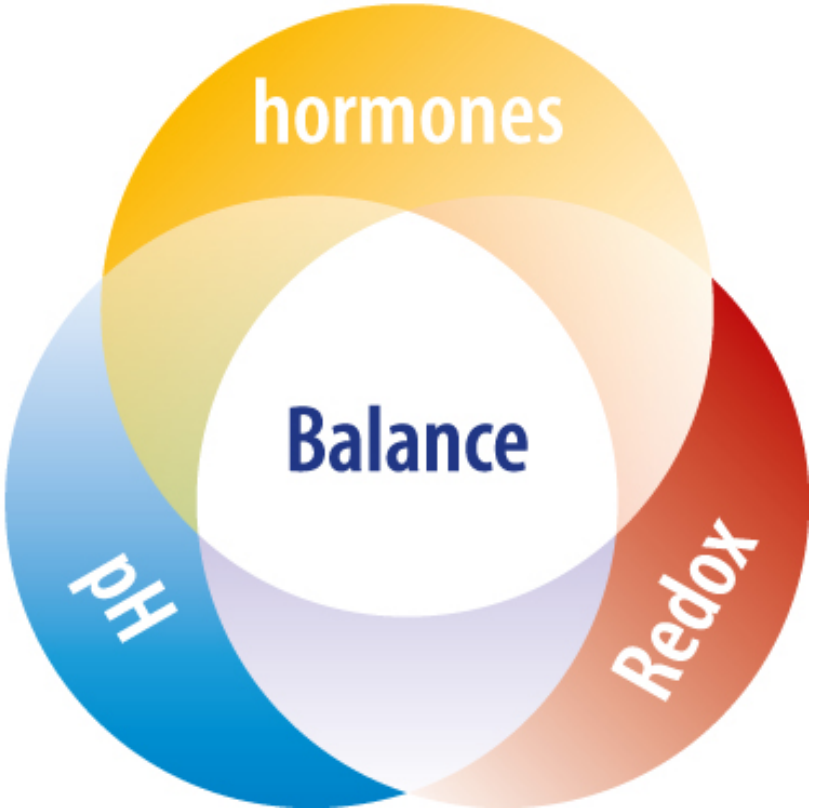
dr. jacob's **institut**
für komplementär-
medizinische Forschung

Acid-base and mineral balance

The basis of body biochemistry



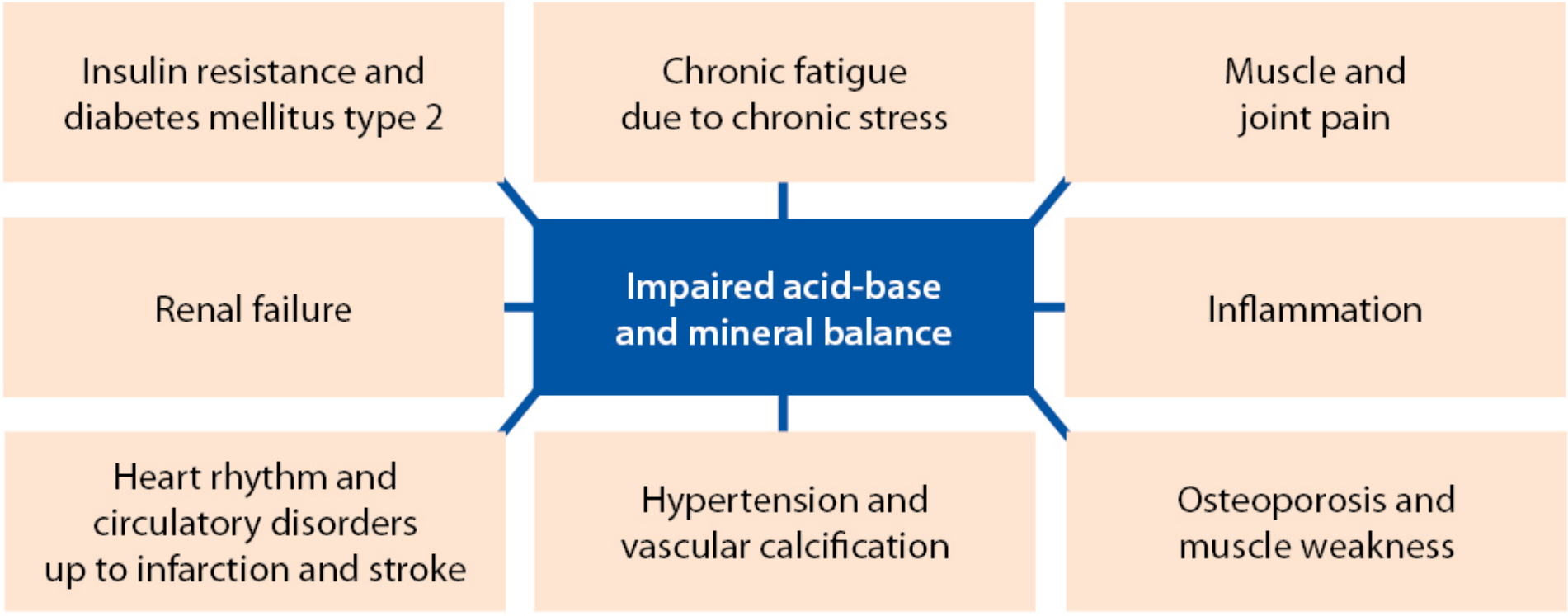
Acute acidosis = medical emergency

- pH range of the blood
  arterial: pH 7.37 to 7.45; venous: 7.26 to 7.46
- Higher values represent alkalosis, lower values acidosis. Values below pH 7.1 are life-threatening.
- Change of 0.3 pH = doubling or halving of the proton concentration.
- Why does the body regulate the pH value and thus the proton concentration so strictly?
- All redox reactions and potentials are pH-dependent. All enzymes act pH-dependent.

Latent metabolic acidosis is always accompanied by mineral imbalance

- **Latent metabolic acidosis**: Buffer systems and elimination routes prevent emergencies
- But: Accumulation of fixed inorganic acids and salts in tissues and cells
- Disturbance of the electrolyte balance
- Long-term damage to kidneys, connective tissue, vessels, muscles and bones
- Cofactor of most chronic diseases

Consequences of an impaired acid-base and mineral balance

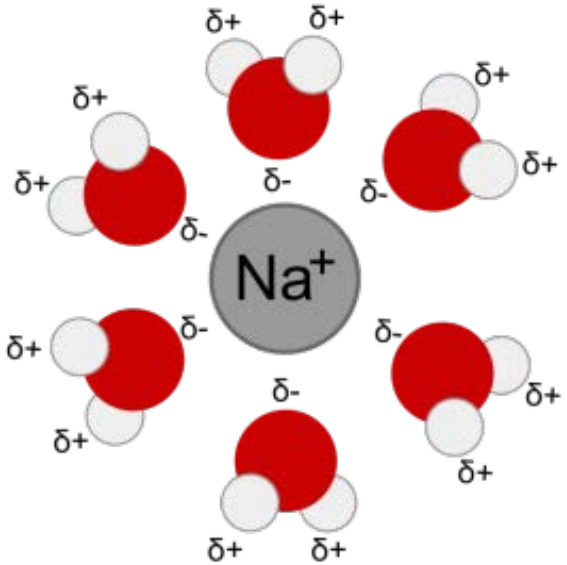


Acid-base and mineral metabolism is inseparable!

Alkaline and acid-forming minerals in the human body

Base-forming	Acid-forming
Calcium (1570 g) - Occurrence: mainly bones - Tasks: bone structure, muscle contraction, gland secretion, excitability of tissues	**Phosphorus/phosphate (840 g)** - Occurrence: mainly bones - Tasks: Bone formation; intracellular: energy production - Excretion: kidney
Sodium (130 g) - Occurrence: mainly extracellular - Tasks: water- & osmoregulation, excitation of cells	**Chloride (109 g)** - Occurrence: extracellular - Tasks: hydrochloric acid formation - Excretion: kidney
Potassium (190 g) - Occurrence: mainly intracellular - Tasks: resting potential of the cell membrane	**Sulphur/sulphate (175 g)** - Occurrence: intracellular - Tasks: enzymatic activity - Excretion: kidney
Magnesium (35 g) - Occurrence: mainly intracellular - Tasks: Electrical stability of cells, involved in over 300 enzymes	

Acids and bases, electrolytes and water as basis of life



- Minerals always have a water shell
- Water shell determines osmotic pressure conditions inside & outside the cell
- Smaller ions with a higher charge have a
  - higher charge density + larger hydrate shell
- Sodium and chloride ions: 6 x H_20

  Potassium ions: 4 x H_20

→ we die of thirst when we drink sea water

→ Sodium and chloride increase vessel volume

Organic vs. anorganic acids

Organic acids

- Protons + salts of organic acids (e.g. citrate, lactate, bicarbonate)
- Weak, volatile acids
- Buffering effect
- Can be degraded via metabolism and excreted via respiration

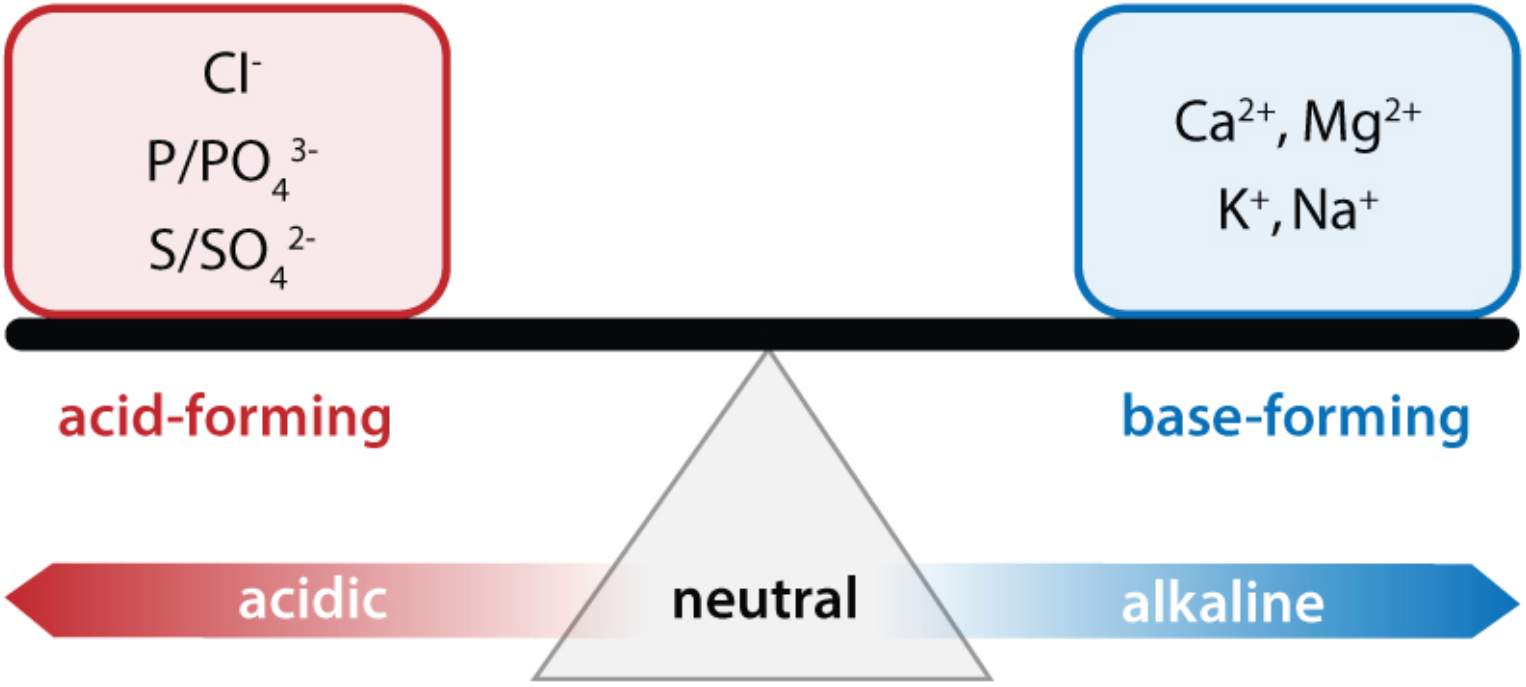
Strong, anorganic acids

- Protons + anorganic, fixed acid formers (e.g. phosphate, chloride, sulphur compounds)
- Highly aggressive, fixed acids
- Protons dissociate much more strongly (pKs value)
- Renal excretion → damage the kidneys
- Are neutralized by Na^+, K^+, Mg^{2+}, Ca^{2+} or ammonia (protein degradation!) to salts
- Ammonia also harms the kidneys

Degradable, organic, "good" acids

- Have a basic effect:
  - Citrate → citric acid
  - Lactate → lactic acid
  - Acetate → acetic acid
  - Malate → malic acid
- Intake mainly via vegetables, fruit and herbs
- Volatile acids (carbonic acid, produced from citrate and acetate) can be exhaled via the lungs
- Metabolic acids (lactates) are broken down by the liver

Acid-base-balance:
The inorganic, fixed acids are the "bad" ones.

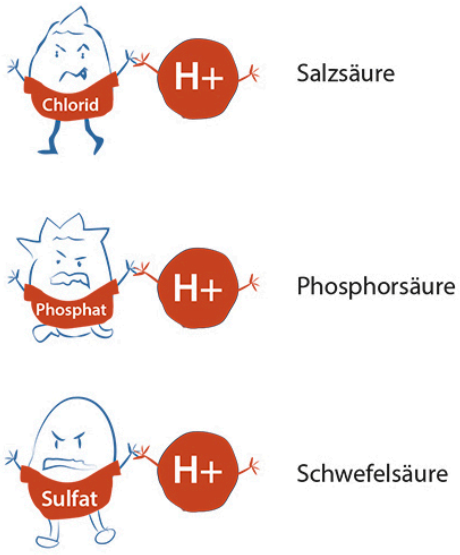


The anorganic acid-formers Cl^-, SO_4^{-2} and PO_4^{-3} must be neutralized by base-forming cations K^+, Mg^{2+} , Ca^{2+} or Na^+ to salts.

Potassium plays the central role for intracellular deacidification.

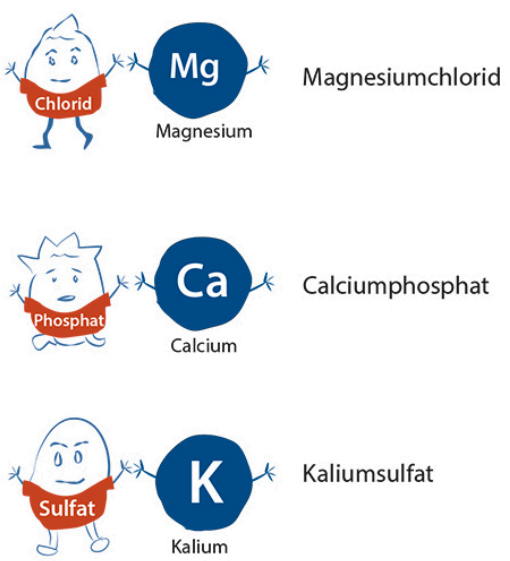
Säuren - Salze - Basen – entscheidend ist die richtige Zusammensetzung

Negativ - starke Säure



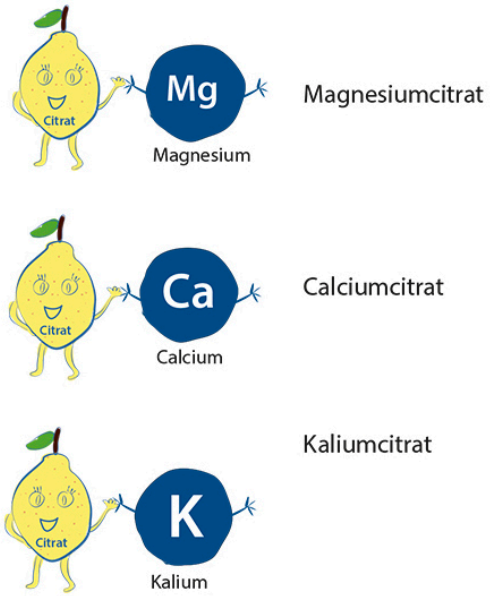
Durch Verbindung der negativ geladenen Anionen Chlorid, Phosphat und Sulfat mit den positiv geladenen Protonen entstehen starke Säuren. Diese können dem Körper schaden, z.B. die Niere bei der Ausscheidung der Säuren über den Urin.

Neutral - Salz



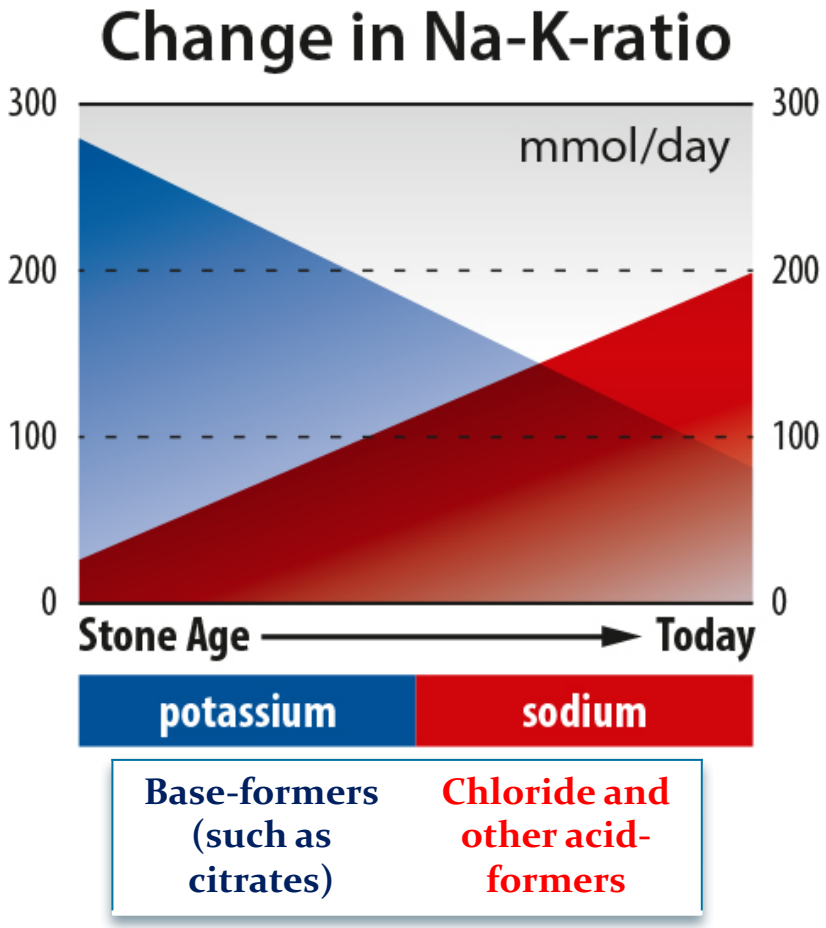
Verbinden sich die Anionen Chlorid, Phosphat und Sulfat mit positiv geladenen Mineralstoffen (Kalium, Magnesium, Calcium, Natrium), so entstehen neutrale Salze, mit denen der Körper gut umgehen kann. Die Anionen können problemlos über den Urin ausgeschieden werden.

