

## The History of Nutrition Science

18th - 19th Century

### THE TIME OF ENERGY & MACRONUTRIENTS

*Antoine Laurent de Lavoisier*

discovered bodies burn energy.

*Justus von Liebig*

analysed the carbon content of foods.

*Wilbur O. Atwater*

described the Atwater factors of foods.

**4.19kJ = 1 kcal**

Food energy content is officially measured in kilojoules (kJ), but kilocalories (kcal) are more common.

19th- 20th Century

### THE ERA OF VITAMINS



#### Nutrient deficiencies

Beri Beri Vitamin B1

Rickets Vitamin D

Vitamin C Scurvy

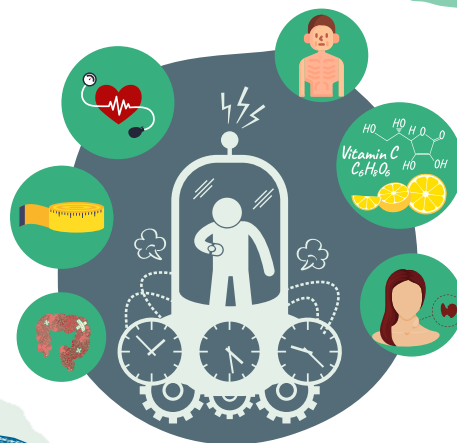
Vitamin B3 Pellagra

20th - 21st Century

### FROM DEFICIENCIES TO NONCOMMUNICABLE DISEASES (NCDs)

#### Fat or sugar?

Fat lost the science-lobbyist battle, which led to widespread recommendations to cut down dietary fat intake over decades.



#### The Burkitt Hypothesis

*Denis Burkitt* observed the association of dietary fibre intake and the incidence of colon cancer, diverticulitis, atherosclerosis, diabetes.

The first




### DIETARY GUIDELINES

were established in the USA.



## Macronutrients

### Carbohydrates 4 kcal/g

-  Energy source and storage
-  Skeletal structure of DNA/RNA
-  Synthesis of glycoproteins and glycolipids

*How to assess carbohydrate quality?*




- Glycaemic index (GI)
- Glycaemic load (GL)
- Dietary fibre content

**>1M**

deaths/year due to eating too little fruit



### Protein 4 kcal/g

-  Energy source
-  Mobility and stability
-  Immune function and blood clotting



*How to assess protein quality?*

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

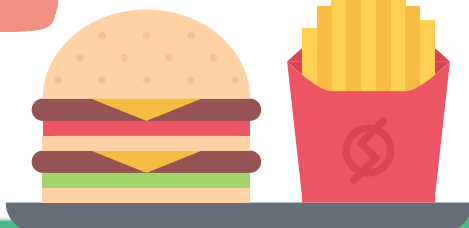


*A varied plant-based diet can cover protein requirements.*

max. **2-4**  
tablespoons of **free**  
and **added sugars**






or below 10%, preferably 5%, of your daily calories.



**limit**  
**trans fatty acids**

### Omega-6 to Omega-3

### Fat ~9 kcal/g

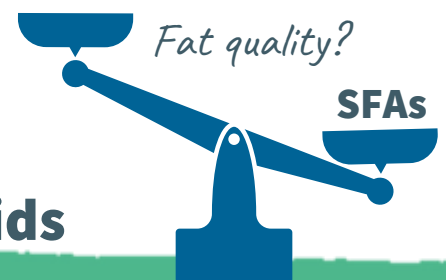
-  Energy source and storage
-  insulation and protection
-  absorption of fat-soluble vitamins



**MUFAs**  
**PUFAs**

*Fat quality?*

**SFAs**



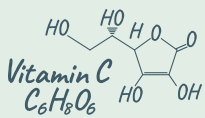
## Micronutrients Minerals



### Iron deficiency

is the most common nutrient deficiency worldwide.

- ↓ inadequate intake
- ↑ increased requirements
- 🧬 impaired absorption or losses



Plant-based iron sources



## Daily Recommended Values

**DRVs consider averages for intrinsic factors & extrinsic factors**

**Adequate Intake (AI)**

**Average Requirement (AR)**

**Reference Intake Range (RI)**

**Population Reference Intake (PRI)**

## Vitamins

### Fat-soluble vitamins

🟡 Vitamins A, D, E, K

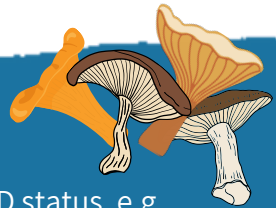
### Water-soluble vitamins

💧 Vitamins C, B1, B12,...



