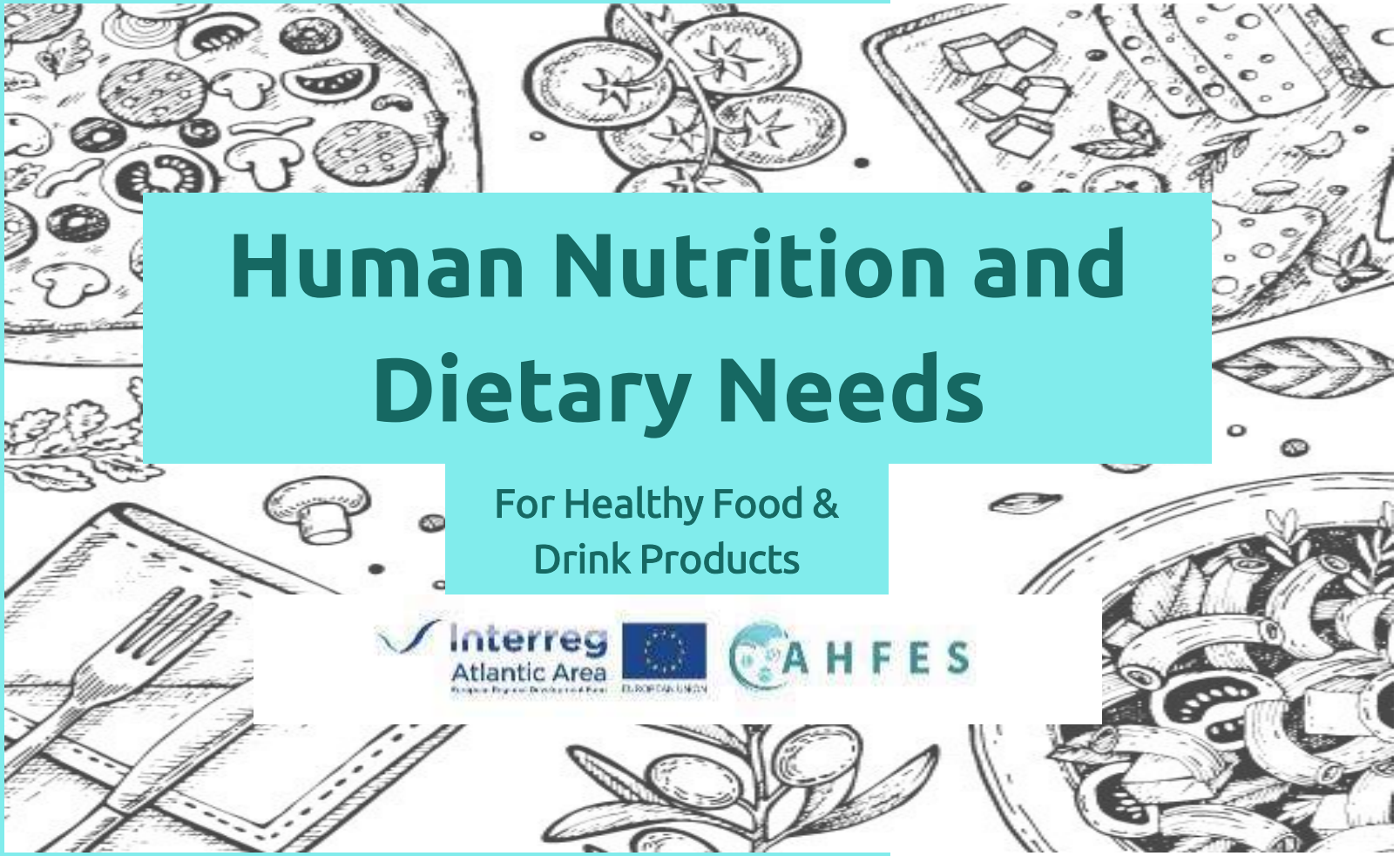


Human Nutrition and Dietary Needs

For Healthy Food & Drink Products

Interreg Atlantic Area

AHFES

Module Contents

1.

Introduction
Overview of Human Nutrition
Food Security
Food Basics
Reference Intakes

2.

Food Fundamentals to Consider
Retention Factors
Cooking and its Effect on Nutrition
Anti-Nutrients
Protein Quality
Bio-accessibility
Nutrient Bioavailability
Food Databases

3.

Nutrition and Specific Diets
Food and Chronic Diseases
Food Allergy and Food Intolerance
Nutrition and Life Course

Human Nutrition and Dietary Needs

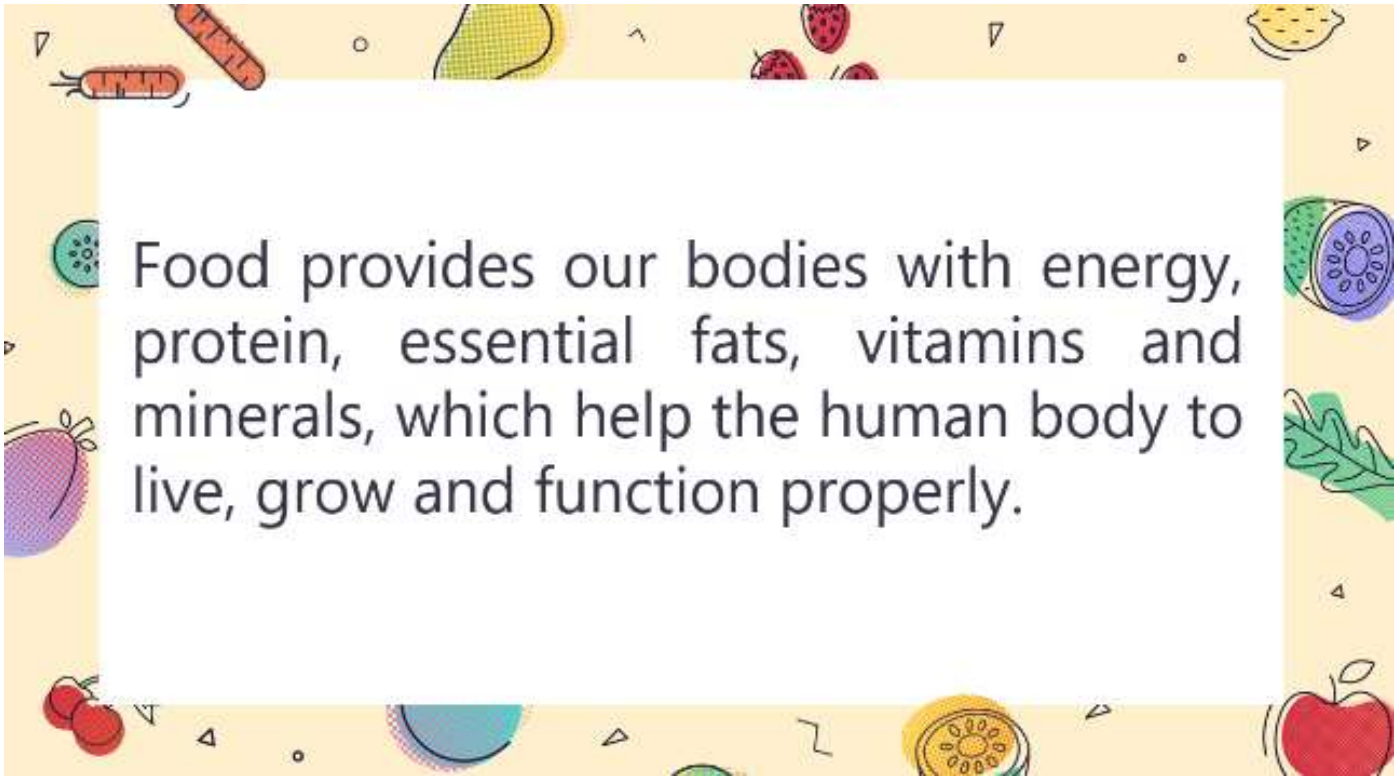
Human Nutrition is a wide and varied topic, encompassing many disciplines and is also heavily influenced by social and cultural within communities. Given this diversity, it is not possible for us to provide you with an exhaustive source of information in this short training session. Please do not rely upon it as your only source of human nutrition reference.

We do hope however, that the information in this module, which has been provided by qualified nutritionists in Portugal and Wales, will serve as an introduction to the key elements of human nutrition.

We have sought to suggest considerations and references to support the development of innovative healthy food and drink products, to allow new launches and reformulated products to successfully fulfil the dietary needs of consumers and have a positive impact on their health and well-being.

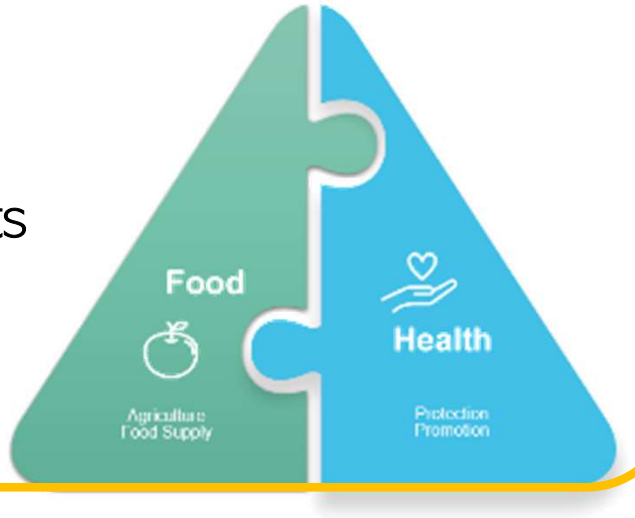
The accompanying module P3-M3 Innovation in the Healthy Food and Drink Sector will offer you more information and examples of how public policy in the area of human nutritional health and dietary needs are influencing the opportunities for innovative new launches in the sector.

