumption %

	Developed countries		Developing countries	
Cereals	1020	30,73%	1391	52,57%
Oil & Fats	566	17,05%	257	9,71%
Animal products	712	21,45%	311	11,75%
Sugar	427	12,87%	194	7,33%
Pulses	286	8,62%	198	7,48%
Fruit, vegetables and roots	308	9,28%	295	11,15%

5. FOOD CONSUMPTION

5.A. CONSUMPTION HABITS

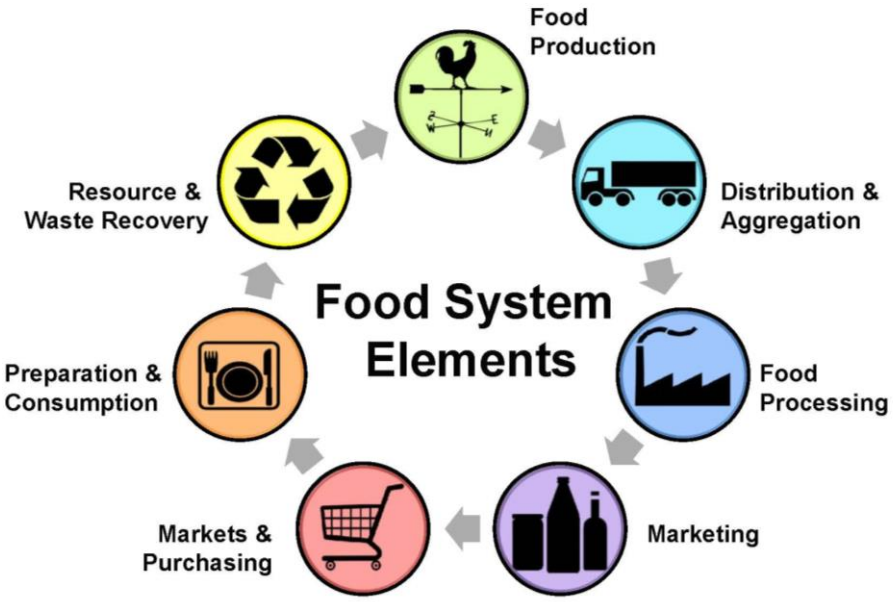
- Investigate how consumption habits have changed over the past 40 years.
- Ask a questionnaire and ask your parents and relatives

5. FOOD CONSUMPTION

5.B The Food Supply Chain

A food supply chain or food system refers to the processes that describe how food from a farm ends up on our tables. The processes include production, processing, distribution, consumption and disposal.

Because a food supply chain is domino-like, when one part of the food supply chain is affected, the whole food supply chain is affected, which is often manifested through changes in price.



Adapted by Christy Shi, Center for Environmental Farming Systems.
From: Wilkins, J. and Eames-Sheavly, M. Discovering the Food System; An experiential learning program for young and inquiring minds
Cornell University, Departments of Nutritional Science and Horticulture. http://www.discoverfoodsys.cornell.edu/

5. FOOD CONSUMPTION

5.B The Food Supply Chain

Food Preservation

Food preservation consists of the application of science-based knowledge through a variety of available technologies and procedures, to prevent deterioration and spoilage of food products and extend their shelf-life, while assuring consumers a product free of pathogenic microorganisms.