Positive - Basensalz (Pufferwirkung)



Am besten wirkt sich eine Verbindung der positiv geladenen Mineralstoffe (Kalium, Magnesium, Calcium, Natrium) mit den Salzen schwacher Säuren (Citrat, Laktat) aus. Der Körper kann die entstandenen Basensalze als Mineralstoffquelle und als Citratquelle nutzen. Citrate sind ein wichtiger Bestandteil des Zellstoffwechsels (Citratzyklus).

The problem: inversion of the potassium-to-sodium and base-to-chloride ratios



Sodium-potassium ratio has shifted significantly:

- Previously: 10 g potassium, 1 g sodium
- Today: 3 g potassium, 10 g sodium chloride

- Diet, evolution and aging--the pathophysiologic effects of the post-agricultural inversion of the potassium-to-sodium and base-to-chloride ratios in the human diet (Frassetto et al.) European Journal of Nutrition · November 2001

Traditional vs. modern diet

	Okinawa	Germany
Potassium	5200 mg	3300 mg
Sodium	1130 mg	2800 mg
Magnesium	396 mg	400 mg
Calcium	500 mg	1000 mg
PRAL*	-75 mEq	+22 mEq

* Potenial renal acid load

Remer et al. 2003

Natural calcium-to-magnesium ratio: 3:2

Causes of acidosis

- Western diet
  - Animal protein (sulphur, ammonia)
  - Too much salt (sodium, chloride)
  - Convenience products (phosphate + salt), coke (phosphate)
  - Lack of potassium
  - insufficient base-forming anions (citrates)
- Shallow chest breathing (mostly due to stress)
- Smoking
- Constant stress
- Lack of exercise

Effect of food

- **Strong acid-forming:** meat, sausage, cheese, fish, eggs, sugar, sweets, lemonade/coke, white flour products, alcohol, nicotine, sulphate, sulphite, phosphates, chlorides, salt
- **Weakly acid-forming:** milk, yoghurt, cream, wholemeal products, nuts, coffee

Effect of food

- **Base-forming:** all vegetables, all herbs, all fruits, unsulphured dried fruit, mineral water, potassium, magnesium, calcium
- **Acid-base neutral:** natural vegetable oils, butter

Alkaline nutrition

- Drink enough, at least 2 litres of water/ herbal tea per day
  - ➢ Alkaline coffee alternative: Chi-Cafe *balance*
- Vegetables, herbs and fruit provide organic base-formers (citrate, lactate, acetate) and minerals
- Prepare meals with fresh ingredients
- Reduce
  - Salt
  - Animal protein
  - Convenience products

Sodium chloride = twice as bad

- Table salt/cooking salt → sodium and chloride
- Main sources: bread, meat products, cheese, fast and processed food
- WHO recommendation: max. 2 g sodium (5 g salt) per day – actual consumption often more than double!
- Sodium chloride
  - → Catabolic (breakdown of muscles and bones)
  - → Causes latent acidosis (hyperchloremic acidosis)
  - → Increases blood pressure and cortisol levels
  - → Promotes (gastric) cancer + autoimmune diseases

➢ Reduction particularly important for blood pressure

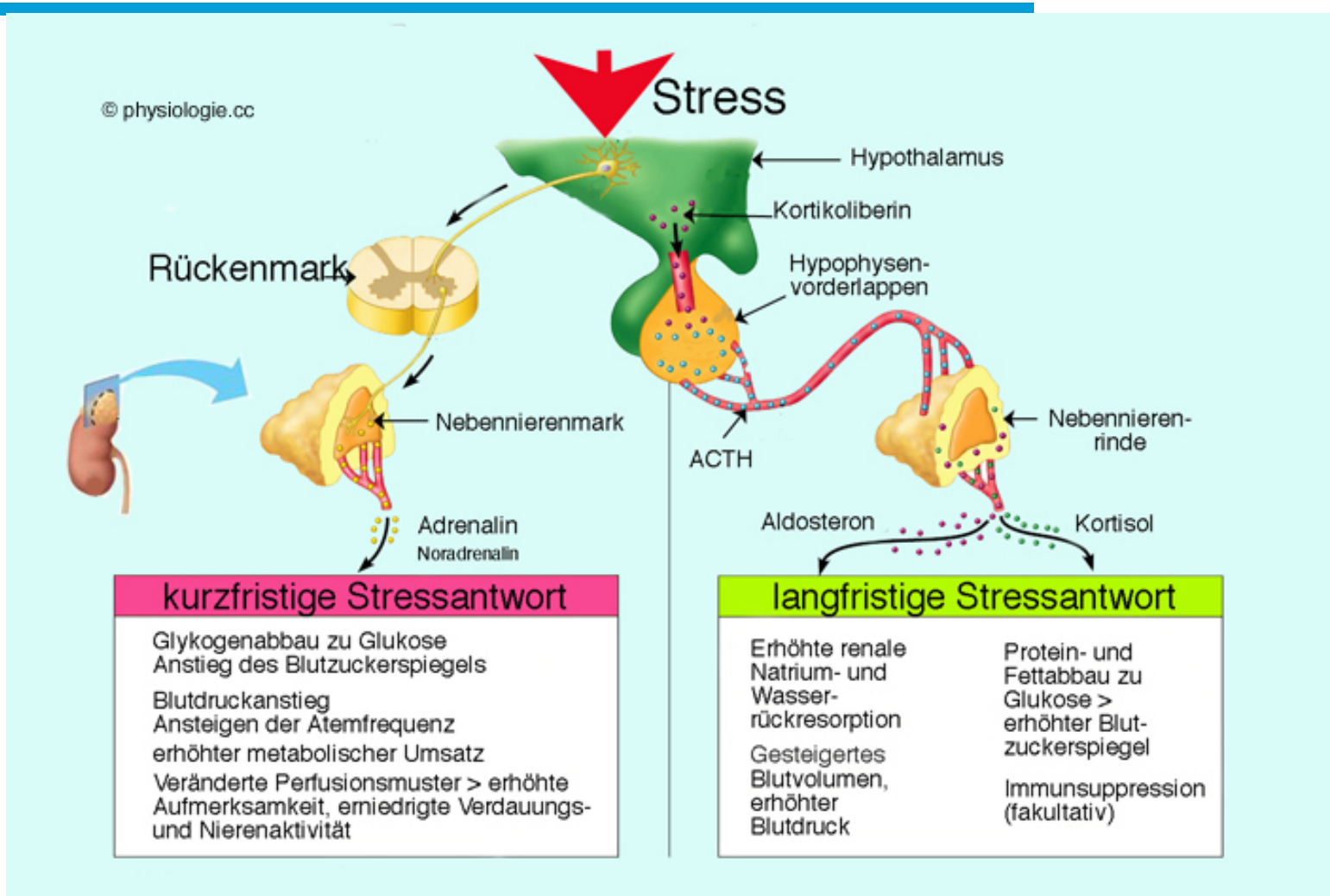
➢ Salt reduction of 2.5 g/day results in 25-30 % less heart attacks, strokes, cardiac deaths

Acidic due to animal protein

- Animal protein contains significantly more sulphur-containing amino acids, especially methionine, than vegetable protein
  → Animal protein carriers are more acidic than indicated in the PRAL table
- Cow's milk also has an acidic effect due to its high protein and phosphate content (PRAL value: 0.7)

➢ Recommended protein sources: Pulses and pseudo-cereals (amaranth, quinoa)
→ Deliver lysine, which is only present in small quantities in cereals

Stress and its main hormones: catecholamins and cortisol



Stress makes acidic and cranky

- Stress increases release of adrenaline, noradrenaline, cortisol and glucose
- Stress makes breathing shallow and fast
  - ↓ Exhalation of acids
  - ↓ Oxygen for energy production
- Consequences of "cold stress": narrowed blood vessels; little oxygen, a lot of sugar in the blood

➢ "Cold stress" exhausts energy metabolism, redox and acid-base balance

➢ Consequences for the mineral balance:

  ➢ Acetylcholine (parasympathetic) → potassium is retained

  ➢ Adrenaline (sympathetic) → NaCl is retained, potassium lost

Catecholamines in metabolic acidosis (I)

- **Catecholamines** = catabolic stress hormones
- **The Purpose of acidosis in stress: more oxygen supply!**
- In athletes, venous blood pH as low as 7.0 with very high lactate of up to 10 mmol litre^{-1}
- 60% increase of the oxygen availability
- Bohr effect: a decrease in pH of 0.2 results in a greater increase in oxygen delivery than a 20% increase in cardiac output. To produce a comparable increase in DO_2, cardiac output would need to increase by 30%. (Handy and Soni, 2008)
- **Natural physical stress activates mitochondria** and energy production, **cold stress does not** (sugar, catecholamins, and acids accumulate in blood).

Catecholamines in metabolic acidosis (II)

- Catecholamines in lactic acidosis
  - common association of stress and lactic acidosis
  - rise in plasma lactate concentration during epinephrine infusion
  - precipitation of lactic acidosis by epinephrine intoxication and phaeochromocytoma
  - vasoconstrictor effects of catecholamines leading to tissue anoxia and lactic acid production
- Catecholamines in ketoacidosis
  - high incidence of stress (approx. 70%) as a precipitating factor
  - elevated levels of norepinephrine in patients
  - rise in concentrations of ketone bodies during catecholamine infusion
  - reduction in the incidence of ketoacidosis with beta-adrenergic pharmacological blockade

Schade, 1982

Stress hormone cortisol: retention of Na, Cl, loss of K, Mg, Ca

- During stress: cortisol increased
- Increases storage of salt (sodium + chloride)
- Promotes excretion
  - of excess acids and nitrogen
  - but also of potassium, magnesium and calcium

  → **chronic fatigue, feeling "wired and tired",**

  → **insulin resistance, hypertension, etc. etc.**
- Sufficient intake of potassium, magnesium and calcium is particularly important during stress!

Providing balance through movement

- Reduces stress hormones
- Causes deep breathing
- Activates sodium-potassium pump and thus deacidifies cell
- Stimulates metabolism:
  - ↑ Blood circulation
  - ↑ Breathing (O_2 in, CO_2 out)
  - ↑ Mitochondrial function
  - ↑ Removal of acids from connective tissue

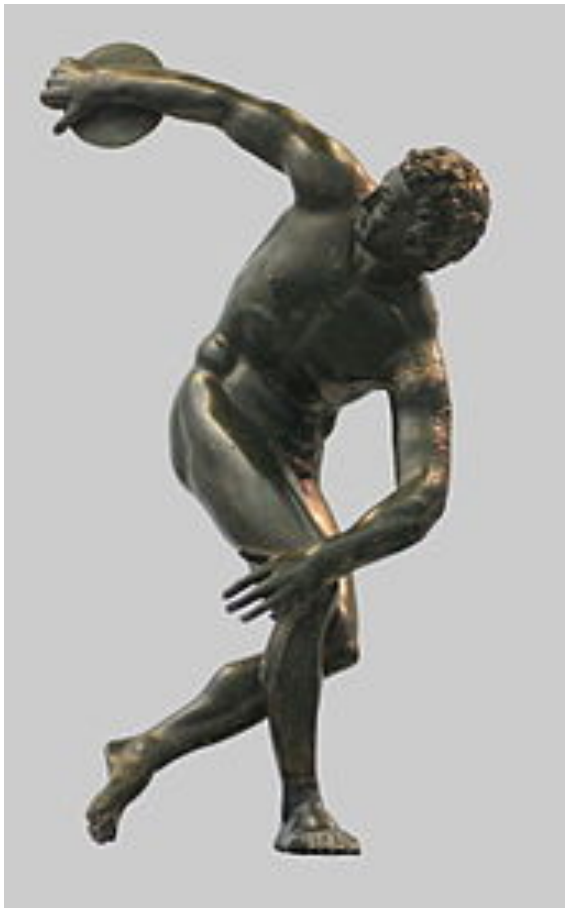
➢ Also very helpful: breathing exercises

➢ But competitive sports acidifies

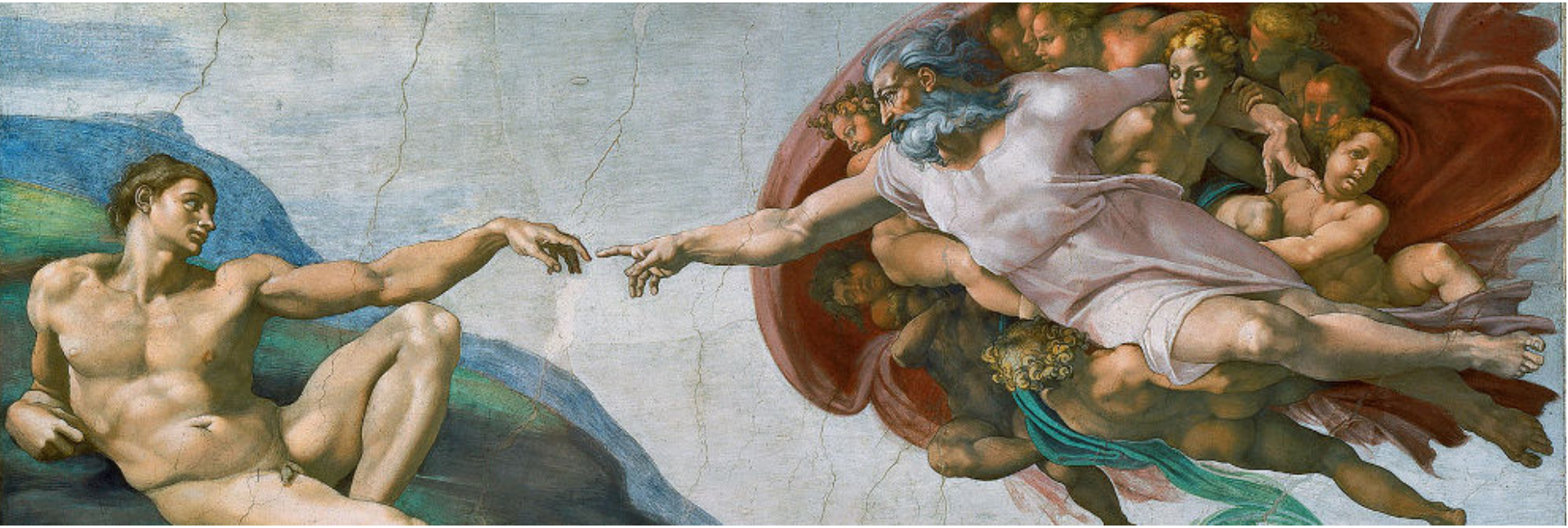
Typical early symptoms of chronic acidosis

- Fatigue and exhaustion
- Irritability, tenseness: wired, but tired
- Loss of connective tissue elasticity and function (edema, cellulite etc)
- Increased hair loss, thin hair
- Brittle nails, skin problems
- Heartburn (GERD)
- Kidney gravel, kidney stones
- chronic pain, incl. headaches
- etc.

Hair loss is a modern problem



The proof:
God has hair! Adam too!



Hair loss due to acidosis: an encyme regulated by pH

- Study: Athletes often have less hair
- Cause: Higher cortisol and testosterone levels
- Testosterone is converted to dihydrotestosterone (DHT) by the enzyme **5-alpha-reductase** → DHT is a risk factor for hair loss, among other things
- Activity of 5-alpha-reductase is pH-dependent
  - Very active in the acidic pH range
  - More DHT is produced in acidosis → hair loss more pronounced
  - Hair loss is more severe on the head than e.g. on the cheeks, because there is less buffer tissue

Early vertex hair loss may double risk of prostate cancer (Yassa et al., 2011)

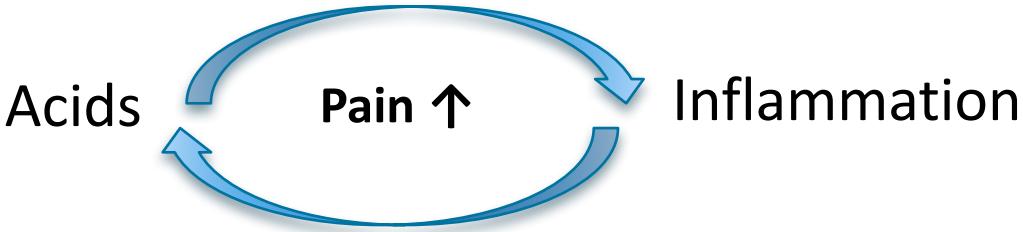
- DHT is a key risk factor for prostate hyperplasia and prostate cancer
- "Our study revealed that patients with prostate cancer were twice as likely to have androgenic alopecia at age 20."
- Activity of 5-alpha-reductase is pH-dependent
  - Very active in the acidic pH at 5,5
  - Urine pH value in acidosis usually in the range of pH 5.5
  - Urinary tract in close proximity to the prostate!

Lots of sports, little hair?

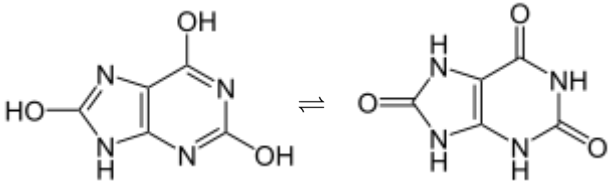
Acidotic!