Overview of Human Nutrition

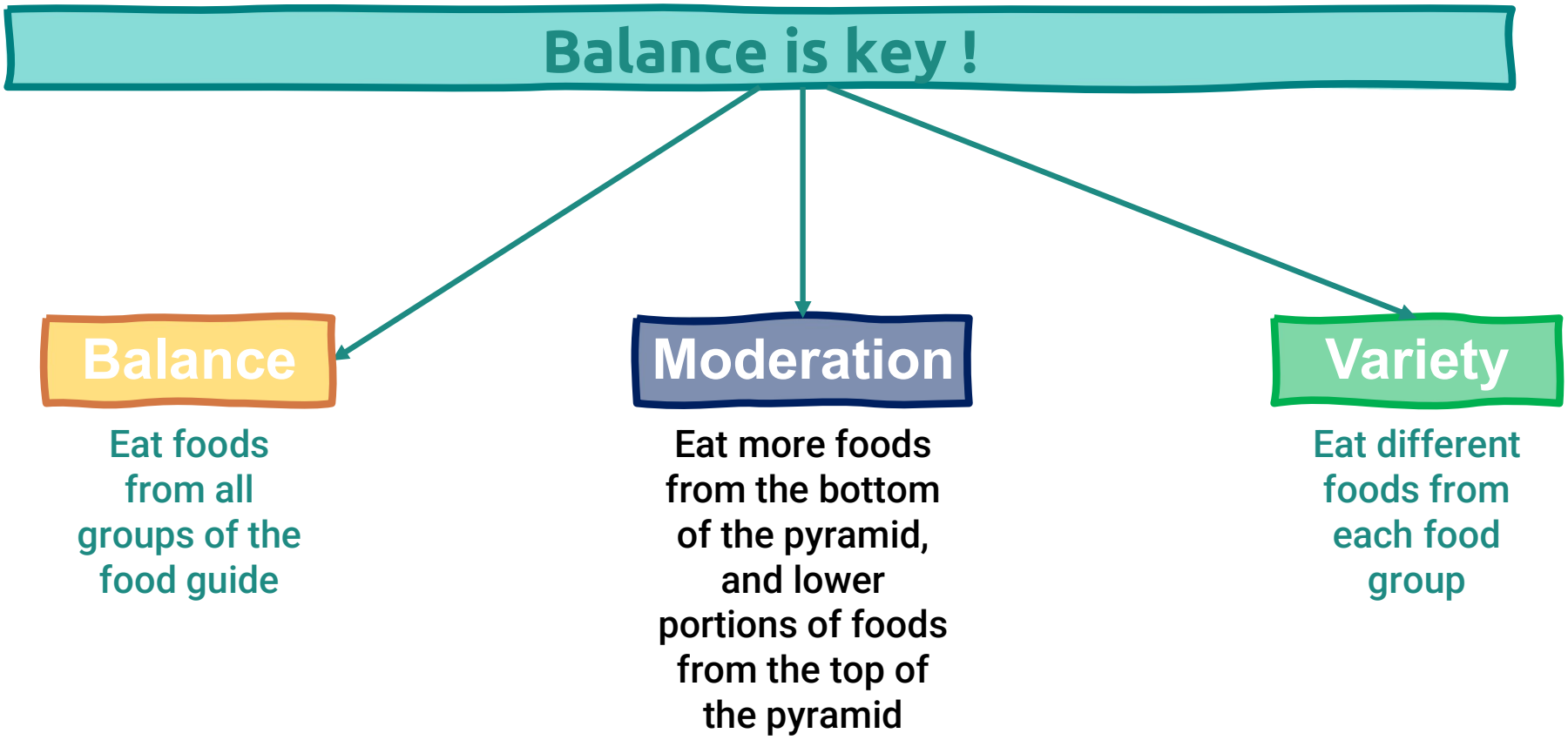


Overview of Human Nutrition

Nutrition is a link between food and health regarding nutrient and non-nutrient requirements in the human life cycle.



Nutritional well-being for all


Balance is key !
Balance
Eat foods from all groups of the food guide
Moderation
Eat more foods from the bottom of the pyramid, and lower portions of foods from the top of the pyramid
Variety
Eat different foods from each food group

The food you eat is a source of nutrients

Nutrients are defined as “the substances found in food that keep your body functioning”

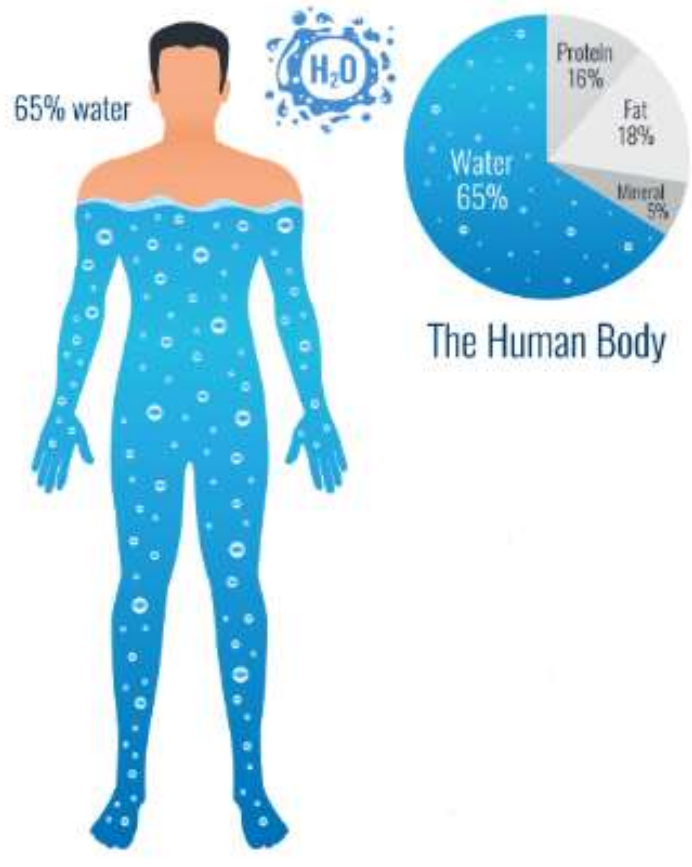
Your body needs nutrients to:

- Fuel your energy
- Help your grow
- Repair itself
- Maintain basic body conditions

You are what you eat!

- By mass, your body is made of mostly water, then protein and Fat.

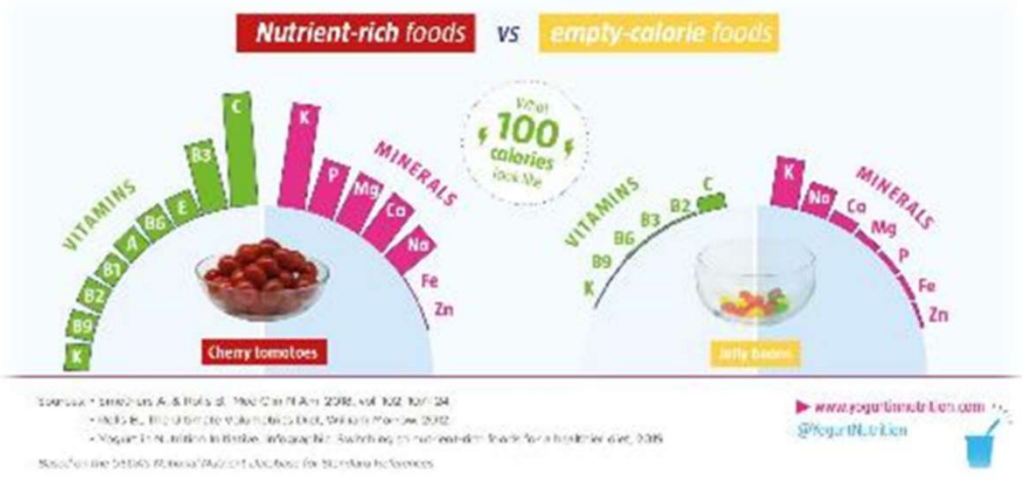
- Less than 6% is made up of carbohydrates and minerals.



Food security is a global need, but more important is Nutrient Security

- This means focusing on the nutritional quality of the food, not just the food volume, or caloric content.
- The human body needs nutrients from natural-original sources is essential, to achieve and maintain all aspects of health.
- Fortification is a widely used and accredited method of nutrient delivery, that has closed gaps in nutrient deficiencies across the globe, however research overwhelmingly points to wholefood sources as the bodies preferred and safest route of nutrient delivery.
- Chronic intakes of calorie dense but low nutrient value foods, has resulted in growing populations in both developing and developed countries of people who are both overweight and have micronutrient deficiencies.

- The UK's National Diet and Nutrition Survey highlighted that intakes of omega 3, iron (in females), magnesium, selenium, iodine, and potassium are far below the recommended daily intakes.
- Nutrients must be regularly ingested and at sufficient quantities to meet and maintain health.