### Vitamin D

Factors affecting vitamin D status, e.g. sun exposure, pigmentation of the skin, genetics



### In Europe,

supplementation may be required between October and March.

### Vitamin B12

Risk factors affecting vitamin B12, e.g. old age, gastrointestinal issues, diet,...

- ✅ Holotranscobalamin (HoloTC)
- ✅ Methylmalonic acid (MMA)

### B12 deficiency

→ serious health problems, e.g. anaemia, irreversible neurological and psychiatric disorders...

- ✅ help monitor nutritional status of a population
- ✅ set standards for food services



## Plant Compounds

### Fibre

is resistant to digestion and absorption in the small intestine.

#### Insoluble

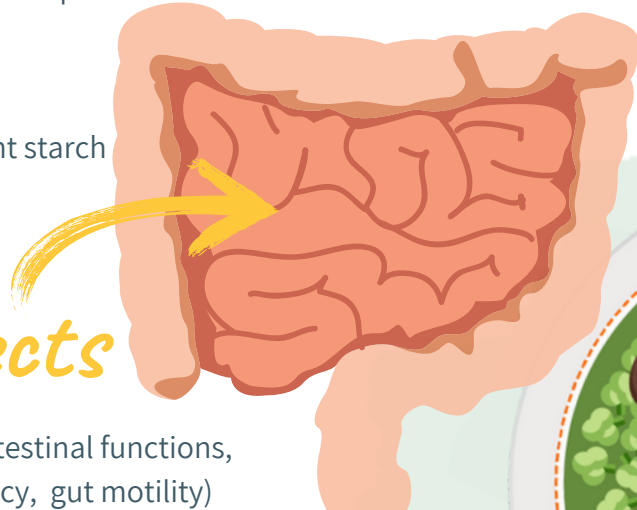
e.g. cellulose, lignins, resistant starch

#### Soluble

e.g. Inulin, pectins, dextrins

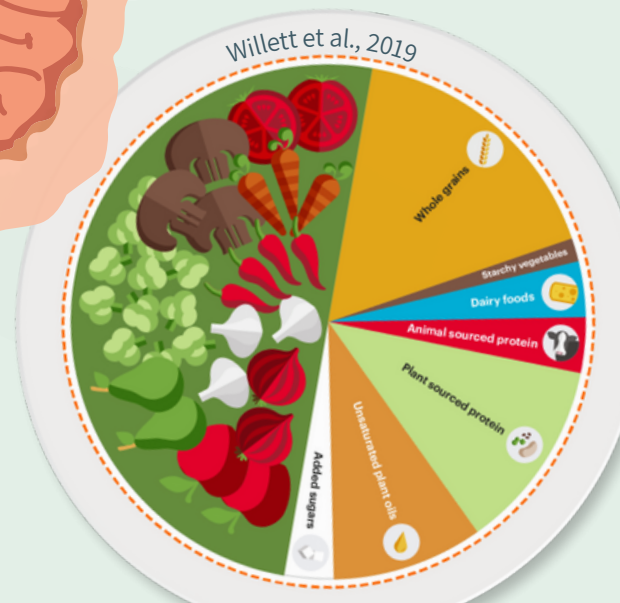
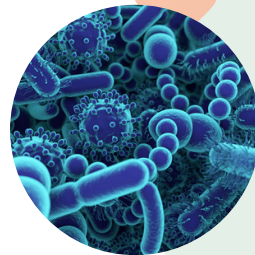
**Low fibre intake**

is associated with a number of diseases, including the development of colorectal cancer, diabetes, cardiovascular disease and all-cause mortality.



### Health effects

- Local effects (e.g. gastrointestinal functions, stool softness and frequency, gut motility)
- Systemic effects (e.g. metabolic health, satiety, insulin sensitivity)



## Phytochemicals



**Phenolic compounds**



**Terpenoids**



**Nitrogen-containing compounds**



**Sulfur-containing compounds**



## PACKAGE DEALS

The food and meals we eat may contain several thousand chemical substances, not isolated nutrients.

This is why it is important to zoom out and think about health-promoting dietary patterns!

### Health effects

- Local effects (e.g. altered microbiome composition, antioxidative, anti-inflammatory properties)
- Systemic effects (e.g. antioxidative, anti-inflammatory, anticarcinogenic properties)