CANNING

VACUUM-PACKAGING

DRYING

FOOD PRESERVATION

SMOKING

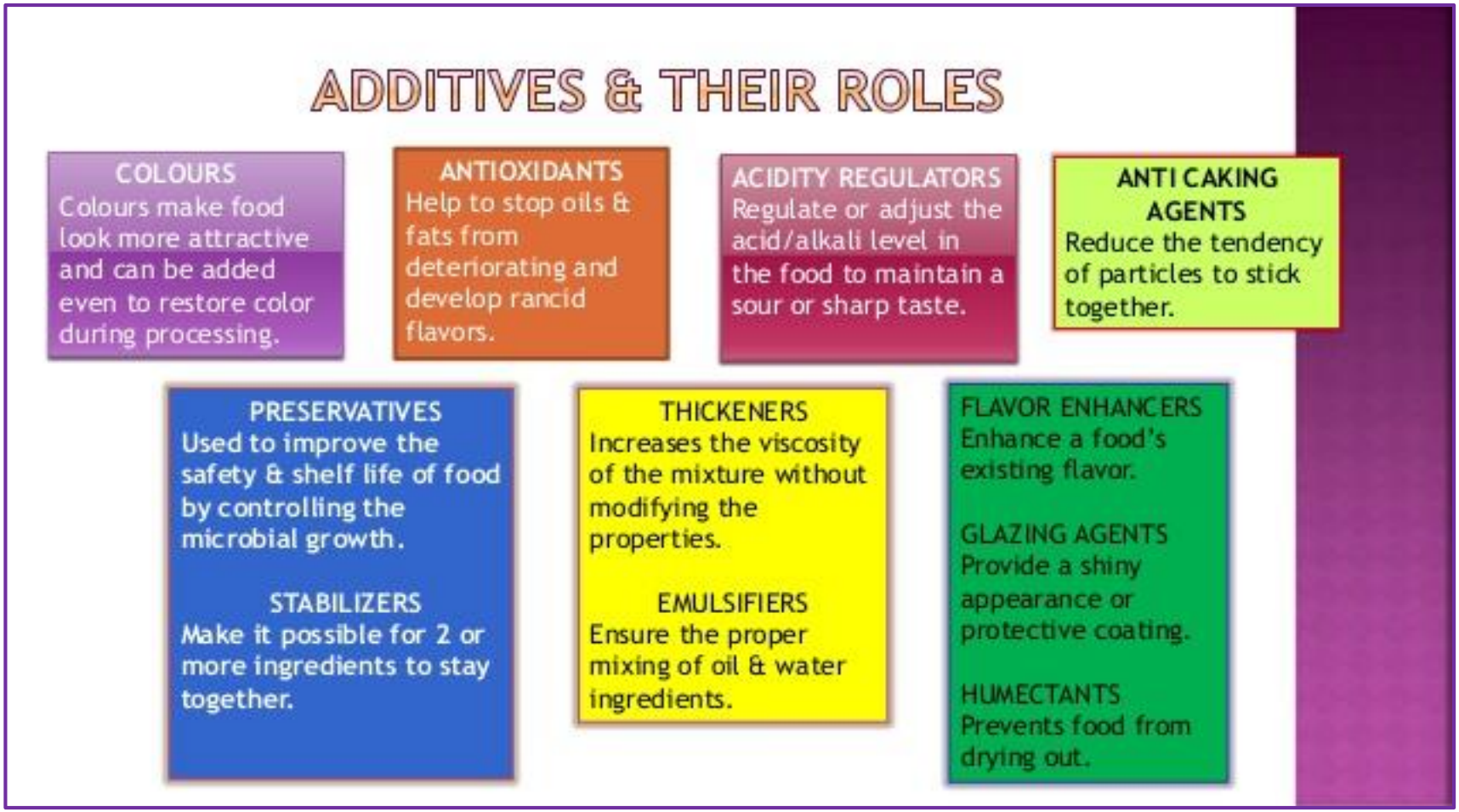
FREEZING

COOLING

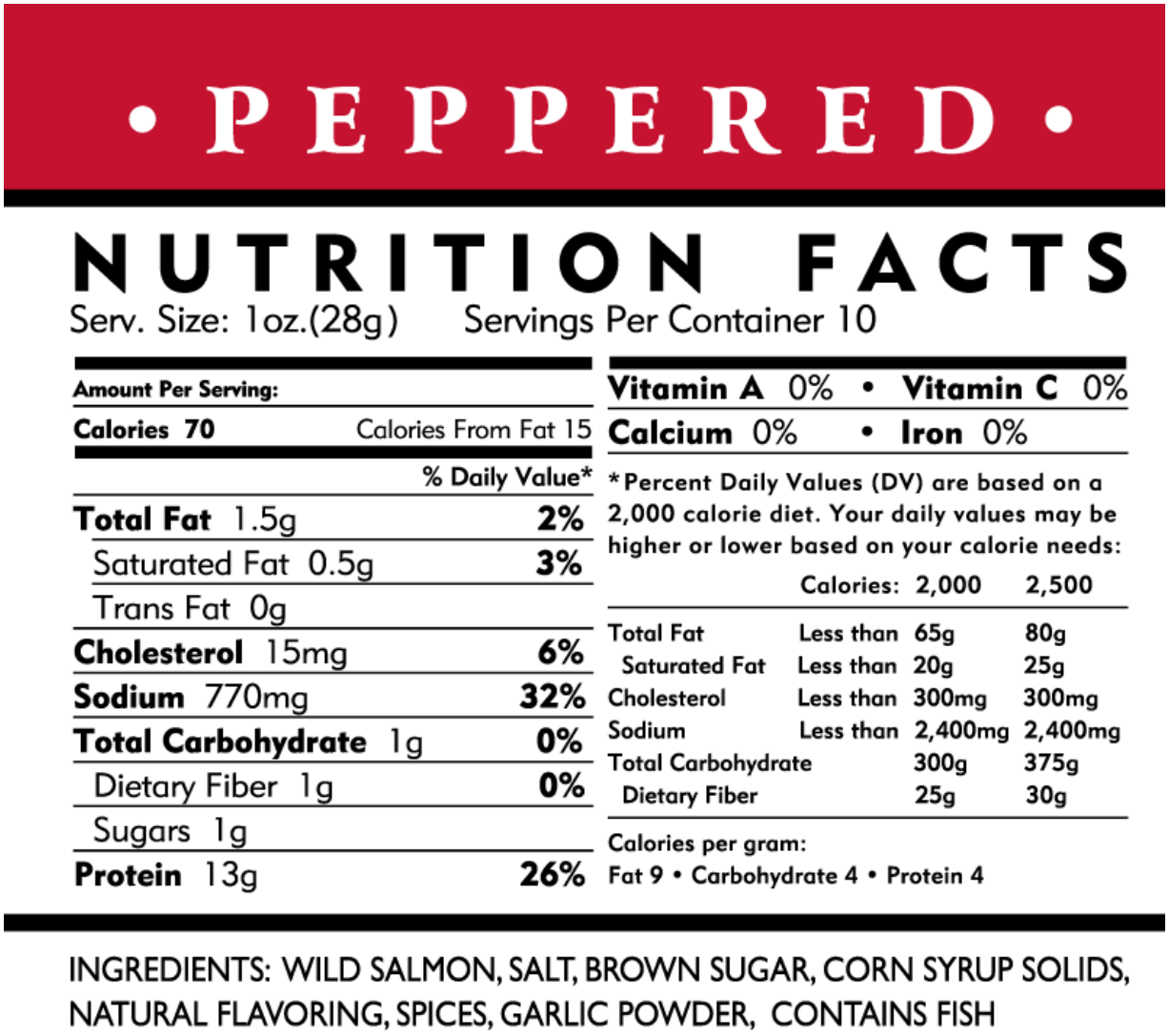
SALTING

PLICKING

5.c. Food Additives



5.d. Nutritional Information



• PEPPERED •

NUTRITION FACTS

Serv. Size: 1oz.(28g) Servings Per Container 10

Amount Per Serving:	
Calories 70	Calories From Fat 15
	% Daily Value*
Total Fat 1.5g	**2%**
Saturated Fat 0.5g	**3%**
Trans Fat 0g	
Cholesterol 15mg	**6%**
Sodium 770mg	**32%**
Total Carbohydrate 1g	**0%**
Dietary Fiber 1g	**0%**
Sugars 1g	
Protein 13g	**26%**

Vitamin A 0% • **Vitamin C** 0%

Calcium 0% • **Iron** 0%

*Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower based on your calorie needs:

		Calories: 2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

INGREDIENTS: WILD SALMON, SALT, BROWN SUGAR, CORN SYRUP SOLIDS, NATURAL FLAVORING, SPICES, GARLIC POWDER, CONTAINS FISH

6. FOOD-RELATED ILLNESSES

- Obesity-related health problems
- Anorexia and bolumia
- Nutrient deficiency diseases