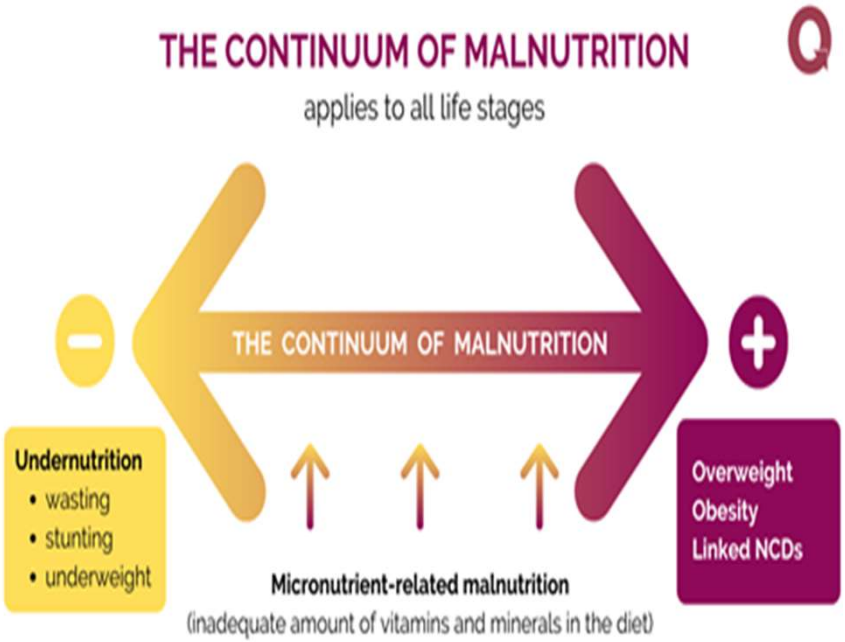


Nutrient Security – Obesity & Malnutrition

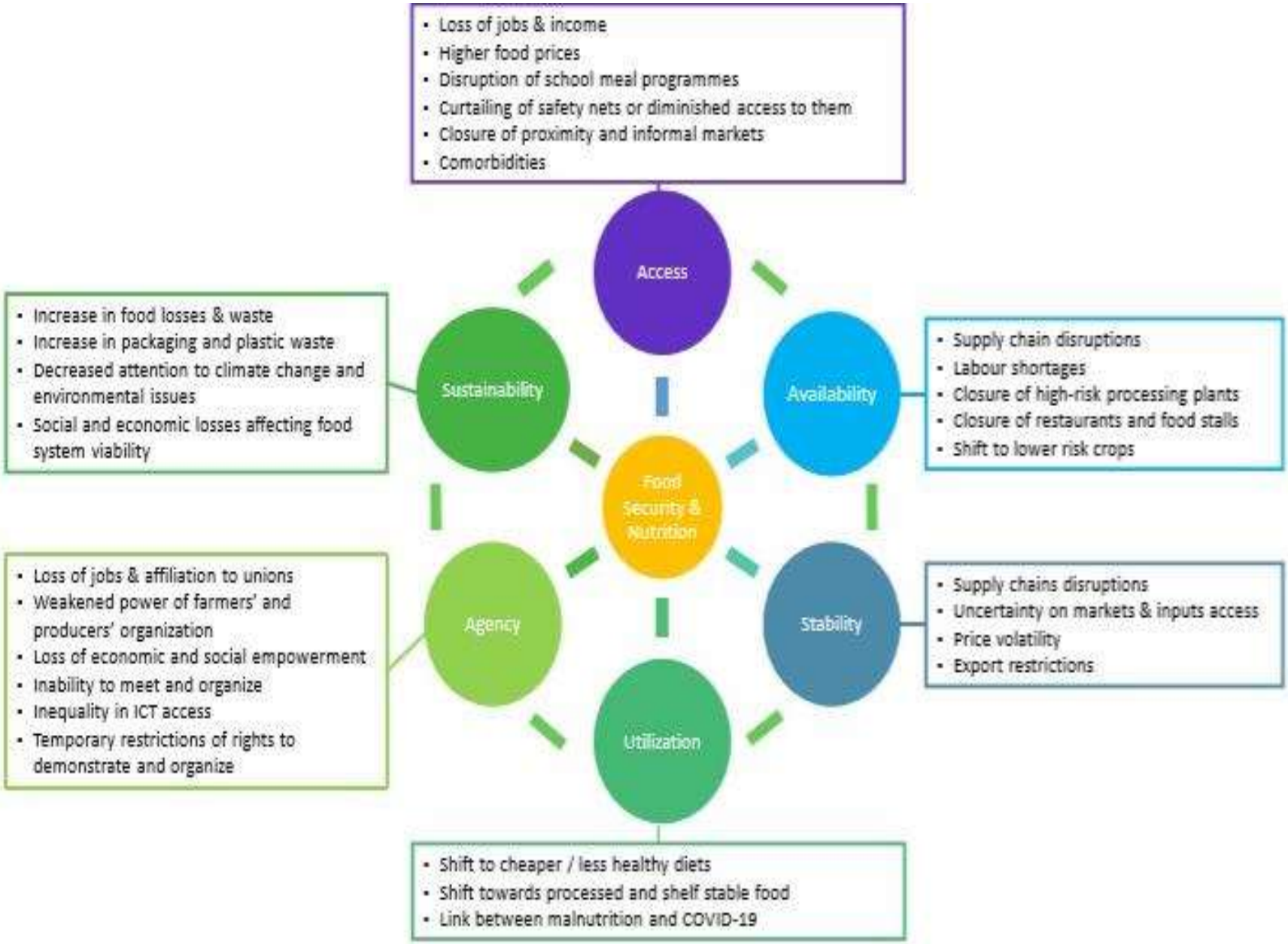
Nutrient malnutrition manifests in both wasting and obesity.

As the global incidence of obese-malnourished populations increases, there is a great **need to address the nutritional needs** of the population at **their specific life stage**, rather than simply providing high-calorie dense foods, with little nutrient value.

Meeting the required nutrient intakes has profound **positive impacts** on **health status**, leading to the reduced incidence of non-communicable disease, and thus reduced pressures on health service providers.



Food and Nutrition Security



Food Basics

Micronutrients

Protective Food

- Vitamins
- Minerals

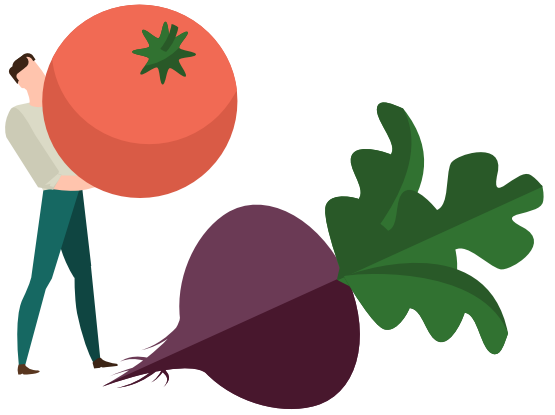
- Fats
- Carbohydrates

Energy Giving Food

Macronutrients

- Proteins

Body Building Food



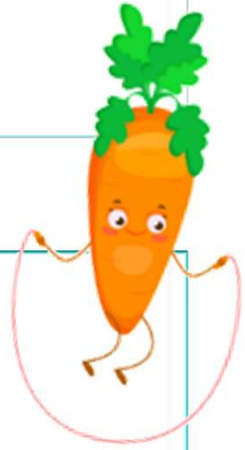
Carbohydrates

The fruit, vegetables, dairy, and grain food groups all contain carbohydrates.

Sweeteners like sugar, honey, and syrup and foods with added sugars like sweets, soft drinks, biscuits and cookies also contain carbohydrates.

Daily Requirement

- 400 to 600 g

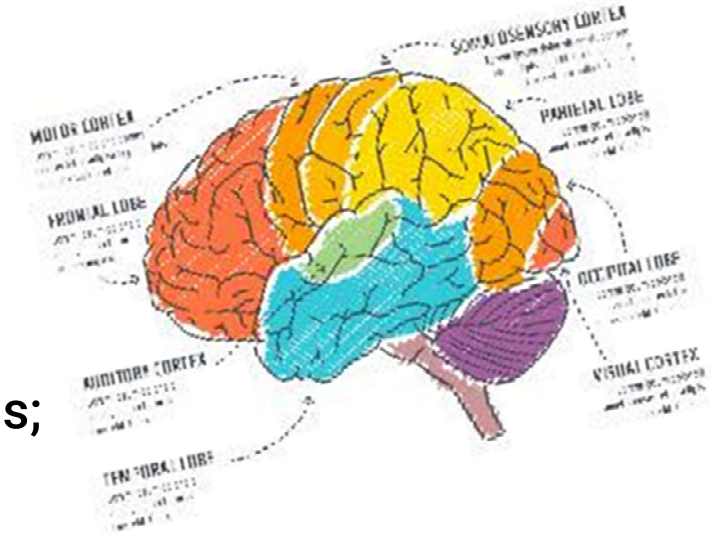


Sources

- Starches – Millets, cereals, roots, tubers, plant stems
- Sugars – Monosaccharides, Disaccharides, Polysaccharides
- Cellulose – Fibrous lining of fruits, vegetables and cereals

Carbohydrates - Functions

- The Body’s main source of energy. It is important to note that glucose is our brain’s primary source of energy;
- For achieving oxidation of fat;



- Lactose promotes growth of desirable bacteria;
- Lactose is also useful in the synthesis of B-vitamins;

- Ribose sugar is an important compound for DNA and RNA

Fat - Sources

Animal – Ghee, Butter, meat, fish oil

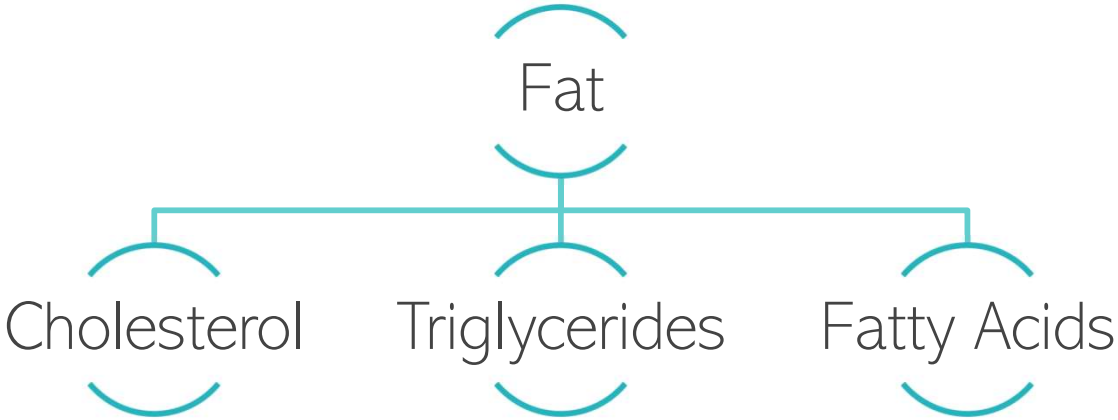
Plant – Soya bean, ground nuts, mustard, cotton seed, sunflower, coconut oil

Rich Sources: pure oils & fats; ghee; butter

Good Sources – Nuts & oils seeds; milk powder; eggs; meat & fish

Fair Sources – Cow milk, pulses, cereals & millets

Types of Fat



Saturated fats are found in the greatest amounts in butter, beef fat, and coconut, palm, and palm kernel oils. Higher-fat meats and dairy and cakes, cookies, and some snack foods are higher in saturated fats. Dishes with many ingredients are common sources of saturated fat, including pizza, casseroles, burgers, tacos, and sandwiches.

