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# ikifood®

WE SHAPE HEALTH

exclusive
European
distributor

Mirpain
"Milling & Baking Ingredients"

# Introduction

- **Food** is any substance consumed to provide nutritional support for an organism.
- Food is usually of plant, animal or fungal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals.
- Food is converted by oxygen into **energy** for your body, A waste product of this process is carbon dioxide which you then breathe out.

**KEY POINT**

Food and nutrition are the way that we get fuel, providing energy for our bodies. **We need to replace nutrients in our bodies with a new supply every day**.

# Introduction

➔ **The effective management of food intake and nutrition are both key to good health. Smart nutrition and food choices can help prevent disease.**

➔ **How is it necessary?**

Our bodies consist of tiny building blocks known as cells. For your cells to function properly, you need a balanced diet enriched with all the necessary nutrients.

Along with energy, all of these nutrients have specific roles in your body that allows you to function properly.

# NUTRITIONS

## Macro Nutrients

Macronutrients are the nutrients we need in larger quantities that provide us with energy. The human body can release these materials.

- Proteins
- Lipids
- Carbohydrates (Glucose etc)

## Micro Nutrients

Micronutrients are mostly vitamins and minerals, and are equally important but consumed in very small amounts.

- Vitamins
- Minerals

# Macro Nutrients

- Macronutrients are the nutritive components of food that **the body needs for energy and to maintain the body's structure and systems**.
- Carbohydrates, fat and protein are called macronutrients.
- They are the nutrients you use in the largest amounts.

**Macronurients can be categorized into 3 groups:**

- **Proteins**
- **Lipids**
- **Carbohydrates**

# Macro Nutrients

**PROTEINS**

- Proteins are made up of many different amino acids linked together.
- The **amino acid 'letters'** can be arranged in millions of different ways to create 'words' and an entire **protein** **'language'**

- **Some of proteins are enzymes** that allow key chemical reactions to take place within your body.

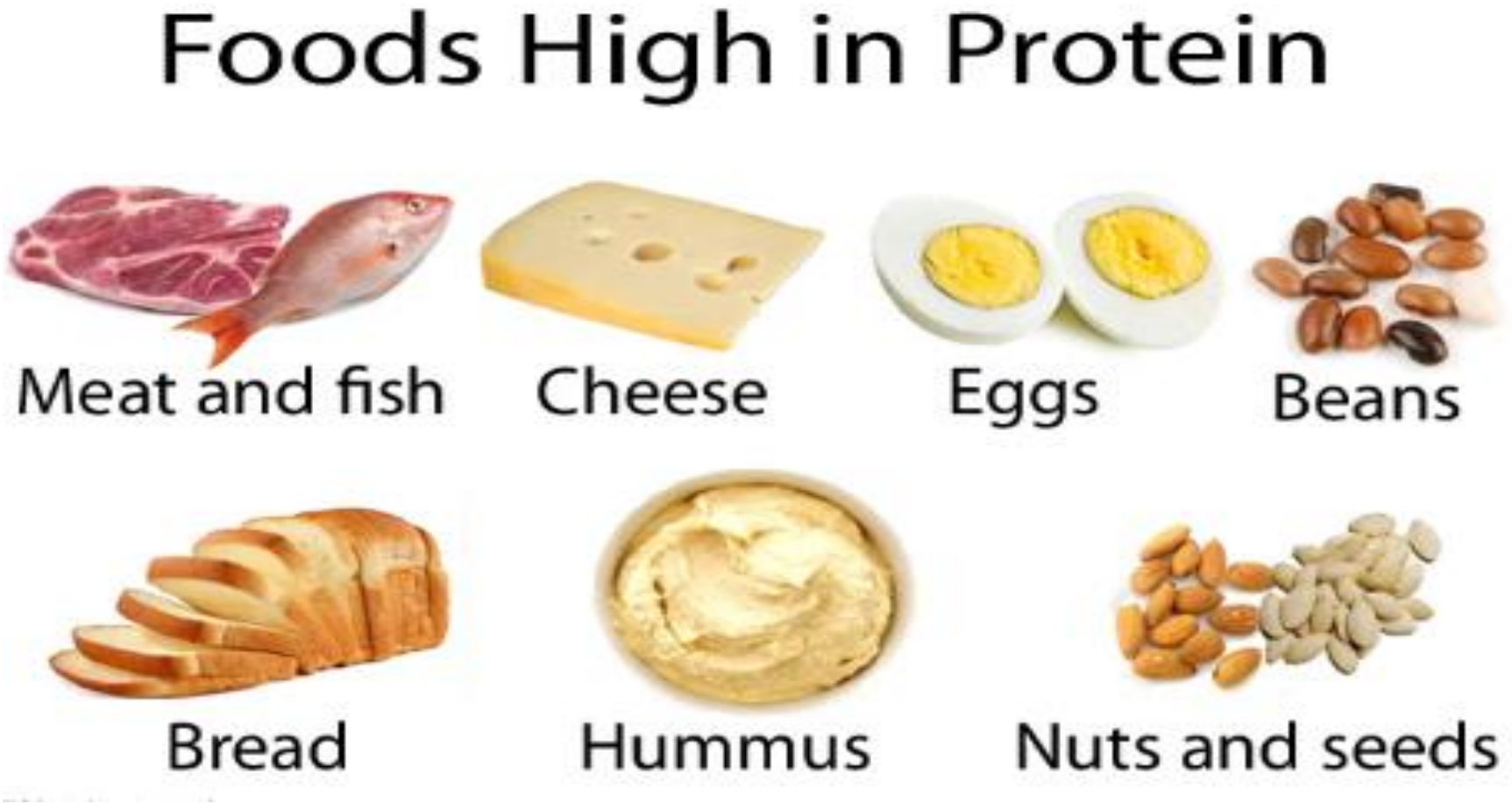
- **Some of proteins are hormones** which are chemical messengers that aid communication between your cells, tissues and organs.

- **Some of proteins** help form immunoglobulins, or antibodies, to fight infection.




# Macro Nutrients

**PROTEINS**

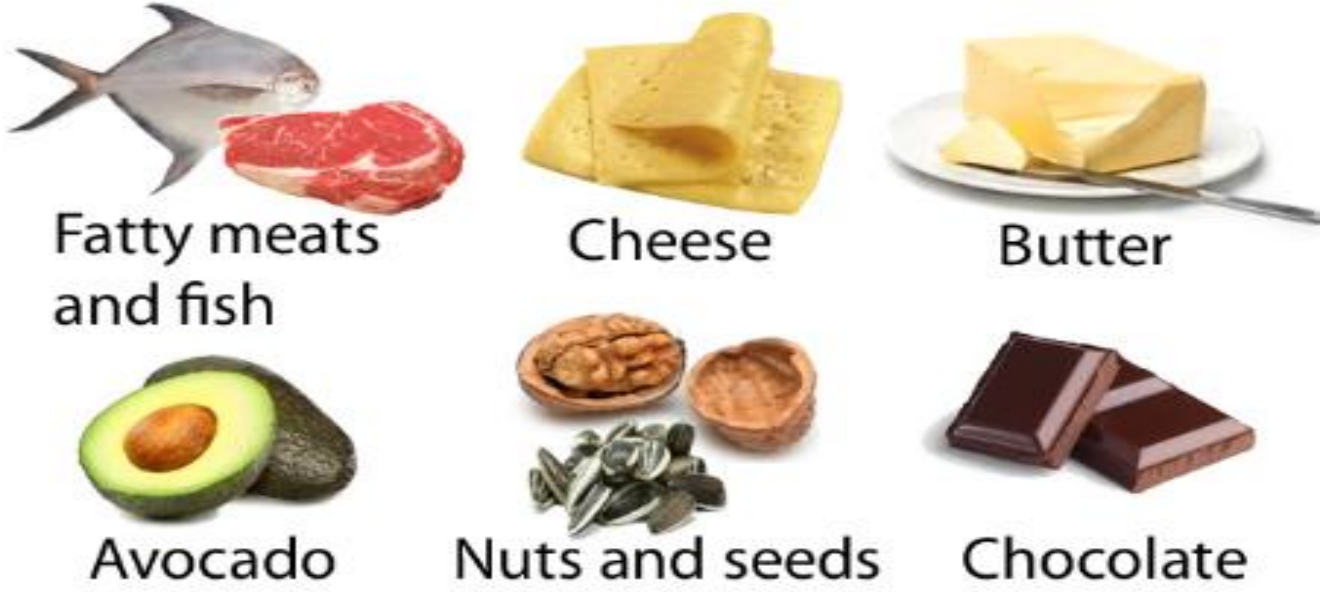


# Macro Nutrients

## LIPIDS

- Lipids are utilized directly from fats present in the diet.
- The main biological functions of lipids include **storing energy,** as lipids may be broken down to yield large amounts of energy.
- Lipids also form the **structural components of cell membranes, and form various messengers and signaling molecules within the body.**

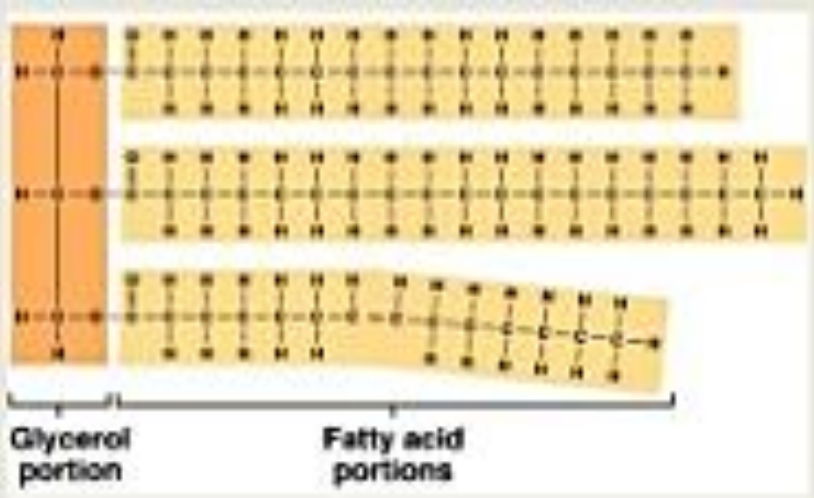
**NATURAL SOURCES**



# Macro Nutrients

## LIPIDS

### Structure of lipids:




The monomer of a lipid is made up of **glycerol** and fatty acids.

**Some of lipids are ;** steroids, tri-glyserid and colestrol.

# Macro Nutrients

## CARBOHYDRATES

➔ Carbohydrates are macronutrients **the sugars, starches and fibers** found in fruits, grains, vegetables and milk products.

### Functions of Carbohydrates

➔ **Carbohydrates are the body's main source of energy.**

➔ **Carbohydrates provide fuel** for the central nervous system and energy for working muscles.

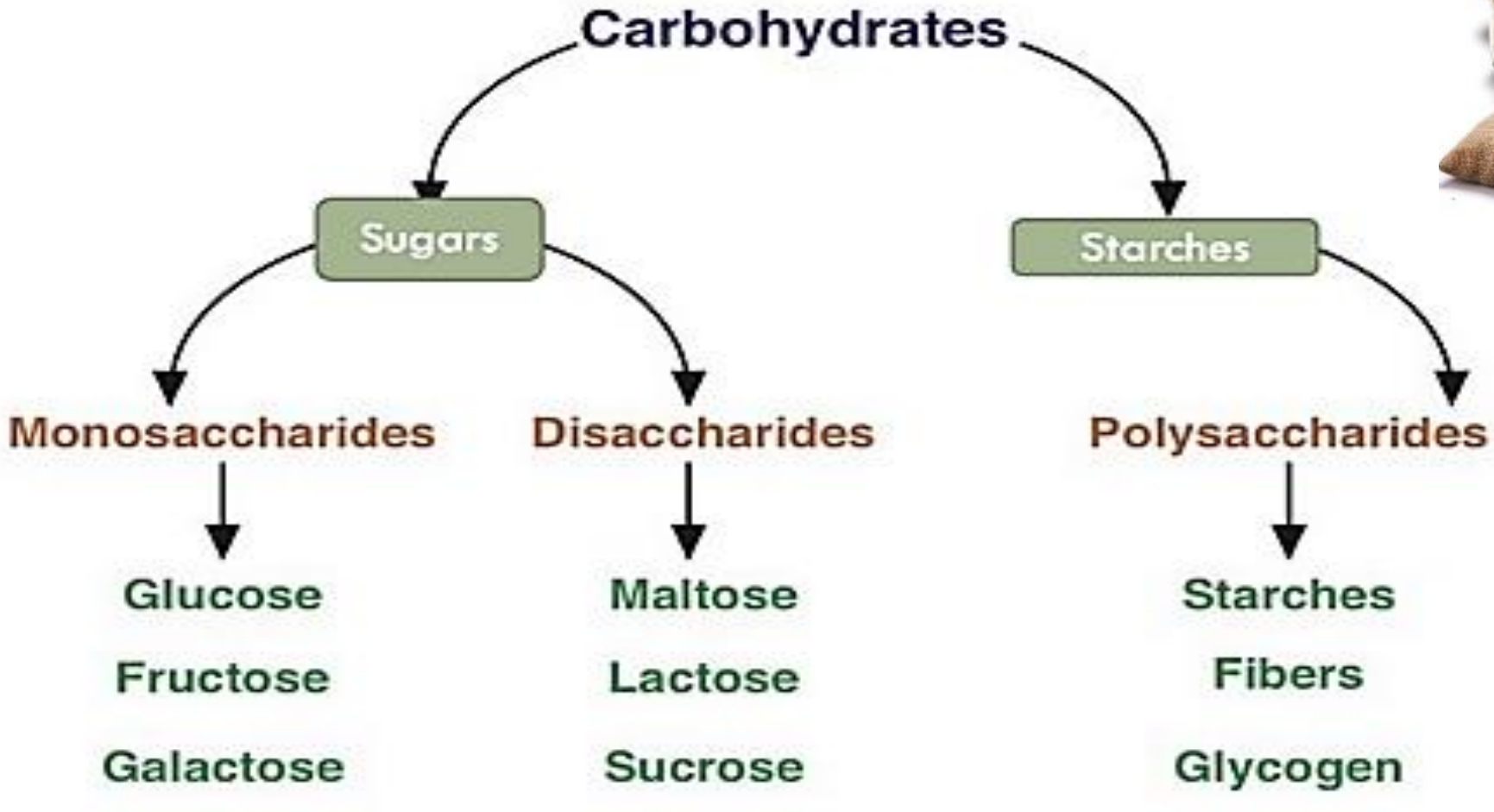
➔ They also **prevent protein from being used as an energy source** and enable fat metabolism.

### NOTE

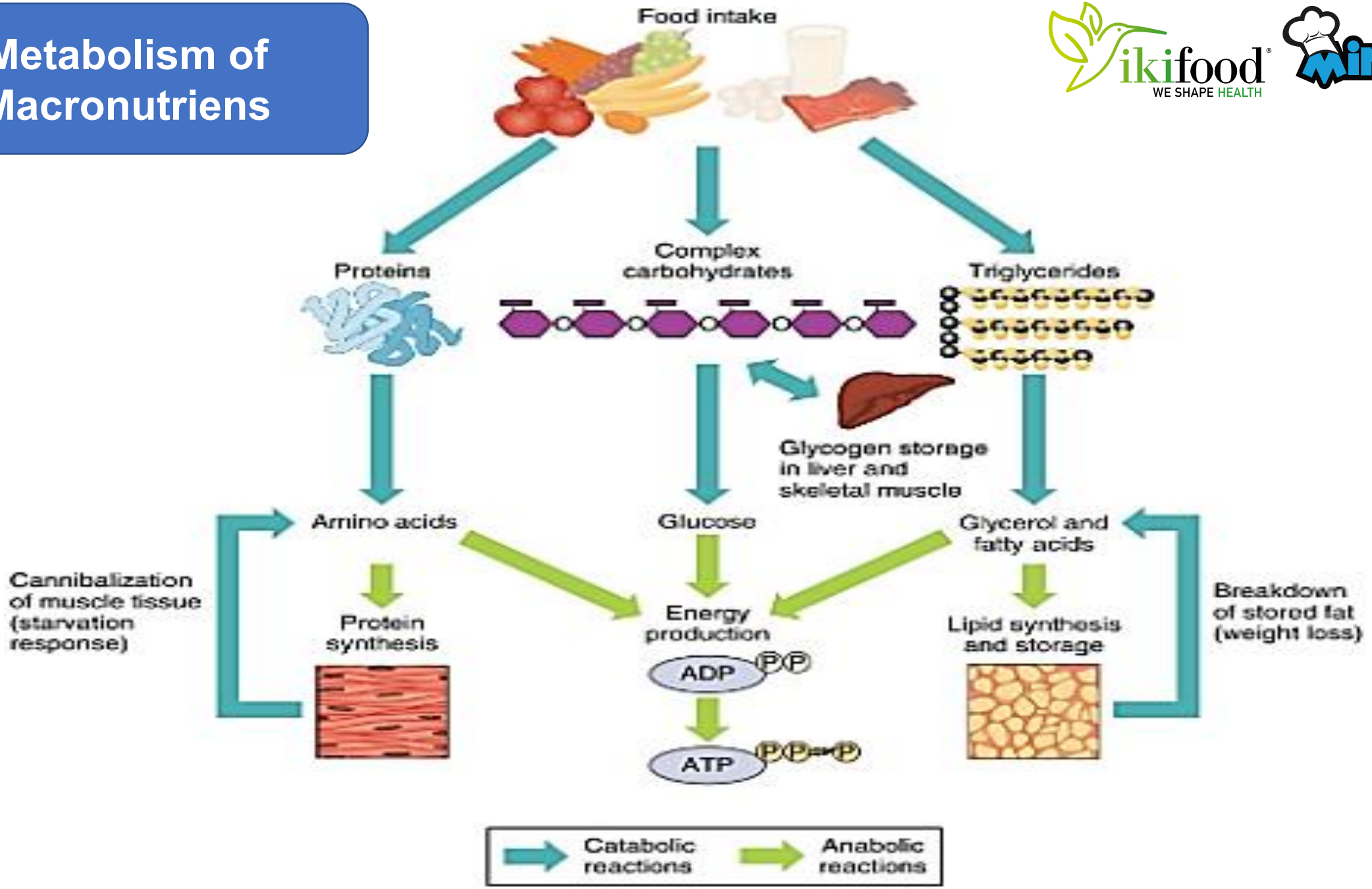
If the glucose is not immediately needed for energy, the body can store up to 2,000 calories of it in the liver and skeletal muscles in the form of **glycogen**.