Acidosis, pain and inflammation

- Acids are deposited in the tissue
- Acid measuring ion channels play a central role in pain transmission
  - Acidic tissue pH may cause pain
- Acids promote silent inflammation → pain.
- Inflammation promotes acids → vicious circle
- E.g.: chronic pain in rheumatism, back or joints
- Clinical studies show improvement with citrates



When an acid deposits: uric acid is highly inflammatory



- Uric acid has a proinflammatory effect in the body (gout!)
- Gout as a typical disease of prosperity (a lot of meat)
- Increased uric acid values due to e.g.
  - Insufficient excretion through the kidneys
  - Increased uric acid production due to high consumption of
    - animal food → degradation of purine
    - foods rich in fructose (mainly sugary beverages, sweets) → Fructose promotes the body's own purine synthesis and inhibits uric acid excretion
    - Fruit is no problem, because it is rich in base-forming substances
- Uric acid forms crystals when
  - concentrations too high (solubility product exceeded)
  - pH is acidic (e.g. in urine and tissues in case of acidosis)
  - Dr. Jacob‘s alkaline formula provides balance

Acidosis and pain

Acids → **Pain ↑** → Inflammation

Cell battery

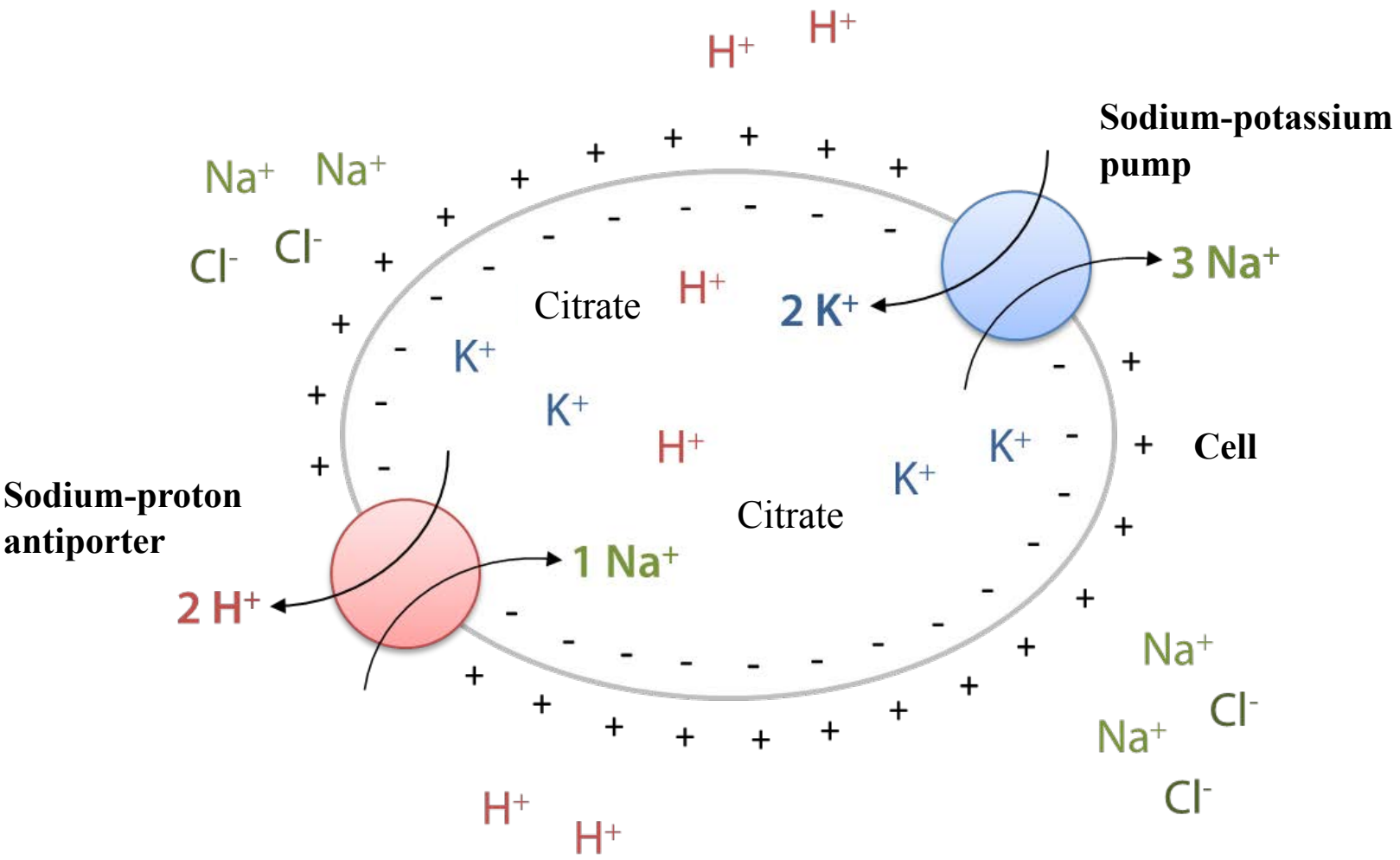
- Membrane potential supplies cells with electrical energy
- Inside negative, outside positive charge
- Decisive: Ion concentrations, especially potassium (K^+), sodium (Na^+) and chloride (Cl^-)
- Changes in membrane potential direct nerve impulse transmission, muscle contraction, hormone release
- In case of potassium deficiency: depolarisation of the cell

Cell battery

Ion	Intracellular concentration	Extracellular concentration	Equilibrium potential
Sodium (Na^+)	15 mM	145 mM	V_{Na} = +60.60 mV
Potassium (K^+)	150 mM	4 mM	**V_K = −96.81 mV**
Calcium (Ca^{2+})	70 nM	2 mM	V_{Ca} = +137.04 mV
Acid (proton, H^+)	63 nM (pH 7,2)	40 nM (pH 7,4)	V_H = −12.13 mV
Magnesium (Mg^{2+})	0.5 mM	1 mM	V_{Mg} = +9.26 mV
Chloride (Cl^-)	10 mM	110 mM	V_{Cl} = −64.05 mV
Bicarbonate (HCO_3^-)	15 mM	24 mM	V_{HCO3-} = −12.55 mV

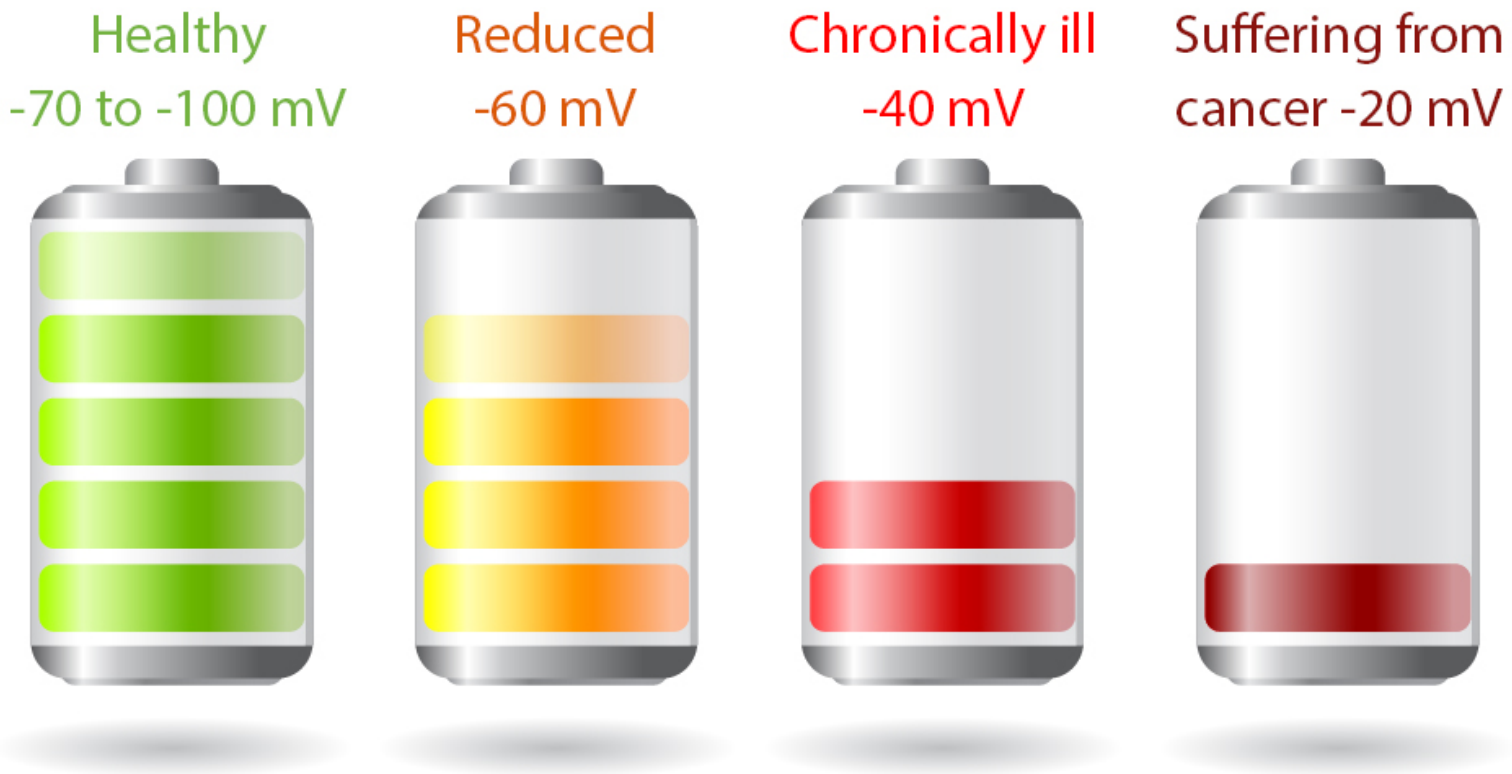
Intra- and extracellular concentrations and Nernst equilibrium potential of important ions

Cell battery



Cell battery

- Direct connection between membrane potential and health status

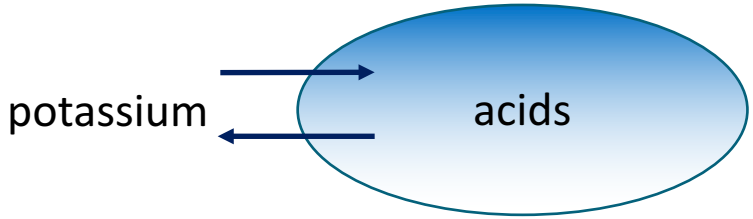


Importance of potassium

- Resting potential is essentially determined by potassium
- Potassium activates the sodium-potassium pump, which consumes 25% of the body's energy for membrane potential
- Basic potassium compounds stabilize the resting potential and deacidify the cell
- Ideal: about 3-4 times more potassium than sodium (in mg)
- The lower the potassium concentration in the nerve cells, the weaker the resting potential, the more susceptible the nerves and psyche are

Potassium deacidifies the cells

- Most important ion for intracellular deacidification!
- Potassium removes acids from the cells

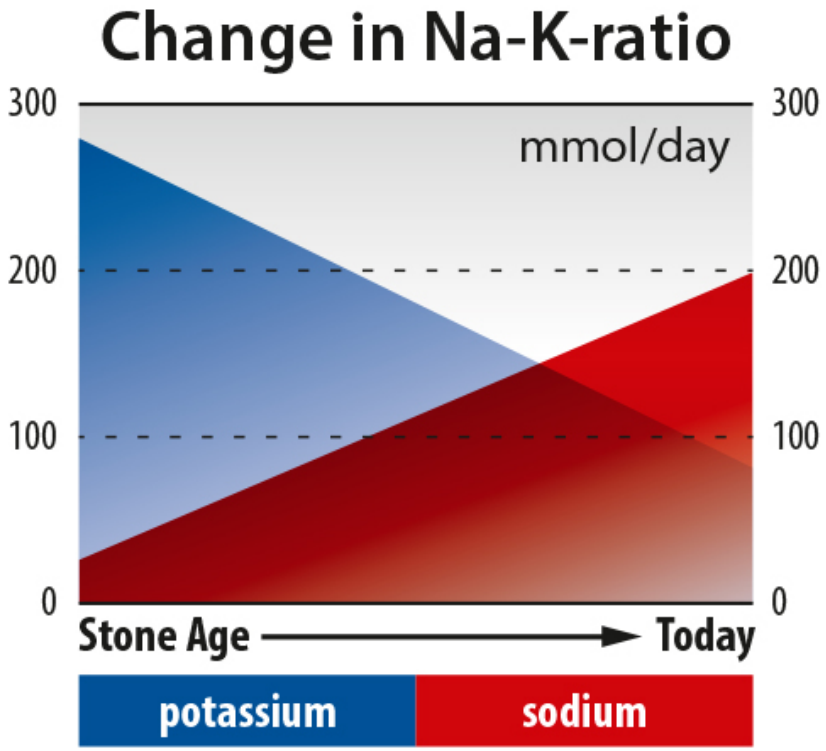


- Potassium-rich diet significantly reduces the risk of stroke and protects the kidneys
- Recommendation of the FNB: 4700 mg/day
- Actual intake in Germany Ø 3400 mg/day
- Intake through vegetables, fruits, herbs and nuts

Acidosis and effects on potassium balance

- Cellular effects of chronic latent acidosis:
  - Protons enter the cell → intracellular pH value ↓
  - Changed pH value influences Na-K pump
  - Intracellular increase in proton concentration inhibits the uptake of potassium into the cell
  - Protons compete with potassium ions for binding sites on cellular proteins
    - → Configuration and conformational changes
    - → e.g. modification of enzyme activities
- **Chronic acidosis:**
  - intracellular loss of potassium
  - Serum potassium in the normal range
- **Acute acidosis:**
  - Hyperkaliaemia

Sodium-potassium ratio



Sodium-potassium ratio has shifted significantly:

- Previously: 10 g potassium, 0.8 g sodium
- Today: 3 g potassium, > 3 g sodium
- US recommendation: min. 4.7 g potassium, max. 2 g sodium

Sodium-potassium ratio

- Killer No. 1 before smoking: hypertension
- Human is the only mammal with high blood pressure
- The potassium-sodium ratio essential for blood pressure
- Sodium and potassium are natural antagonists
- Potassium-rich, low-sodium diet normalizes blood pressure

➢ Original sodium-potassium ratio in unprocessed vegetable foods

Stroke and heart attack due to sodium-potassium imbalance

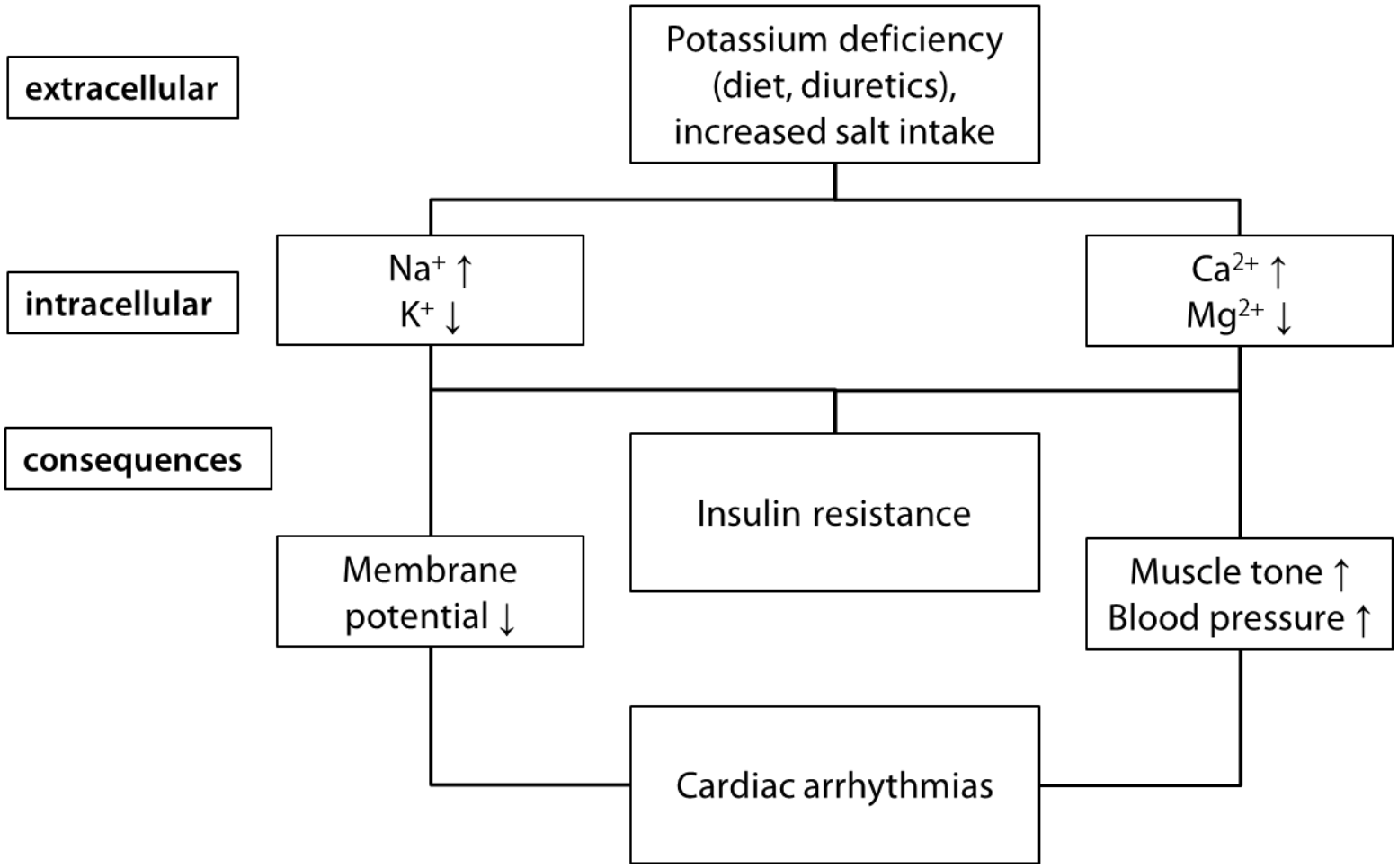
- Mortality after 15 years: (Yang *et al.*, 2011)
  - by 20 % ↑ per 1 g sodium
  - by 20 % ↓ per 1 g potassium
- Salt reduction of 2,5 g per day:
  - ➢ 30 % fewer cardiovascular events (Cook *et al.*, 2007)
- Potassium supplements in hypertension:
  - ➢ ↓ Stroke risk by up to 64 % (Ascherio *et al.*, 1998)

Calcium and magnesium

- If acidosis persists, calcium and magnesium reserves are broken down from bones
- Absorption of calcium and magnesium depends on vitamin D
- High-dose calcium (>1400 mg/day) without vitamin D is harmful (risk of heart attack by 30 %↑)!