***Trans* fats,** which is short for trans fatty acids, occur naturally in some foods but are also artificially produced. Because *trans* fats are not healthy, food manufacturers are phasing them out. But *trans* fats can still be found in some processed foods, such as some desserts, microwave popcorn, frozen pizza, margarine, and coffee creamer.

Fat – Daily Requirement

Adult

10% - 20% of total calories

Children and adolescents (1-18 years)

15% - 20% of total calories

Infants (birth – 1 year)

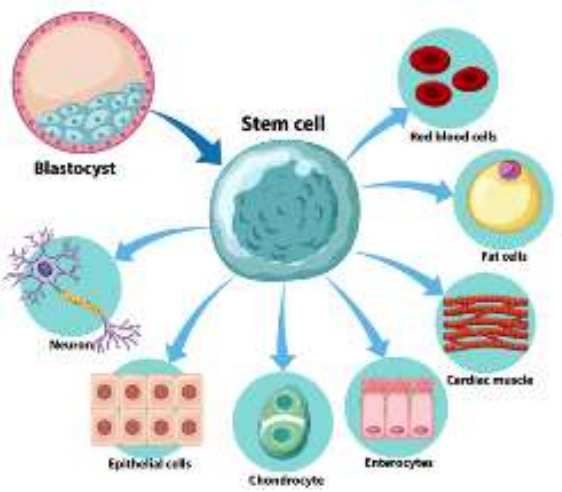
25% - 30% of total calories

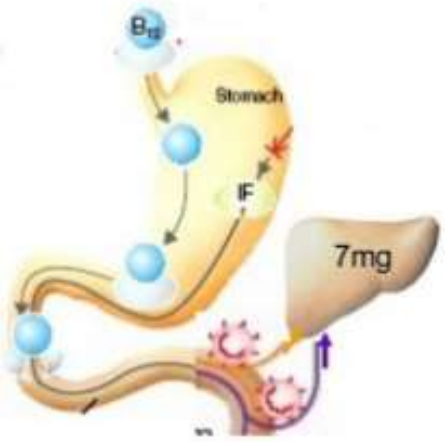
Fat - Functions

Synthesis and repair of cell parts

Energy storage

Aids in the absorption of fat-soluble vitamins (A, D, E and K)

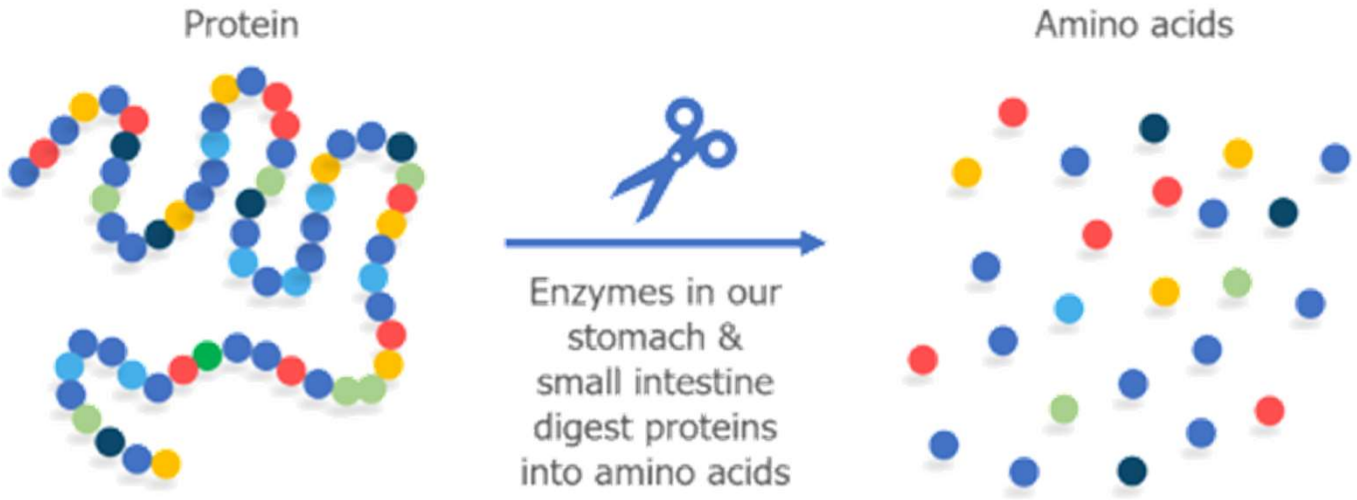




Proteins

- It is the only nutrient that contains nitrogen, which is the element responsible for growth!
- RDA is 1 gram of protein per kg of body weight

Protein is comprised of a number of amino acids joined together by peptide links to form a chain



Proteins - Source

Animal Protein

- Meat
- Fish
- Milk
- Eggs
- Cheese
- Yogurt

Vegetable Protein

- Peas
- Beans
- Lentils
- Nuts
- Cereals

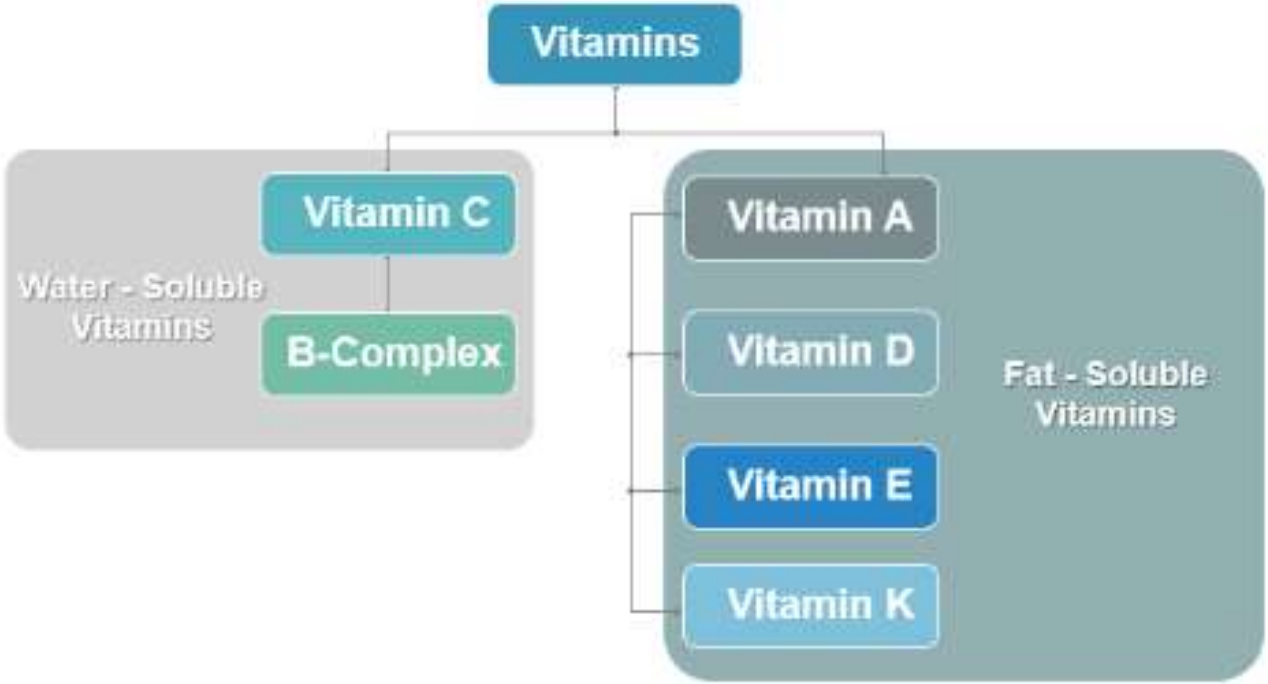
Protein - Functions

- Helps the body make important substances such as promoting the production of hormones, enzymes and antibodies which are required to keep the body healthy
- Important for growth of all body cells (skin and bones)
- Repair damaged cells
- Regulates body processes

Vitamins

Vitamins are molecules required by the body in small amounts for a variety of essential processes in the body.

Most vitamins cannot be synthesised by the body so must be obtained through the diet.