# Macro Nutrients

## CARBOHYDRATES

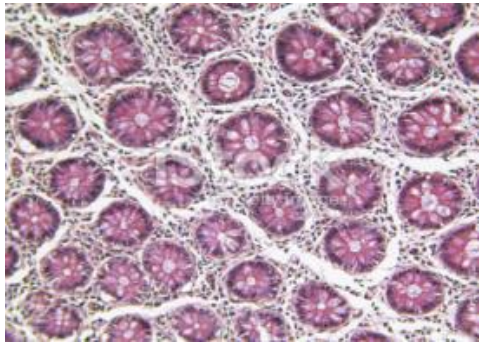


# Metabolism of Macronutriens

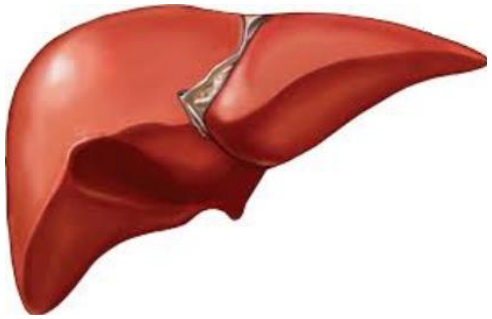


# THE CELL IS THE FUNDAMENTAL UNIT OF LIFE.

CELLS



TISSUE

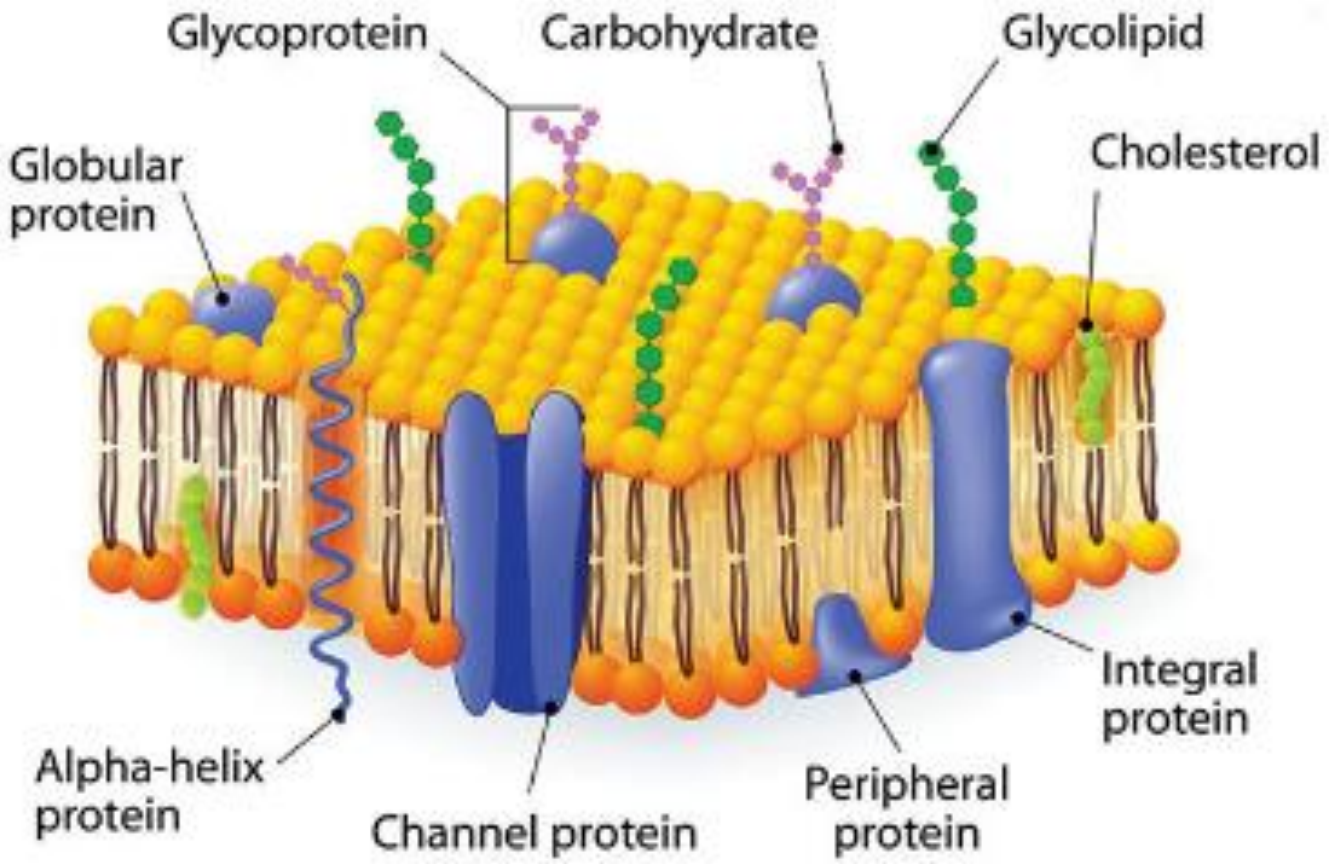


ORGAN

ORGAN SYSTEM

ORGANISM

# Metabolism of Macronutriens




*The membrane of that surrounds a cell is made up of proteins and lipids and carbohydrates.*

# Micronutrient Deficiency

An alarming proportion of world's population suffers from '**malnutrition**' this term leads to micronutrient deficiency.

**ONE OF THE MAJOR PROBLEM OF THE WORLD**

**MALNUTRITION**

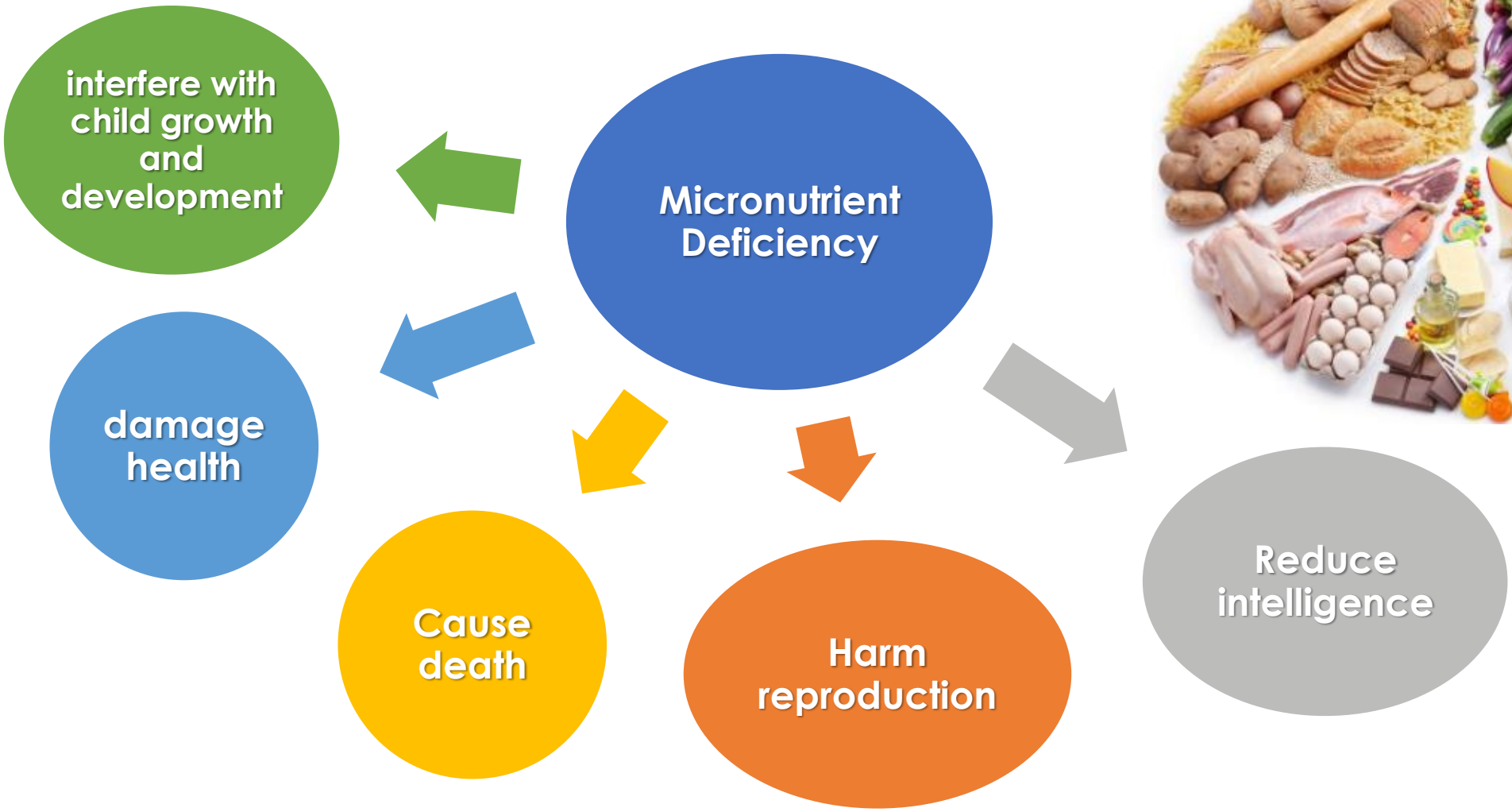
# Micronutrient Deficiency

Micronutrient malnutrition (MNM) is widespread in the industrialized nations, but even more so in the developing regions of the world.

It can affect all age groups, but young children and women of reproductive age tend to be among those most at risk of developing micronutrient deficiencies.

Micronutrient malnutrition has many adverse effects on human health, all of which are clinically evident.

# Micronutrient Deficiency




# Micronutrient

**Micronutrients**

small quantities of **vitamins and minerals** that the body needs for physical and mental development


# Micronutrient

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## MICRONUTRIENTS

### VITAMINS

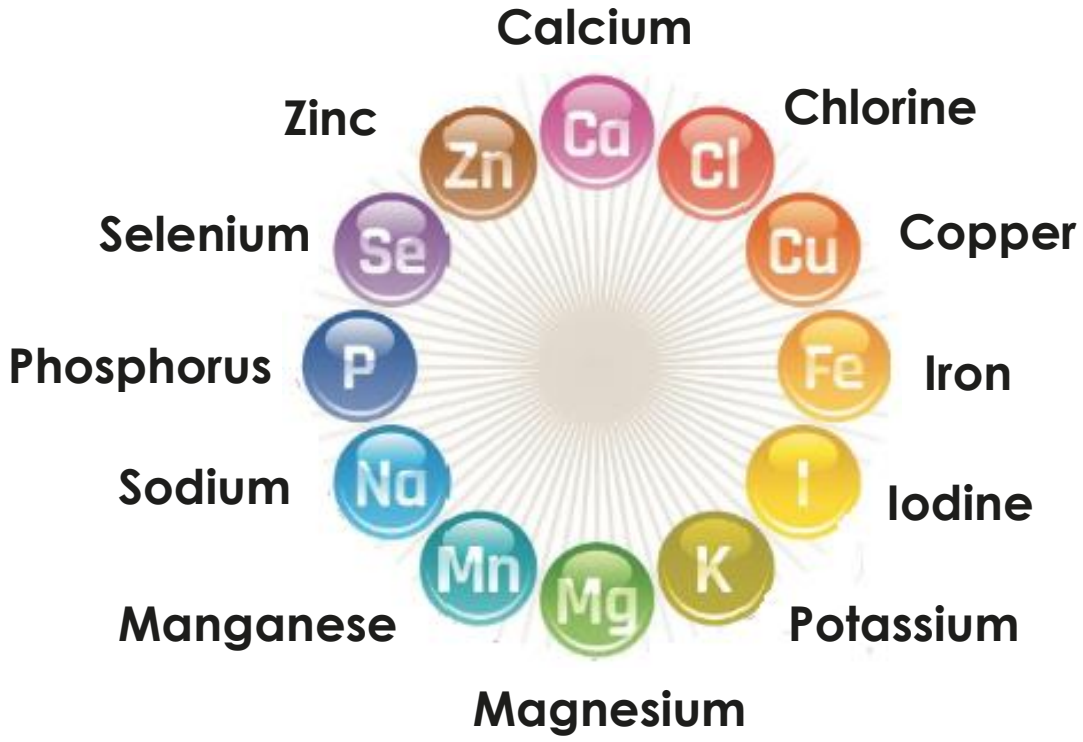
#### WATER-SOLUBLE

- Vitamin B1
- Vitamin B2
- Vitamin B3
- Vitamin B5
- Vitamin B6
- Vitamin B7
- Vitamin B9
- Vitamin B12
- Vitamin C

#### FAT-SOLUBLE

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

### MINERALS



# Vitamins

- Vitamins are organic compounds that people need **in small quantities.**
- Most vitamins need to come from food because **the body either does not produce them.**
- **Different vitamins play different roles in the body, and a person requires a different amount of each vitamin to stay healthy.**
- Having too little of any particular vitamin **may increase the risk of developing certain health issues.**

**Vitamins are either soluble, or dissolvable, in fat or water. We describe both types below:**


WATER-SOLUBLE

FAT-SOLUBLE

# Vitamins

➔ Vegetables and fruits on the diet are the natural sources to get vitamins also industrially produced vitamins are widely used on food fortification, supplements, pharmaceutical sector.

**Industrial Production**

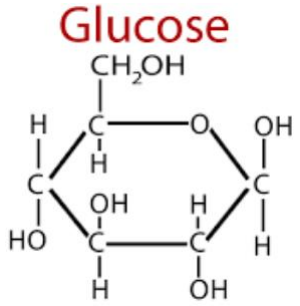
➔ It is called as biosynthesis (fermentation) because of the source materials.

➔ It is used natural ingredients as a source to synthesis of vitamins for instance glucose.

➔ There is a microbial producer like bacteria, yeast to produce vitamins.

Microbial Producer

+




Natural Source

Fermentor

# Vitamins

## WATER-SOLUBLE VITAMINS

The **water-soluble** vitamins — C and the B-complex vitamins (such as vitamins B6, B12, niacin, riboflavin, and folate) — need to dissolve in water before your body can absorb them.

**Because of this**

your body **can't store** these vitamins. Any vitamin C or B that your body doesn't use as it passes through your system is lost (mostly when you pee).

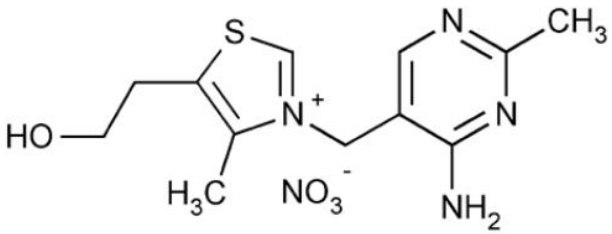

So you need a fresh supply of these vitamins **every day.**

# Vitamins

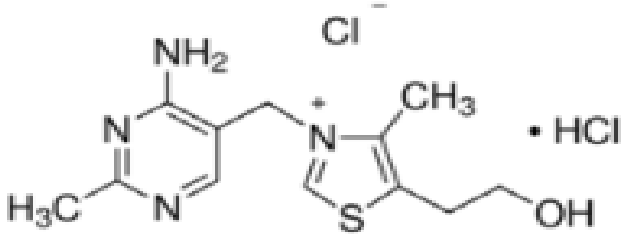
## VITAMIN B1

Vitamin B1 is a water-soluble vitamin, as are all vitamins of the B complex.

**Raw Material Sources**




**Thiamine Mononitrate**




**Thiamine Hydrochloride**

**Natural Sources**

**Meat, fish, liver, yeast and grains (included wheat, breakfast cereals, breads) are a good source of Vitamin B1**

# Vitamins

## VITAMIN B1

**Deficiency**

It helps prevent complications in the nervous system, brain, muscles, heart, stomach, and intestines.

A deficiency of vitamin B1 commonly leads **to beriberi**, a condition that features problems with the peripheral nerves and wasting.

There may be mental problems, including confusion and short-term memory loss.

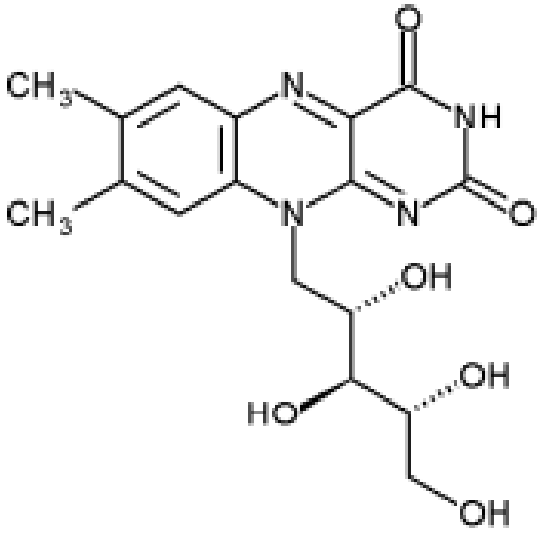
# Vitamins

## VITAMIN B2

Also called riboflavin, is one of eight B vitamins.

**Raw Material Source**

**Riboflavin**




**Natural Sources**

It is found in grains, cruciferous vegetables and dairy products.

# Vitamins

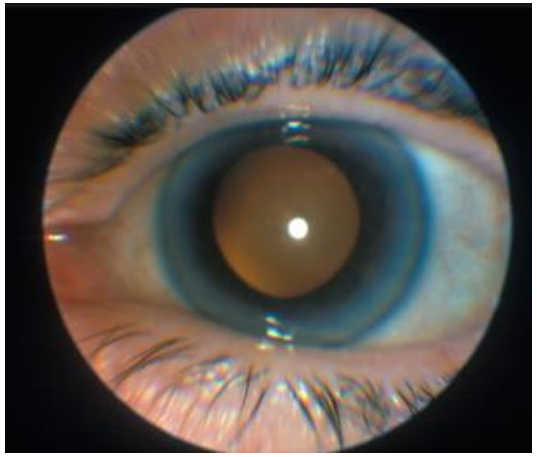
## VITAMIN B2

**Deficiency**

Vitamin B2 helps break down proteins, fats, and carbohydrates. It plays a vital role in maintaining the body's energy supply.

Riboflavin helps convert carbohydrates into adenosine triphosphate (ATP). The compound **ATP is vital for storing energy in muscles**.

**Mouth an toung ulcers**



**Eye fatigue - cataract**

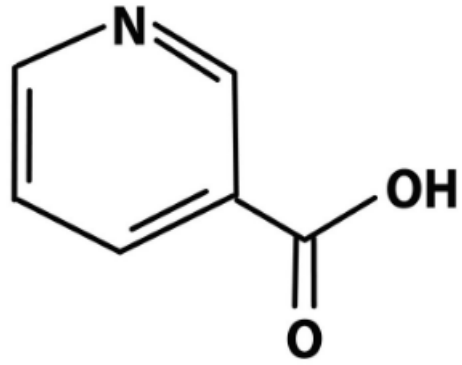
**Sensitivity to light**

# Vitamins

## VITAMIN B3

It is also known as niacin.

**Vitamin B3**
Niacin




**Raw Material Source**

**Niacinamide**

**Natural Sources**

**It is found in beans, beef, enriched grain products (e.g., bread, cereal, pasta, rice), nuts, pork, poultry, seafood and hole grains.**

# Vitamins

## VITAMIN B3

**Deficiency**

Niacin also helps the body **make various sex and stress-related hormones** in the adrenal glands and other parts of the body.

Other possible benefits of vitamin B-3 stem from its **potential cholesterol-lowering**, antioxidative, and anti-inflammatory properties.

