

Ko ēdam? Kas par to jāzina? Pienā produktu nozīme osteoporozes terapijā

Pienā (un citi) produkti un kaulu veselība

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Dietoloģe PKUS un Capital Clinic Riga

- *Cochrane Library / Medline*
- Sistemātiskie pārskati / metaanalīzes / vadlīnijas
 - 2010 – 2020
- Pētījumi
 - 2014 -2020

Osteoporosis/fracture

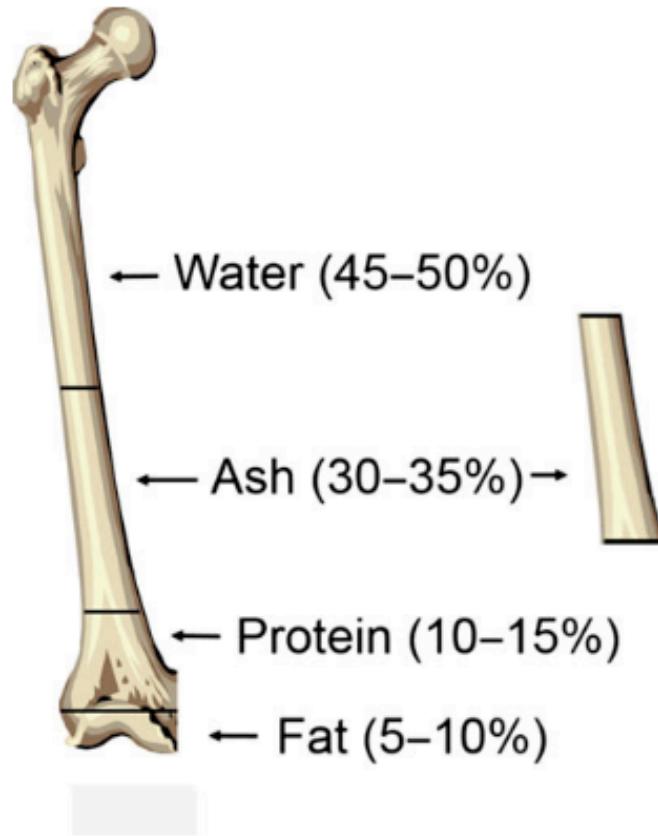
AND milk/dairy

AND risks

Adults

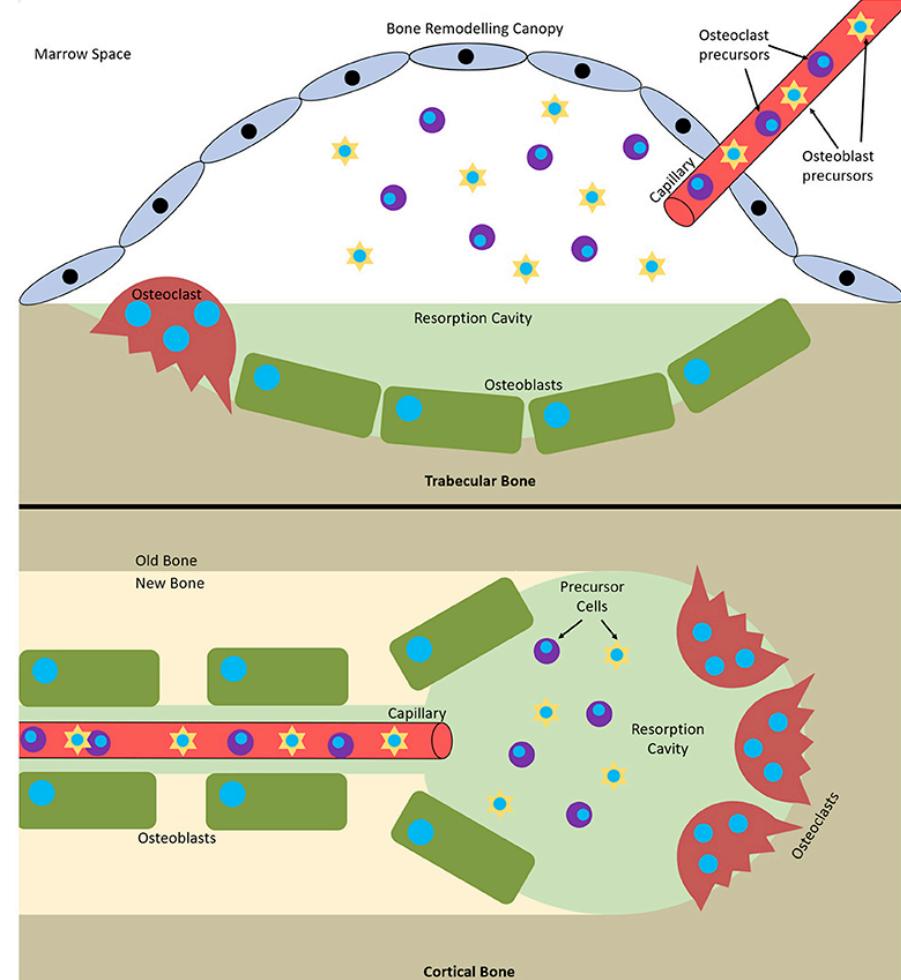
Osteoporosis

AND Nutrition



Calcium (36%) from dairy products
 Phosphorus (17%) from dairy, meats, processed foods
 Magnesium (0.8%) from green leafy vegetables, nuts, whole grains, dairy

- Grūtniecība
- Laktācija
- Zīdaiņa periods
- Pubertāte
- Menopauze
- Novecošanās