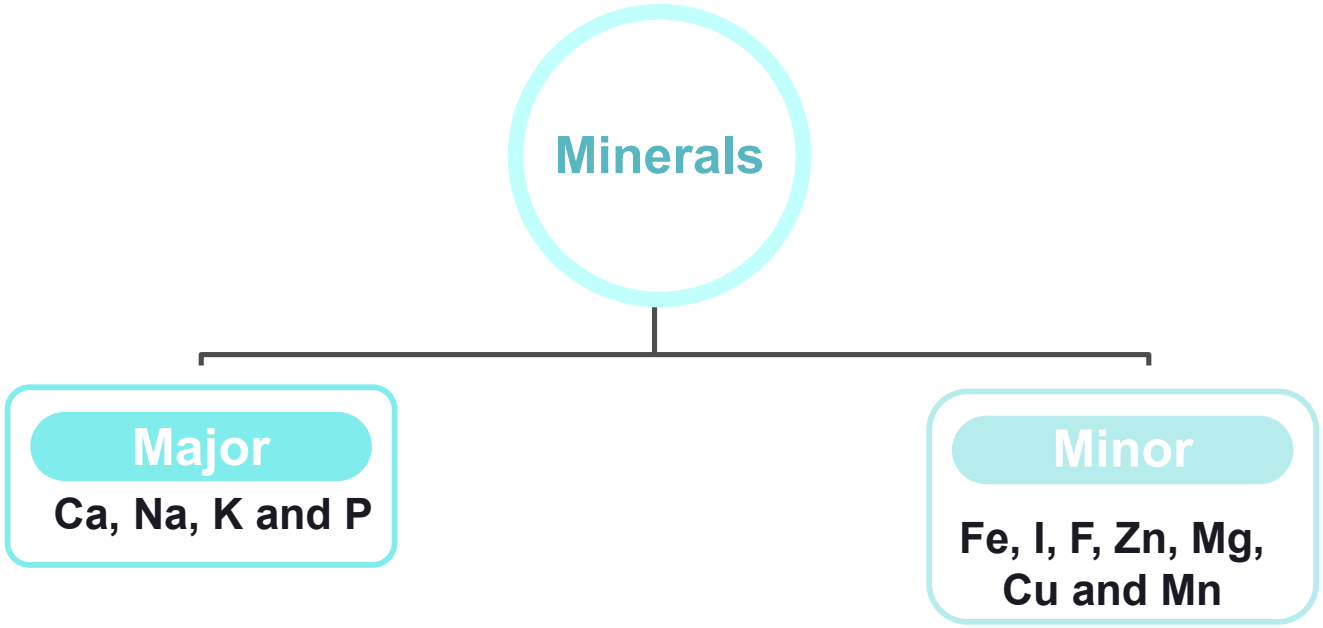


Vitamins – Sources and Functions

Vitamin	Sources	Functions
A	Butter, dark green and yellow fruits and vegetables, egg yolk, liver	Keeps skin and mucus membranes healthy Prevents night blindness Promotes Growth
D	Egg yolk, fortified butter, margarine and milk	Builds strong bones and teeth
E	Eggs, liver, salad oils, whole grain cereals	Acts as an antioxidant to protect cell membranes
K	Cauliflower, egg yolk	Helps blood clot
B-Complex	Oranges, grapefruits, tangerines, cantaloupe, broccoli, citrus fruits, tomatoes and raw cabbage	Helps fight infection Helps nervous tissue function healthily Plays important role in breakdown of proteins fats and carbohydrates
C	Pork, whole grain breads and cereals	Keeps nervous system healthy Helps promote healthy gums and tissues

Minerals

Sufficient intake of minerals is as crucial for your body functions as is getting the whole range of them.



Minerals - Sources


Green leafy vegetables

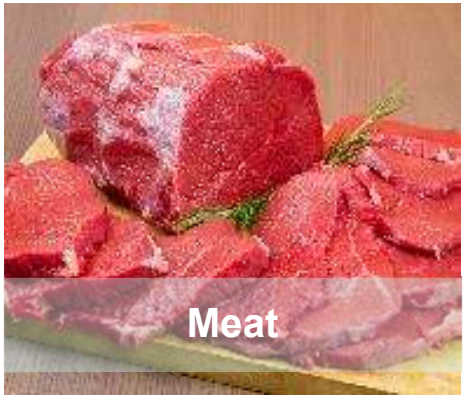

Fruits


Whole grain cereals

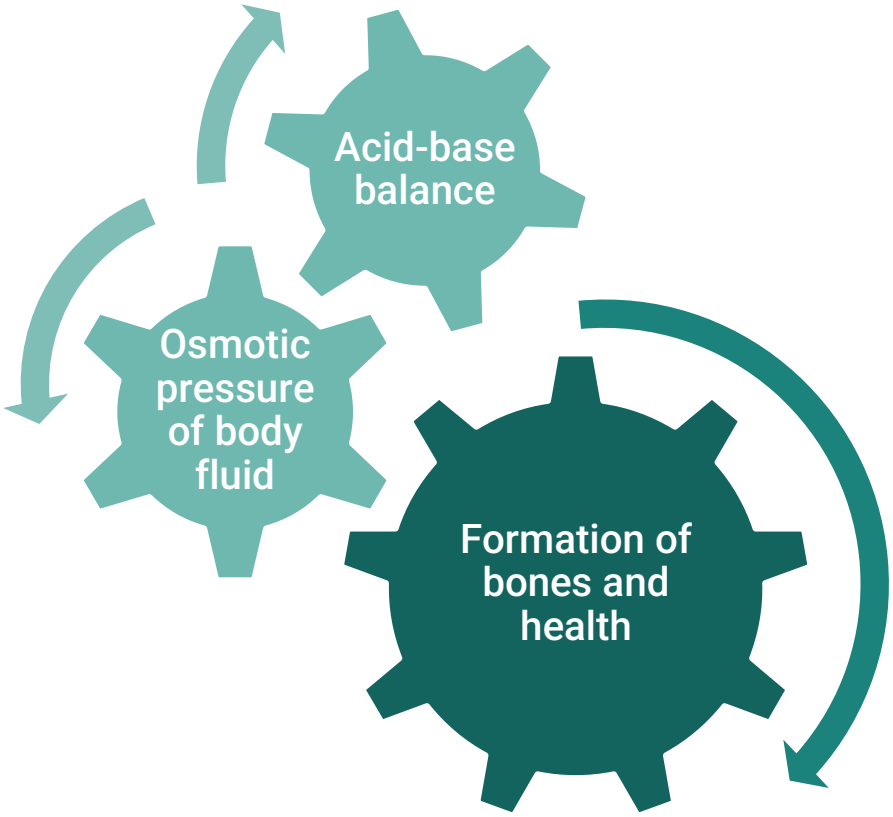

Sea Foods


Eggs


Milk


Meat

Minerals - Functions



Reference Intake

As we know, nutrition is an area of health adjusted on a case-by-case basis. Depending on the person’s goal, we need to adapt the macronutrients intake such as :

- Protein
- Carbohydrates
- Lipids
- Energy

It is also necessary to comply with micronutrient recommendations to provide a complete diet from a nutritional point of view, respecting all the body's needs.

Reference Intake-Energy

A regular supply of dietary energy is essential for life to fuel many different bodily processes. These include keeping the heart beating and organs functioning, maintaining body temperature, muscle contraction and growth. However, daily energy requirements vary widely from one individual to the next. This is due to sex, body size, body weight, climate and physical activity levels.

Energy is obtained, from the food and drink we consume, by oxidation of carbohydrate, fat, protein and alcohol, known as macronutrients. The amount of energy that each of these macronutrients provides varies:

•Fat is the most energy-dense nutrient and provides 9kcal (37kJ)/g.
•Alcohol is the second most energy-dense nutrient, providing 7kcal (29KJ)/g.
•Protein provides 4kcal (17kJ)/g
•Carbohydrate (starch and sugars) is the minor energy-dense nutrient, providing just 3.75kcal (16kJ)/g. [A value of 4 kcal is used for food labelling purposes.]

Reference intake is between 1800(♀) Kcal and 2000 (♂) Kcal.

Reference Intake- Protein

Proteins are the macronutrient consisting of amino acids. Fundamental for structural and functional elements within every cell of the body. All cells and tissues contain protein. Therefore, protein is essential for growth and repair and the maintenance of good health.

Proteins are large molecules made up of long chains of amino acids. Amino acids are the building blocks of proteins. There are about 20 different amino acids commonly found in plant and animal proteins.

For adults, 8 of these have to be provided in the diet and defined as 'essential' or 'indispensable' amino acids. These are:

- Leucine
- Valine
- Methionine
- Tryptophan
- Isoleucine
- Threonine
- Phenylalanine
- Lysine

We need 0,8 g of protein per kg of body weight per day.

Reference Intake- Carbohydrates

Carbohydrates are the primary source of energy in most human diets.

They can be classified into two main types: simple and complex.

They have different characteristics on their digestibility and expenditure of energy.

Reference intake for this macronutrient is 40%-60% of the total energy consumption.

Complex Carbohydrates

Complex carbohydrates raise blood glucose levels for longer and produce a more lasting elevation in energy. The primary function of carbohydrates is to provide the body with energy, and complex carbohydrates do this more effectively.

Complex carbohydrates are also called polysaccharides because they contain many sugars. (The prefix “poly-” means “many.”)

There are three main polysaccharides:

1. Starch
2. Glycogen
3. Fibre

Simple Carbohydrates

Simple carbohydrates, or sugars, are shorter chains of molecules and are quicker to digest than complex carbohydrates; increasing the blood glucose level rapidly yet fall rapidly, compared to complex carbohydrates.

Simple carbohydrates are sometimes called “sugars” or “simple sugars.” There are two types of simple carbohydrates: monosaccharides and disaccharides.

There are three monosaccharides:

1. Glucose
2. Fructose
3. Galactose

Reference Intake – Total Fat

Fat is a crucial dense energy source and facilitates the absorption of fat-soluble dietary components such as vitamins.

Dietary fat also is the source of Essential Fatty Acids (EFA) and thus must be present in the diet. The EFA derive from two families of fatty acids, namely those of the n-6 and those of the n-3 families of unsaturated fatty acids.

In addition to its role as an essential source of energy and EFA, dietary fat serves as a source of fat-soluble vitamins (vitamins A, D, E, and K) and carotenoids. Aids in their absorption, and as in vitamin E, is an essential source of the vitamin.

Reference intake for this macronutrient is **20%-35%** of the total energy consumption.