A severe lack of vitamin B-3 can **result in pellagra.**

**Canker sores**

**Vomiting**

**Indigestion**

**Pellagra**

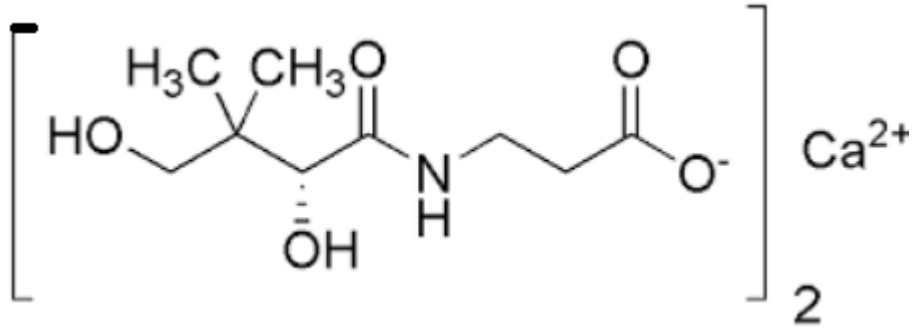
# Vitamins

## VITAMIN B5

Also called pantothenic acid, is one of eight B vitamins.

**Raw Material Source**

**D-Calcium Pantothenate**




**Natural Sources**

**It is found in beef liver, shiitake mushrooms, sunflower seeds, chicken, tuna, avocados and fortified breakfast cereals.**

# Vitamins

## VITAMIN B5

Deficiency

Pantothenic acid is **necessary** for the body **to create new coenzymes, proteins, and fats.**

**Hormone production**, Nervous system function and **Red blood cell formation**

**numbness and burning of the hands and feet**

**headache**

**irritability**

**A lack of appetite**

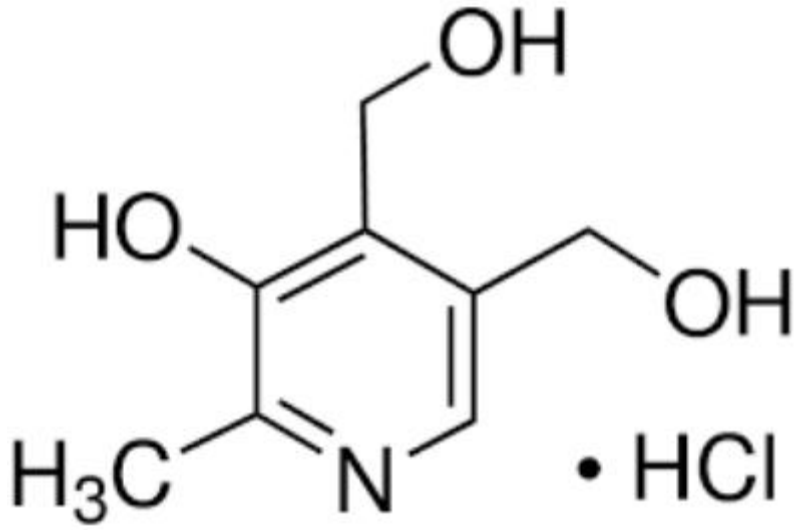
# Vitamins

## VITAMIN B6

Also called pyridoxine, is one of eight B vitamins.

**Raw Material Source**

**Pyridoxine Hydrochloride**




**Natural Sources**

**It is found in Chickpeas, Fruits (other than citrus), Potatoes, Salmon, Tuna.**

# Vitamins

## VITAMIN B6

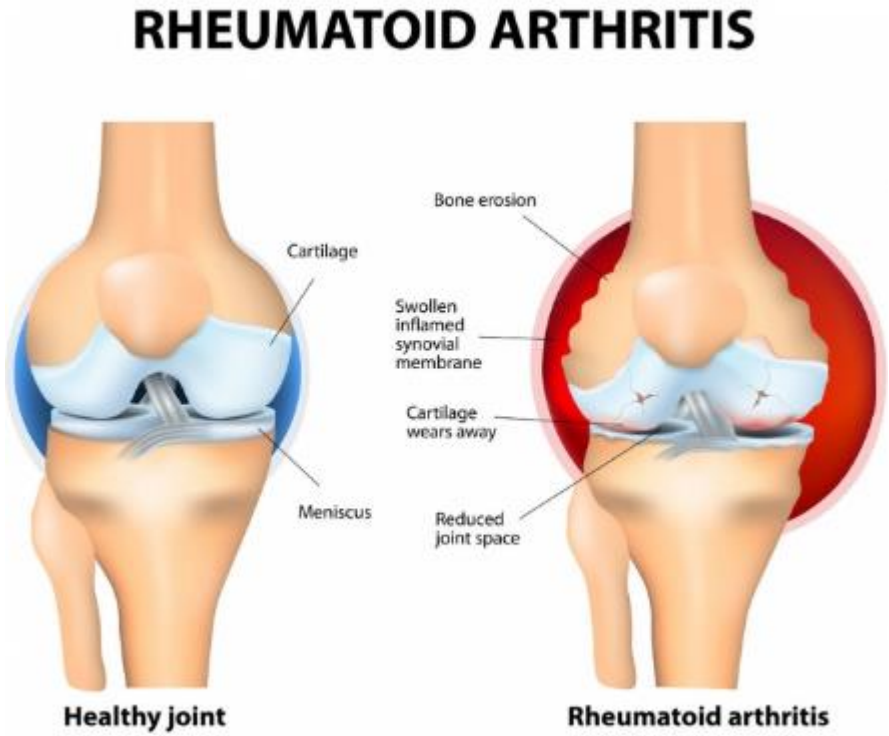
**Deficiency**

It plays role in amino acid metabolism, breaking down carbohydrates and fats, **brain development and immune function**.

Also, it reduces risks of developing AMD, an eye disease that can cause vision loss.


**Age-Related Macular Degeneration (AMD)**

**Heart Disease**



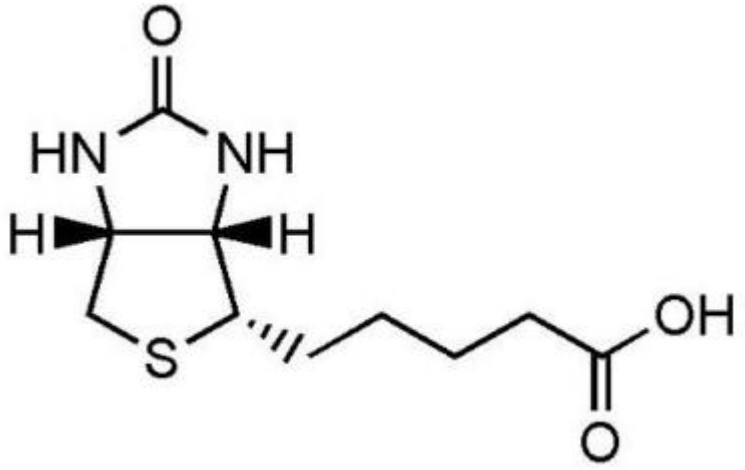
# Vitamins

## VITAMIN B7

Also called vitamin H, is one of eight B vitamins.

**Raw Material Source**

**Biotin**




**Natural Sources**

**It is found in organ meats, eggs, salmon, pork, beef and sunflower seeds.**

# Vitamins

## VITAMIN B7

**Deficiency**

It plays role on breaking down fats, carbohydrates, and protein, communication among cells in the body and **regulation of DNA**.

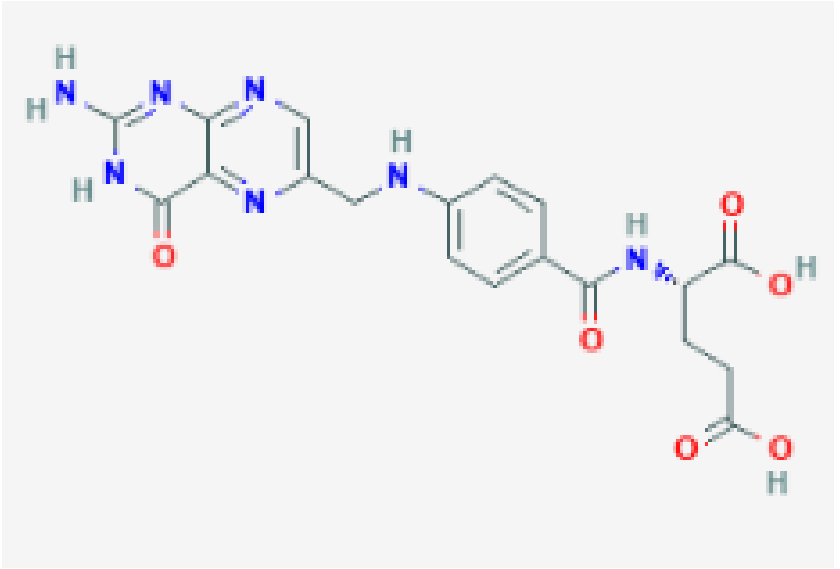
**Biotin has vital metabolic functions**. Without biotin as a co-factor, many enzymes do not work properly, and serious complications can occur, including seborrheic dermatitis, **dry skin**, brittle hair/**hair loss**, fatigue, intestinal tract issues, **muscle pains**, and nervous system issues.

# Vitamins

## VITAMIN B9

Also called folic acid, is one of eight B vitamins.

**Raw Material Source** → **Folic Acid**



**Natural Sources** → **It is found in Asparagus, Avocados, Beans and peas, Enriched grain products (e.g., bread, cereal, pasta, rice), Green leafy vegetables (e.g., spinach), Oranges and orange juice**

# Vitamins

## VITAMIN B9

**Deficiency**

It plays role on **prevention of birth defects**, protein metabolism and **red blood cell formation.**

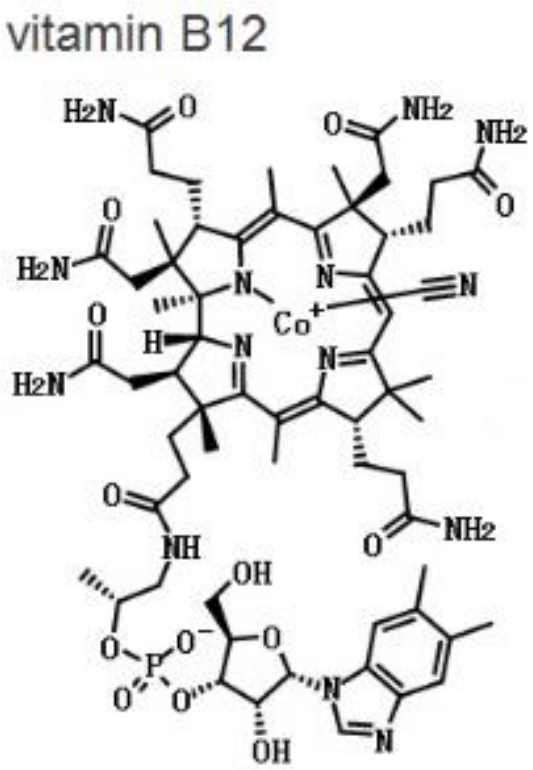
It is also necessary for **DNA replication**, metabolism of vitamins, metabolism of amino acids and proper cell division.

# Vitamins

## VITAMIN B12

Also called cyanocobalamin, is one of eight B vitamins.

**Raw Material Source** → **Vitamin B12**




**Natural Sources** → **It is found in dairy products, eggs, fortified cereals, meat, poultry, seafood (e.g., clams, trout, salmon, haddock, tuna)**

# Vitamins

## VITAMIN B12

It plays role on conversion of food into energy, nervous system function, **red blood cell formation.**

**Deficiency**

It leads to fatigue, weight loss, constipation, loss of appetite, numbness and tingling in the hands and feet, **memory problems** and depression.

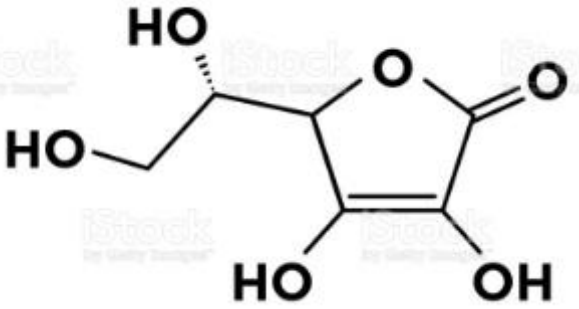
May support bone health and prevent **Osteoporosis**.


# Vitamins

## VITAMIN C

Also called ascorbic acid, is one of water-soluble vitamins.

**Raw Material Source**




**Vitamin C**
**L-Ascorbic Acid**

**Natural Sources**

**It is found in fruit (e.g., cantaloupe, citrus fruits, kiwifruit, and strawberries), juices (e.g., oranges, grapefruit,
and tomato), vegetables (e.g., broccoli, Brussels sprouts, peppers, and tomatoes).**

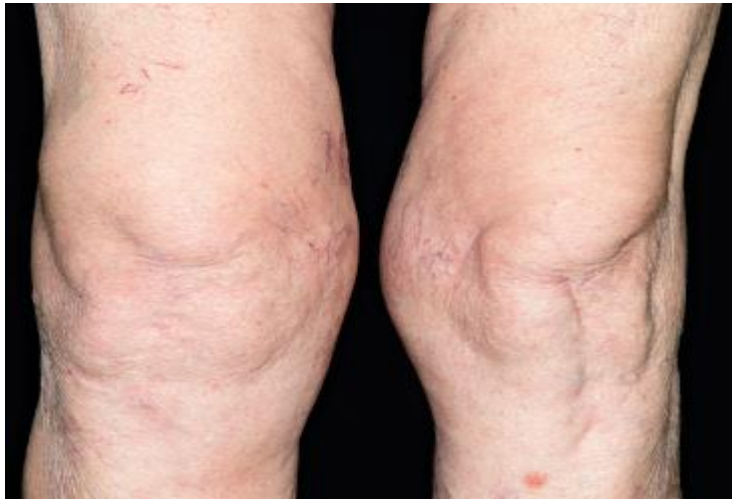
# Vitamins

## VITAMIN C

**Vitamin C** (also known as ascorbic acid) is A water-soluble **vitamin** and powerful antioxidant, it helps the body form and maintains connective tissue, including bones, blood vessels, and skin.

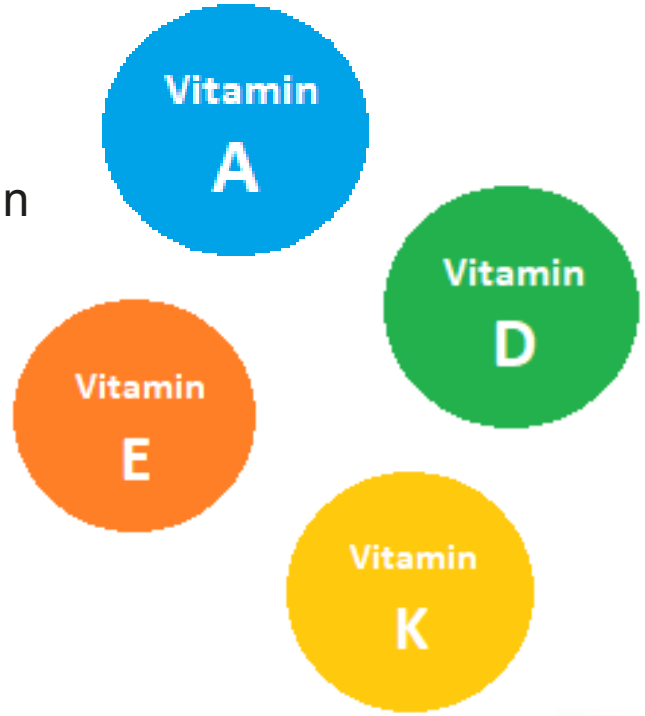
**Deficiency**

### Osteoarthritis



# Vitamins

## FAT-SOLUBLE VITAMINS




The **fat-soluble** vitamins — A, D, E, and K — dissolve in fat and can be stored in your body.

Fat soluble vitamins are a whole group on their own, **re-emerging in importan**

The body does not need these vitamins every day and stores them in the liver and adipose (fat) tissue when not used; there is, therefore, **a risk of toxicity** from supplementing megadoses.

Fat-soluble vitamins have a diversity of functions that range from strengthening the **immune system** to maintaining **healthy bones and skin, vision, enabling blood clotting and so much more**.

# Vitamins

## VITAMIN A

The main role of vitamin A in the body is to facilitate normal vision by producing the pigments of the retina in the eyes, as well as to support the bones, teeth, skin, and mucous membranes.

**Raw Material Source**

**Vitamin A Palmitate (Retinyl Palmitate)**

**Vitamin A Acetate (Retinyl Acetate)**


**Natural Sources**

**beef, chicken, liver, fish, carrots, spinach, sweet potatoes**

# Vitamins

## VITAMIN A

While it is advisable to ensure you eat foods that are rich in vitamin A, it is important to be cautious, **as too much vitamin A can cause problems.**

The primary function of vitamin A is to **support vision**.

It also plays important roles in the development of bones, including the teeth. In addition, vitamin A aids **immune function** and helps **provide a barrier against infections** of the skin, lungs and mouth.

# Vitamins

## VITAMIN A

### Vitamin A Deficiency


Night Blindness

Bitot Spots

# Vitamins

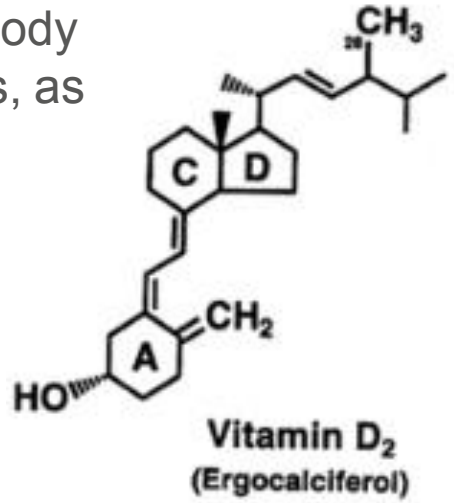
## VITAMIN D

The principal roles of vitamin D in the body are to help the body **absorb calcium** in order to build and maintain strong bones, as well as to strengthen the immune system.