➢ Important: Take up calcium and magnesium in a balanced ratio (in vegetables and fruit: 3:2)

Health consequences of an impaired mineral balance



Long-term consequences

- Increase in chronic inflammation
- Decrease in renal function up to renal insufficiency
- Bone and muscle loss
- Hypertension, vascular calcification, increased risk of stroke and heart attack
- Promotion of carcinogenesis

Halved kidney function

- Loss of 50% of kidney function in old age is the rule, but not normal!
- High acid load of modern nutrition leads to gradual decline in kidney function
- ↑ Acid production in the body
  ↓ Glomerular filtration rate, kidney function (Scialla *et al.*, 2012)
- Excess acid is excreted less

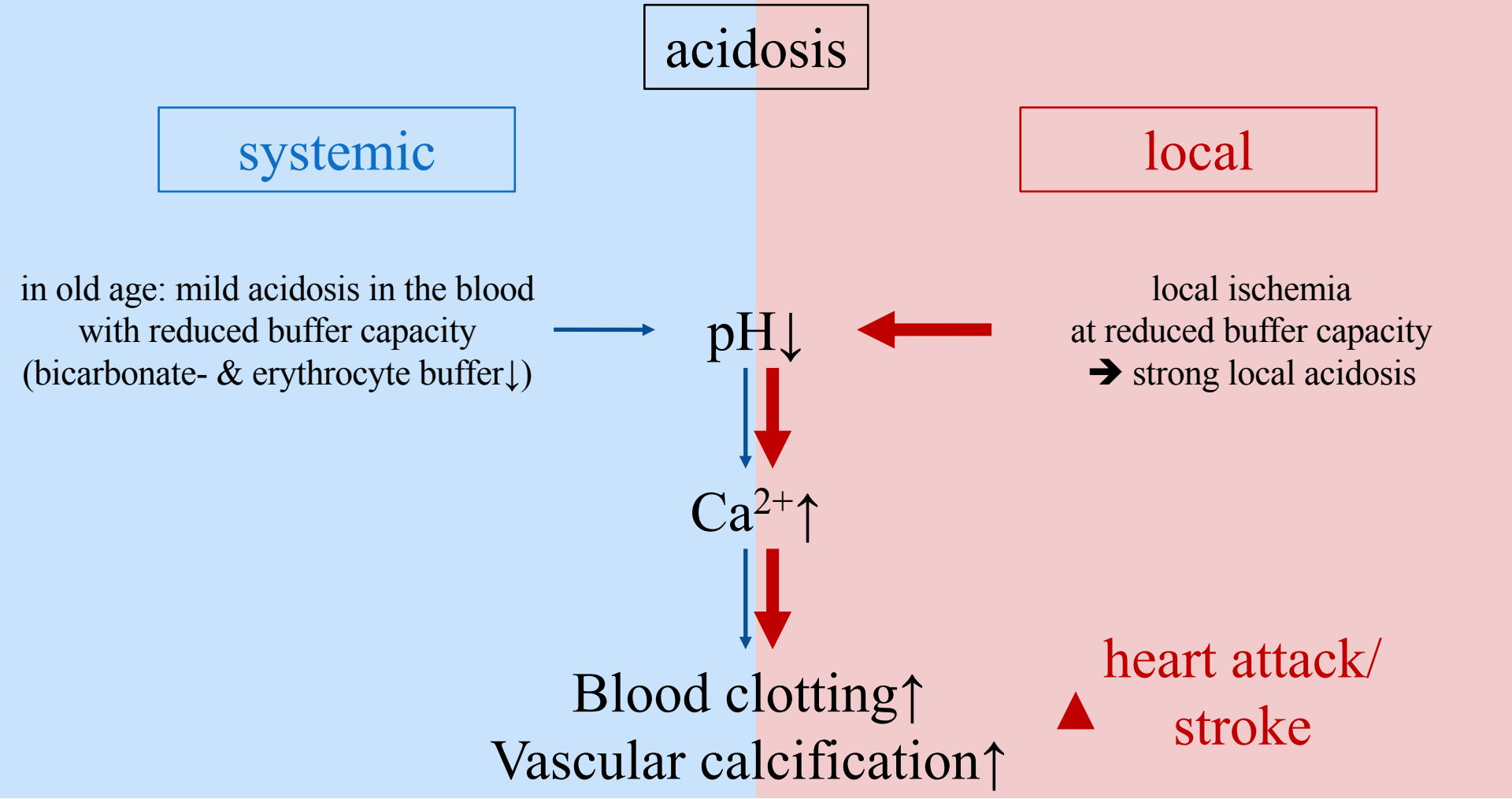
→ Vicious circle: acids accumulate
→ Bicarbonate buffer decreases, erythrocyte buffer decreases
→ Muscle breakdown (glutamine/ammonia as buffer)
→ Bone breakdown → Calcium and magnesium as buffer

Alkaline supplements for the bones

- Study over 12 months with 161 women
  - after menopause
  - with osteopenia
- Daily intake of
  - 1.2 g of potassium (as **potassium citrate**)
  - 500 mg of calcium
  - 400 IU of vitamin D
- Results
  - significantly elevated bone density
  - Improved bone structure
  - Just as effective as raloxifene (drug for treatment and prevention of osteoporosis in postmenopausal women)
  - Bone status worse in control group (**potassium chloride**, calcium, vitamin D)

(Jehle *et al.*, 2006)

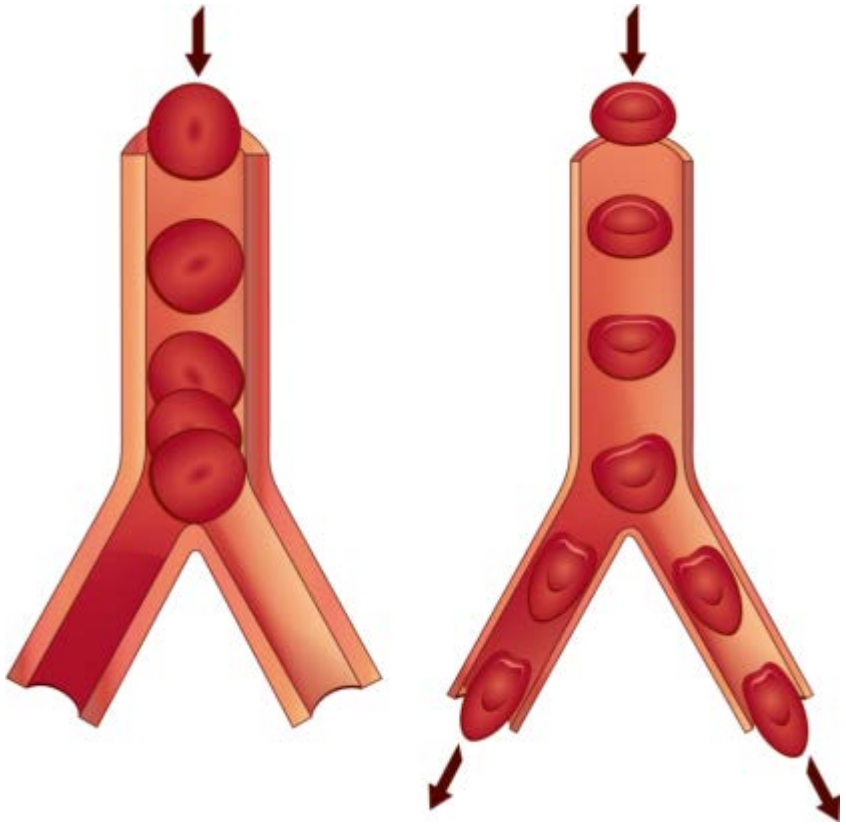
The calcium paradox: why the calcium does not stay in bones, but arteries



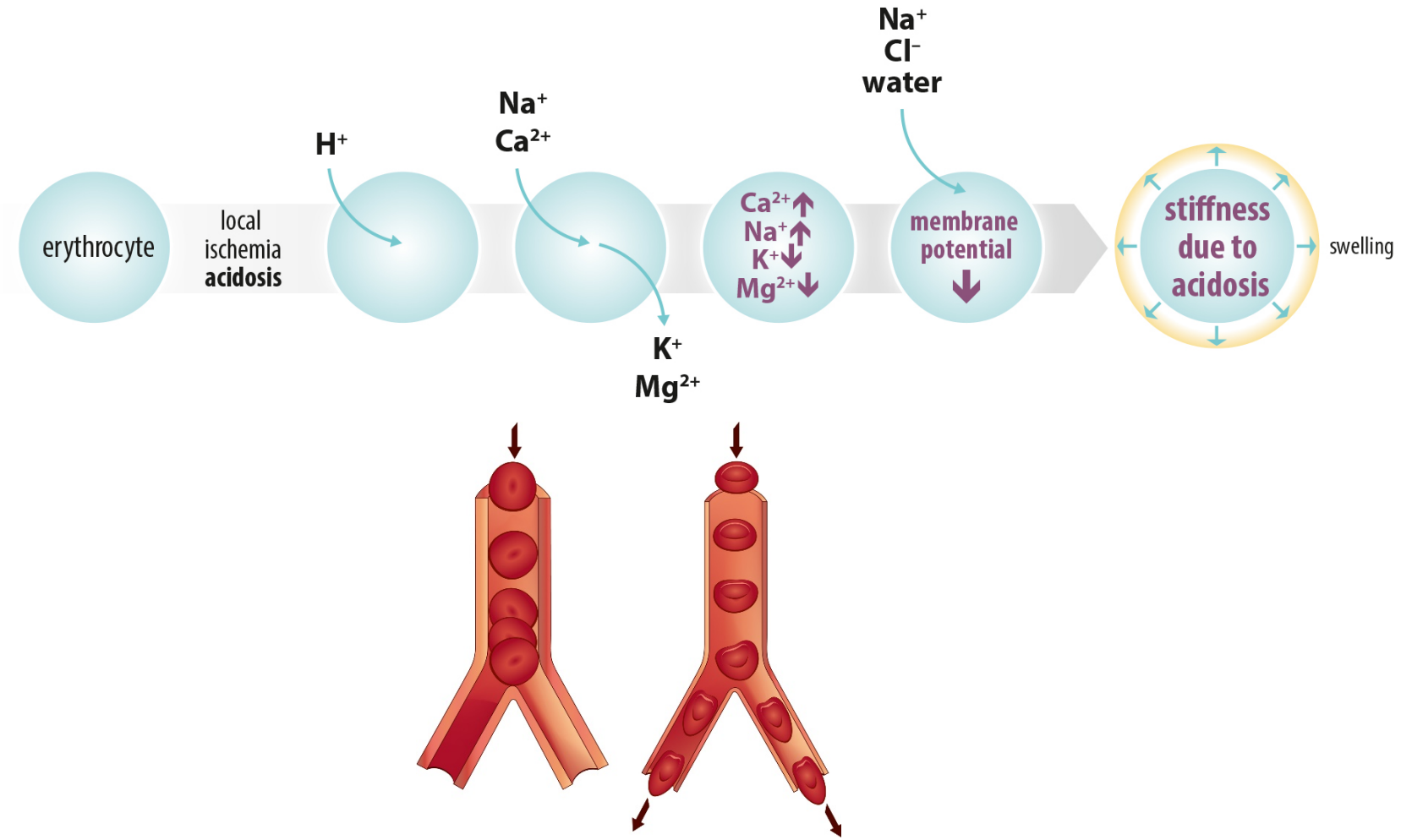
To make the bad worse: erythrocyte get rigid in acidosis

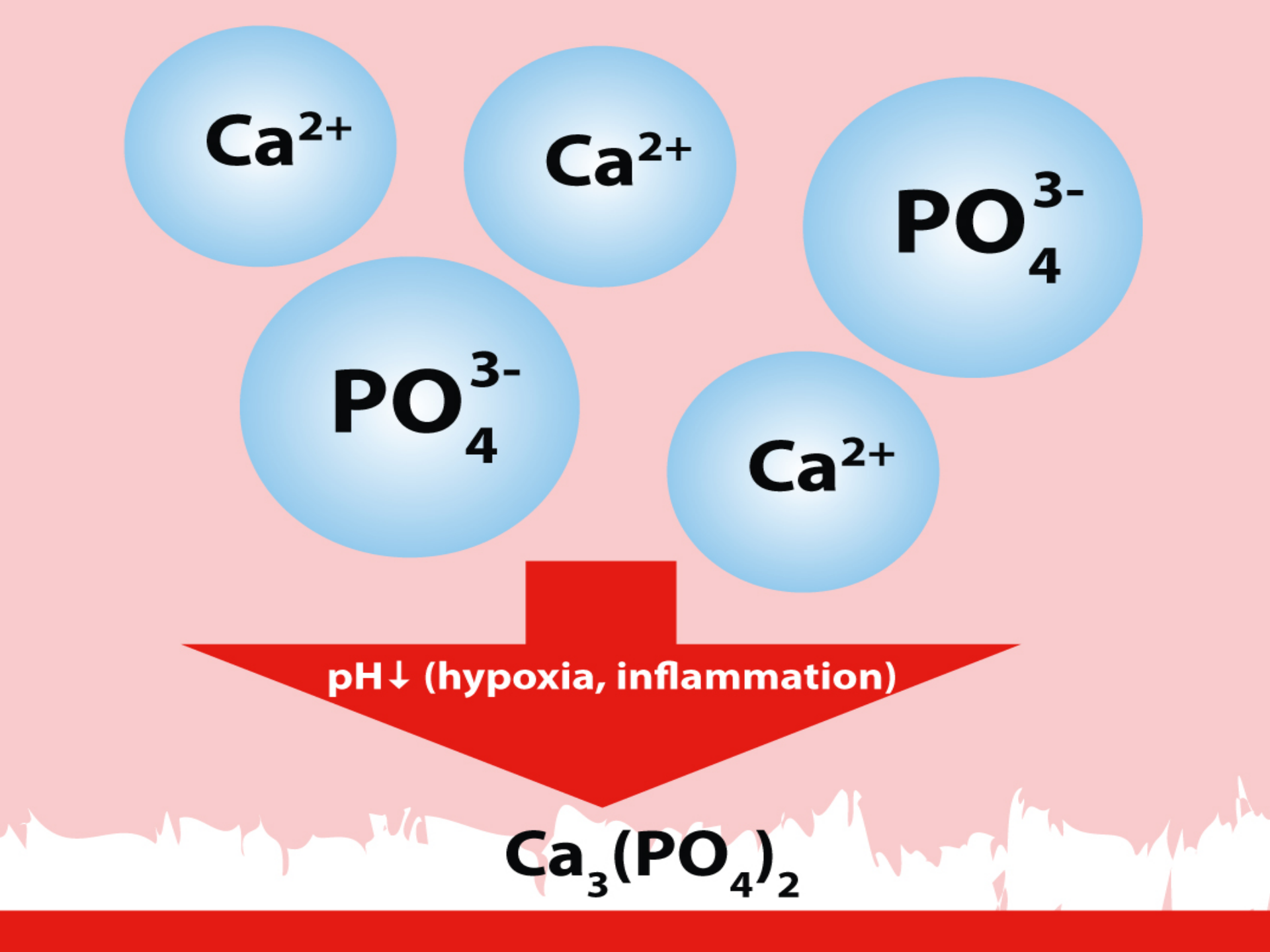
- Potassium softens vessels, salt makes them hard
- Rigid vessels + swollen, rigid erythrocytes (erythrocyte stiffness) → vessel occlusions, circulatory disorders

➢ Consequences: stroke, heart attack



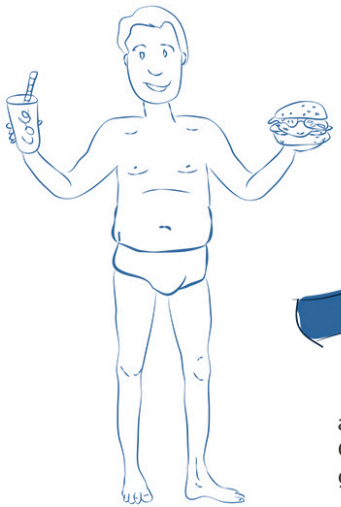
Erythrocyte stiffness due to acidosis

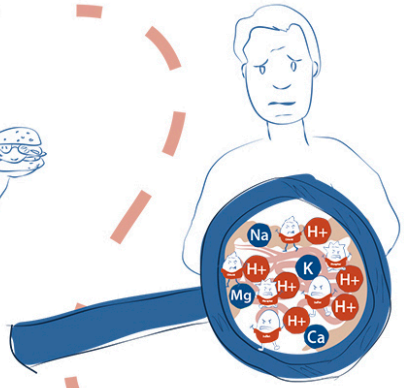



Ca^{2+}
Ca^{2+}
PO_4^{3-}
PO_4^{3-}
Ca^{2+}
pH↓ (hypoxia, inflammation)
$Ca_3(PO_4)_2$

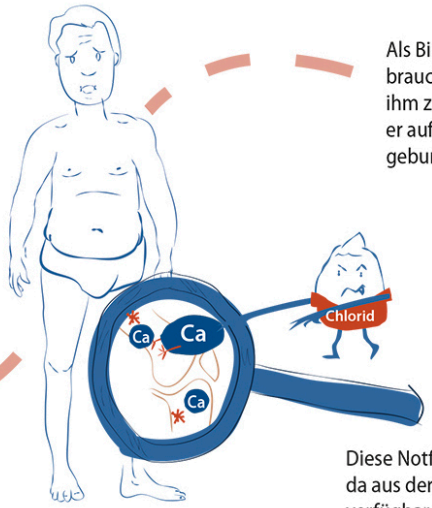
The calcium lost in urine and arteries needs to be replaced – from the bones

Eine Ernährung mit viel Fast Food, Salz und (tierischem) Eiweiß führt dazu...





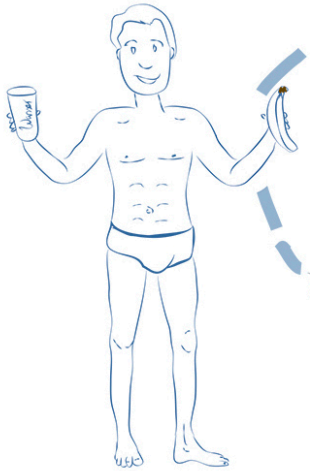
…dass dem Körper nur wenige Mineralstoffe, aber viele Protonen sowie die Bindungspartner Chlorid, Phosphat und Sulfat (Anionen) zur Verfügung stehen.

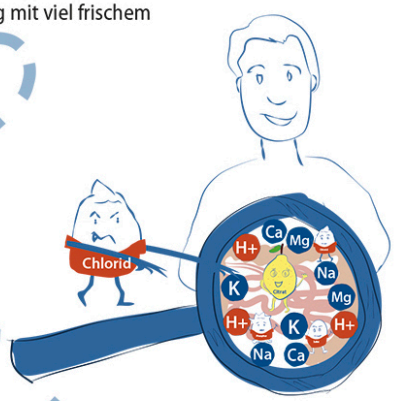


Als Bindungspartner für die Anionen braucht der Körper mehr Mineralstoffe als ihm zur Verfügung stehen. Deshalb greift er auf die in den Geweben (z.B. Knochen) gebundenen Mineralstoffe zurück.

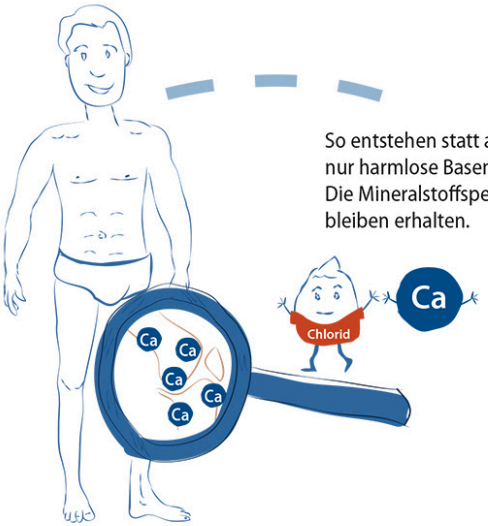
Diese Notfallmaßnahme wendet der Körper an, da aus der Verbindung der Anionen mit den verfügbaren Protonen aggressive Säuren entstehen würden, die dem Körper schaden können.

Durch eine ausgewogene Ernährung mit viel frischem Gemüse, Obst und Kräutern…





…stehen dem Körper ausreichend Mineralstoffe als Bindungspartner für die Anionen zur Verfügung.



So entstehen statt aggressiver Säuren nur harmlose Basensalze.
Die Mineralstoffspeicher der Gewebe bleiben erhalten.

Health consequences of an impaired mineral balance

stroke

muscle loss

skin, hair and nail problems

bone loss

pain and inflammation

overexcitation of nerves

vascular calcification

cardiac arrhythmia

hypertension

decrease in renal function

loss of connective tissue elasticity

Best measures against acidosis and energy deficiency

1. Plant-rich wholefood
2. Healthy, base-forming and abundant drinking
3. Deep abdominal breathing
4. Exercise with joy
5. Deep relaxation and good sleep
   (sleep apnea can lead to acute acidosis)
6. Help in phases of increased stress:
   Potassium-rich citrate base products & intestinal care
   (with lactic acid and dietary fibres)
7. Some alkaline formulas can do more harm than good.
   And here is why:

Liver force = „life“-force

- Most important deacidification organ for metabolic acids (40 x kidney)
- Most important organ of energy metabolism:
  - 1/5 of liver volume = mitochondria
  - Mitochondria = power plants of the cell, acid degradation
- Most important detoxification organ
- Most important organ for synthesis: produces enzymes, hormones, blood proteins

Healthy intestine – healthy human

- About 10 times more intestinal bacteria than body cells
  - > 500 different types
  - Enormous metabolic capacity
- Healthy colon is slightly acidic (pH < 6,5)
  - Thanks to bifidobacteria and lactobacilli (e.g. produce butyric acid) → natural enemies of fungi
- Sick colon is alkaline
  - Due to putrefication of proteins of e.g. clostridia (ammonia, cadaveric poisons)

Healthy intestine – healthy human

- After 2 days in the intestine at body temperature every meat is rotten meat!