Uzturvielas – kaulu masas veidošanās /osteoporoze

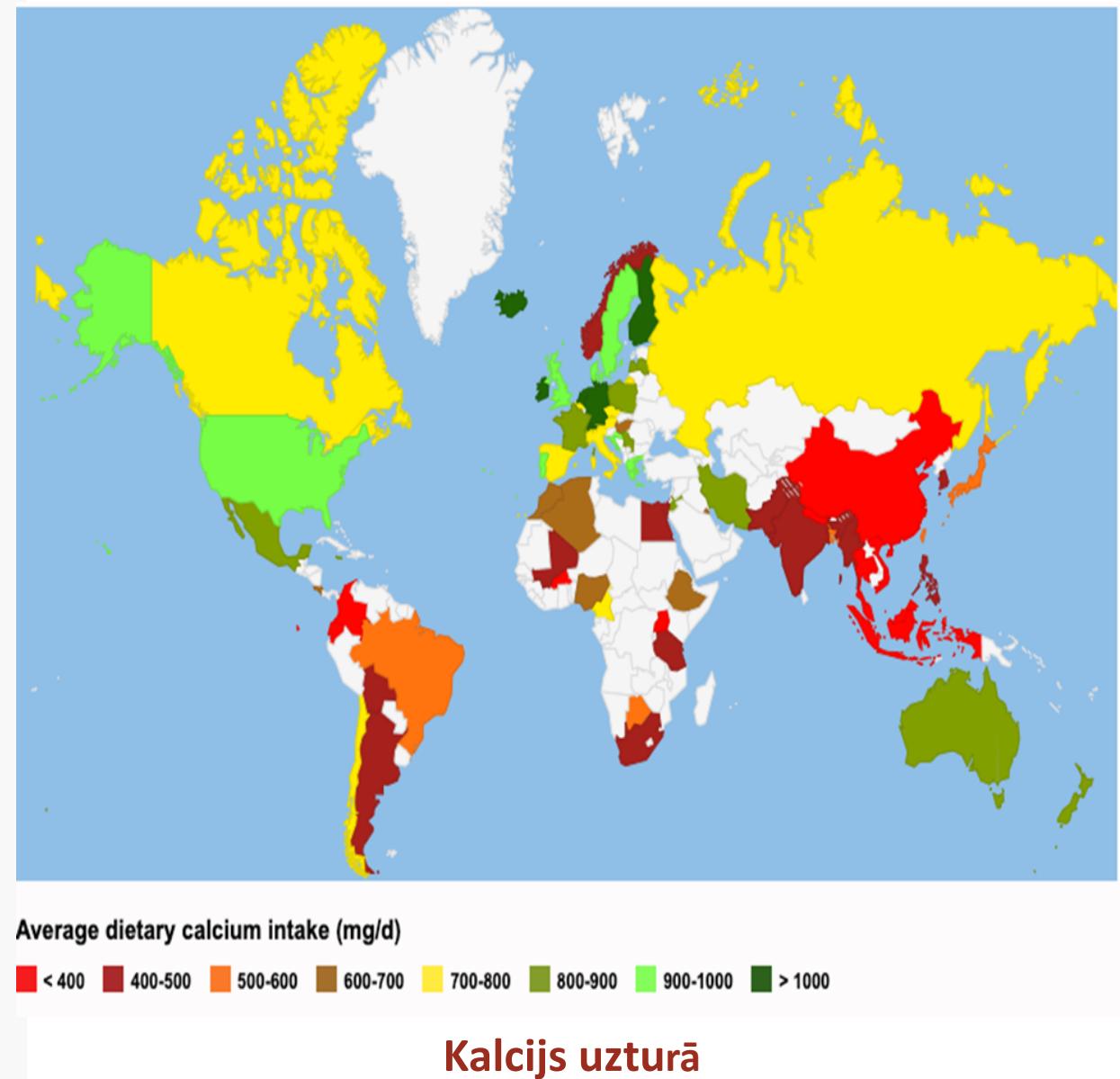