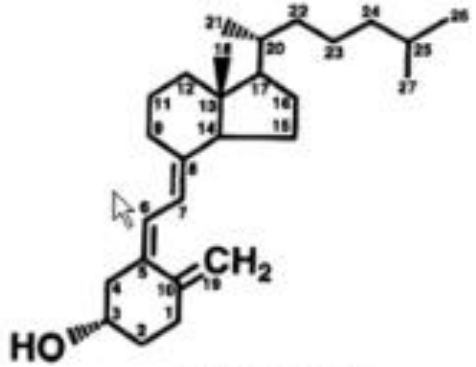
**Raw Material Source**

**Vitamin D2 (Ergocalciferol)**

**Vitamin D3 (Cholecalciferol)**



Vitamin $D_2$ (Ergocalciferol)



Vitamin $D_3$ (Cholecalciferol)

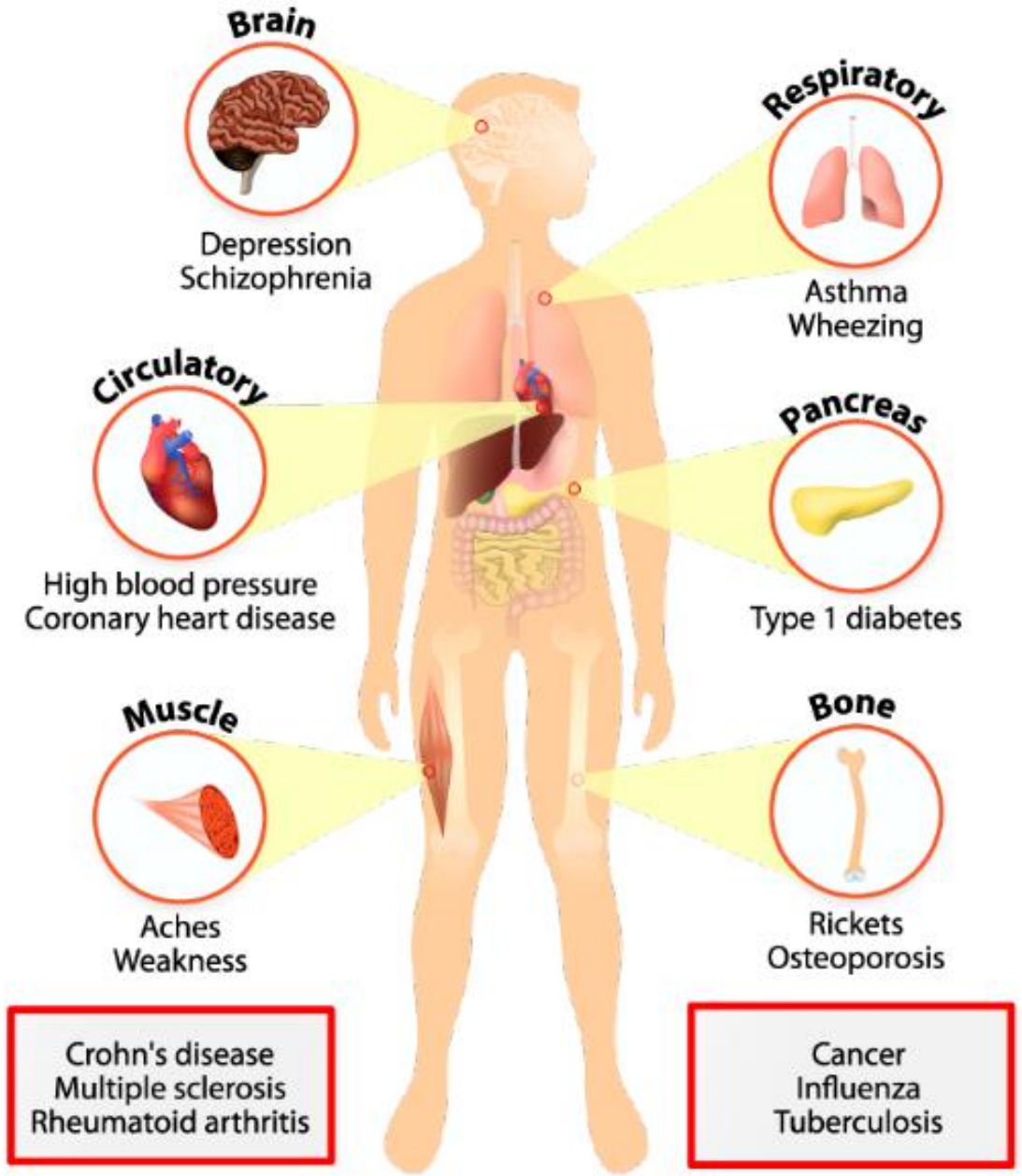
**Natural Sources**

**sources of vitamin D include fatty/oily fish (salmon, sardines, trout, mackerel), cod liver oil, and egg yolks.**

# Vitamins

## VITAMIN D

**Deficiency**



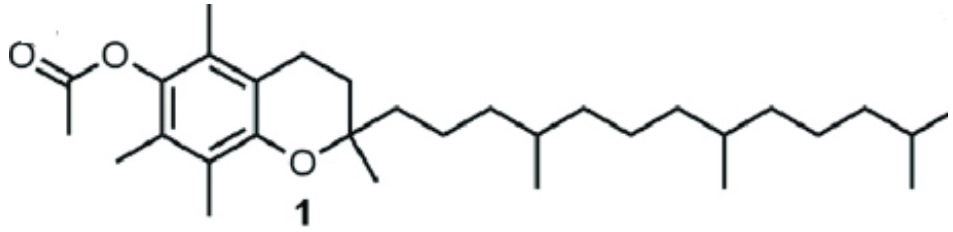

Some of vitamin D deficiency include recurrent bacterial and viral infections, **bone pain** (especially back pain), decreased bone density (**rickets in children, osteoporosis in adults**), mood deterioration (**particularly depression**), slow wound healing, and **muscle pain**.

# Vitamins

## VITAMIN E

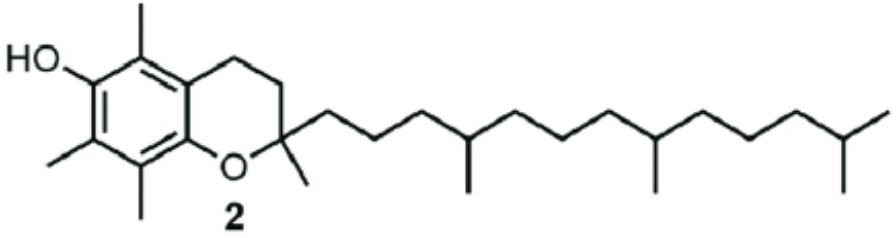
Vitamin E is a fat-soluble nutrient found in many foods.

In the body, it acts as **an antioxidant**, helping to protect cells from the damage caused **by free radical.**




1

Vitamin E acetate




2

Vitamin E

**Raw Material Source**

**Vitamin E Acetate**
**(as alpha tocopherol)**

**Natural Sources**

**sources of vitamin include fortified cereals and juices, green vegetables (e.g., spinach and broccoli), nuts and seeds, peanuts and peanut butter, vegetable oils**

# Vitamins

## VITAMIN E

**Deficiency**


When vitamin E does occur, it is usually due to an underlying medical illness such as **cystic fibrosis, cholestasis, Crohn's disease, chronic pancreatitis, and primary biliary cirrhosis**. Vitamin E deficiency can also occur as a result of genetics and **in premature infants**.

# Vitamins

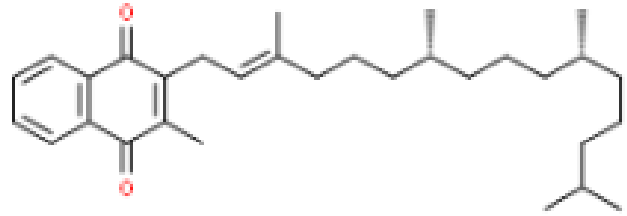
## VITAMIN K

Vitamin K has 2 major forms- vitamin K1 (phylloquinone) and vitamin K2 (menaquinone).

Is an important factor in **bone health** and wound healing and is a fat-soluble vitamin **that makes proteins** for healthy bones and normal blood clotting.

**Raw Material Source**

**Vitamin K1**
**(Phylloquinone)**



**Vitamin K2**
**(Menaquinone)**

**Natural Sources**

**sources of vitamin K include green vegetables (e.g., broccoli, kale, spinach, turnip greens, collard greens, Swiss chard, mustard greens)**

# Vitamins

## VITAMIN K

**Deficiency**

Vitamin K's main role is in **blood clotting**, which is **necessary to prevent uncontrolled bleeding**. It aids in the production of the proteins that facilitate blood clotting.

# Minerals

Minerals are essential nutrients which are required for growth, repair and regulation of vital body functions.

Minerals are also important for making enzymes and hormones.

**Minerals can be categorized into 3 groups:**

- **Major minerals**
- **Trace minerals**
- **Trace contaminants (heavy metals)** without known function: **Lead, mercury, arsenic, cadmium and aluminum**

# Minerals

Minerals include calcium, phosphorus, potassium, sodium, chloride, magnesium, iron, zinc, iodine, chromium, copper, fluoride, molybdenum, manganese, and selenium etc.


**MINERALS**

**MAJOR ELEMENTS**

- Potassium
- Calcium
- Phosphorus
- Magnesium

**TRACE ELEMENTS**

- Iron
- Zinc
- Iodine
- Selenium
- Copper
- Manganese

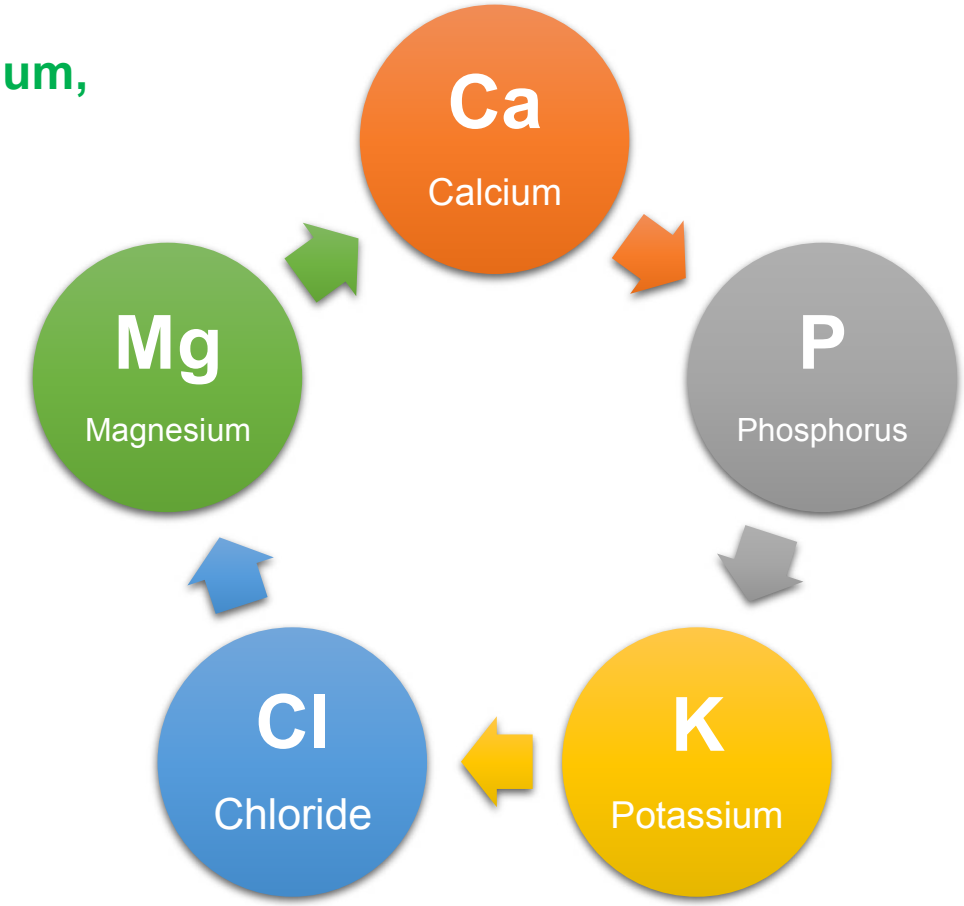
**HEAVY METALS**

- Arsenic
- Aluminum
- Cadmium
- Mercury
- Lead

# Macrominerals

The macrominerals are **calcium, phosphorus, magnesium, sodium, potassium, chloride.**

- **Macrominerals are needed in large amounts.**
- **They are vital to health.**
- **Required in the diet by more than 100mg per day**.



# Macrominerals

## Calcium

Calcium is 1.5-2% of the body weight of an adult human.

An average adult body contains about 1200 gm of calcium of which present in bones (more than 98%)

The developing fetus requires about 30 g of calcium.

**Severe Sweating– loss of 42-121mg/day**

**Natural Sources** → **Milk and milk products, egg, fish, Green leafy vegetables, millets, cereals and Water**

# Macrominerals

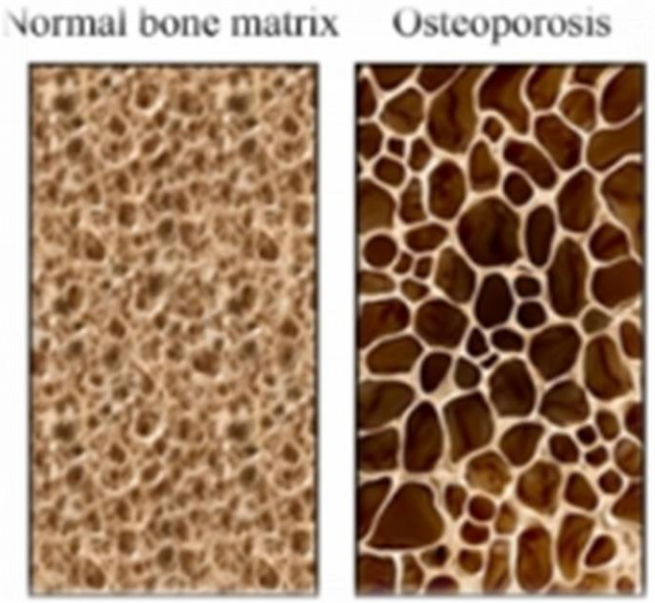
## Calcium

**Function of Calcium :** Bone formation, Teeth Formation, Contraction of the heart and skeletal muscle, Acts as an activator for enzymes.

## Deficiency

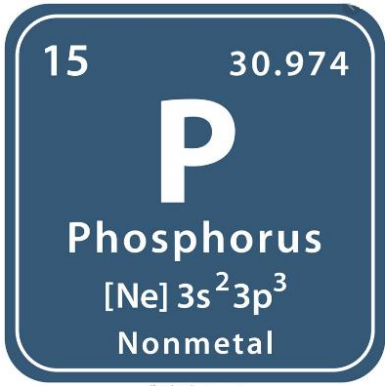
**Effects in Adults:**
Osteoporosis
Fractures of brittle bone by miner accidents

**Effects in Children:**
- Decreased rate of growth
- Osteoporosis
- Hyperplasia of parathyroid gland



# Macrominerals

## Phosphorus




Phosphorus makes up about **0.65–1.1% of the adult body (~600 g)**

**85%-Bones and teeth**, **15%- soft tissue.**

FAO/WHO Committees have suggested that **phosphorus intake should be at least equal to calcium intakes** in most age groups, except in infancy where the ratio suggested is 1:1.5 (P:Ca)

**Natural Sources**

**Milk and milk products, egg, fish, vegetables, cereals, pulses, nuts and Oil seed.**

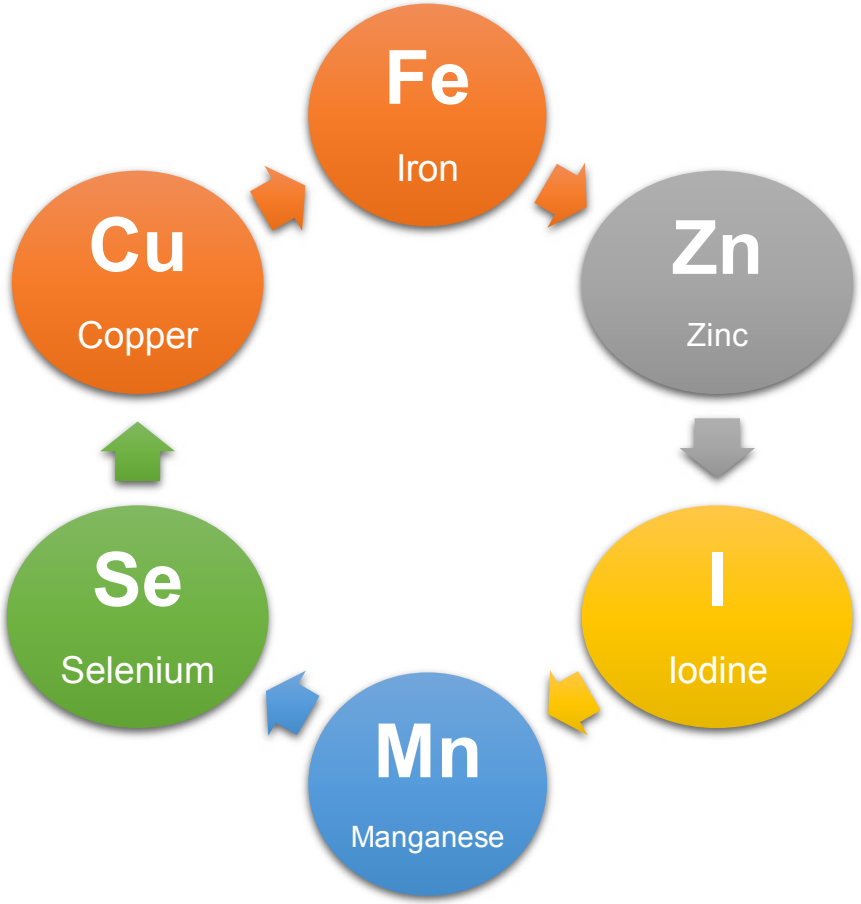
**Deficiency**

- **Bone and Teeth Formation**
- Phosphorus is also used in cell membranes.
- **DNA and RNA also contain phosphorus.**

# Microminerals

The microminerals are **iron, zinc, iodine, manganese, selenium, copper, etc.**

- ➔ **Microminerals are needed in small amounts.**
- ➔ **They are vital to health.**
- ➔ **İt is also called as trace elements**
- ➔ **Required in the diet by less than 20mg per day.**

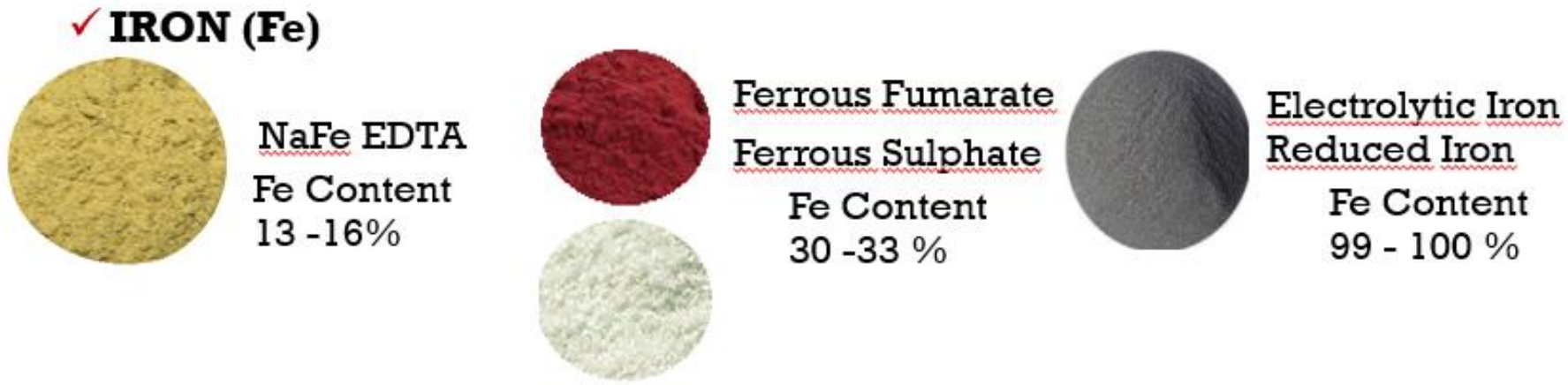


# Microminerals

## IRON (Fe)

Iron deficiency is the most common nutritional disorder in the world, and **is a public health problem** in both industrialized and non-industrialized countries.