Intestinal dysbiosis

- Causes:
  - Too much meat, too much animal protein
  - Too little dietary fibre; recommendation: at least 30 g/day! Actual intake: 10-25 g, formerly 50-90 g
  - Antibiotics: excessive use in fattening animals, frequent medical use
- Consequences:
  - Disturbance of the immune system, Leaky Gut, allergies, colon cancer
  - Ammonia is completely absorbed and strains the liver
  - „Ammonia Hangover"

Metabolic poison ammonia NH3

- Ammonia: product of protein or amino acid degradation
- Ammonium and ammonia are balanced, i.e. part of the ammonium is always present as toxic ammonia
- Ammonia must be detoxified by the liver
- Ammonia blocks acid degradation in the liver and energy metabolism

„Ammonia Hangover“

- Ammonia blocks the citrate cycle (central metabolic circular saw)
- Blockade of the energy and acid-base metabolism
  - Increased acidosis
  - Blocked deacidification
  - Lack of energy
    "Ammonia Hangover"

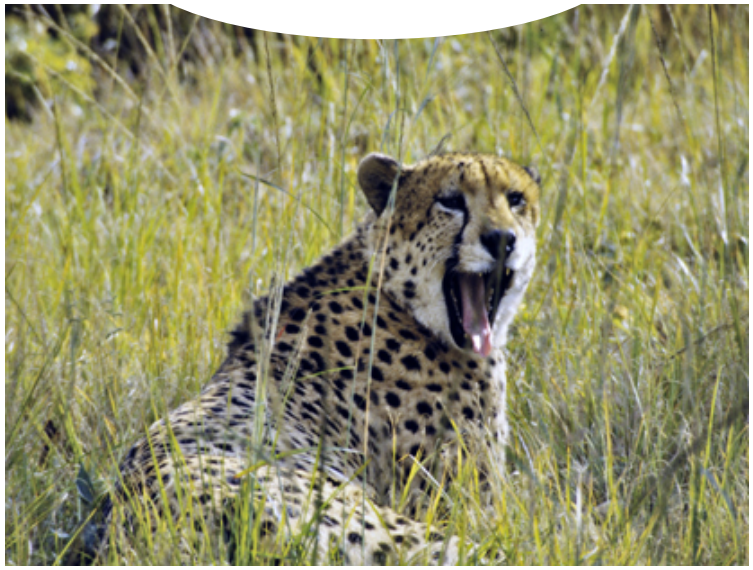
Energy balance: A question of nutrition?

Too much protein inhibits the energy metabolism (-> ammonia)!

pure herbivores

Racehorse Hawkster:
61 km/h at 2414 meters

fastest carnivore



Cheetah study (*Nature*):
54 km/h at max. 200 meters

Dextrorotatory lactic acid

- Nutritional dextrorotatory lactic acid repairs the intestine and relieves the liver
- Lowers colon pH and thus restores healthy, slightly acidic intestinal milieu

→ Ammonia is excreted as non-toxic ammonium NH4 in feces → liver relief → liver can deacidify fully and dedicate itself to energy production

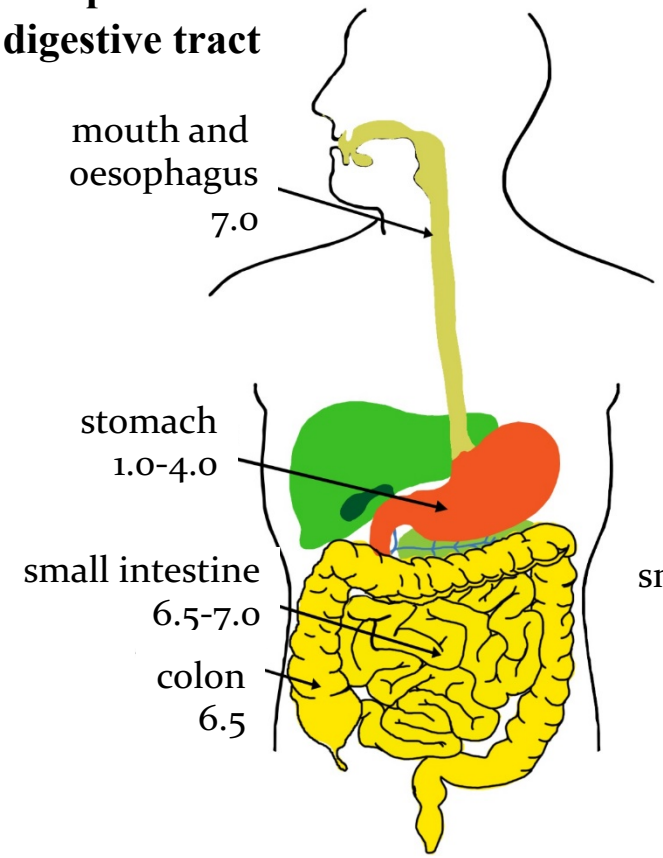
- Generation of butyrate by bacteria
- acts in cells as a buffering compound

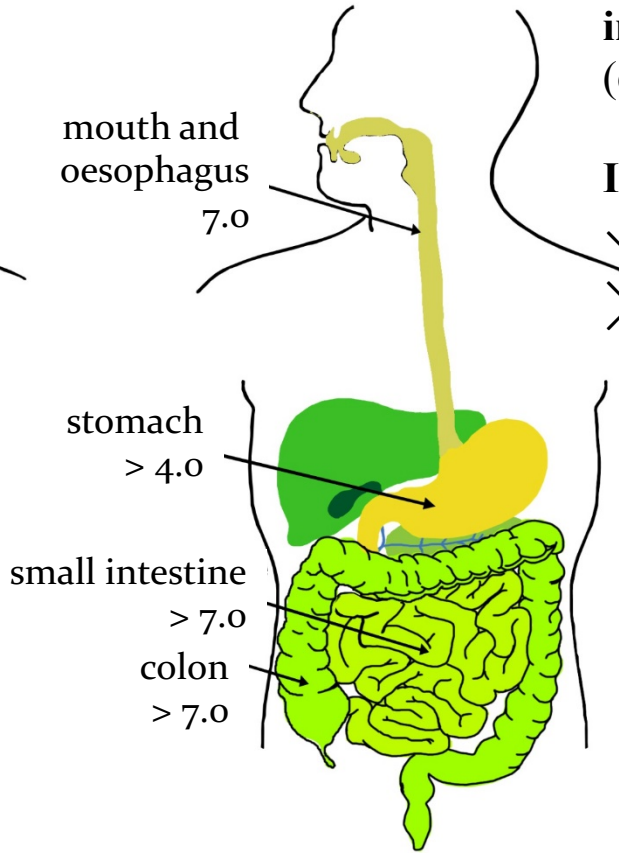
Prebiotic dietary fibres

- Nourish healthy intestinal flora
- lower intestinal pH value by forming short-chain fatty acids, such as cancer inhibitor butyric acid
- If taken, bloating may occur at the beginning:
  - Increase the dose slowly!
  - Supplementary use of probiotics, if necessary
  - Not suitable for Small Intestinal Bacterial Overgrowth

Alkalizing agents - what to look for?

Normal pH values in the digestive tract





Increased pH values after ingestion of carbonates
(calcium carbonate/soda)

In the stomach:
↓ stomach acid
↓ digestion
↑ pathogenic bacteria

In the intestine:
↑ **ammonia**
(liver burden, inhibition of energy metabolism)
↑ **carcinogens**
(poisoning of bile acids)

A healthy colon is slightly acidic
thanks to lactic acid, butyric acid etc.. (from probiotic bacteria)

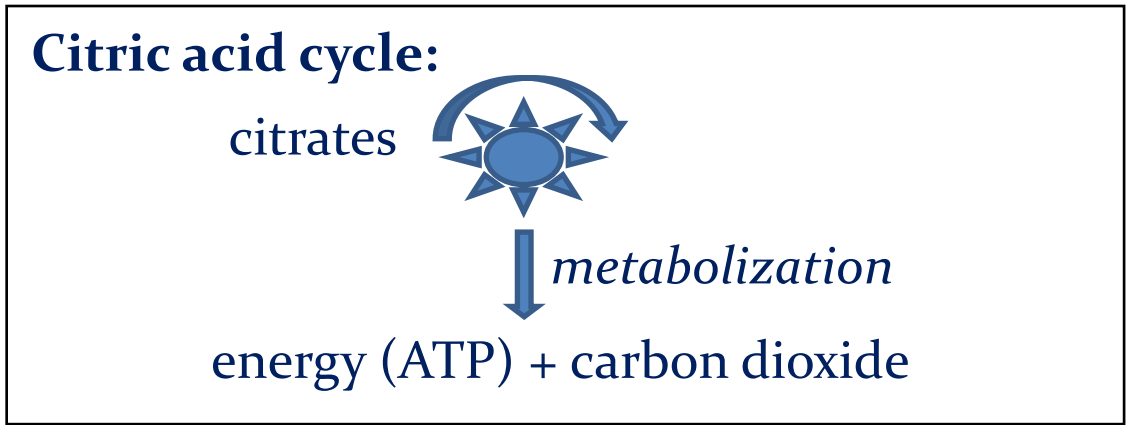
Carbonate/Bicarbonate

- e.g. soda/sodium bicarbonate, calcium carbonate
- Highly alkaline, effective in the gastrointestinal tract
  - Neutralize stomach acid
  - Alkalize the large intestine (↑ pH value)
- Alkaline large intestine burdens the liver
  - Balance between ammonium and ammonia shifts to toxic ammonia; ammonia is absorbed 400 times more easily than gas
  - Intestinal bacterial overgrowth → detrimental metabolic products
  - Liver cannot deacidify properly

Deacidification with citrates

- Organic, naturally present in food
- Active in cell metabolism, gentle on stomach & intestine
- Elimination of 3 acid molecules per citrate molecule (bicarbonate only 1)
- The mineral binding partners are particularly important: potassium, magnesium, calcium

➢ Deacidifying effect is effective and long-term



Application of Dr. Jacob‘s alkaline formula

- Base cure for 1 month with 2 measuring spoons of Dr. Jacob‘s alkaline formula daily:
  - Dissolves acids in the tissue
  - Neutralizes the acids
  - Supports their elimination

- Afterwards permanently:
  1 measuring spoon of Dr. Jacob’s alkaline formula daily:
  Balances the daily acid load of Western diets

Dr. Jacob's Basen-Vitalkuren

mit 3 Kurprogrammen

Auch bei Gluten-, Fruktose-, Laktose- und Histamin-Intoleranz

SUZANNE JACOB

LUDWIG JACOB

Dr. Jacob's Basen-Vitalkuren

BASISCH ESSEN & TRINKEN • BASISCH ABNEHMEN • ENTSPANNEN • BEWEGEN • EINFACH BEWUSSTER LEBEN

Kleine Änderungen des Lebensstils, große Wirkungen auf Ihr Wohlbefinden

Abnehmen leicht gemacht mit der richtigen Ernährung und Bewegung

Dr. Jacob's®

DR. JACOB'S ALKALINE VITAL CURES

1 - The basic program

2 - DR. JACOB'S ALKALINE DRINKING REGIMEN

3 - The complete program - DR. JACOB'S ALKALINE REGIMEN

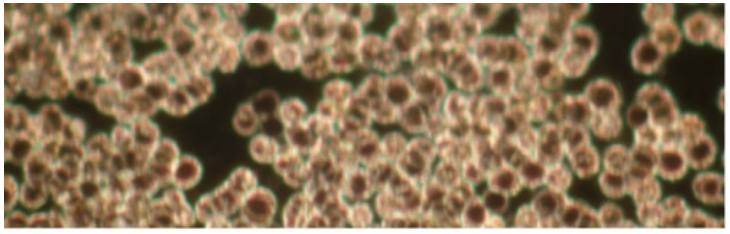
- The special program - DR. JACOB'S RELIEF REGIMEN

Dr. Jacob's Alkaline Vital Cures

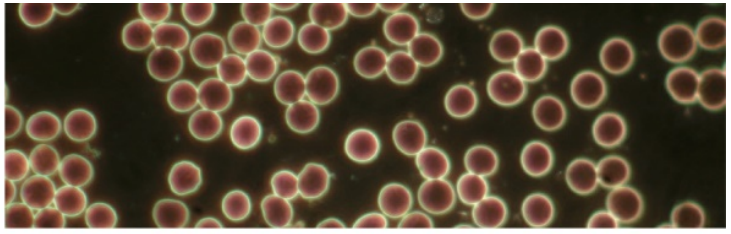
1. **The basic program: Dr. Jacob's Alkaline Drinking Regimen**
   - ✓Time required: 5 minutes/day
   - ✓Can be optimally integrated into everyday working life
   - ✓Feeling good immediately
2. The complete program: Dr. Jacob's Alkaline Regimen
3. The special program: Dr. Jacob's Relief Regimen

DRINK YOURSELF HEALTHY!

- Bodys warning signals for insufficient fluid: fatigue, headache, constipation, nausea
- **Drink at least two liters throughout the day:** water, herbal tea, drinks containing lactic acid, Chi-Cafe instead of coffee
- At night our body loses about 0.5 L of water: The blood becomes thicker and flows more like ketchup than tomato juice.
  → Threefold risk for stroke and heart attack in the morning!
- **Morning drinking ritual:** Drink two glasses (approx. 500 ml) of liquid immediately after getting up.



Blood count in the dark field before…



…and after

DR. JACOB'S ALKALINE DRINKING REGIMEN

THE BASIC PROGRAM FOR MORE ENERGY IN EVERYDAY LIFE

- Provides liquid and the right electrolytes (minerals)
- Absorption of electrolytes is best in isotonic liquid

➢ Dr. Jacob's isotonic citrate drink: each ½ liter

1. in the morning
2. to afternoon low
3. in the evening

CHEERS! DRINK YOURSELF HEALTHY

1 The basic program

Dr. Jacob's Alkaline Drinking Regimen

- **Preparation of isotonic citrate drink:** 1 liter of (sparkling) water with 1 measuring spoon (4.5 g) Dr. Jacob's Alkaline Formula

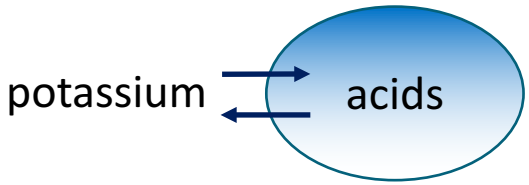
! Tips

- **Metabolic stimulant "Citralact alkaline lemonade":**
  Mix 1 ml (30 drops) Lactacholin with ½ liter citrate drink.
- **Ayurvedic alkaline lemonade:**
  Add a little lemon juice and a pinch of ginger to the citrate drink.

1 The basic program

BASE-FORMING MINERALS

- Potassium (K) → removes acids from the cells
- Magnesium (Mg) and calcium (Ca)



The minerals support the normal functions of the body:

- maintenance of bones and teeth (Ca, Mg)
- muscle function (K, Mg, Ca)
- functioning of the nervous system (K, Mg)
- reduction of tiredness and fatigue (Mg)
- energy-yielding metabolism (Mg, Ca)
- maintenance of normal blood pressure (K)
- Calms allergic reactions (Ca)

BASE-FORMING DRINKS

- Ideal: still or carbonated water and/or unsweetened herbal tea
- **PARTICULARLY RECOMMENDED:**
  drinks containing lactic acid (e.g. sparkling water with Grana*forte*, Lactirelle or Aronia elixir) or sparkling water with pomegranate elixir
- By the way: sparkling water does not make you sour, because the carbon dioxide is simply exhaled
- Healthy coffee alternative: Chi-Cafe *balance*
- 1 cup corresponds to the base content of approx. 100 g of vegetables

2 The complete program

Dr. Jacob's Alkaline Vital Cures

1. The basic program: Dr. Jacob's Alkaline Drinking Regimen
2. **The complete program: Dr. Jacob's Alkaline Regimen**
   - ✓Time required: 15-60 minutes/day
   - ✓Exercise with joy
   - ✓Relaxation thanks to deep breathing
   - ✓Healthy sleep
   - ✓Suitable for weight reduction
3. The special program: Dr. Jacob's Relief Regimen

2 The complete program

DR. JACOB'S ALKALINE REGIMEN

IS BASED ON DR. JACOBS WAY AND COMBINES:

1. Base-forming nutrition with pleasure
2. Exercise with joy
3. Relaxation thanks to deep abdominal breathing and good sleep

BASE-FORMING NUTRITION

- Healthy drinking
- Lots of vegetables, fruit and herbs
  - Contain abundant base-forming minerals: potassium, calcium and magnesium
  - Have a low calorie density
  - As the main ingredient of every meal
- Significantly reduce animal foodstuffs
  - No animal protein suppliers: Meat, sausages, fish, cheese, dairy products
  - No coke, energy drinks, white flour and sugar
  - Protein (approx. 50 g) and salt (max. 5 g) in moderation

2 The complete program

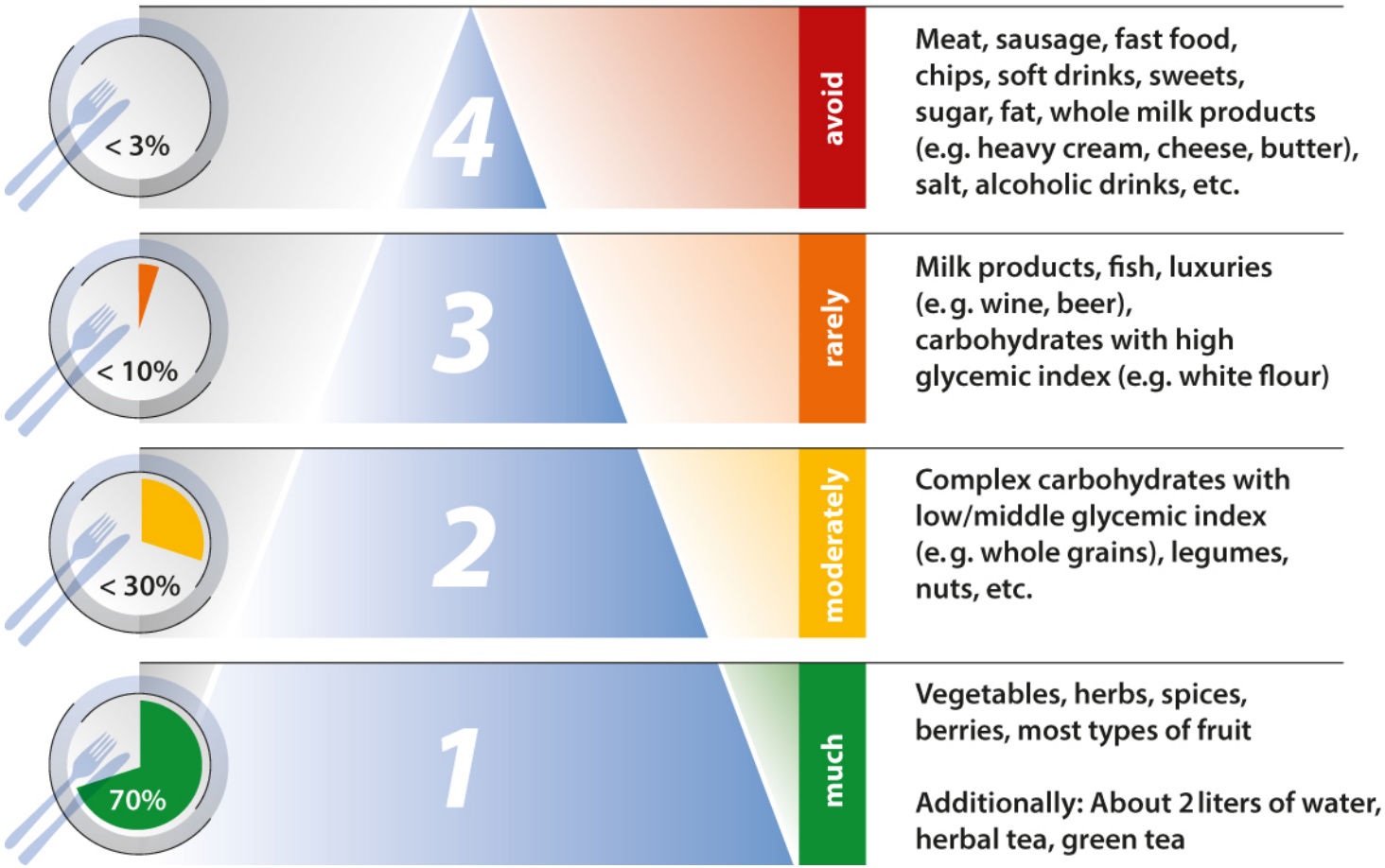
DR. JACOB'S GOLDEN DIETARY RULES

1. Drink plenty, regularly and healthily.
2. Eat plenty of colourful vegetable food and make sure it is well-tolerated.
3. Choose foods with low calorie and high nutrient density as well as low salt/sodium and high potassium.