Retention Factors

Actual retention measures the proportion of nutrients remaining in the cooked food concerning the nutrients originally in the raw food.

Nutrient retention factors are given for a range of cooking and preparation methods such as, but not limited to, baked, boiled, reheated, broiled, pared, and drained. The methods applied were based on food type.

These factors can be used to formulate new products in an attempt to launch high nutritional quality products. And by applying retention factors to ingredients in a recipe, the estimated nutrient value will be more accurate.

The table has retention factors for 16 vitamins, eight minerals, and alcohol for approximately 290 foods. Available on: Nutrient retention factors : USDA ARS

Retention Factors

- The most comprehensive database on retention factors is published by the United States

- The American Table has data on:
  - Red meat and white meat
  - Vitamins and minerals being published 26 retention factors % retention varies between 40% and 100% the lowest retention factor was found in vitamins

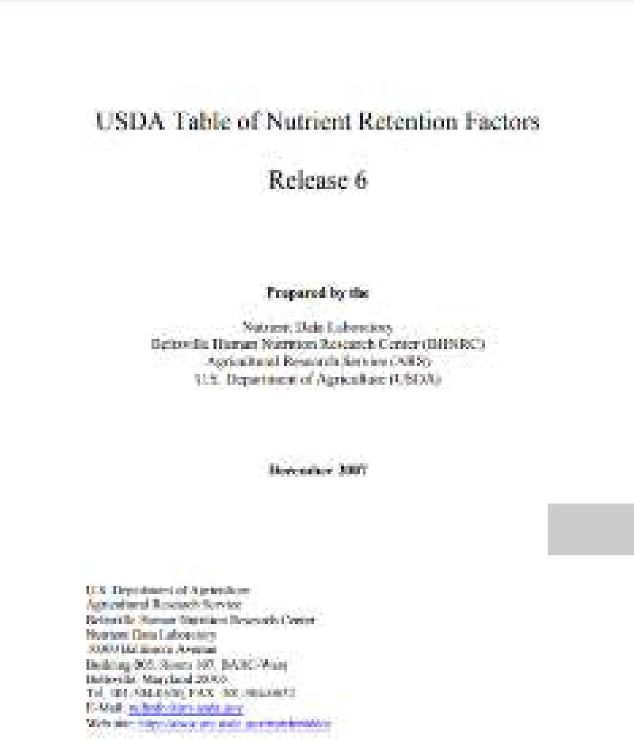
These factors were determined from analytical data of raw and then cooked foods and based on the following calculation formula

$$\%TR = (Nc*Gc) / (Nr*Gr) * 100$$

Nc - analytical value of the cooked nutrient
Gc - weight of cooked food
Gc - raw food weight
Nr - analytical value of the nutrient in raw food

Database: Retention Factors Tables

1. Search: USDA Table of Nutrient Retention Factors
2. See Table



USDA Table of Nutrient Retention Factors

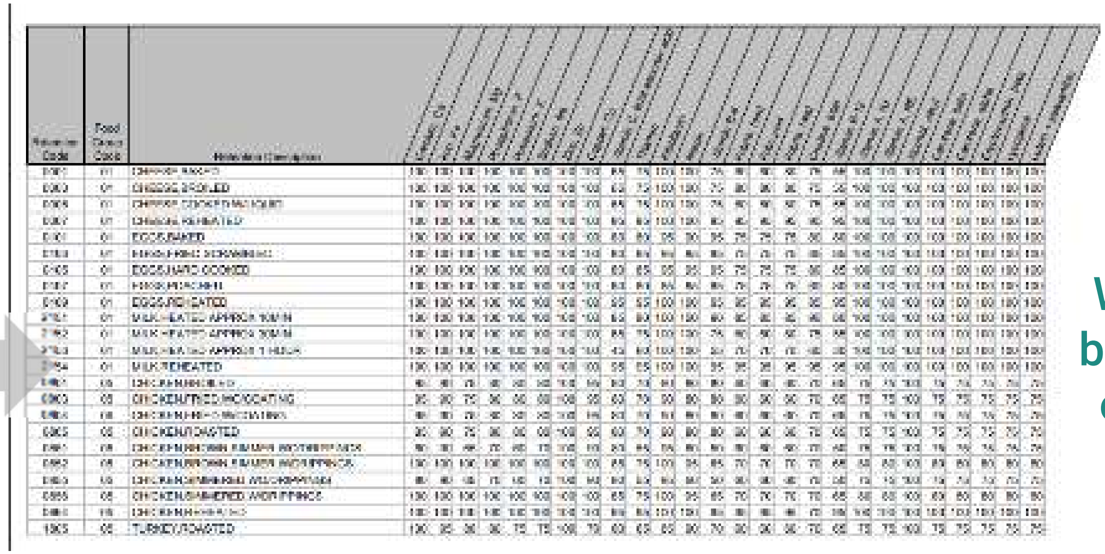
Release 6

Prepared by the

Nutrient Data Laboratory
Beltsville Human Nutrition Research Center (BHNRC)
Agricultural Research Service (ARS)
U.S. Department of Agriculture (USDA)

December 2007

What nutrients are lost during the cooking process



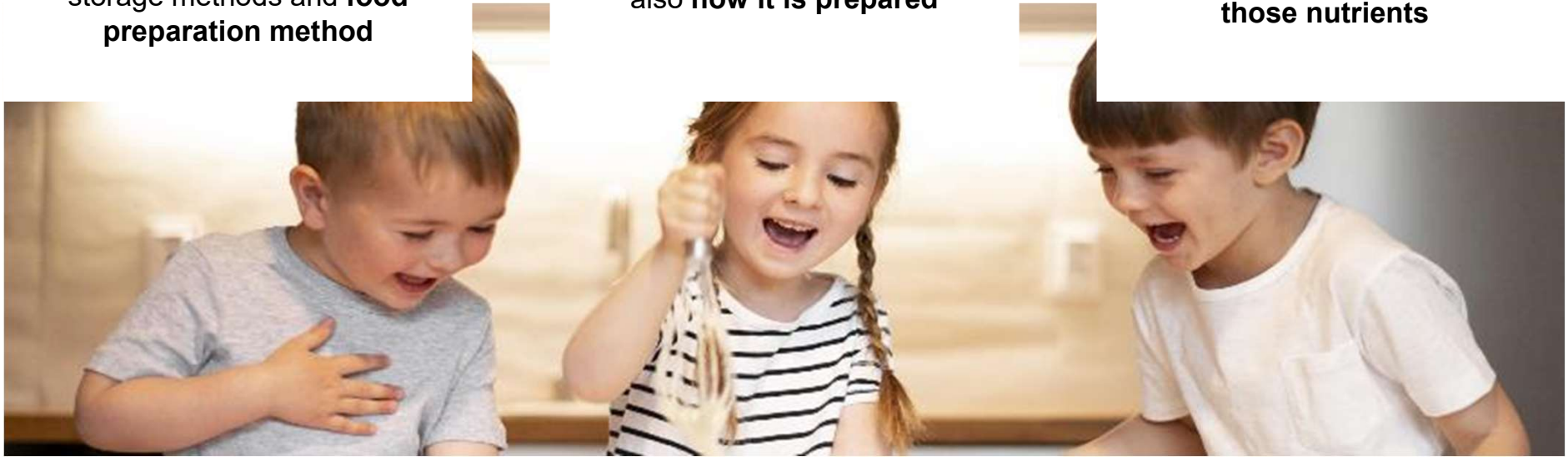
What is the best method of cooking food

Cooking and Its Effect on Nutrition

The **nutrient content** in food is influenced and changed through many processes including growing methods, harvesting methods, storage methods and **food preparation method**

The **nutritive value** of food depends not only upon what and how much is consumed but also **how it is prepared**

The **process of preparing and cooking food changes**, not only it's appearance and texture, but also it's **nutrient content and availability of those nutrients**



Nutritional Changes During Cooking

Methods of Cooking	Nutritional changes
Boiling	• Destroys vitamin C since it is water soluble and sensitive to heat. • Boiling fish helps to preserve omega-3 fatty acid.
Simmering	• Thiamine, niacin and other B vitamins may be lost when meat is simmered and its juices run off.
Steaming	• One of the best cooking methods for preserving nutrients, including water soluble vitamins, that are sensitive to heat and water.
Poaching	• Poaching allows the proteins in food to denature slowly, without squeezing out moisture.
Grilling and Broiling	• B vitamins may be lost.
Roasting and baking	• Most vitamin losses are minimal except B vitamins
Sautéing	• Cooking for a short time without water prevents loss of B vitamins.
Frying	• Preserves vitamin B and vitamin C. • Increases the amount of fibre in potatoes. • Degrades omega – 3 fatty acid content
Microwave cooking	• Preserves most nutrients. • Short cooking time.

Nutrient Bioavailability

Nutrient bioavailability is the rate, proportion, and extent to which food's active substances or therapeutic food components are absorbed and become available after digestion at a specific site.

Specific nutrient bioavailability is associated with the efficiency of absorption and metabolic utilisation of an ingested nutrient.

The bioavailability of nutrients is highly variable and can be influenced by numerous factors:

- Food product characteristics;
- Components that enhance or inhibits absorption;
- Metabolisation after absorption;
- Host related factors (including state of health, genetic factors, age and lifestyle);
- as well as other individual factors.

Anti-nutritional Factors (I)

Those compounds found in most food substances are harmful to humans or, in some ways, limit the nutrient availability to the body.

These anti-nutritional factors are also known as ‘secondary metabolites’ in plants. They are highly biologically active. Plants evolved these substances to protect themselves and to prevent them from being eaten.

Anti-nutrients are chemical substances that reduce the maximum utilisation of nutrients, especially proteins, vitamins, and minerals, thus preventing optimal exploitation of the nutrients present in food and decreasing the nutritional value.