**Raw Material Source**




**Natural Sources**

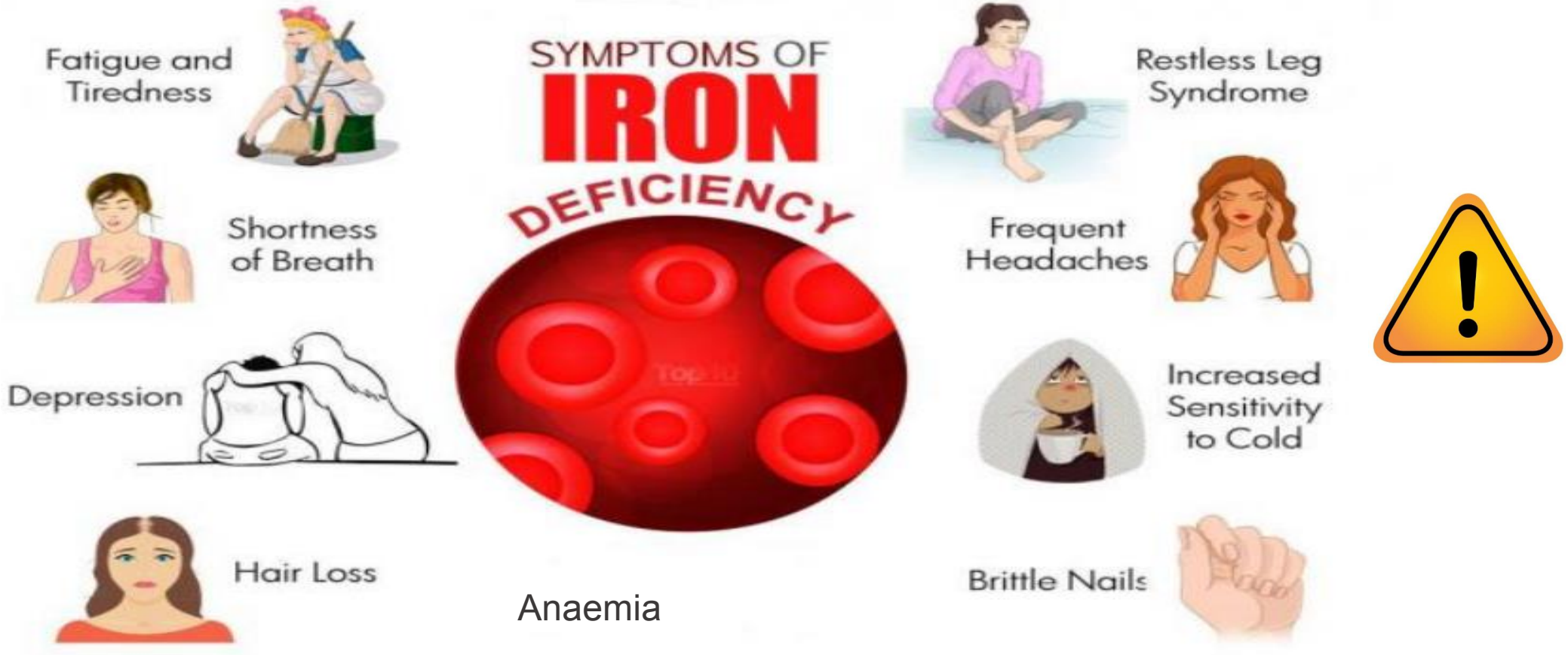
**Organ meats; red meats; fish; poultry; shellfish (especially clams); egg yolks; legumes; dried fruits; dark, leafy greens; iron-enriched breads and cereals; and fortified cereals**

# Microminerals

## IRON (Fe)

### Deficiency

If you don't have enough iron, **your body can't make enough healthy oxygen-carrying red blood cell**s. A lack of red blood cells is called **iron deficiency anaemia**. Without healthy red blood cells, your body can't get enough oxygen.

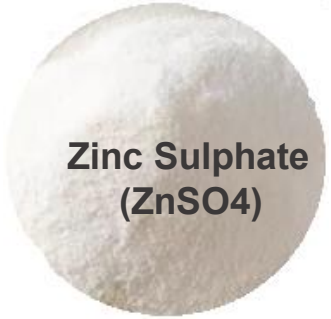


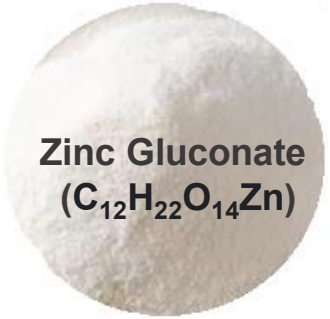
# Microminerals

## ZINC (Zn)

Zinc is essential for growth and sexual development. There are three type of raw materials : Zinc Oxide, Zinc Gluconate and Zinc Sulphate.

**Raw Material Source**


**Natural Sources**

**Meats, fish, poultry, leavened whole grains, vegetables**

# Microminerals

## ZINC (Zn)

**Deficiency**

**Zinc is a part of many enzymes**; needed for making protein and genetic material; has a function in taste perception, wound healing, **normal fetal development**, production of sperm, normal growth and **immune system health**.

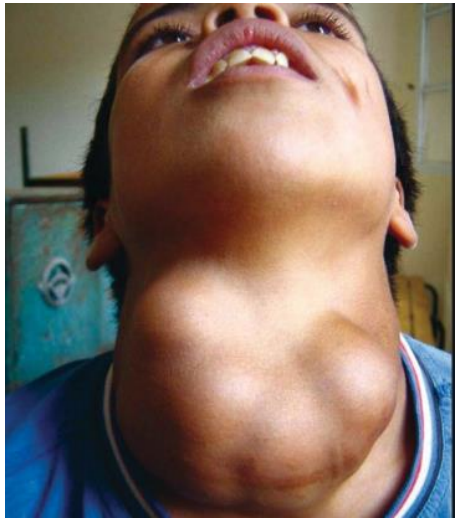
# Microminerals

## Iodine (I)

Iodine is a critical mineral in the body.

It is a component of the **thyroid hormone** and is required for normal thyroid function.

Iodine deficiency can **cause brain damage, mental retardation, hypothyroidism, goiter, and other health problems.**



Additionally, in the US and many other countries, **salt is fortified with iodine to prevent deficiencies in the population.**

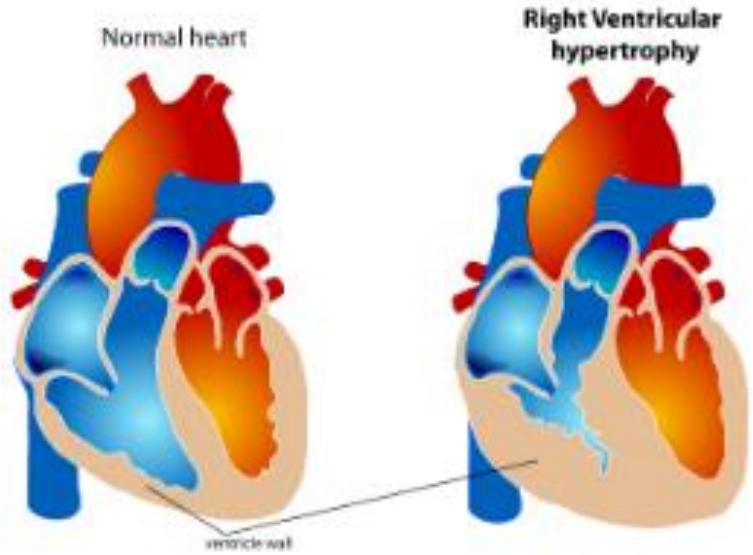
**Natural Sources**

Iodine is found naturally in **seafood, dairy products, grains, eggs, and poultry.**

# Microminerals

## Copper (Cu)

- Copper is a **cofactor for certain enzymes** involved in energy production, connective tissue formation, and iron metabolism.
- **Deficiency : Cardiac Hypertrophy, Aortic Aneurysm, Ataxia, impaired bone formation**




**Natural Sources** Copper is found in shellfish, nuts, seeds, and whole grains.

# Other Microminerals

## Selenium (Se)

- Selenium functions in the body **in the form of selenoproteins**, which have many metabolic functions.
- Foods rich in selenium include Brazil nuts, tuna, oysters, beef, chicken, whole wheat bread, and milk.

## Molybdenum (Mb)

- Excess absorption of molybdenum has been shown to **produce bony deformities**.
- On the other hand, deficiency of molybdenum is associated **with mouth and oesophageal cancer**

# Heavy Metals

The heavy metals are **arsenic, mercury, cadmium, etc.**

- Heavy metals are natural components of the Earth's crust that has a relatively high density and is toxic or poisonous at low concentrations.
- They cannot be degraded or destroyed. To a small extent they enter our bodies via food, drinking water and air.
- **Because of these reasons, it must be on controlled.**

# INTRODUCTION OF FOOD FORTIFICATION

**Problem**
**(Micronutrient Deficiency)**

Globally, more than two billion people, including women and children, do not get the micronutrients they need to survive and thrive.

**Solution**
**(Fortification)**

**Food fortification** or **enrichment** is the process of adding micronutrients (essential trace elements and vitamins) to food.

**Control**
**(Regulations)**

It can be carried out by food manufacturers, or by governments as a public health policy which aims to reduce the number of people with dietary deficiencies within a population.

# Micronutrient Deficiencies Throughout the World

In 2016, an estimated **107,000 deaths** were caused by iron deficiency anemia and other nutritional deficiencies.

**Today one in nine people – 805 million worldwide** – still goes to bed hungry every night. At the same time, an estimated two billion people are affected by **"hidden hunger"**, or micronutrient deficiency, which is the lack of essential vitamins and minerals required in small amounts by the body.

Micronutrient malnutrition (MNM) is widespread in the industrialized nations, but even more so in the developing regions of the world. It can affect all age groups, **but young children and women of reproductive age tend to be among those most at risk of developing micronutrient deficiencies.**

# THE NEED FOR FOOD FORTIFICATION

**MAIN REASON**

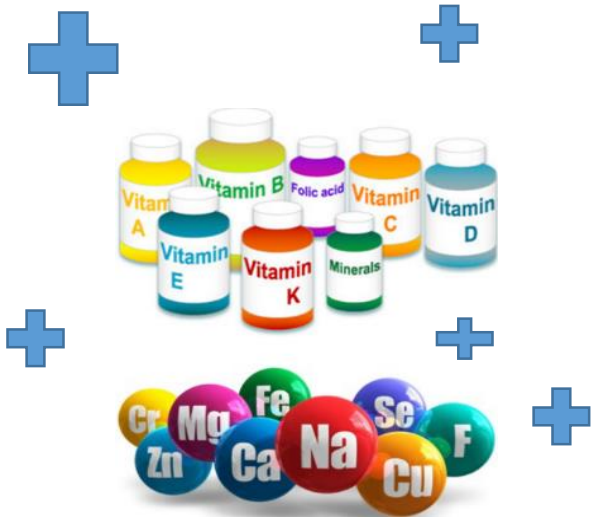
is the realization that micronutrient malnutrition contributes substantially to the global burden of disease. **In 2000, the World Health Report identified iodine, iron, vitamin A and zinc deficiencies as being among the world's most serious health risk factors.**

**THE OTHER REASON**

**It is not uniquely the concern of poor countries**. While micronutrient deficiencies are certainly more frequent and severe among disadvantaged populations, they do represent **a public health problem in some industrialized countries.**

# WHAT IS FOOD FORTIFICATION

Food fortification (FF) **is the addition of one or more essential vitamins and minerals to a food, whether or not it is normally contained in the food**, for the purpose of preventing deficiency of micronutrients in the population




**Adding to the foods**

# WHAT IS FOOD FORTIFICATION

**Globally**

**Vitamin A, iron, folate and iodine** deficiency are the primary micronutrient deficiencies of public health concern.

**Vitamin A** — **is critical for preventing childhood blindness and protecting the immune system**

**Iron (Fe)** — **iron helps prevent anaemia**

**Folic Acid (B9)** — **folic acid can prevent neural tube birth defects.**

**Iodine (I)** — **iodine deficiency during pregnancy detrimentally affects maternal thyroid function and child neurobehavioral development.**

# HISTORY OF FOOD FORTIFICATION


- Salt Fortification with Iodine Introduced in 1920s
- Mandatory milk fortification legislation first introduced in the 1930s
- Food fortification became commonplace during the First and Second World Wars to help prevent nutritional deficiencies within the population, and to replace nutrients that were lost during food processing.
- Mandatory wheat flour fortification legislation first introduced in 1942
- Mandatory rice fortification legislation first introduced in 1952

# HISTORY OF FOOD FORTIFICATION


- Mandatory oil fortification legislation first introduced in 1965
- Food Fortification has been undertaken in the Arab Gulf Region since the late 1970's.
- In 1978, KSA became one of the first countries in the region to introduce wheat flour fortification.
- In the 1990s, several more countries in the region began fortifying wheat flour with encouragement from international organizations such as the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the Micronutrient Initiative (MI).
- Many countries in Europe (including Ireland, the UK, Spain and Denmark) and the USA introduced mandatory fortification of foods to increase intake of A, D and B-group vitamins, and these practises are still ongoing today.

# Which Foods are Most Commonly Fortified?

Countries add nutrients to **flour and rice** to help people and nations thrive. Iron, zinc, folic acid, and other B vitamins are commonly added to prevent anemia from nutritional deficiencies and reduce the risk of infants with severe brain and spine birth defects known as neural tube defects.

Wheat Flour

Edible Oil

Rice

Salt

Milk

# WHEAT FLOUR FORTIFICATION

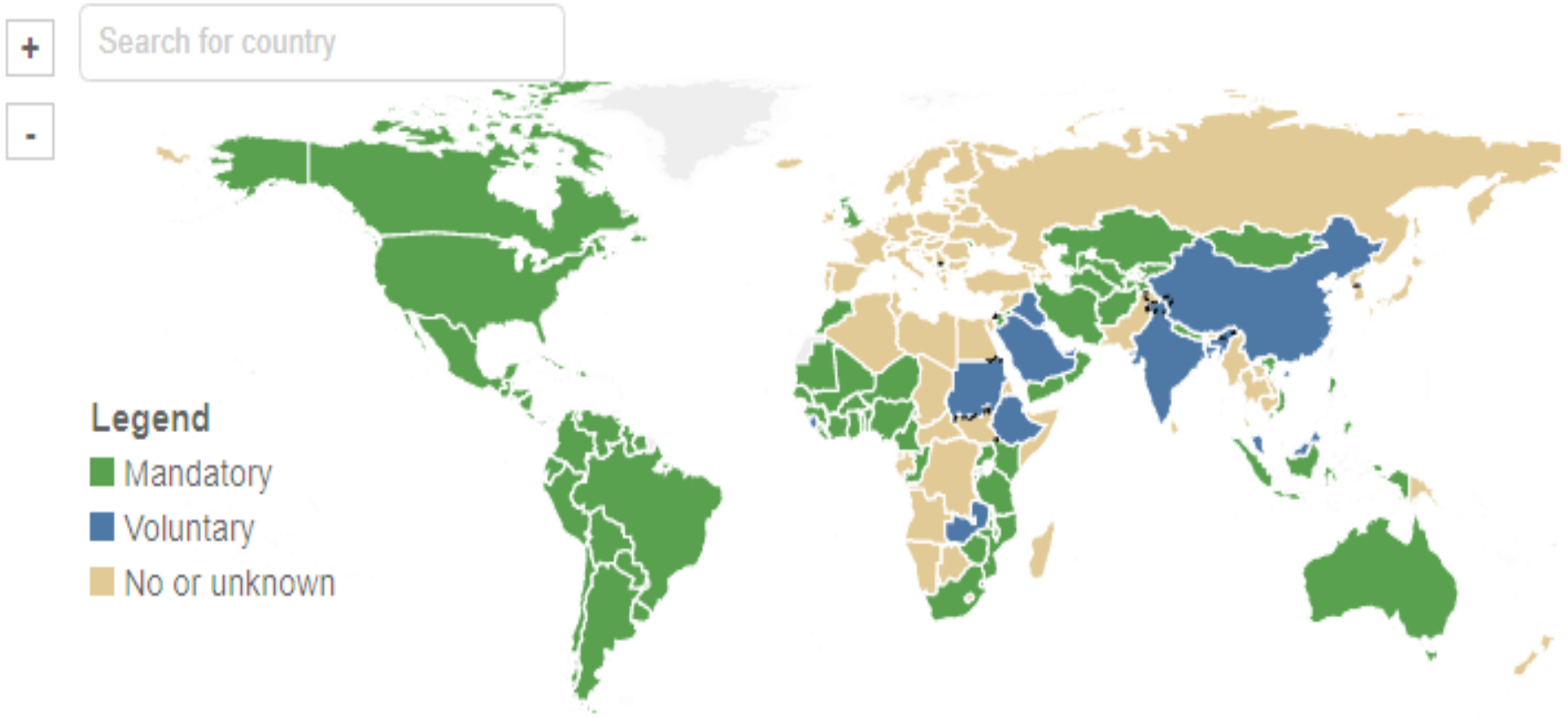
**FLOUR FORTIFICATION** : The addition of vitamins and minerals to the wheat flour during milling in order to gain more qualified and more nutritive products.

**Mandatory Fortification:** Governments legally oblige food producers to fortify (mostly iodine, iron, vitamin A, folic acid)

**Voluntary Fortification:** Food manufacturers freely choose to fortify food

# WHEAT FLOUR FORTIFICATION

*99 countries have either mandatory or voluntary fortification of wheat flour*




Region

(All)

Indicator

Mandatory and vol...