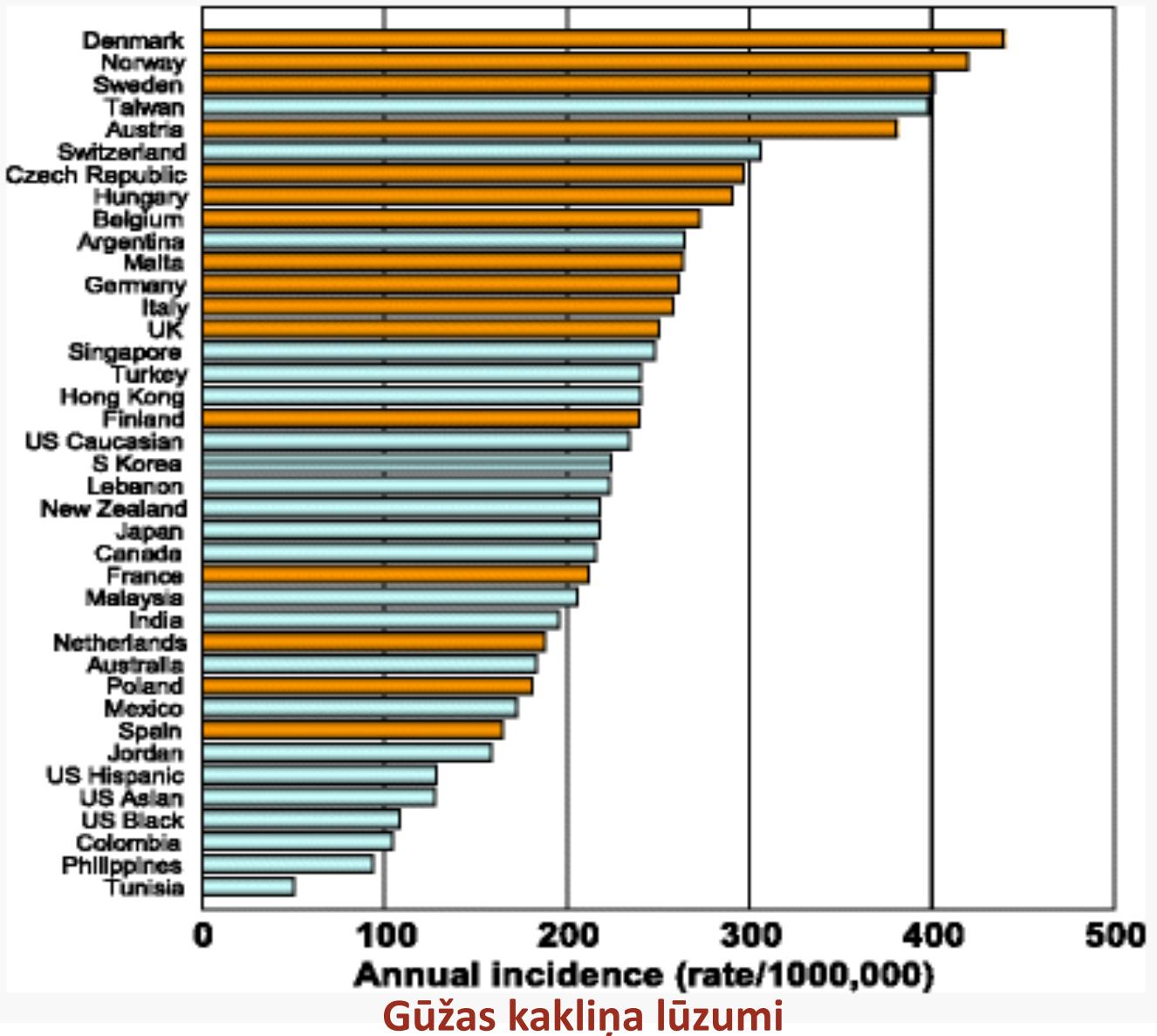
K₂ vitamīns
Mg
P
K
F
Mn
Cu
B
Fe
Zn
K₂, A, C, B vit.(B₆, B₁₂), folāti)