In the next slide, we have the anti-nutritional factors that can be divided into two large groups. And by the basis of their chemical structure, a specific action or their biosynthetic origin.

Anti-nutritional Factors (II)

Heat-stable Group

- Can be maintained at high temperature.
- Phytic acid, polyphenolic compounds (such as condensed Tannins), alkaloids, saponins, non-protein amino acids etc.

Heat labile Group

- sensitive to standard temperature and lost at high temperature
- lectins, Cynogenic Glycosides, Protease inhibitors, and Toxic amino acids etc.

PROTEINS

* Protease inhibitors
  - >Trypsin inhibitors
  - >Chemotrypsin
* Hemagglutinins
* Amylase inhibitors
* Food allergens
* Toxic amino acids

GLYCOSIDES

Saponins*
Cyanogens *
Estrogens*
Goitrogens*

Anti-nutritional factors may be classified on the basis of their chemical structure, the specific actions they bring about or their biosynthetic origin.

PHENOLS

* Gossypol
* Tannins

OTHERS

Anti-minerals*
Phytic acid*
Anti-vitamins*
Plant carcinogens *

Anti-nutritional Factors (III)

Adverse effects of Anti-nutrients:

Anti-nutrients	Effects on body
Phytates	Reduce Ca and Fe absorption
Oxalates	Reduce Ca absorption, encourage kidney stone formation
Cyanide	Respiratory inhibitors
Lectins (Hemagglutinins)	prevent absorption of digestive end products in the small intestine.
Protease inhibitors	substances reduce protein digestion.
Phenol Compounds	They reduce bioavailability of some minerals (especially zinc). Tannins are usually stable when confronted with heat, and they may negatively affect pH mechanism, reduce protein digestion.

Here are some examples of the adverse effects of anti-nutrients, on our body and there are some measures we can perform to reduce the possibility of this anti-nutrients enter in our diet.

Protein Quality (I)

Global concerns around the consumption of animal products because of the adverse effects on the environment and health reasons. Which makes consumers shifting towards plant-based diets.

Protein quality is important in all diets, because of the amino acids provided by them. We need protein quality consumption to provide the necessary amino acids to us.

In plant based diets we have scientific evidence of limiting amino acids. For example, lentils lack threonine and tryptophan, and oats are short on lysine. Though soy protein is usually considered a complete protein, by some accounts, methionine is a limiting amino acid. But protein complementarity can suppress this problem.

To evaluate the protein quality, we can use two methods:

- Protein Digestibility Corrected Amino Acid Score (PDCAAS)
- Digestible Indispensable Amino Acid Score (DIAAS)

Protein Quality (II)

PDCAAS

PDCAAS (Protein Digestibility Corrected Amino Acid Score) evaluates a food's protein quality. It's a method for assessing the quality of a protein based on humans' amino acid requirements and their ability to digest it.

The highest PDCAAS value that any protein can achieve is 1.0. After digestion of the protein, this score means it provides per unit of protein 100% or more of the essential amino acids required.

In the following table, we demonstrate some examples:

Protein	PER	Digestibility	AAS	PDCAAS
		%		
Egg	3.8	98	121	118
Cow's milk	3.1	95	127	121
Beef	2.9	98	94	92
Soy	2.1	95	96	91
Wheat	1.5	91	47	42

DIAAS

DIAAS is the ratio of the digestible amino acid content in the food (mg/g of protein) to the same amino acid in a reference pattern taken from age-specific amino acid requirements. The lowest value across amino acids is multiplied by 100 to convert the ratio to a percentage. This percentage represents the DIAAS of the food. Samples are taken from the ilium and are collected from a pig. Pigs have more biological similarities to humans than rats.

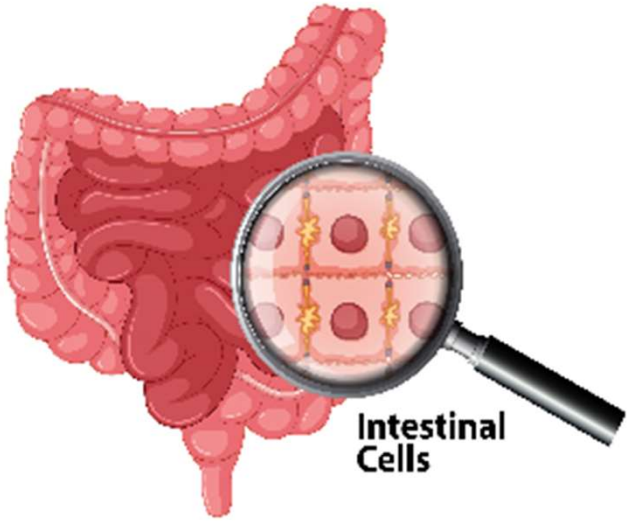
Quality will be dictated by where the tested protein's DIAAS score falls within the scale. Specific brackets are recommended below:

- No protein quality claim – Score of <75%
- Good protein quality – Score ranging from 75% to 99%
- Excellent or High protein quality – Score of 100% or more.

Bioaccessibility

Bioaccessibility is defined as the quantity of a compound that is released from its matrix in the gastrointestinal tract, becoming **available for absorption** (e.g. enters the bloodstream).

This term includes **digestive transformations of foods**: into material ready for assimilation, the absorption/assimilation into intestinal epithelium cells, and the pre-systemic, intestinal and hepatic metabolism.



In summary, bioaccessibility can be the:

- Events that place during food digestion for transformation into potential bioaccessible material
- Absorption/assimilation through epithelial tissue
- Pre systematic metabolism

Food Components Databases

FR- ANSES
PT- PortFir
ESP- bedca
EuroFIR Databases

Nutrients

Nutrient Retention Factors

USDA Table of Nutrient Retention Factors

EFSA Botanical Compendium

Edible plants toxic substances

Bioactives

Phenol-explorer
Eurofir
USDA
Plant Libra

WHO-GEMS

Contaminants

Barilla Database

Ecological footprint

Dietary Supplements

Dietary Supplement Label Database (DSLD)

Food additives

European commisson additives database

Nutrition and Specific Diets

Food and Chronic Diseases

Chronic Diseases are responsible for 71% of all deaths worldwide

Examples

Key considerations for food development?

Cardiovascular Diseases

An estimated **17.9 million people died from CVDs in 2019**, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke with an increasing number of people dying from cancer.

Global industrialisation has led to increased processing of everyday foods. resulting in negative nutritional consequences.

Due to the high energy density and nutritional composition of processed food products, the **consumption of ultra-processed foods seems to be positively associated with several negative health outcomes**. One of them is cardiovascular disease.

A plant-based diet that completely excludes animal products can **contribute to beneficial** associations, in this case on **cardiovascular diseases**.

The benefit of this lifestyle is associated with the fact that, in this diet, there is lower consumption of saturated fat and cholesterol.

Because of the increased consumption of fruits, vegetables, whole grains, nuts and soy products, it is a good source of antioxidants and phytochemicals beneficial to health.

Food and Cancer

Increase

- Rich in whole grains, vege tables, fruit and beans
- Rich antioxidants

Limit

- Alcohol
- Red and processed meat
- Sugar
- Sugar-sweetened drinks

Food and Diabetes

- Simple sugars should be avoided
- Complex carbohydrates must be used

- Use lean meats, poultry and fish
- Replace animal fats like butter and chicken fat with unsaturated plant oils

Food Allergy and Food Intolerance

The ingestion of specific foods induces a wide range of adverse reactions:

Food Allergy

The immune system recognises specific food proteins as an allergen and generates an immune response that causes various allergies

Food Intolerance

Non-immunological mediated adverse reaction (manifestations include dermatological symptoms, respiratory symptoms, gastrointestinal symptoms)

- **Gluten - Celiac Disease**
- **Lactose - Lactose intolerance**

Coeliac Disease

Coeliac disease (CD) can be described as an immune-mediated enteropathy triggered by the consumption of gluten.

This disease can be prevented by consuming a **"diet-free diet".**

The Codex Alimentarius defines '**gluten-free foods**' as those with gluten levels below 20 ppm (mg/kg). Although many countries adopt the Codex threshold, most lack a consistent monitoring process to evaluate gluten content in food.

The cereals and pseudocereals base followed in the development of gluten-free products are rice, sorghum, maize, millets and teff, and buckwheat, amaranth and quinoa, respectively.

To achieve the necessary food security by following the below best practices:

1. **Use certified suppliers;**
2. **Segregate storage areas;**
3. **Dedicate your processing lines;**
4. **Manage production schedules-** if you can't have dedicated production lines (non-allergenic → allergen products);
5. **Implement proper cleaning techniques;**
6. **Test for the presence of allergens;**
7. **Adapt your processing and distribution to gluten-free specific nuances**

Lactose Intolerance

Lactose intolerance affects about 75% of the world population.