! **SUPPLY THE MOST ESSENTIAL MICRONUTRIENTS ON A DAILY BASIS:**
5 µg **B12** (in case of poor absorption 500-1500 µg)
200 µg **iodine** e.g. from algae, 800-4000 IU **vitamin D_3**
Omega-3 fatty acids (linseed/oil, chia, DHA-EPA from algae)

2 The complete program

Dr. Jacob's Food Pyramid

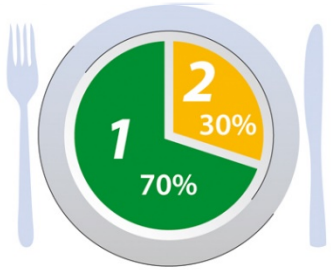


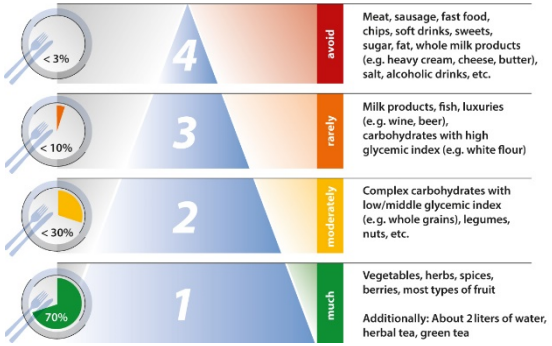
Detailed list of the four food categories in Dr. Jacob's dietary plan

2 The complete program

LONG-LASTING FEEL-GOOD WEIGHT WITH DR. JACOB'S DIETARY PLAN

TIP: Think of iodine and selenium when weight loss is blocked
an Iod und Selen denken!
Essential for the production of thyroid hormones.



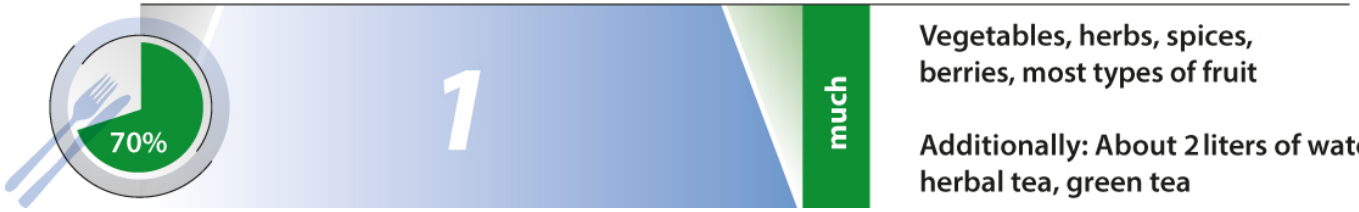


Lean people eat 70% category 2.

For overweight: eat 70% category 1

2 The complete program

ALKALINE FASTING MADE EASY



7 days regimen "Alkaline fasting made easy"

- Alkaline drinking regimen: in the morning (0.5 l with ½ MS Alkaline Formula plus to replentish circulation) and in the afternoon (0.5 l with 1 MS)
- 1-2 principal meals: recipes in Dr. Jacob's Alkaline Vital Cure
- Replace 1-2 meals with AminoBase (alkaline meal replacement with essential nutrients)
- Snack vegetables and berrys at will
- Chi-Cafe *balance* instead of coffee

! TIP: AminoBase as meal replacement

EXERCISE WITH JOY

EXERCISE PROMOTES DEACIDIFICATION

- Light, aerobic movement promotes deep breathing
- Carbon dioxide produced during metabolism (a volatile acid) is exhaled better
- Sweating increases the excretion of salts and acids via the skin
- Exercise also effectively reduces stress

2 The complete program

EXERCISE WITH JOY

- Movement as an integral part of the day
- At least 30 MINUTES of sporting activity per day
- Optimal: easy endurance sports in the fresh air
- Alternative: gym, fitness studio, home trainer
- Sport should be fun, not stressing!
- **Exercise in everyday life:** e.g. cycling, climbing stairs, walking or gardening, playing

EXERCISE WITH JOY

It would be **IDEAL** if you could integrate the following movement units into your daily routine:

- At least 30 minutes per day for everyday activities: climbing stairs, cleaning, walking instead of driving, etc.
- 2x per week strength and stabilisation exercises
- 2-3x per week 30-60 minutes endurance sports: running, swimming, cycling, dancing etc.

- Remember: it activates sodium-potassium pump!

ABDOMINAL BREATHING AGAINST ACIDOSIS

- Inhalation: Supply of oxygen - Energy supply
- Exhalation: release of volatile acids (carbon dioxide) - deacidification
- Shallow and short thoracic breathing is typical during stress and when seated

ABDOMINAL BREATHING

Consumes less energy, massages the intestines, trains the abdominal musculature, lowers the blood pressure and promotes relaxation

Drastic improvement of oxygen uptake, since the lung volume increases by a factor of 2 to 3

! **TIP:** 5-minute breathing exercise against the afternoon low and every evening before bedtime

RELAXATION

- Regular relaxation phases support active acid reduction
- Find an activity where you can really switch off and try to integrate it into your daily or weekly schedule:
  - e. g. reading a good book, a sporting hobby, crafting, making music, going for a walk, afternoon nap, yoga, meditation or prayer
- If you tend to pack up the day: enter a "time-out" as a fixed date in your calendar.

SLEEP WELL!

- Sufficient sleep is essential for health
  - Important for recreation
  - Influences our metabolism in many positive ways
  - Protects against disease
- **SLEEP FROM 22:00-2:00** at night is the most effective sleep
- In order to sleep well, the head must first come to rest
  - e. g. by going for a walk, gardening, manual work, a hot bath or simply going to bed early - whatever is good for you
  - Television, Internet etc. keep your head busy
  - The high blue light component of display, television and monitor lastingly disturbs the natural sleep-wake-rhythm

2 The complete program

SLEEP WELL!

- *Product tip 1:* **MELATONIN B12**:
  - ✓ 1 mg melatonin, consumed close to bedtime, contributes to the reduction of time taken to fall asleep.
  - ✓ The contained vitamin B12 contributes to normal functioning of the nervous system and to normal psychological function.

- *Product tip 2*: **MELISSA ALKALINE TABLETS**:
  - ✓ The contained magnesium contributes to normal functioning of the nervous system and to normal psychological function.
  - ✓ Enriched with melissa extract, potassium, zinc (for normal acid-base metabolism) and all B vitamins.

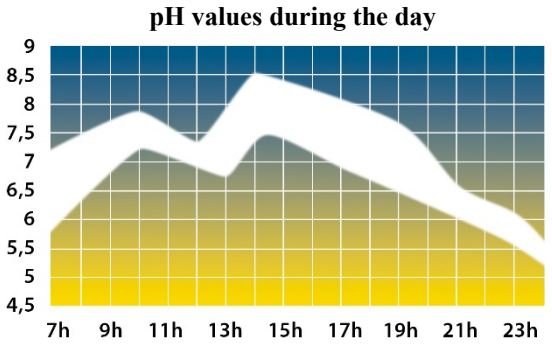
2 The complete program

How » sour« are you?

urine pH measurement with indicator strips

- The urine pH value naturally fluctuates during the day between 5.0 and 7.5 and depends, among other things, on meals
- To determine the individual acid-base profile: 7 measurements spread over the day for at least 3-6 days
- To detect changes: One measuring period at the beginning of the base regimen, one after its end
- urine pH normally varies between 5.0 and 7.5; value depends on meals

➢ Dynamic curve is a sign of good acid-base regulation of the kidneys



Dr. Jacob's Alkaline Vital Cures

1. The basic program: Dr. Jacob's Alkaline Drinking Regimen
2. The complete program: Dr. Jacob's Alkaline Regimen
3. **The special program: Dr. Jacob's Relief Regimen**
   - ✓ Time required: no additional time required
   - ✓ Quinoa – the ancient whole grain
   - ✓ Light and wholesome food

3 The special program

DR. JACOB'S RELIEF REGIMEN FOR INTOLERANCES

- Intolerances such as fructose, lactose, gluten or histamine intolerance should always be considered

RECOMMENDATIONS FOR GASTROINTESTINAL PROBLEMS

- Most effective measure: relief diet
- Healthier: easily digestible and gentle, wholesome food
- Best (pseudo-)grains: quinoa, but also amaranth, millet and red or black rice
- Ginger as a natural digestive aid

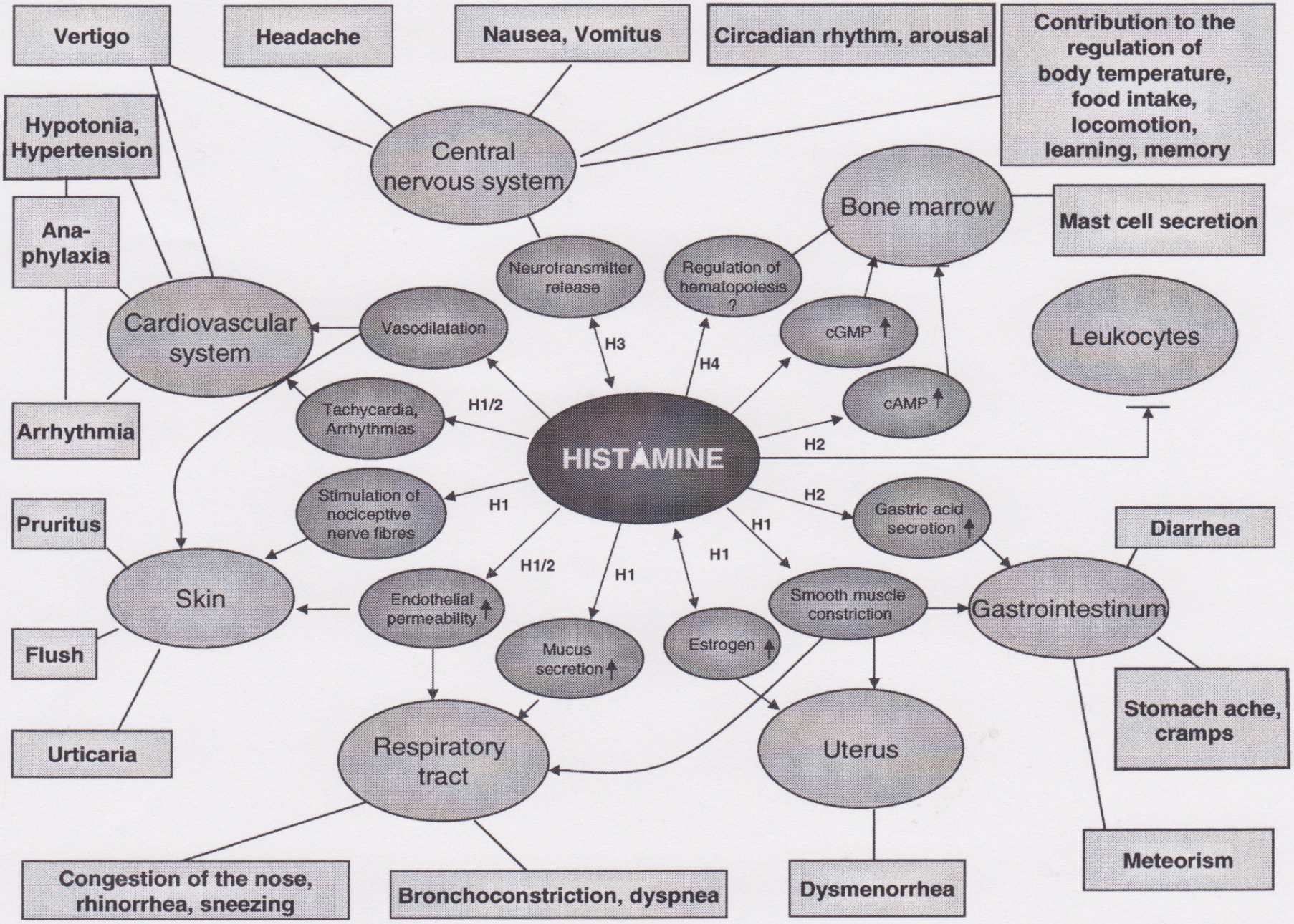


FIGURE 1. Summary of histamine-mediated symptoms. Adapted with permission from Maintz L et al. Dtsch Artzebl 2006;103:A3477-83.

HISTAMINE INTOLERANCE (HIT)

- With HIT, more histamine accumulates in the body than can be broken down
- No allergy, but symptoms are similar to allergies
- Causes:
  - Defect or reduced activity of the enzyme DAO
  - Uptake of histamine liberators (certain foods, drugs, intestinal bacteria)
  - Histamine-rich foods (e.g. mature cheese)
  - Classics: old cheese, red wine, sauerkraut, soy, sausage, etc.
- Symptoms can be corrected by
  - ANTI-HIT diet
  - Medicines (e.g. antihistamines, mast cell stabilizers)
- Histamine degradation can be promoted by
  - Water, vitamin C, copper, vitamin B6

3 The special program

DR. JACOB'S RELIEF REGIMEN

FOR INTOLERANCES

TIP 1: Easily digestible base-formers such as Dr. Jacob's Quinoa base soup and recipes for the special program are ideal.

TIP 2: Avoid all bloating, difficult to digest food you do not tolerate!

TIP 3: Good chewing and a regular meal rhythm facilitate digestion and improve tolerance.

GRADUAL BUILDING UP OF THE DIET:

- After 2-3 weeks of treatment, add one food every second day to the diet and check for tolerance.

3 The special program

REGENERAT *IMUN*

- Vegan, synergistic nutrient complex for intestinal mucosa and immune system
- Omega-3 fatty acids, proteins, specific amino acids, micronutrients (12 vitamins and 5 trace elements) and valuable plant substances such as curcumin and phospholipids (lecithin)
- Take additionally to Dr. Jacob‘s Quinoa Regimen in the morning or at noon
- Ideal amino acid spectrum especially for vegan diets and relief diets
- Especially suitable for gluten, fructose, lactose and histamine intolerance

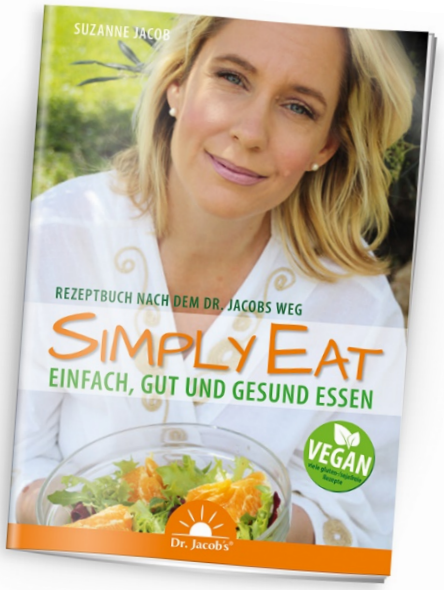
MY ELIXIR OF LIFE

THE NUTRIENTS CONTAINED CONTRIBUTE TO THE FOLLOWING NORMAL BODY FUNCTIONS:
Immune system – selenium, zinc, vitamins A, B6, B12, C, D; maintenance of normal mucous membranes – biotin, niacin, vitamins A, B2; reduction of tiredness – Folsäure, Niacin, B2, B6, B12

Dr. Jacobs Dietary Plan

For permanent metabolic and weight optimizati

- Basis for Dr. Jacob's Alkaline Cures: the book „Dr. Jacob's Way" and Dr. Jacob's dietary plan
- Considers the healthiest nutritional concepts and about 1,400 scientific studies



- Simply eat contains many simple recipes
- Get to know new cereals, vegetables, herbs and spices
- For a healthy, versatile, plant-based diet without deficiency