Food vehicle

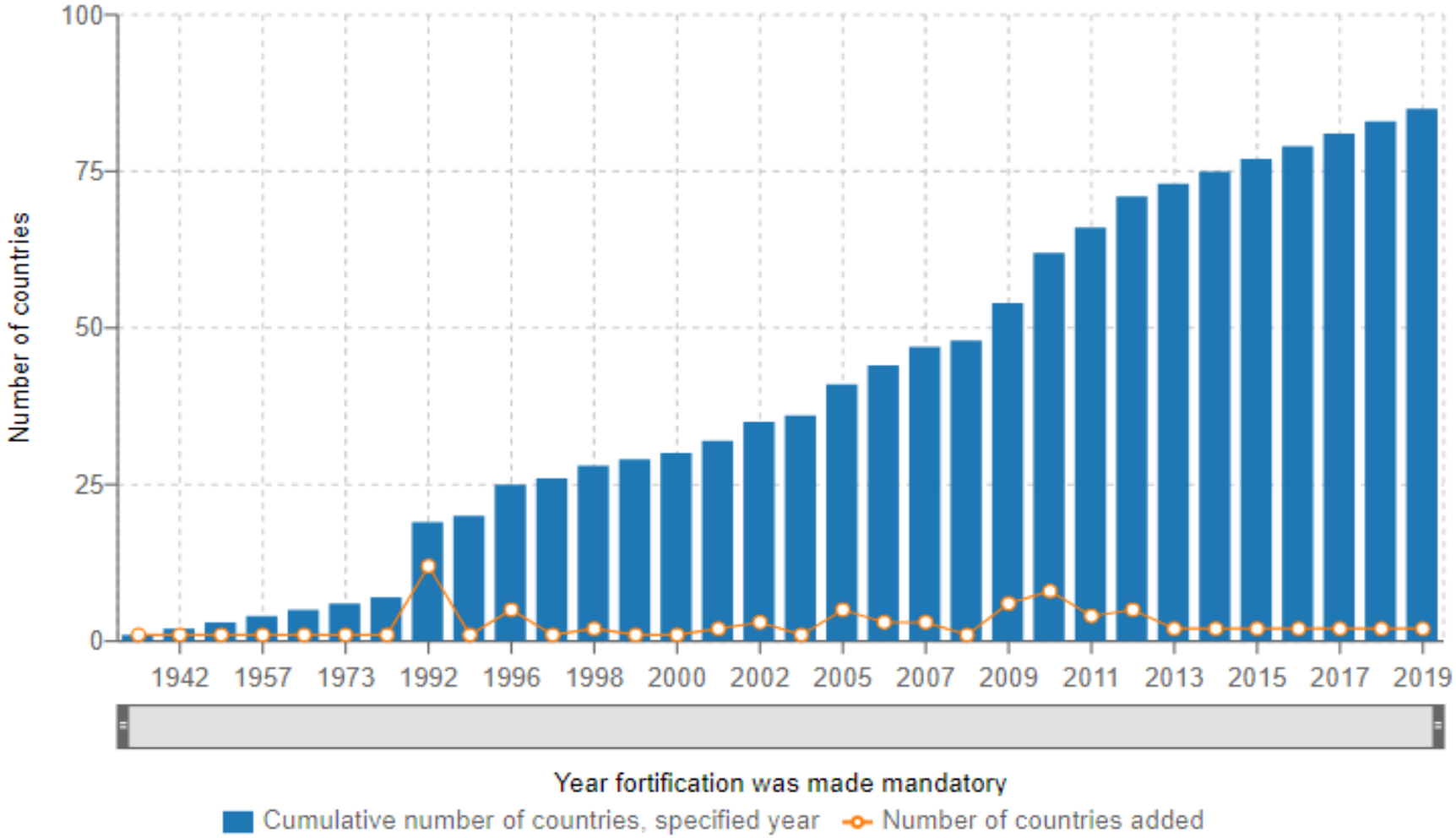
Wheat flour

Year

1940 2020

# WHEAT FLOUR FORTIFICATION

Between 1940 and 2020 (inclusive) 84 new countries added mandatory fortification legislation. As of 2020, 85 countries had mandatory fortification of food vehicle(s): Wheat flour




Income status

(All)

Region

(All)

Food vehicle

Wheat flour

# WHEAT FLOUR FORTIFICATION

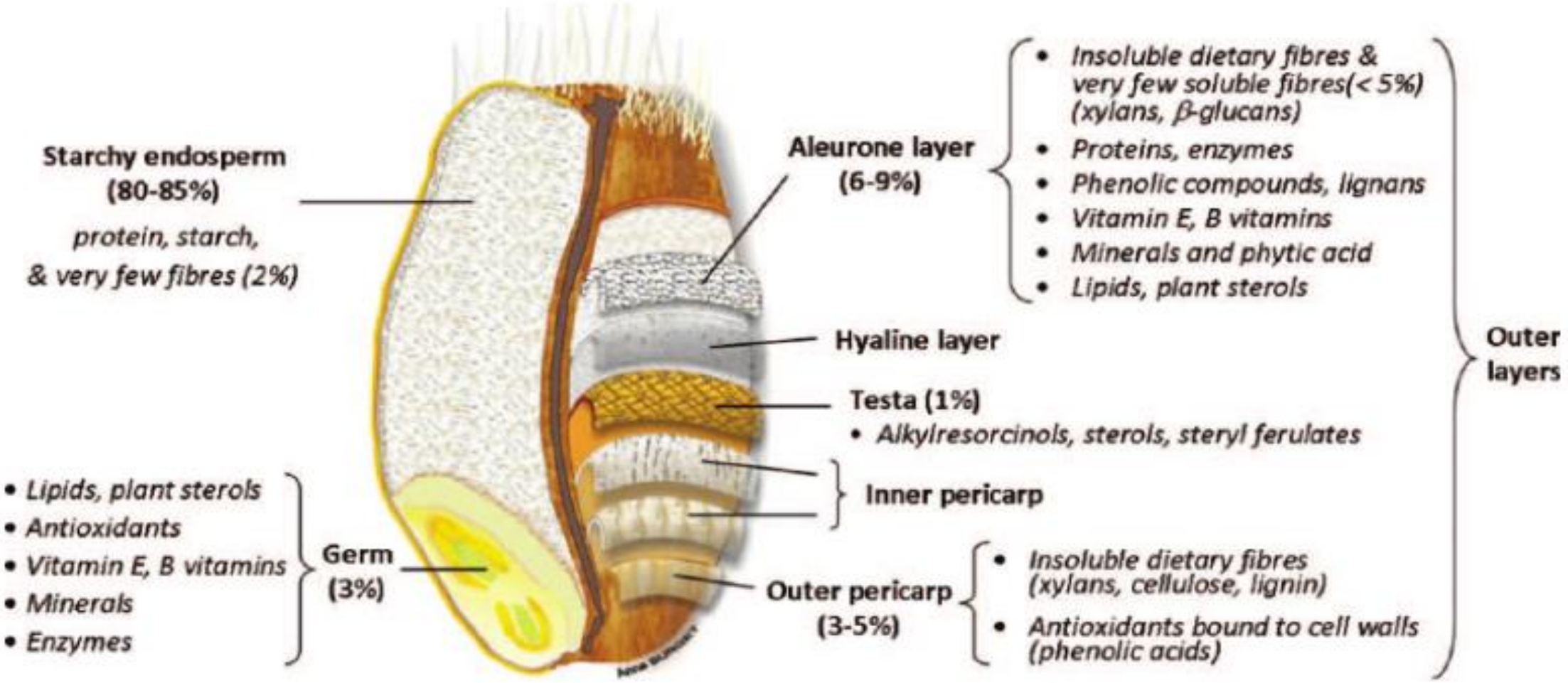
## Reasons of Flour Fortification

The whole grain includes macronutrients such as calorie, protein, carbohydrate and diet fibers**; also, it contains vitamins and minerals (micronutrients).**

Generally, the vitamins present in the bran and the germ is separated during milling of wheat.

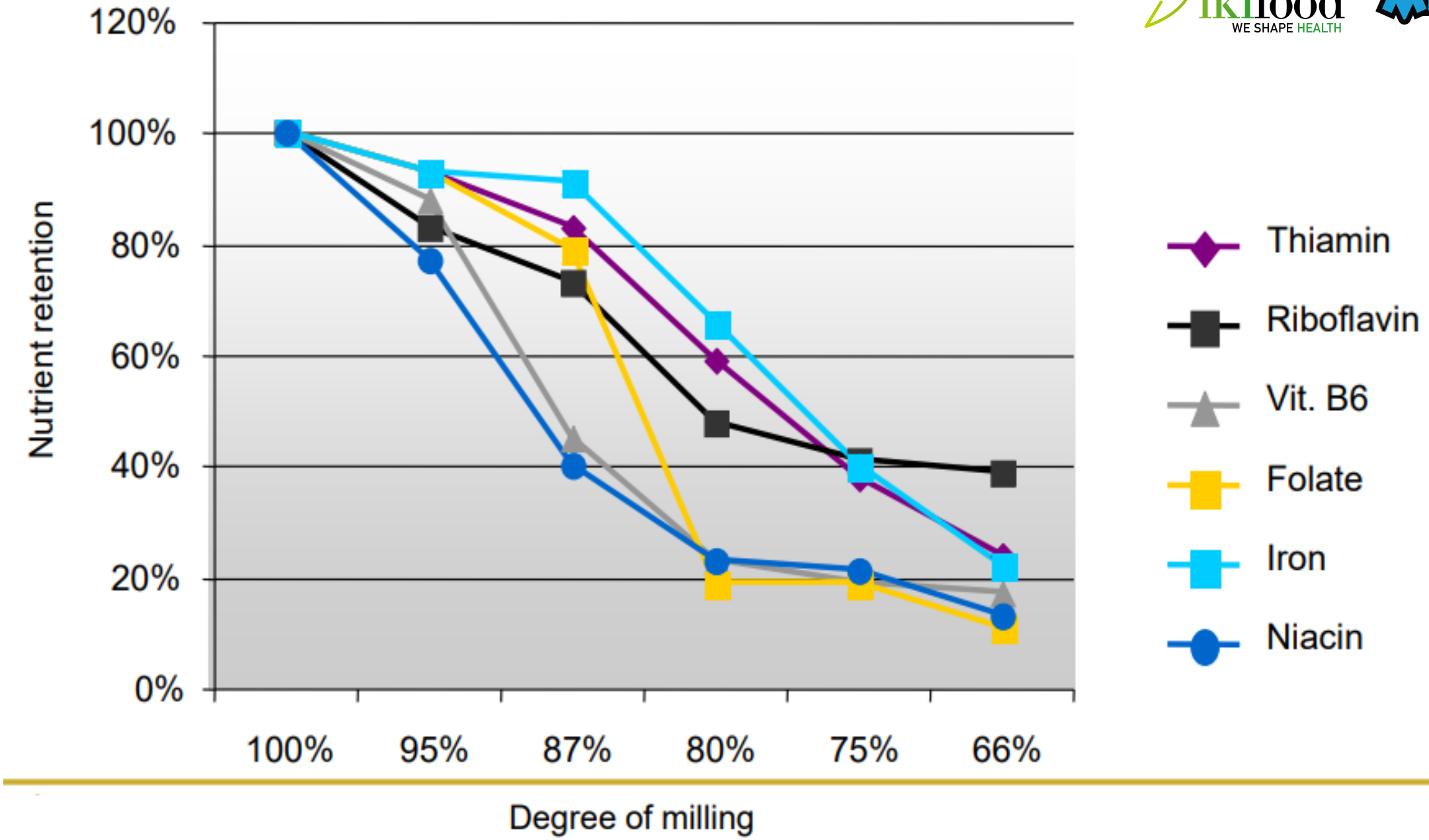
As a result of milling, **the nutritional value of the product is very much lower than the one of whole wheat.**

# WHEAT FLOUR FORTIFICATION




Histological structure of wheat grain. Adapted from Surget and Barron (2005). (color figure available online.)

# Loss of vitamins and minerals during milling of wheat



# WHEAT FLOUR FORTIFICATION

## Reasons of Flour Fortification

Wheat flour is a basic food material whose consumption is widespread.

Fortification of flour is an effective and economic way to prevent the deficiencies of essential nutrients in a large mass of people.

Fortification of flour during milling is more effective than fortification of bakery products because the use of flour is widespread in society.

Helps consumers improve their health without changing their eating habits.

**KEY ROLE**

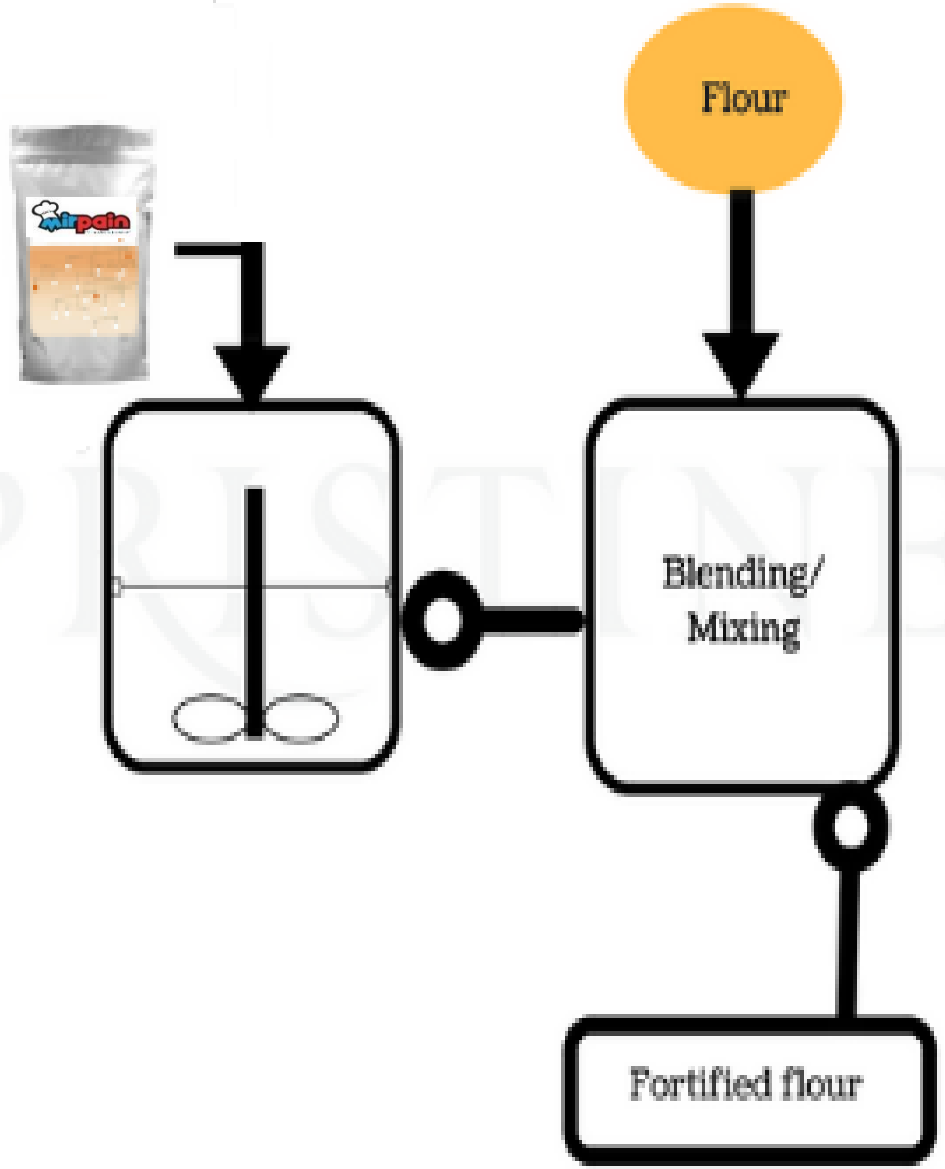
**Flour millers can have a key role to overcome nutrition-related health problems by enriching the flour. They can supply to the consumers superior and healthier food with a very low extra capital.**

# WHEAT FLOUR FORTIFICATION

**The Vitamins and Minerals Used in Flour Fortification**

**Widely used vitamins and minerals**

- Iron
- Zinc
- Folic Acid
- Vitamin B1 (Thiamine)
- Vitamin B2 (Riboflavin)
- Vitamin B3 (Niacin)
- Vitamin B6 (Pyridoxine)
- Vitamin B9 (Folic Acid)
- Vitamin B12 (Cyanocobalamin)
- In some countries; Vitamin A, Calcium and B12



# WHEAT FLOUR FORTIFICATION

## Determination of the premix components

Generally, it is decided by counting on the determinations of the organizations whose research areas are alimentary standards and the eating disorders in the society.

**Other factors:**

- Current regulations
- Nutritional needs and deficiencies in the society
- Cost of different premix combinations
- Research results on vitamin and mineral deficiencies

**Each country sets standards to include the specific nutrients its population needs**.

World Health Organization

ikifood WE SHAPE HEALTH

Mirpain "Milling & Baking Ingredients"

| Micronutrient (Daily Intakes) | Unit | 1-3 Years | 4-6 Years | 19-50 Year Female | Pregnants | 19-50 Years Male |
|---|---|---|---|---|---|---|
| **Vitamin A** | µg | 286 | 321 | 357 | 571 | 429 |
| **Thiamine (Vitamin B1)** | mg | 0,4 | 0,5 | 0,9 | 1,2 | 1 |
| **Riboflavin (Vitamin B2)** | mg | 0,4 | 0,5 | 0,9 | 1,2 | 1,1 |
| **Niacin (Vitamin B3)** | mg | 5 | 6 | 11 | 14 | 12 |
| **Pyrodoxine (Vitamin B6)** | mg | 0,4 | 0,5 | 1,1 | 1,6 | 1,1 |
| **Folic Acid (Vitamin B9)** | µg | 120 | 160 | 320 | 480 | 320 |
| **Vitamin B12** | µg | 0,7 | 1 | 2 | 2,2 | 2 |
| **Zinc** | mg | 3,4 | 4 | 4,1 | 5,8 | 5,8 |
| **Iron** | mg | 5,8 | 6,3 | 29,4 | >40 | 10,8 |

*Table : Vitamin and mineral requirements in human nutrition. (2nd ed.). (2004). Geneva: World Health Organization*

WFP
World Food Programme

Technical Specifications for

# FORTIFIED WHEAT FLOUR - YEMEN

Commodity code: **CERWHF010 – YEMEN**
Version: **2, adopted 2019**
Replacing: **Version 1.0 dated 29.03.2019**
Date of **OSCQ** issue: **24.10.2019**

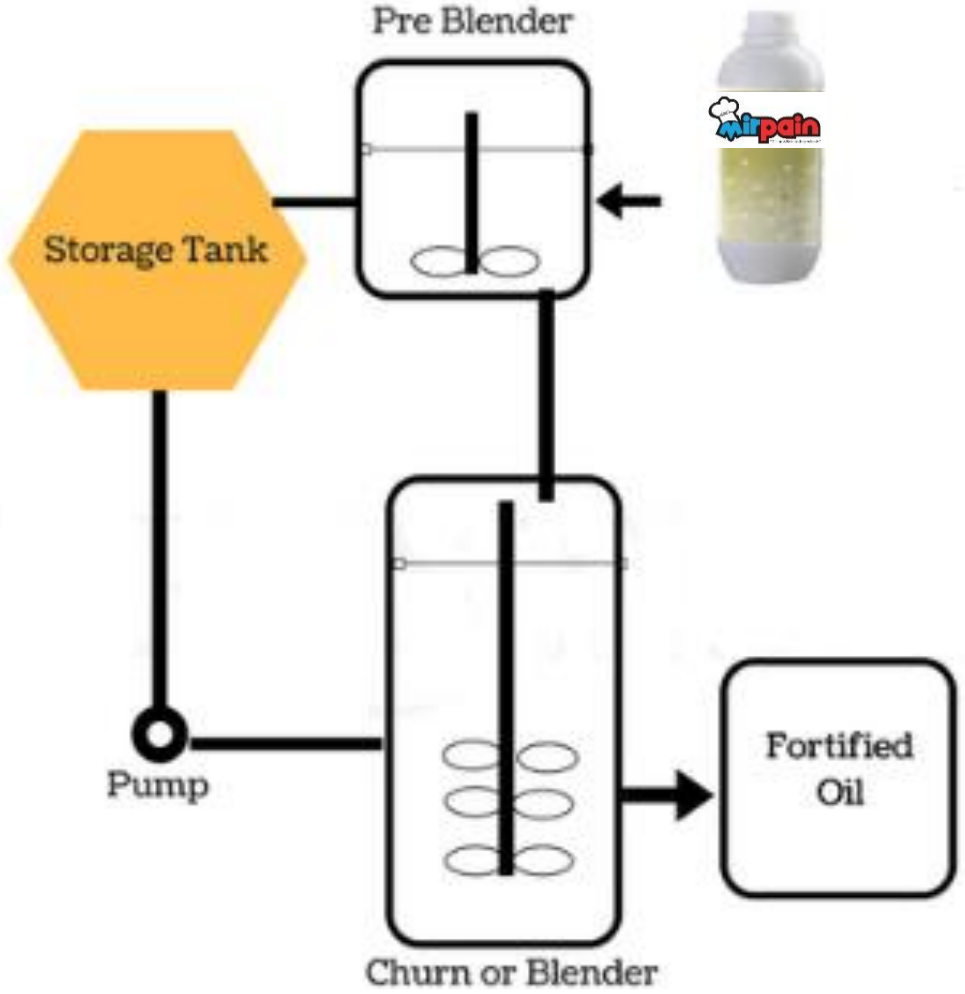
| Micronutrient | Target |
|---|---|
| Vitamin A | 1.0 mg/kg |
| Thiamine (vitamin B1) | 4.4 mg/kg |
| Riboflavin (vitamin B2) | 2.6 mg/kg |
| Niacin (Vitamin B3) | 35 mg/kg |
| Folic Acid | 1.5 mg/kg |
| Vitamin B12 | 0.008 mg/kg |
| Iron | 60 mg/kg |
| Zinc | 30 mg/kg |

# EDIBLE OIL FORTIFICATION

- Cooking oils fortified with essential micronutrients can help address nutrient deficiency.
- Edible oils are good solvents for fat soluble vitamins.
- Fortification of cooking oil with Vitamin A is considered a cost-effective, **simple to implement strategy to cover all segment of population.**
- The stability of vitamin A is greater in oils than in any other food.