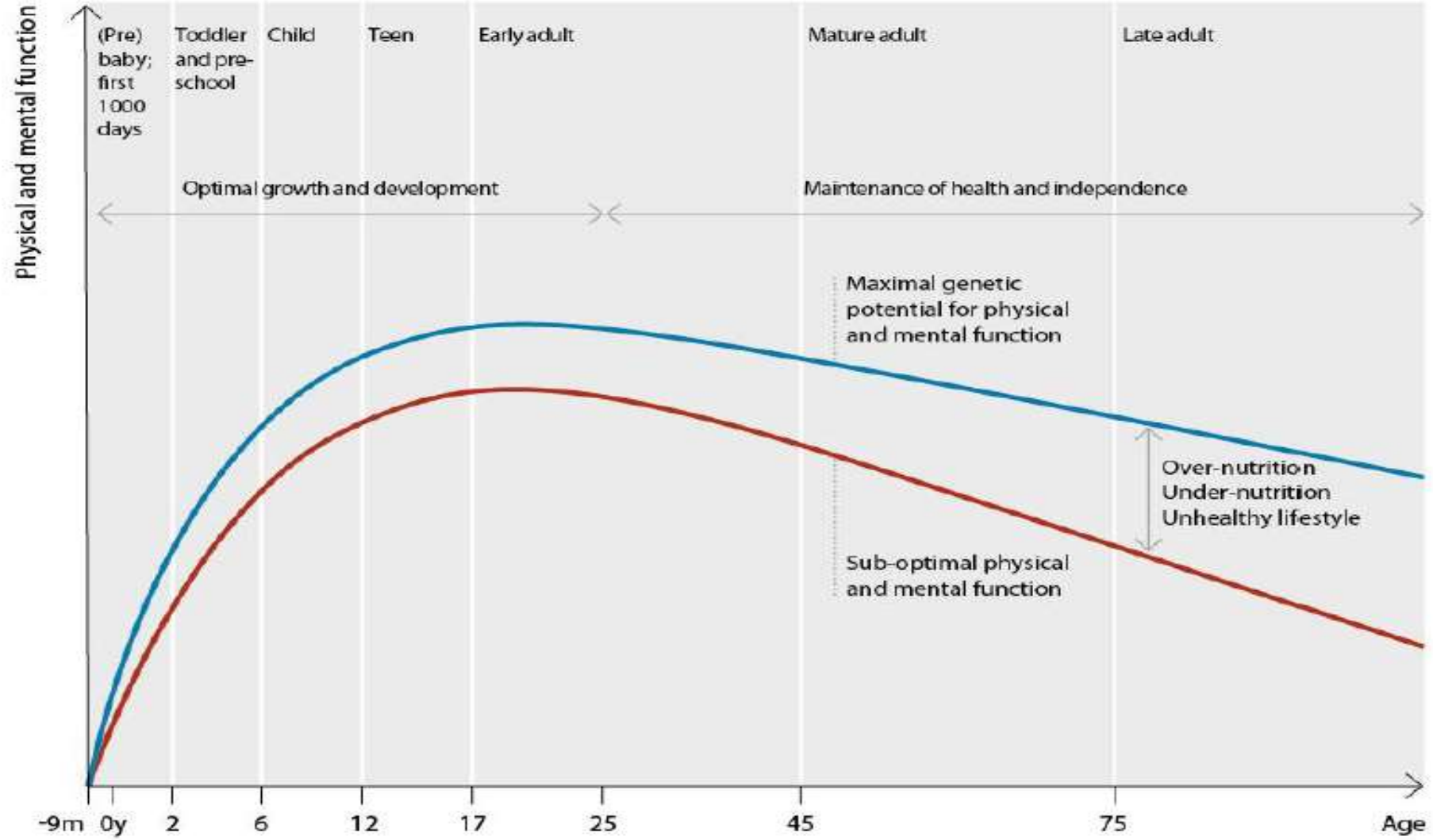
Lactose intolerance occurs when small intestine does not produce enough lactase enzyme to digest lactose

Avoiding foods that contain lactose can lead to calcium and vitamin D deficiency.

It is increasingly necessary to explore and develop alternative sources to dairy products, taking into account the age groups and their nutritional needs.

For the development of lactose-free products, it is necessary to consider that the new product must have a nutritional profile similar to dairy products. Furthermore, it is essential to take into account the RDA (Recommended Dietary Allowances).

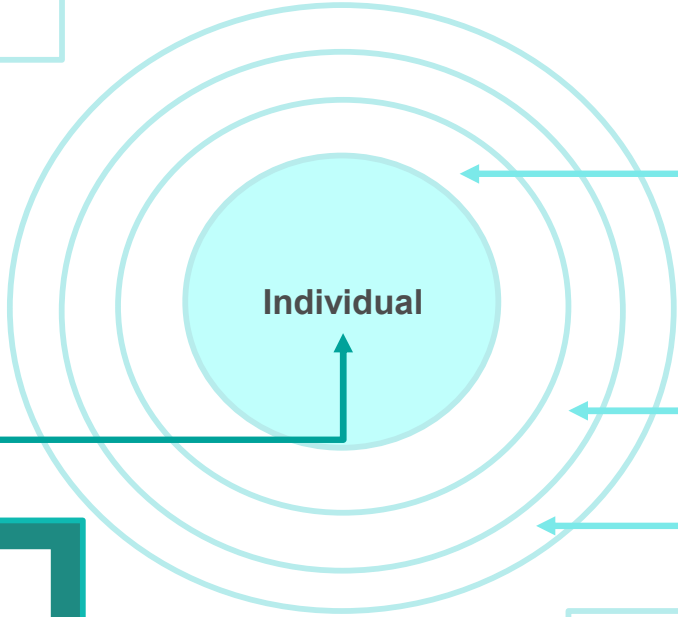
Promoting Optimal Health through the Life Course



Nutrition and Life Course

Macrosystem: Social and health policies, cultural norms and values

Microsystem: Home, School, Work



Mesosystem: Neighbourhood, home-work-social-life relationships

Individual: Lifestyles (nutrition, physical activity), obesity status

Exosystem: Decision from town council regarding use of public spaces for leisure

Children’s Nutrient Needs

- **Children are constantly growing, so they have different nutritional needs compared to adults.**

- **They need access to a variety of vitamins and minerals**

Vitamin D

Principal function

Maintain normal calcium and phosphorus values in the blood for adequate mineralisation of the bones, preventing rickets

Food sources

Oily fish, egg yolks and some mushrooms

Fortified foods: milk, milk flour for babies and breakfast cereals

Iron

Principal function

Required to produce hemoglobin, which carries oxygen from the blood to all cells and it is essential for Brain development

Food sources

Meat, fish, eggs and cereals

The Nutritional Needs of Older People

- **Energy requirements gradually decrease and the density of nutrients in the diet becomes more important**

- **Nutrients needs include :**
  - **Proteins;**
  - **OMEGA-3 fatty acids;**
  - **Dietary fiber;**
  - **Vitamins B6, B12 and E;**
  - **Calcium;**
  - **Magnesium;**
  - **Potassium**

Nutritional Considerations for Vegetarians

Anyone following a vegetarian diet should be mindful to ensure they consumer a balanced range of foods which provide all their nutrient needs. Some nutrients may be deficient without meat consumption, unless specifically included from other sources.

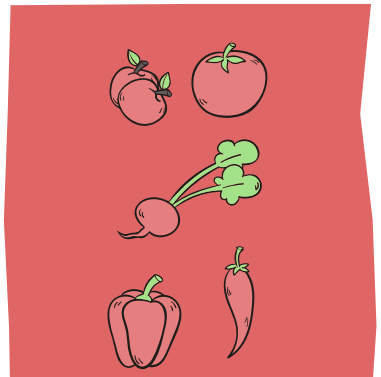
- **Protein**
- **Iron**
- **Zinc**
- **Calcium**
- **Vitamin D**
- **Vitamin B12**
- **Vitamin A**
- **Omega-3 fatty acids**
- **Iodine**

Nutrient Requirements common to both stages of Pregnancy and Lactation

Pregnancy and Lactation increase the demands on the female body and a balanced range of nutrients is required to maintain good health.

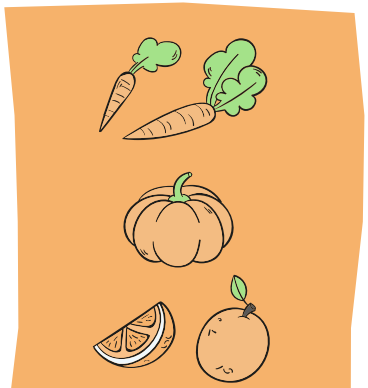
Folate (B9)	Calcium	Vitamin A	Zinc	Vitamin D
Protein	Iodine	Magnesium	Iron	Vitamin B12

Innovation Opportunities for Products to Meet Nutritional & Dietary Needs



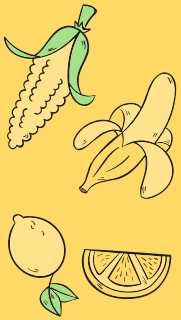
Healthier Versions of Established Products

Providing healthier alternatives for everyday products consumers know and love



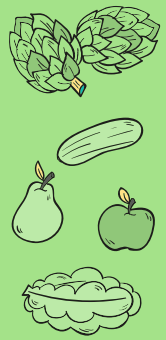
Convenient Healthy Products

Providing healthy options in convenient formats for busy consumers



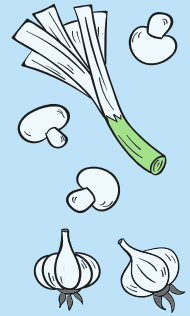
Products for Allergy & Illness Sufferers

Providing a wider range of safe choices for allergy sufferers or those with food intolerances or following a diet to prevent or alieviate illness



Supporting Lifestyle Choices

Providing products that support a blanced diet within lifestyle choices such as Veganism



Fulfilling Lifestage Needs

Providing products which provide targeted nutrition tailored to the needs of consumers age and lifestage

We hope that you have found this training module a useful and helpful support to your healthy food and drink innovation.

This training module is one of a number of training opportunities, organised into themed training programmes to support SME's (small & medium sized enterprises) in the participating regions of Wales, Northern Ireland, Ireland, Spain, Portugal and France to successfully bring new and reformulated healthy food and drink products to market.

The training was created by the partners within the AHFES project
which is a quadruple helix Atlantic area healthy food eco-system for the growth of SME's
funded by the European Union under the Interreg Atlantic Area Funding Programme.

This programme promotes transnational cooperation among 36 Atlantic regions of 5 European countries and co-finances cooperation projects in the fields of Innovation & Competitiveness, Resource Efficiency, Territorial Risks Management, Biodiversity and Natural & Cultural Assets.

For more information about other training available please click here.

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