Uzturviela	Pierādījumu līmenis
Pamatuzturvielas	
Tauki	D
Olbaltumvielas	C
Mikrouzturvielas	
Kalcījs	A
D vitamīns	B
Citas	D
Uztura paradumi	
Pienā produkti	B
Šķiedrvielas	C
Augļi un dārzeņi	C
Kola u.c. kofeīna saturošo dzērienu negatīvā iedarbība	C
Alkohols	D

The National osteoporosis Foundation's position Position Paper, 2016

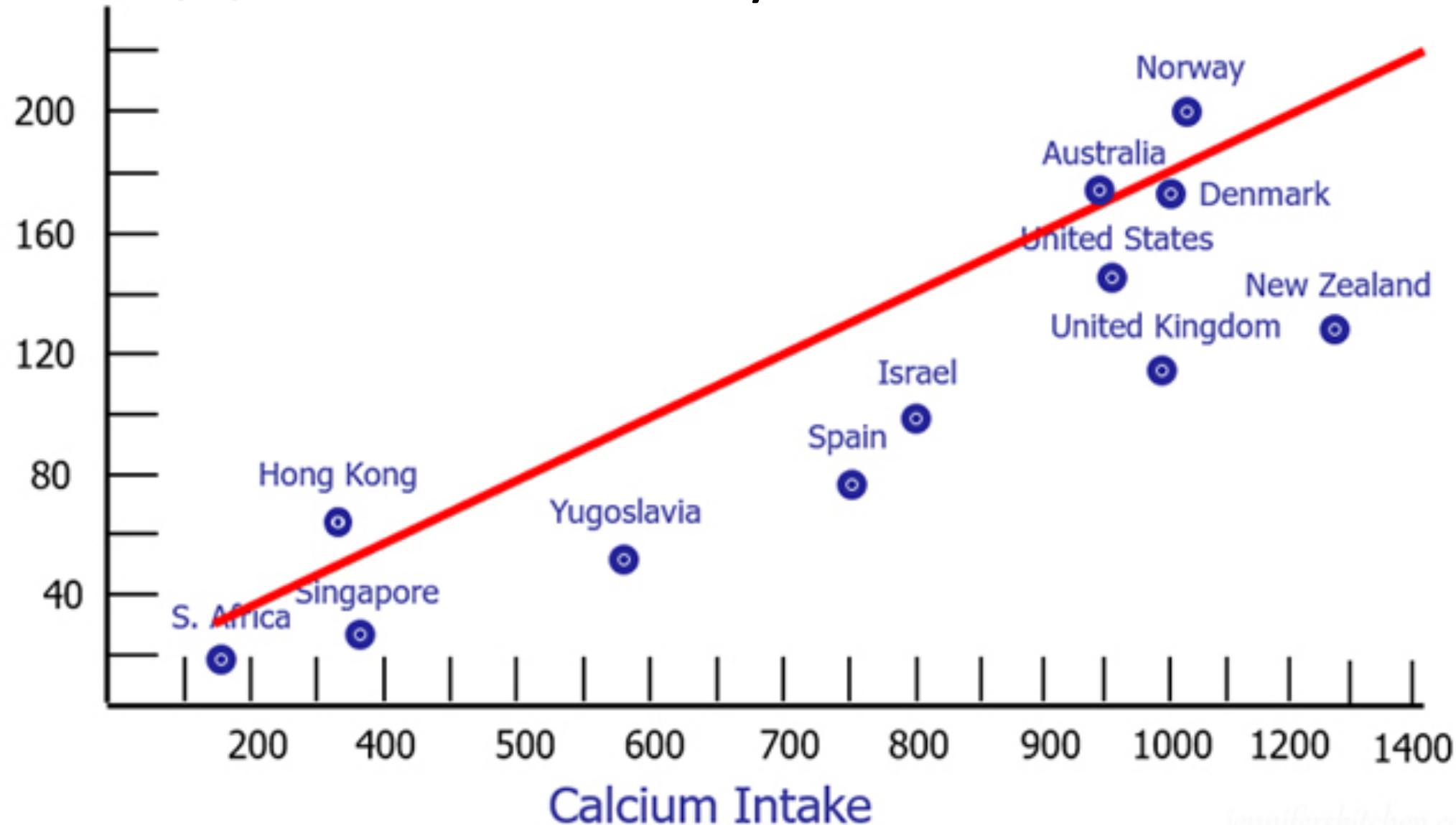
PVO : uzturs un ar osteoporozi saistītie lūzumi

Pierādījumu līmenis	↓ risku	Nav ietekmes	↑risku
Pārliecinoši Vecāki cilvēki	D vitamīns Kalcījs Fiziskās aktivitātes		Liels alkohola patēriņš