# EDIBLE OIL FORTIFICATION

| Nutrient | Range (mg/kg oil) |
|---|---|
| Vitamin A | 6 – 55 |
| Vitamin D3 | 0.075 – 1.0 |

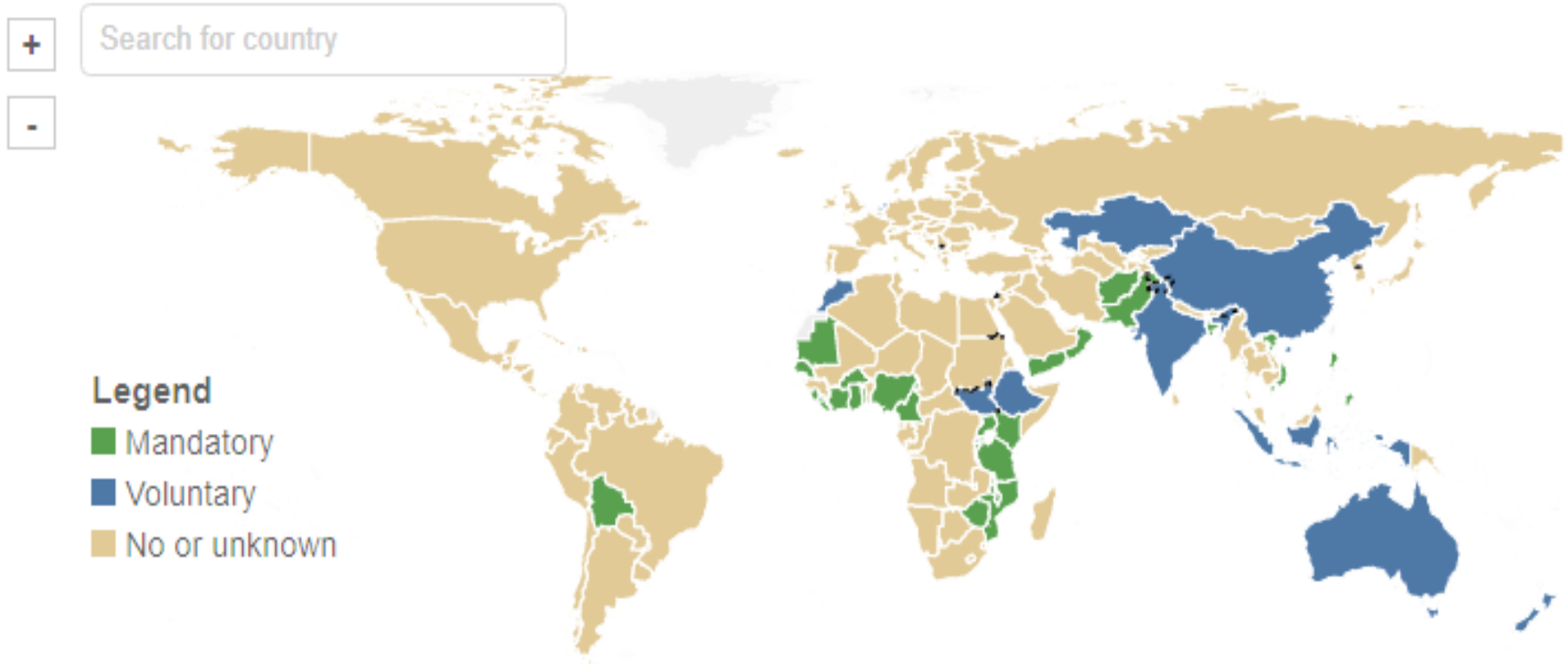



# EDIBLE OIL FORTIFICATION

## Mandatory and voluntary fortification legislation

The country has legal documentation or guidance for fortification of a food with one or more vitamins or minerals

*38 countries have either mandatory or voluntary fortification of oil*




**Income status**

(All)

**Region**

(All)

**Indicator**

Mandatory and vol...

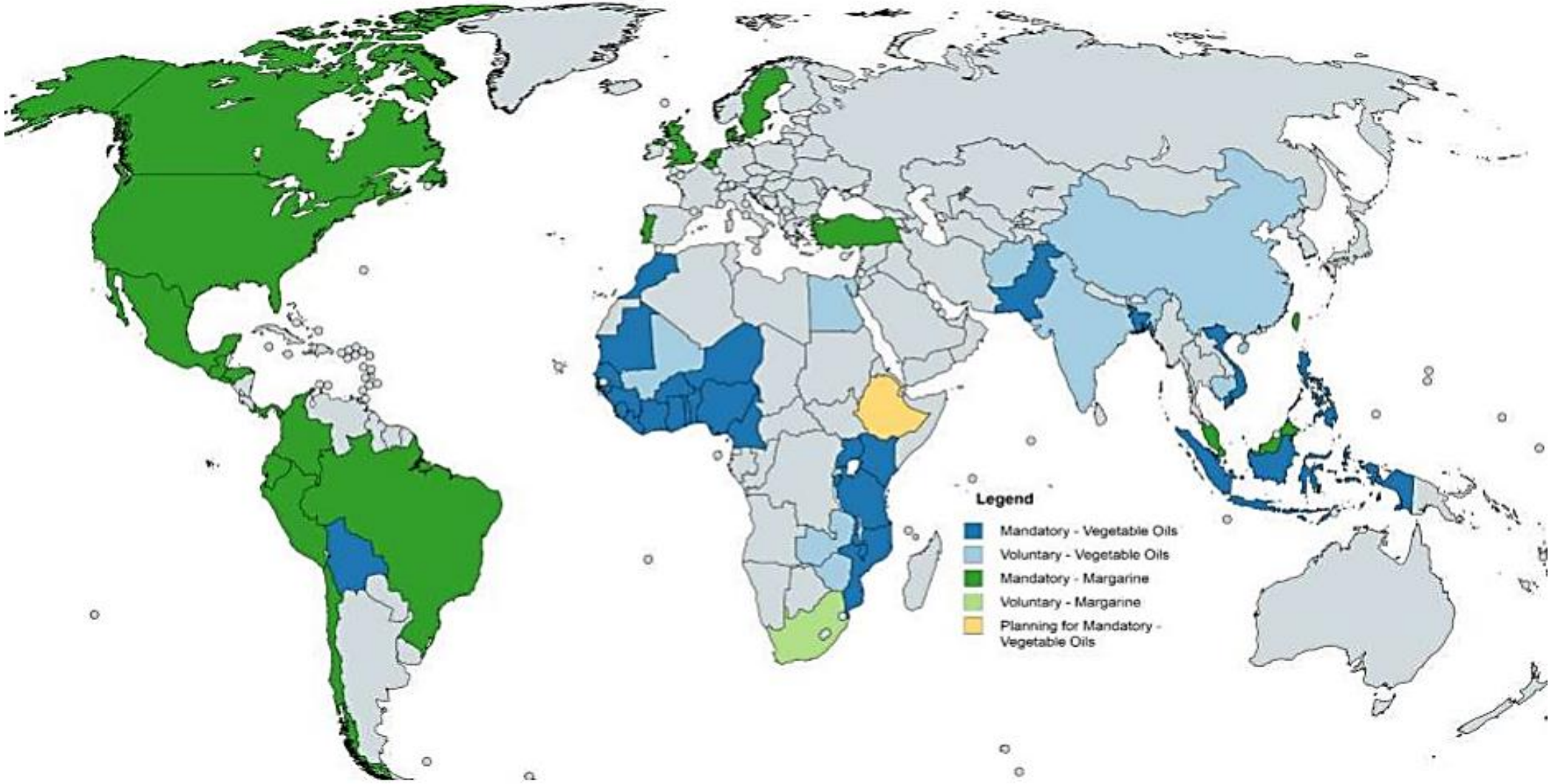
**Food vehicle**

Oil

**Year**

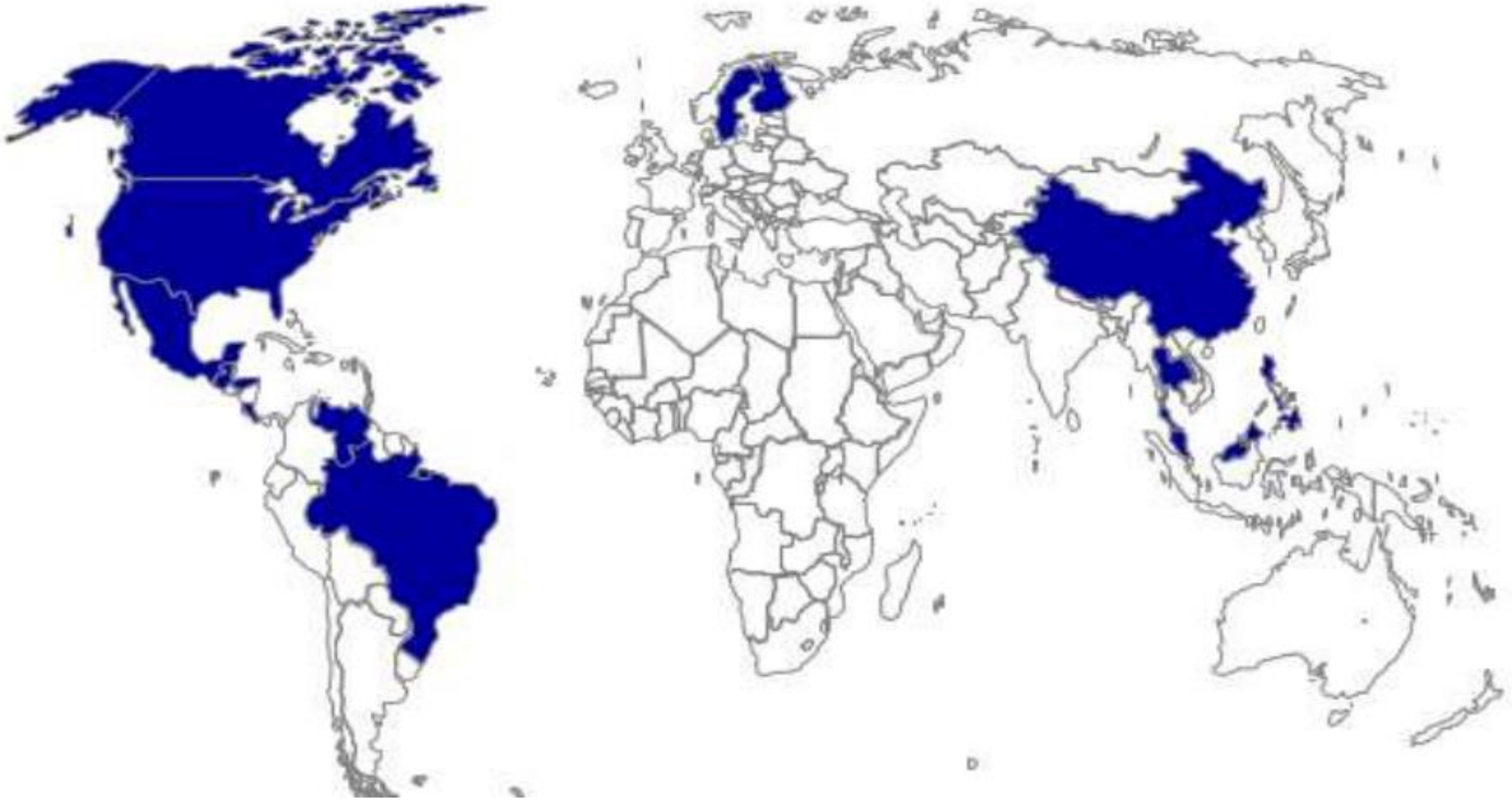
1965 2020

# MARGARINE FORTIFICATION



# MILK FORTIFICATION

## 14 countries mandate milk fortification



## MILK FORTIFICATION

# Nutrients added to fortified milk

| Nutrient | Number of countries (N=14) |
|---|---|
| Vitamin A | 12* |
| Vitamin D | 11† |
| Vitamin C | 1 (Canada) |
| Calcium | 1 (China) |
| Folic acid | 1 (Costa Rica) |
| Iron | 1 (Costa Rica) |

* Finland & Sweden do not add vitamin A to fortified milk

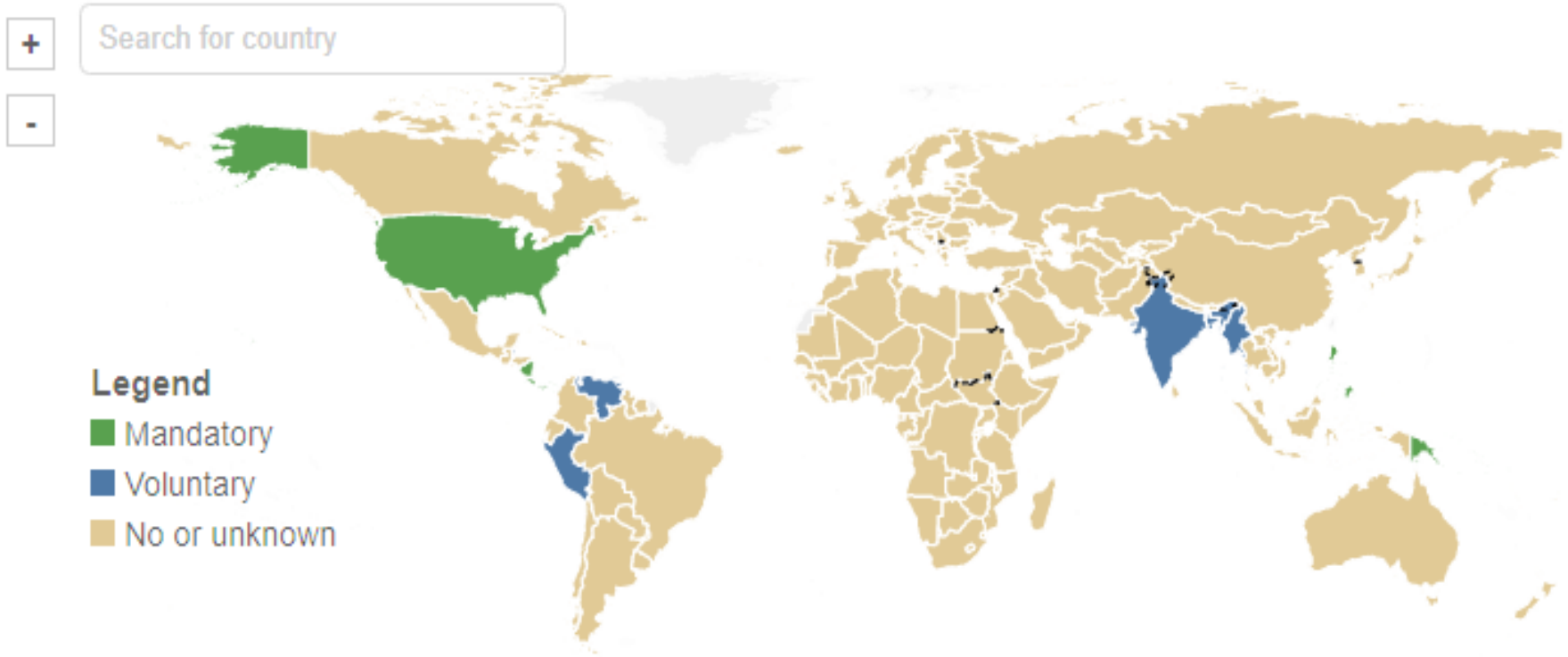
† Costa Rica, Malaysia & Thailand do not add vitamin D to fortified milk

# RICE FORTIFICATION

## Mandatory and voluntary fortification legislation

The country has legal documentation or guidance for fortification of a food with one or more vitamins or minerals

*14 countries have either mandatory or voluntary fortification of rice*




Income status

(All)

Region

(All)

Indicator

Mandatory and vol...

