

A young boy with dark skin and short hair, wearing a white shirt, is looking towards the camera with a slight smile. In front of him is a white plate filled with various fruits, including several green apples, a few red apples, and a bunch of yellow bananas. The background is a blurred indoor setting.

Nutritional knowledge

Minerals & trace-elements

Nigeria, March 2005

Presentation

- Chemical structure
- Classification
- General function
- Specific functions
 - Ca, P, Mg / Na, K, Cl
 - Fe, Cu / Zn, I
 - Anti-oxidative action: Se, Zn, Mn, Cu
- Requirements
- Cow's milk & minerals and trace-elements
- Check your knowledge

The key lines

- **Minerals & trace-elements** are essential for life
- **Minerals & trace-elements** are needed in very small quantities (traces)
- **Minerals & trace-elements** do not provide energy
- **Minerals & trace-elements** have to be supplied by food

Chemical structure

- Minerals & trace-elements are single chemical (inorganic) elements
- They are naturally occurring substances

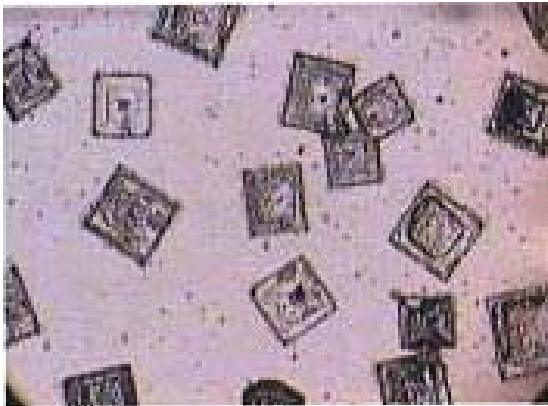
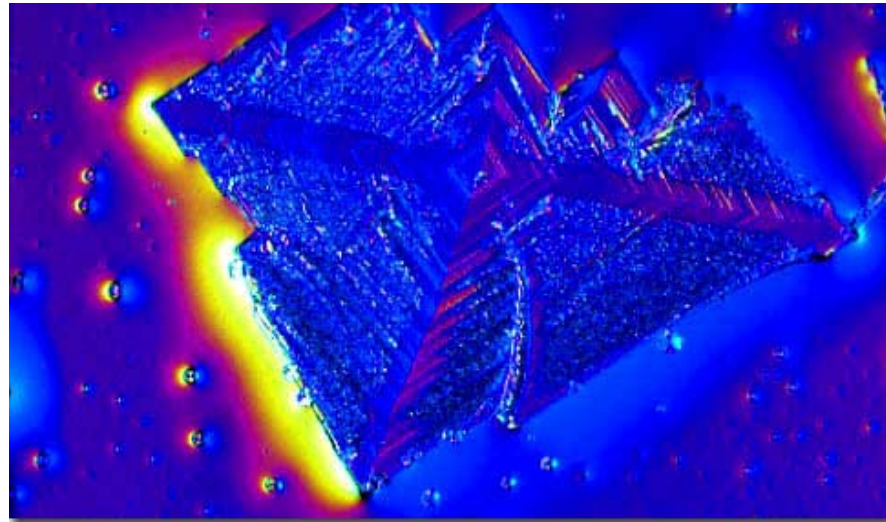


Table salt = NaCl



Classification

Minerals	Trace-elements	
Calcium (Ca)	Iron (Fe)	Molybdenum (Mo)
Phosphorus (P)	Copper (Cu)	Chromium (Cr)
Magnesium (Mg)	Zinc (Zn)	Fluoride (F)
Sodium (Na)	Iodine (I)	Cobalt (Co)
Potassium (K)	Manganese (Mn)	
Chloride (Cl)	Selenium (Se)	

Other trace-elements

Trace-elements	
Arsenic (As)	Cadmium (Cd)
Boron (B)	Lead (Pb)
Nickel (Ni)	Lithium (Li)
Silicon (Si)	Tin (Sn)
Vanadium (V)	

Function

Minerals

- 4 to 5 percent of body's total weight
- Act on cellular level
- Catalyse (speed-up), activate, control many different body processes
- In general: *building and regulating*

Function (2)

- Building functions e.g.
 - Bones, teeth e.g. Ca, P
- Component of enzymes e.g. Fe, Cu, Zn, Mg
- Regulating functions like
 - Heart beating
 - Blood clotting e.g. Ca
 - Transport of O₂ lungs → tissues e.g. Fe

The role of Ca, P & Mg

- Formation & maintenance of bones & teeth
- Sources: milk & dairy products
- Deficiency disease Ca
 - Poor mineralization bones & teeth
 - Osteoporosis / osteomalacia (loss of bone mass with increased risk for fractures)
 - Tetany (muscular spasms)
 - Impairment of growth

The role of Na, K & Cl

- Regulating water balance of body
- Sources:
 - Table salt (NaCl)
 - Tomatoes, bananas (K)

The importance of Fe

- Transport of O₂
- Brain development & function
- Absorption ↑ by vitamin C
- Sources: meat, green leafy vegetables, whole grains
- Iron deficiency anaemia
 - Fatigue, pallor (paleness),
 - Glossitis (inflammation of tongue)
 - Tachycardia (abnormal heart rhythm)

The role of Zn & I

Zn

- Good functioning of immune system
- Role in vit. A + β -carotene metabolism
- Anti-oxidative action
- Sources: meat, seafood, whole grains

I

- Brain development & function (like Fe)
- Part of thyroid hormones: growth & activity
- Sources: seafood, iodised table salt

**Anti-oxidative action of
Se, Zn, Mn, Cu**

Normal body process: formation of free radicals

- O₂ = essential component of living organisms
- Body cells: energy producing processes + O₂ → formation free radicals
- Normal circumstances: free radicals are constantly produced
 - Needed in several body processes

Oxidative stress: overproduction of free radicals

- Overproduction of free radicals → oxidative stress → *damage of body cells*
- Due to today's modern life styles / environment
 - pollutants we inhale
 - excess to ultra-violet light
 - illnesses
- Increasing scientific evidence linking cell damage to chronic diseases
 - e.g. cancer, cardiovascular disease (heart disease), diabetes mellitus, cataracts, aging

Anti-oxidants: protect body cells against overproduction of free radicals

- Dietary anti-oxidants: substances (nutrients) in food → neutralise free radicals → protect body cells against overproduction

Anti-oxidants:

- β -carotene (+ other carotenoids)
- vitamin E & C
- Se, Zn, Mn, Cu: components of anti-oxidative enzymes

Minerals & trace-elements requirements

- Requirements depends on e.g. age and gender
- Every country: own, local nutrient recommendations
 - Internationally: US/Canadian Dietary Reference Intakes (DRIs)

Milk: good source of minerals & trace-elements

Milk %RDA per 400 ml adults