RECIPE EXAMPLES

BREAKFAST: Quinoa berry granola by Dr. Jacob

LUNCH: Green base soup with quinoa

DINNER: Vegetable pan with quinoa

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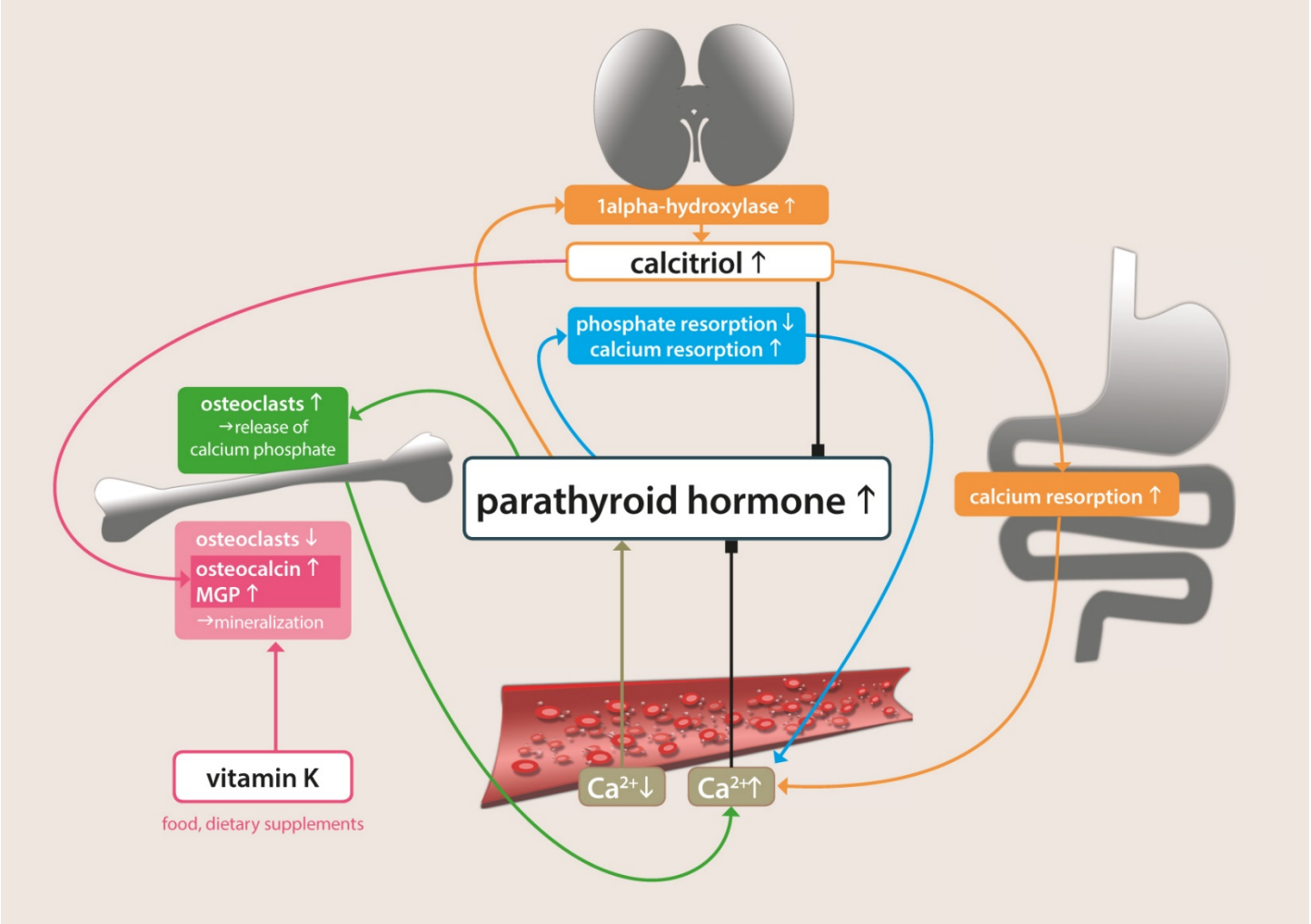
Vitamins D3 and K2

Regulation of calcium metabolism



Vitamin D3

- Vitamin D deficiency very prevalent
- Intake through food is low
- Formation in the skin by sun exposure
  - Only when staying outdoors without sun protection
  - No formation from October to March
  - Declines with age
- Food supplements useful for
  - Dark-skinned, elderly people, lack of staying outdoors (office!)
  - In autumn + winter for almost everyone
- Recommendation for everyone: blood value monitoring

Vitamin D3

- Helps to prevent many chronic diseases:
  - Muscle weakness (→ falls) and osteoporosis
  - Cardiovascular diseases (hypertension, myocardial infarction, stroke)
  - Metabolic syndrom, Diabetes mellitus type 2
  - Neurological diseases (multiple sclerosis, dementia)
  - Cancer

2 The complete program

GET SOME SUN WITH VITAMIN D

- Vitamin D ist essential for immune system, bones and muscles.
- Vitamin D deficiency is very common.
- Lack of sun in autumn and winter lowers vitamin D levels in many people. Office work keeps levels low all year round.
- The body's own production of the sun vitamin decreases with age.
- In the absence of endogenous vitamin D formation:
  - 1 drop of Dr. Jacob's vitamin D_3 oil = 800 I.E.
  - **Recommended blood levels of 75-125 nmol / l (30-50 ng / ml)**
  - Daily intake of 100 µg (4000 IU) is safe (EFSA)
  - ***American Geriatrics Society guideline:***
    „people over 70 should take **daily 4000 I.E.“**

Vitamin D3 formation

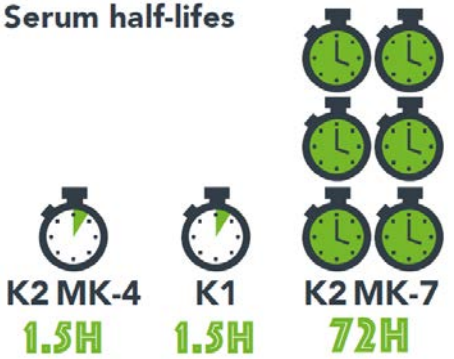
- In the skin:
  - Formation from
    skin cholesterol by solar irradiation
- The raw material:
  - Formation from
    cholesterol in wool grease (lanolin) by UV-light-irradiation

Vitamin K2

Functions:

- Supports incorporation of calcium into the bones
  - together with vitamin D3
- Prevents deposition of calcium in blood vessels

Vitamin K1 vs. Vitamin K2 MK-7



Vitamin K1

- Phylloquinone
- Short half-life (1-2 hours)
- Function is limited especially to liver
  - Blood coagulation (carboxylation of coagulation factors)

Vitamin K2 MK-7

- Menaquinone-7 (MK-7)
- Long half-life (3 days)
- Very good absorption
- Especially extrahepatic functions
  - Bone mineralization (carboxylation of osteocalcin → incorporation of calcium in bones)
  - Inhibition of vascular calcification (carboxylation of Matrix-Gla-Protein (MGP) → binds calcium in blood vessels)

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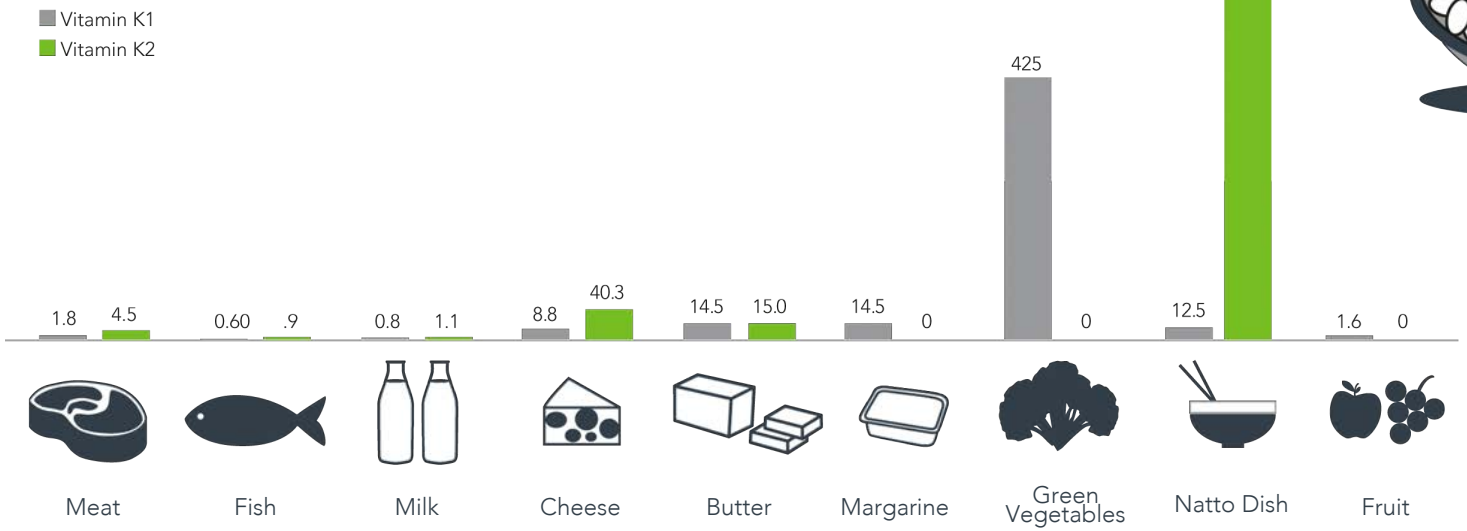
Dietary sources

Western diets are K2 deficient

Amount of Vitamin K1 and K2 in Various Food
(in µg / 100g food)

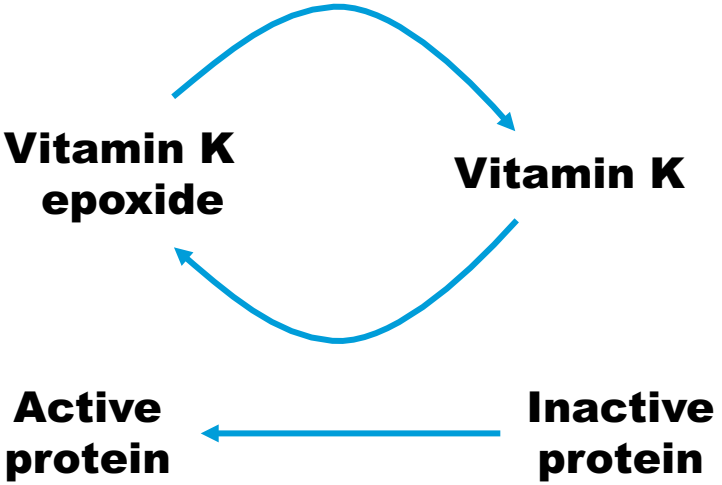


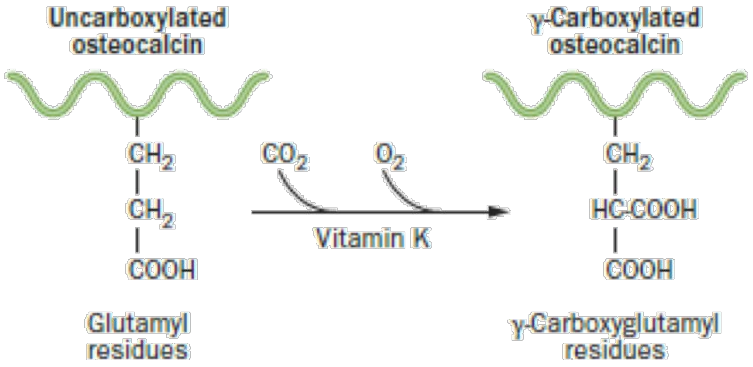
Vitamin K2

- Supports incorporation of calcium into the bones with D_3
- Prevents deposition of calcium in blood vessels
- Activates osteocalcin (BGP) and Matrix Gla proteins (MGP) by g-carboxylation of glutamic acid
  → BGP & MGP bind calcium

Function - biochemistry

- Carboxylation (protein activation)
- Vitamin K cycle
- Coagulation factors
- Osteocalcin
- Matrix gla-protein (MGP)

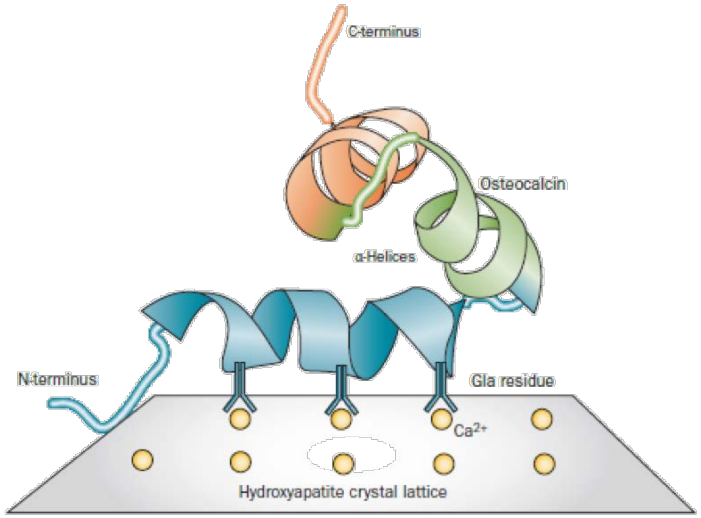




- Coagulation factors
- Osteocalcin
- MGP

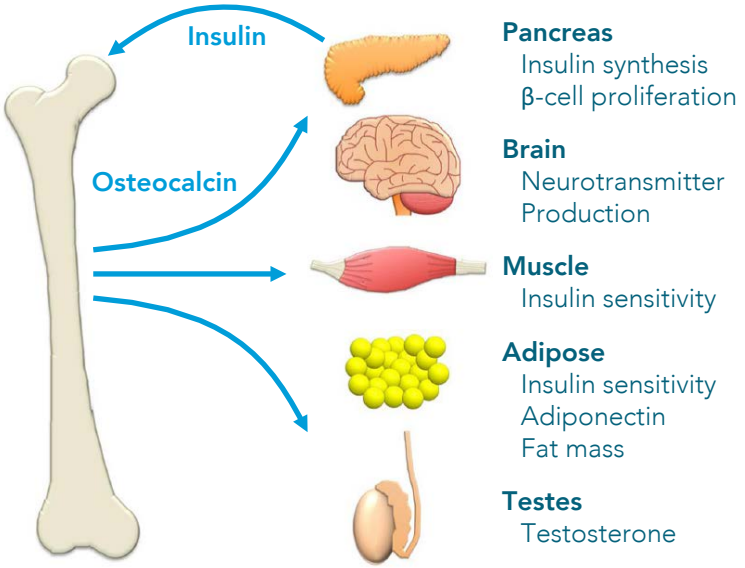
Booth et al. 2013, Nature Review

Osteocalcin



Booth et al. 2013, Nature Review

Endocrine functions



Zoch et al., Bone 2016; 82;42-9

- Only synthesized in osteoblasts
- Carboxylation allows calcium binding and mineralization
- Mechanical function by binding hydroxyapatite and collagen

Osteocalcin

Design	Observational trial
Population	Age of 70 and older
Sample size	792
Follow-Up Period	5 years
Main Endpoints	Fractures, carboxylated and total osteocalcin

	Fracture cases		Controls		
Sex and OC form	**n**	**mean (SD)**	**n**	**mean (SD)**	**p***
Men					
TOC	21	9.45 (4.76)	280	9.30 (4.69)	0.786
COC	21	6.66 (4.22)	279	8.54 (4.03)	0.022
COC/TOC	21	0.74 (0.36)	279	0.96 (0.30)	0.002
Women					
TOC	85	13.45 (7.56)	406	11.42 (6.63)	0.006
COC	84	9.17 (5.32)	403	9.82 (4.72)	0.073
COC/TOC	84	0.77 (0.46)	403	0.96 (0.44)	0.001

** t-Test*

Luukinen, J Bone Miner Res 2000; 15(12); 2473-8

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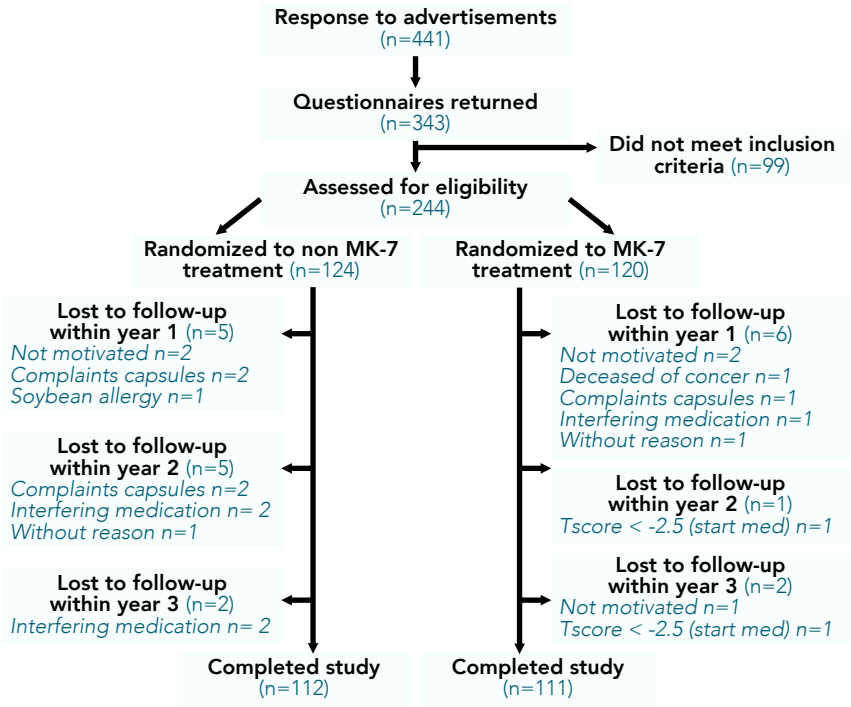
Bone Health

Three-year low-dose menaquinone-7 supplementation helps decrease bone loss in healthy postmenopausal women

M. H. J. Knapen, N. E. Drummen, E. Smit, C. Vermeer, E. Theuwissen

Osteoporos Int. 2013; 24(9); 2499-507

Design	Double-blinded, randomized, placebo controlled
Intervention	180µg/d MK-7 for 3 years
Participants	244 healthy postmenopausal women
Endpoints	■ Carboxylated osteocalcin ■ Uncarboxylated osteocalcin ■ Bone mineral content ■ Bone mineral density



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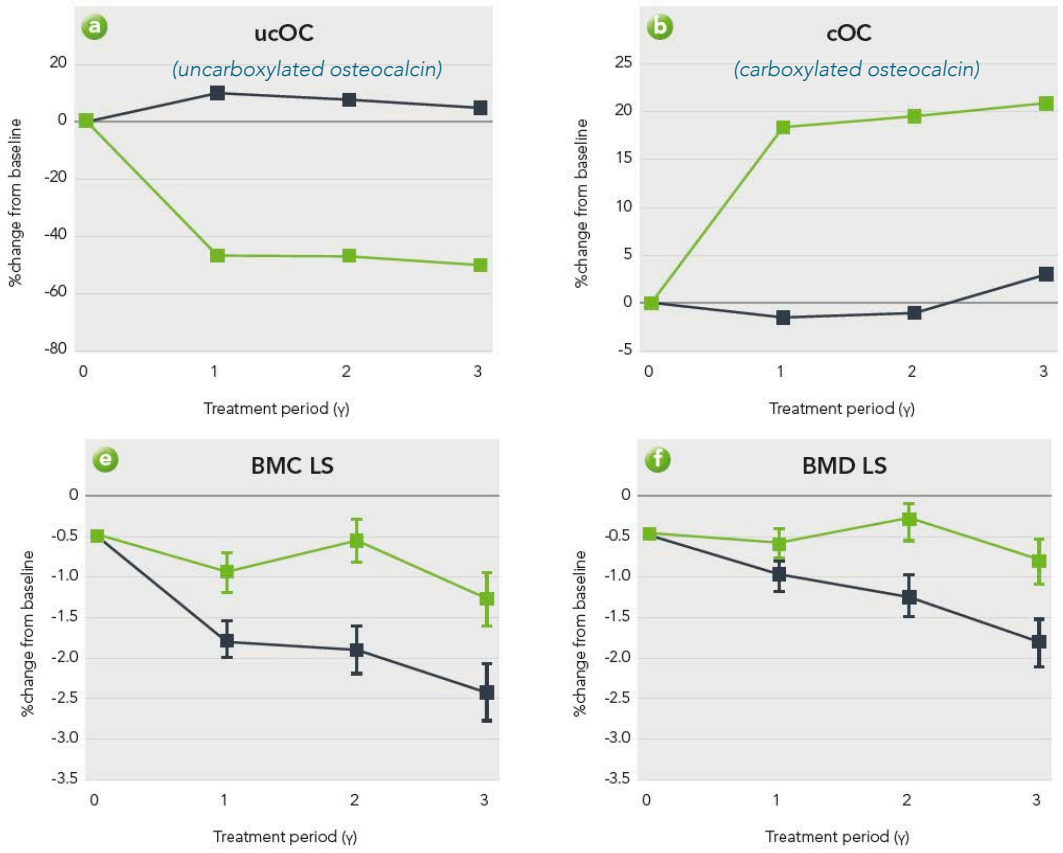
Bone Health