Food vehicle

Rice

Year

1952 2020

# RICE FORTIFICATION

## Vitamins in rice standard (mandatory countries)

| Country | Fortification Levels (mg/kg) | | | | | |
|---|---|---|---|---|---|---|
| | Thiamin (B1) | Niacin (B3) | Pyridoxine (B6) | Folic Acid (B9) | B12 | Vitamin E |
| Costa Rica | 5.3 | 35 | -- | 1.8 | 0.01 | 10.1 |
| Nicaragua | 5 | 40 | 4 | 1 | 0.01 | -- |
| Panama | 5 | 40 | 4 | 1 | 0.01 | -- |
| Papua New Guinea | 5 | 60 | -- | -- | -- | -- |
| Philippines | -- | -- | -- | -- | -- | -- |
| USA | 4.4-8.8 | 35.2-70.4 | -- | 1.54-3.08 | -- | -- |
| *No. countries* | *5* | *5* | *2* | *4* | *3* | *1* |

# RICE FORTIFICATION

## Minerals in rice standard (mandatory countries)

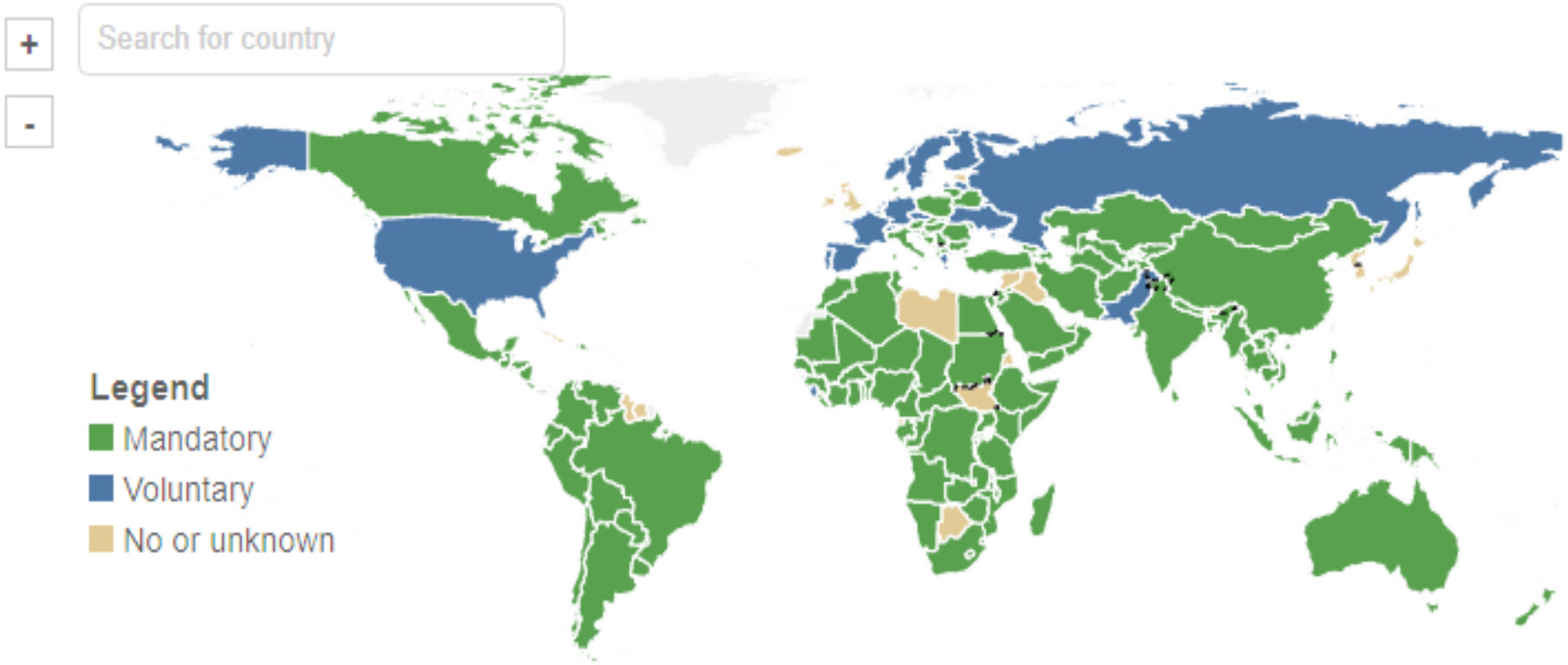
| Country | Iron (mg/kg) | Type of Iron | Selenium (mg/kg) | Zinc (mg/kg) |
|---|---|---|---|---|
| Costa Rica | -- | -- | 0.105 | 7.5 |
| Nicaragua | 24 | Ferric pyrophosphate | -- | 25 |
| Panama | 24 | Ferric pyrophosphate | -- | 25 |
| Papua New Guinea | 30 | Not specified | -- | -- |
| Philippines | 60-90 | Ferrous sulfate | -- | -- |
| USA | 28.6-57.2 | Not specified | -- | -- |
| *No. countries* | *5* | *3* | *1* | *3* |

# SALT FORTIFICATION

## Mandatory and voluntary fortification legislation

The country has legal documentation or guidance for fortification of a food with one or more vitamins or minerals

*145 countries have either mandatory or voluntary fortification of salt*




**Income status**

(All)

**Region**

(All)

**Indicator**

Mandatory and vol...

**Food vehicle**

Salt

**Year**

1942 2020

# PASTA FORTIFICATION

Every year, 600 million tons of wheat flour is produced and consumed in the form of noodles, pasta and other products.

It is a simple and effective way of providing the World's population with vitamins and minerals.

The aim is to prevent the nutritional deficiency of people who consume pasta made by adding essential vitamin and minerals.

**Widely used vitamins and minerals**

- **Iron**
- **Folic Acid**
- **Vitamin B1 (Thiamine)**
- **Vitamin B2 (Riboflavin)**
- **Vitamin B3 (Niacin)**
- **Vitamin B9 (Folic Acid)**

# Which Foods are Most Commonly Fortified?

The other commonly consumed fortified foods to include: **pasta, ready-to-eat breakfast cereals, RUSF and RUTF, cereal bars, high energy biscuits, breads, infant foods and juices.**





# Advantages Of Food Fortification

- ✓ If **consumed on a regular and frequent basis**, fortified foods will maintain body stores of nutrients more efficiently and more effectively than will intermittent supplements.
- ✓ Fortified foods are also **better at lowering the risk of the multiple deficiencies** that can result from seasonal deficits in the food supply or a poor quality diet.
- ✓ Fortification can be an excellent way of increasing the content of vitamins in breast milk and thus **reducing the need for supplementation in postpartum women and infants.**
- ✓ Fortification of widely distributed and widely consumed foods has the potential **to improve the nutritional status of a large proportion of the population, both poor and wealthy.**
- ✓ It is usually possible to add one or several micronutrients without adding substantially to the **total cost of the food product at the point of manufacture**.

# Introduction to Mirpain Food Ingredients

Mirpain is an R&D centred Swiss-Turkish joint-venture company, which has developed vitamin & minerals blends in response to customer needs.

We are serving our fortification products to international markets which contain around 46 countries all around the world such as Flour, High Energy Biscuit, Supercereals, Date-bar, MNP for Children 6-59 Months old, RUTF, RUSF Infant food fortification premixes. Also, ***we have been producing the liquid premix for edible oil fortification for February 2020.***

Mirpain follows Worldwide Food Regulations and offers customized fortifications with high-quality ingredients.

# Introduction to Mirpain Food Ingredients

Mirpain is a member of **GAIN (Global Alliance for Improved Nutrition)** that is an international organization driven by the vision of a world without malnutrition.

All around the World there are only 23 suppliers that have GAIN Approval for food fortification, Mirpain is one of them.

Additionally, we are collaborating with the **World Food Programme**.

gain
Global Alliance for Improved Nutrition

World Health Organization

WFP
United Nations
World Food Programme
*Fighting Hunger*

# Introduction to Mirpain Food Ingredients

Premix MNP Iodine Rapid test kits

| GPF approved Premix Blenders | GPF approved production sites |
|---|---|
| [redacted] | USA |
| [redacted] | India |
| [redacted] | India (Chennai, Nashik and Tuticorin). |
| [redacted] | India |
| Mirpain Gida San. ve Tic. A.S. | Turkey |
| [redacted] | China, Germany, Mexico and USA. |
| [redacted] | India |
| [redacted] | India |

**Source :** https://gpf.gainhealth.org/suppliers/current-suppliers

# Introduction to Mirpain Food Ingredients

Premix | MNP | Iodine | Rapid test kits

| GPF approved MicroNutritrient Powder sachets (MNP) suppliers | GPF approved production sites |
|---|---|
| [redacted] Ltd | China |
| [redacted] | France, India, Malaysia and Poland. |
| [redacted] | India (Chennai, Nashik and Tuticorin). |
| [redacted] | India |
| Mirpain Gida San. ve Tic. A.S. | Turkey |
| [redacted] | India |
| [redacted] | India |
| [redacted] | India |
| [redacted] | Bangladesh |

**Source :** *https://gpf.gainhealth.org/suppliers/current-suppliers*

Mirpain is one of the manufacturers for **production of micronutrient powder (MNP) by approved by GAIN**.

**There are only 9 supliers around the World.**

# PRODUCTION PROCESS OF PREMIX

## RAW MATERIAL (Raw Material Procurement)

- Supplier Researchs
- Sampling
- Assessment of product specification
- Analysis of sample (external lab and internal analysis)
- Evaluation of the results
- Purchasing

## QUALITY CONTROL

- Purity analysis of raw materials
- Heavy Metal Analysis in every batch
- Mesh Size Test
- Microbial Analysis

## MIXING PROCESS

## QUALITY CONTROL

- Premix Analysis (Determination of vitamins and minerals)
- Evaluation of Analysis Results and Control of Premix Specification
- Heavy Metal Analysis of premix
- Microbial Analysis of premix
- Mesh Size Test of premix

## PACKING AND STORAGE

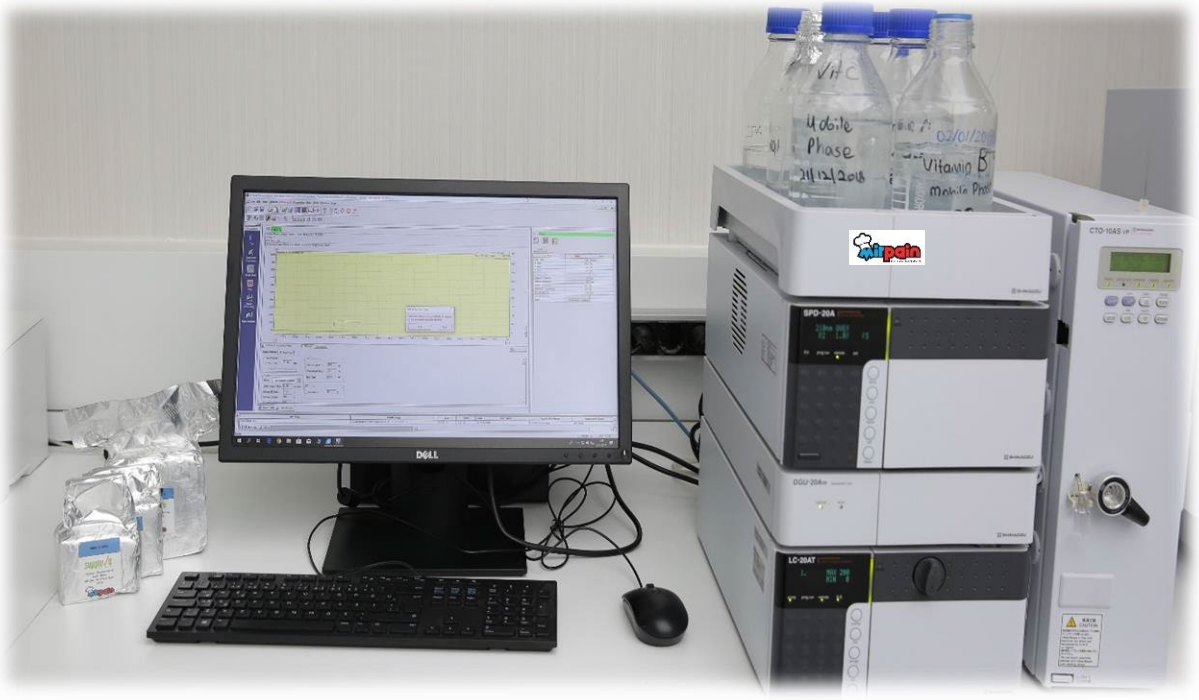
- Premixes are packaged in aluminum bags by using vacuum system.

# VITAMIN – MINERAL LABORATORY

# 1. DETERMINATION OF VITAMINS

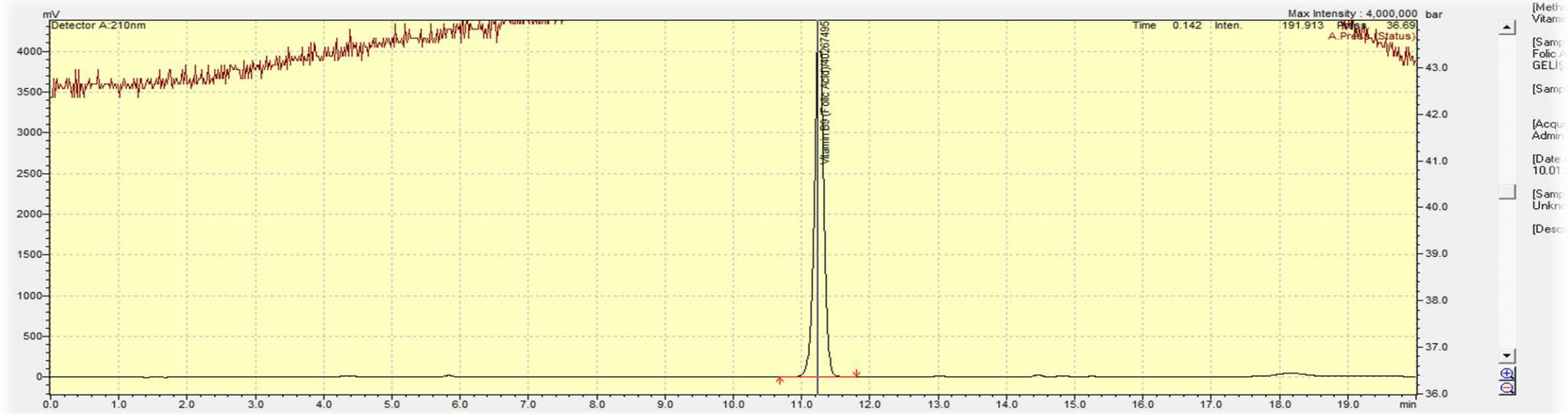
**We are using HPLC (High pressure liquid chromatography) for the determination of vitamins.**

- ✓ **Raw Materials of Vitamins**
  Assay Analysis
- ✓ **Determination of vitamins in the production premixes**
  Quality Control
- ✓ **Vitamin A Palmitate Analysis**
- ✓ **Vitamin B Groups Analysis**
- ✓ **Vitamin C (Ascorbic Acid) Analysis**
- ✓ **Fat Soluble Vitamins (Vitamin D3, Vitamin E and Vitamin K1)**

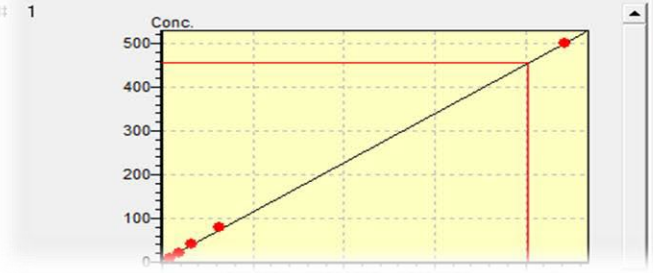


# 1. DETERMINATION OF VITAMINS

## Evaluation of the results




Calibration Curve View




Compound Table View

| ID# | Name | Ret. Time | Conc. | Channel | Peak# | Area | Height | Mark | Peak Start | Peak End |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vitamin B9 (Folic Acid) | 11.233 | 901868.94386 | Detector A - Ch1 (210nm) | 1 | 40267495 | 3995701 | | 10.675 | 11.8 |

Compound Table View

| ID# | Name | Ret. Time | Conc. | Channel | Peak# | Area | Height | Mark | Peak Start | Peak End |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vitamin B9 (Folic Acid) | 11.23 | 901868.94386 | Detector A - Ch1 (210nm) | 1 | 40267495 | 3995701 | | 10.675 | 11.800 |

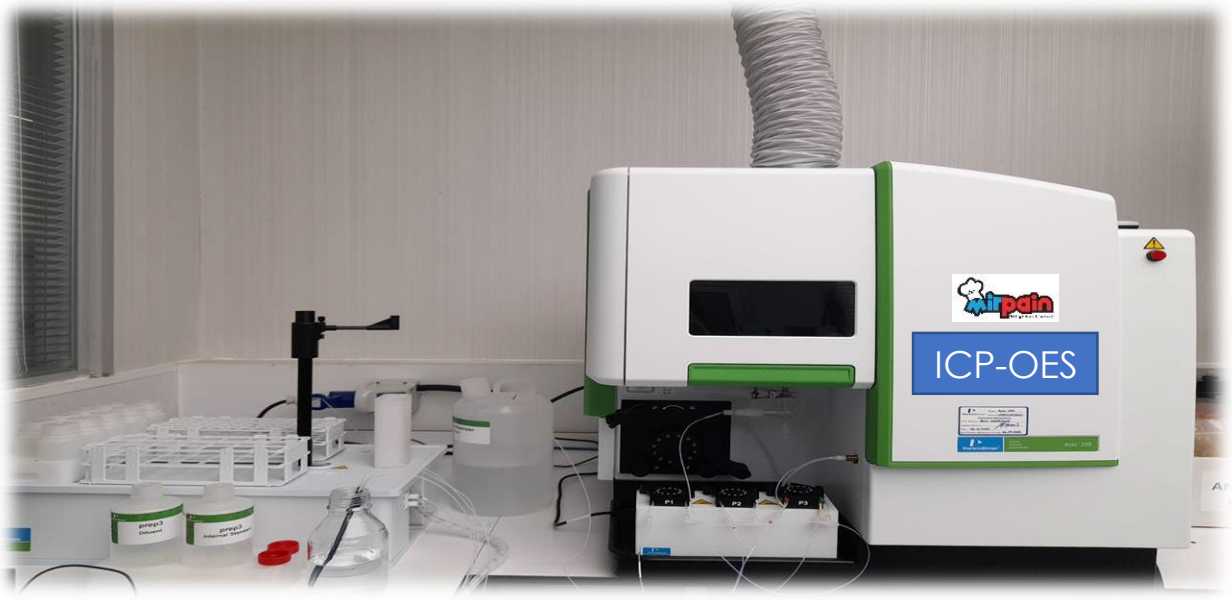
# 2. DETERMINATION OF MINERALS

**Our mineral analysis is performed by using AAS (Atomic Absorption Spectrophotometer) and ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometer) device.**

- ✓ **Raw Material of Minerals**
  Assay Analysis(%)

- ✓ **Determination of Minerals on the Premix**
  Quality Control
  Fe %
  Zn % and other minerals

- ✓ **Heavy Metals Analysis for Raw Materials and Premixes**
- ✓ Arsenic (As)
- ✓ Mercury (Hg)
- ✓ Cadmium (Cd)
- ✓ Lead (Pb)

# 2. DETERMINATION OF MINERALS

## Evaluation of the results

| Sample ID | Gr ap h | X | M | Q | Conc. (ppm) | Abs. | BG | WF | VF | DF | CF | Actual Conc. | Actual Conc. Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.0009 | -0.0021 | | | | | | |
| [redacted]100.Batch February 10ml HNO3 0.12 PPM FE | | | | | 0.2027 | 0.0186 | -0.0051 | 0.2020 | 20.00 | 5000.00 | 0.000 | 10.0333 | % |
| [redacted]100.Batch February 10ml HNO3 0.24 PPM FE | | | | | 0.3639 | 0.0334 | -0.0036 | 0.2020 | 20.00 | 2500.00 | 0.000 | 9.0084 | % |
| [redacted]100.Batch February 10ml HNO3 0.48 PPM FE | | | | | 0.6723 | 0.0617 | -0.0020 | 0.2020 | 20.00 | 1250.00 | 0.000 | 8.3206 | % |
| [redacted]100.Batch February 10ml HNO3 0.96 PPM FE | | | | | 1.3904 | 0.1276 | -0.0043 | 0.2020 | 20.00 | 625.00 | 0.0001 | 8.6038 | % |
| [redacted] NaFeEDTA 5ML HNO3 3ML H2O2 0.4 PPM FE | | | | | 0.3661 | 0.0336 | -0.0025 | 0.2009 | 20.00 | 4000.00 | 0.0001 | 14.5791 | % |

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