Iespējams <i>(probable)</i> Vecāki cilvēki		Fluors	
Varbūt <i>(possible)</i>	Augļi un dārzeņi Mērena alkohola lietošana Sojas produkti	Fosfors	Liels sāls daudzums Mazs olbaltumvielu daudzums (vecākiem cilvēkiem) Liels olbaltumvielu daudzums



Hip Fracture Rate per
100,000 people

Norway and Denmark worst score



Kalcijss

- **1000 mg**
- **1300 mg**
 $\leq 18 \text{ g.}$,
atkārtotas grūtniecības

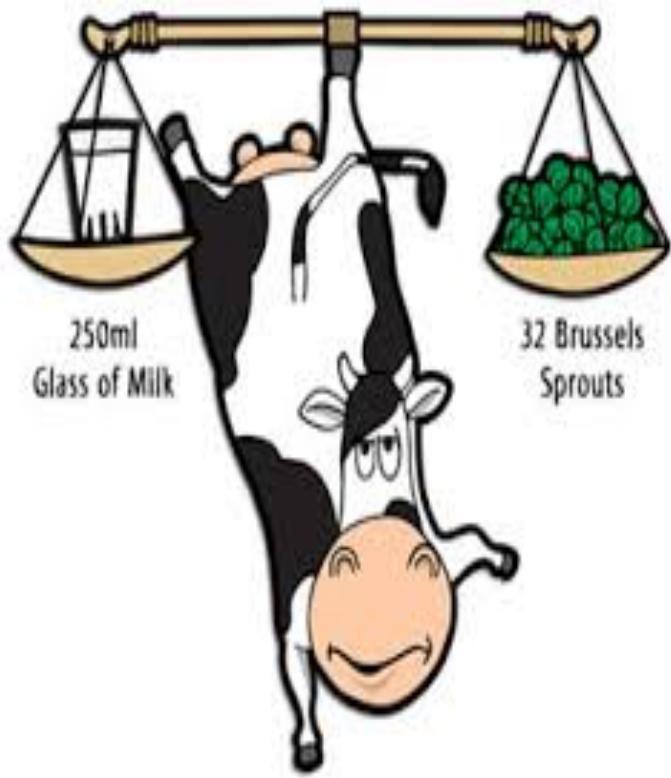


D vitamīns

3-4 porcijas (+1)