Osteocalcin

Bone mineral content

& Bone mineral density



Knapen et al. 2013

MK-7 Placebo

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K2 to prevent Osteoporosis

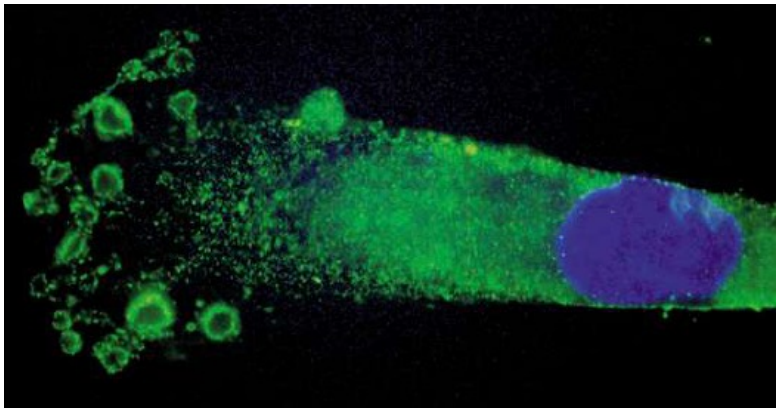
Study or Subgroup	Vitamin K2 Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Year	Mean Difference IV, Random, 95% CI
1.1.1 patients without osteoporosis										
Binkley et al.	0.04	2.92	126	0.4	2.84	129	19.2%	-0.36 [-1.07, 0.35]	2009	
Je et al.	1.32	5.34	18	-1.04	5.09	27	12.4%	2.36 [-0.77, 5.49]	2011	
Subtotal (95% CI)			**144**			**156**	**31.6%**	**0.56 [-1.96, 3.08]**		
Heterogeneity: Tau2 = 2.36; Chi2 = 2.77, df = 1 (P = 0.10); I2 = 64%										
Test for overall effect: Z = 0.43 (P = 0.67)										
1.1.2 patients with osteoporosis										
Shiraki et al.	1.4	0.7	105	-1.8	0.6	100	19.8%	3.20 [3.02, 3.38]	2000	
Iwamoto et al.	1.49	1.45	21	-0.44	3.86	29	17.3%	1.93 [0.39, 3.47]	2000	
Ushiroyama et al.	4.1	5.88	31	0.115	3.07	32	14.9%	3.98 [1.66, 6.31]	2002	
Purwosunu et al.	1.4	5.34	33	0	1	30	16.4%	1.40 [-0.46, 3.26]	2006	
Subtotal (95% CI)			**190**			**191**	**68.4%**	**2.70 [1.72, 3.69]**		
Heterogeneity: Tau2 = 0.53; Chi2 = 6.58, df = 3 (P = 0.09); I2 = 54%										
Test for overall effect: Z = 5.38 (P < 0.00001)										
			Vitamin K2			Control	Weight	Mean Difference		
Total (95% CI)			**334**			**347**	**100.0%**	**2.01 [0.21, 3.81]**		
Heterogeneity: Tau2 = 4.26; Chi2 = 96.95, df = 5 (P < 0.00001); I2 = 95%										
Test for overall effect: Z = 2.19 (P = 0.03)										
Test for subgroup differences: Chi2 = 2.42, df = 1 (P = 0.12); I2 = 58.6%										

Conclusion: Vitamin K2 plays a role in the maintenance and improvement of vertebral BMD and the prevention of fractures in postmenopausal women with osteoporosis

Matrix Gla protein (MGP)

Secreted by smooth vascular muscle cells & chondrocytes

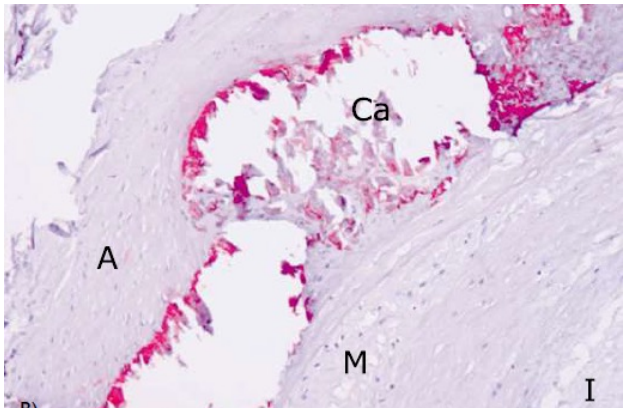
Human vascular smooth muscle cell
Anti cMGP



Green: Anti cMGP, Blue: DNA

Cranenburg et al., Thromb Haemost 2007; 98: 120-125

Calcified artery, diabetic patient
Anti ucMGP



A: adventitia, Ca: calcification, I: intima, M: media

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Heart Health

Menaquinone-7 supplementation improves arterial stiffness in healthy postmenopausal women: double-blind randomised clinical trial

Design	Double-blinded, randomized, placebo controlled
Participants	244 healthy postmenopausal women
Intervention	180µg/d or placebo in 3 years
Main Endpoints	■ Arterial stiffness by pulse wave velocity and echotracking ■ ucMGP

Marjo H. J. Knapen, Lavienja A. J. L. M. Braam, Nadja E. Drummen, Otto Bekers, Arnold P. G. Hoeks, Cees Vermeer
VitaK & Cardiovascular Research Institute (CARIM), Maastricht University, The Netherlands; Central Diagnostic Laboratory, University Hospital Maastricht, The Netherlands; Biomedical Engineering, Maastricht University, The Netherlands

Thromb Haemost. 2015; 113(5); 1135-44

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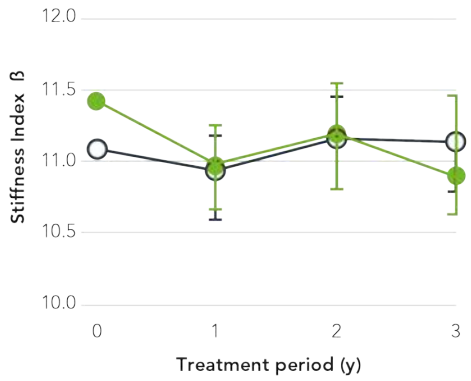
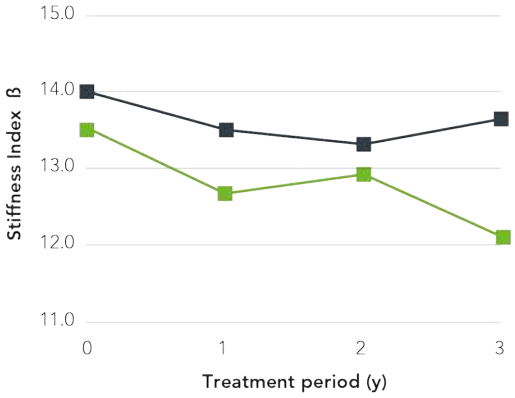
Arterial stiffness

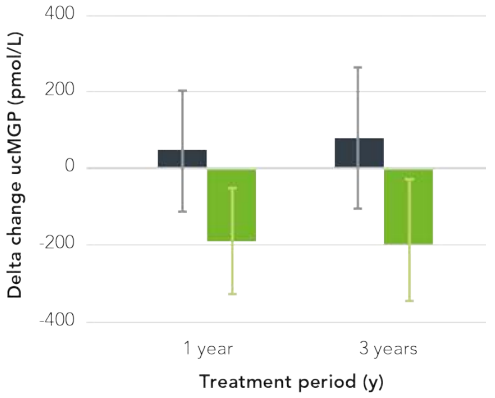
Whole population



Elevated stiffness at baseline



Change in serum ucMGP (mean±SD)



Knapen et al. 2015

Conclusion

Long-term use of MK-7 supplements improves arterial stiffness in healthy postmenopausal women, especially in women high arterial stiffness

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More clinical studies

Publications	Participants	Population	Dose	Duration	Results
Knapen et al. 2015	244	Healthy postmenopausal women	180µg/d	3 years	Significant reduction in arterial stiffness
Kurnatowska et al. 2015	42	Kidney patients	90µg/d	9 months	Slower progression of calcification by MK-7
Mc Farlin et al. 2017	26	Healthy aerobically trained athletes	160-320µg/d	8 weeks	Increased maximal cardiac output during exercise
Mansour et al. 2017	60	Renal transplant patients	360µg/d	8 weeks	Improved arterial stiffness

Formation of vitamin K2 MK-7

Fermentation

- *Bacillus subtilis natto* and *Bacillus licheniformis*, respectively
- Formation of MK-4 to MK-6 in variable quantities
- Formation of the inactive cis-form in variable quantities

Fermentation

Organic synthesis

- Plant derived raw materials (geraniol, farnesol)
- Formation of other MK-forms < 1%
- Exclusive formation of the active trans-form (all-trans MK-7)

Organic synthesis

Dr. Jacob‘s vitamin oil ingredients (I)

- Base: high oleic sunflower oil

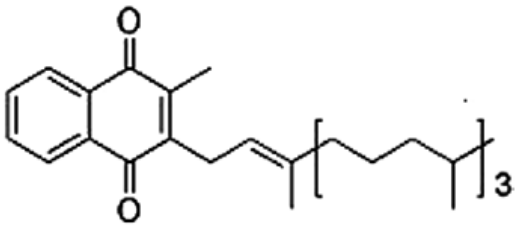
Very low in omega-6, high in oleic acid (like olive oil)
Low in oxidation (unlike olive oil) and high in tocopherols

- Tocopherol-rich extracts (vitamin E of natural origin)
  - From soy, but strongly purified, therefore not allergenic!
  - Consists of about 50% **gamma**-tocopherol

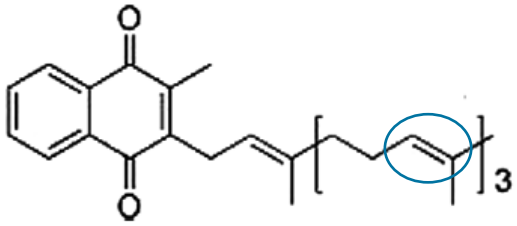
- Vitamin D3
  - Obtained by UV light irradiation of wool grease (lanolin) from lamb‘s wool from living animals.
  - Per bottle of vitamin D3 oil (*forte*), only about 0.016 g (0.04 g) lanolin are used for vitamin D production.

Dr. Jacob‘s vitamin oil ingredients (II)

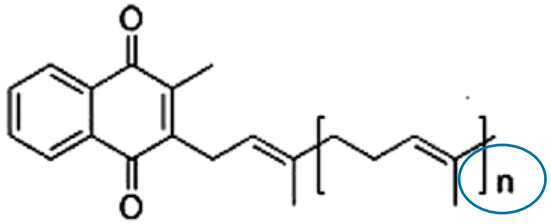
- Vitamin K2
  - all-trans Menaquinone-7 (MK-7)
    - 7 isoprenoid units
  - Obtained by organic synthesis of plant-derived raw materials (geraniol, farnesol)



Vitamin K1



Vitamin K2 MK-4



Vitamin K2 MK-4 to -13

Study on vitamin D3 stability

- Vitamin D3 in soybean oil
  - Period: 2 months
  - Storage under natural light: 61-68% loss in vitamin D3
  - Storage in semi-dark: 24-44% loss in vitamin D3

- Important for stable vitamin D3
  - Storage in the dark
  - Natural tocopherols as antioxidant vitamin

(Hemery *et al.*, 2015)

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Long-term stability of Dr. Jacob‘s vitamin oils

- The vitamins D3 and K2 are light sensitive
  - Protection against oxidation by natural tocopherols
  - Protection from light by folding boxes
- Proven long-term stability:

Product	Age of the sample	Target [µg vitamin D3/drop]	Result [µg vitamin D3/drop]	Target [µg vitamin K2/drop]	Result [µg vitamin K2/drop]
Vitamin D3 oil	7 months	20	22.4	-	-
Vitamin D3 oil	27 months	20	20.3	-	-
Vitamin D3K2 oil	14 months	20	22.0	-	-
Vitamin D3K2 oil	10 months	-	-	19	19,3

- Examination of long-term stability in each batch!

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Dr. Jacob‘s vitamin oil – comparison (I)

Vitamin D3 – the sun vitamin in droplet shape

- **Optimal bioavailability**
  fat-soluble vitamins in oil, vitamin K as long-chain vitamin K2 (all-trans menaquinone-7)
- **Optimal stability** due to natural tocopherols
- **Produced in Germany** with vitamin D from European manufacture
- **Vegetarian**
- Convenient pipette for **easy dosing**

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Dr. Jacob‘s vitamin oil – comparison (II)

	Dr. Jacob’s vitamin D3 oil 	**Dr. Jacob’s vitamin D3 oil *forte*** 	**Dr. Jacob’s vitamin D3K2 oil** 	**Dr. Jacob’s vitamin D3K2 oil *forte*** 	**Dr. Jacob’s vitamin K2 oil** 
Vitamins					
Vitamin D3 per drop or daily dose	20 µg (800 IU)	50 µg (2000 IU)	20 µg (800 IU)	50 µg (2000 IU)	-
Vitamin K2 (all-trans MK-7) per drop or daily dose	-	-	20 µg	50 µg	20 µg per drop / 120 µg per daily dose
Special ingredients					
High oleic sunflower oil	✓	✓	✓	✓	✓
Natural tocopherols	✓	✓	✓	✓	✓
Product features					
Application	1 drop daily (1 serving)	1 drop daily (1 serving)	1 drop daily (1 serving)	1 drop daily (1 serving)	6 drops daily (1 serving)
Content	20 ml/600 drops (600 servings)	20 ml/600 drops (600 servings)	20 ml/600 drops (600 servings)	20 ml/600 drops (600 servings)	20 ml/600 drops (100 servings)

Vitamin D3

Dosage

- Vitamin D serum level (25-OH-vitamin D) as an important basis!
- Recommended blood value:
  - 75-125 nmol/l 25-OH-vitamin D
  - and 30-50 ng/ml 25-OH-vitamin D, respectively
- Study: Traditionally living populations in East Africa have a mean serum 25-OH-vitamin D concentration of 115 nmol/l (46 ng/ml)
  - Maasai: 58-167 nmol/l (Ø 119 nmnol/l) 25-OH-vitamin D
  - Hadzabe: 71-171 nmol/l (Ø 109 nmol/l) 25-OH-vitamin D

Vitamin D3

Dosage

- In case of deficiency:
  - High dosing:
    40 x (target value [nmol/l] – actual value [nmol/l]) x body weight [kg]
  - We recommend moderate dosing according to the formula:
    10 x 800 x 10
    (10 drops à 800 IU over 10 weeks)
  - Thereafter: control of blood values and, if necessary, continued dosing
- After successful dosing:
  - Maintenance dose: 40-60 IU per kg body weight
  - ***American Geriatrics Society guideline:***
    „people over 70 should take **daily 4000 I.E.“**
  - **More heavy people need more. D3 is fat soluble.**

Vitamin D3

Dosage

- Danger of overdose:
  - Long-term intake of more than 4000 IU per day (2000 IU in children up to 10 years)
  - Formation of kidney stones, renal calcification
  - **But:** In case of severe deficiency, higher doses may be medically prescribed
- When taking > 4000 IU per day (e.g. high dosing in case of deficiency):
  - Supplementation of vitamin K2
  - Approx. 20 µg vitamin K2 per 20 µg (800 IU) of vitamin D3

Vitamin K2

Dosage

- Preventive:
  - 0.5-1 µg vitamin K2 per kg body weight
- In case of vitamin K deficiency diseases (e.g. osteoporosis)
  - 2-4 µg vitamin K2 per kg body weight
- When taking > 4000 IU vitamin D3 per day
  - 20 µg vitamin K2 per 20 µg (800 IU) of vitamin D3
  - e.g. 140 µg vitamin K2 at 140 µg (5600 IU) vitamin D3

Supporting product	Cardiovascular health and blood pressur	Bones and Muscles	Brain and Nerves	Immune System	Inflam-mation	Cance	Digestion and Gu	Liver	Kidney	Diabete	Over-weight	Meta-bolism	Sports	↑ Sleep, ↓ Stress
AminoBase	.	+	.	.	.	.	o	o	.	+	+	o	+	.
Aronia-Elixier- Ré-Energetik	.	.	.	o	.	.	+	+	.	.	.	.	.	.
B12 Methylcobalamin MecobalActive	o	.	+	o	.	.	.	.	.	.	.	o	+	.
Basengold, Dr. Jacob's - soon available	+	+	o	o	o	o	.	.	+	+	o	o	+	.
Basenpulver Formule Alcalinisante (*plus*) Dr. Ja	+	+	o	o	o	o	.	.	+	+	o	o	+	.
Basentabletten - Formule Alcalinisante compri	+	+	.	o	o	.	.	.	+	+	.	o	+	.
Blutdruck-Salz - Sel Pression Sanguine	+	.	.	.	.	.	.	.	.	o	o	.	.	.
Brokkolisamen Sulfo*forte*/Sulfoforte *plus*	.	.	.	+	o	+	.	.	.	.	.	.	.	.
Chia-Samen	o	.	.	.	o	.	+	.	.	.	.	.		.
Chi-Cafe (all sorts)	.	o	o	.	.	.	o	.	.	o	.	o	.	.
Curcumin K2	o	+	+	o	+	+	.	.	.	.	.	.	.	.
DHA + EPA vegan TocoProtect	+	.	+	.	+	o	.	.	.	.	.	.	.	.
Flavochino	+	.	+	.	.	.	.	+	.	+	.	o	.	.
GranaCor	+	.	+	o	+	o	.	.	.	o	.	o	.	.
Grana*forte*	o	.	+	o	+	+	.	.	.	.	.	.	.	.
Grana*imun*	o	.	o	+	o	o	.	.	.	.	.	.	o	.
Grana*med*	+	.	+	o	+	o	.	.	.	.	.	.	.	.
GranaProstan *ferment*	o	.	+	o	+	+	.	.	.	.	.	.	o	.
Granatapfel-Elixier	+	.	+	o	+	+	.	.	.	.	.	.	.	.
Granatapfel-Elixier *mediterran*	+	.	+	o	+	o	.	.	.	o	.	.	o	.
Jod-Probio - soon available	o	.	o	o	.	+	+	.	.	.	+	+	+	.
Lactacholin	o	.	+	.	.	o	+	+	.	o	o	+	+	.
Lactirelle	+	.	+	.	.	o	+	+	.	o	o	o	o	.
MCP	.	.	o	.	o	+	.	.	.	.	.	.	.	.
Melissen-Basentabletten - Alca Melisse B+	+	o	+	.	.	.	.	.	+	o	.	o	.	+
pHysioBase	+	+	o	o	o	o	.	.	+	o	o	o	+	.
Q10 Synergie	+	o	+	.	o	.	.	.	.	+	.	+	.	.
Regenerat *imun*- Immuno-Muqueuse	.	.	o	+	+	+	+	o	.	.	.	.	o	.
ReiChi Cafe	.	o	o	.	.	.	.	.	.	.	.	o	.	.
SteviaBase	.	o	.	.	.	.	.	+	.	+	+	o	.	.
Vitamin D3 Öl/D3K2 Öl (*forte*)	o	+	.	+	+	+	.	.	.	o	.	.	.	.
Vitamines D3K2	o	+	.	+	+	+	.	.	.	o	.	.	.	.