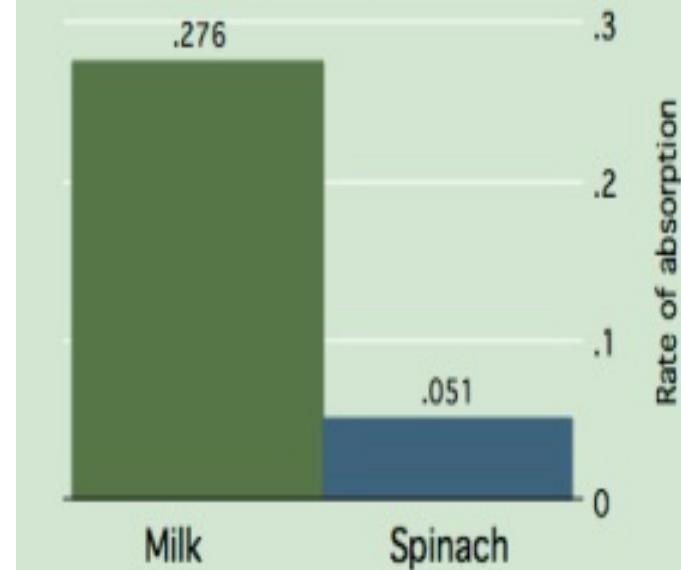
Produkts	Kalcijss
Kefīrs (piens) 2,5% 200 g	300 mg
Vājpiena biezpiens 200 g	380 mg
Siers 35 g	324 mg

Ca biopieejamība



Milk Versus Spinach Absorption of Calcium

www.CalciumRichFoods.org



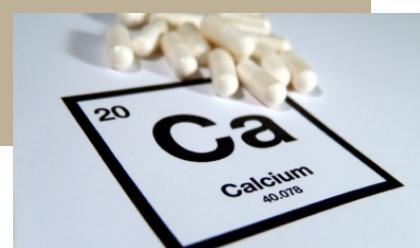
Source: Heaney et al. Am J Clin Nutr 1988; 47: 707-09.

Spinātos - oksalāti



Kalcijs

- Osteoporozes prevencija
 - Kaulu blīvums
- Sievietes meonopauzē
- Kolorektālā adenoma, vēzis
- Holesterīns
- Arteriālā hipertensija (Ca uzturā)
 - Jauniem cilvēkiem
- Svara zaudēšanai (*vājpiena produkti*)
- *Preeklampsija*



Kalcijs + D vit:

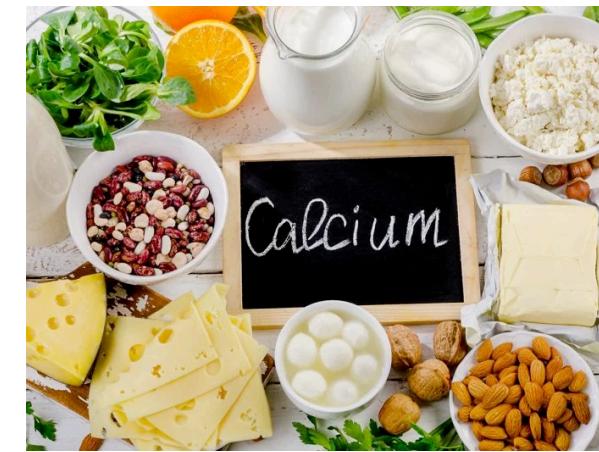
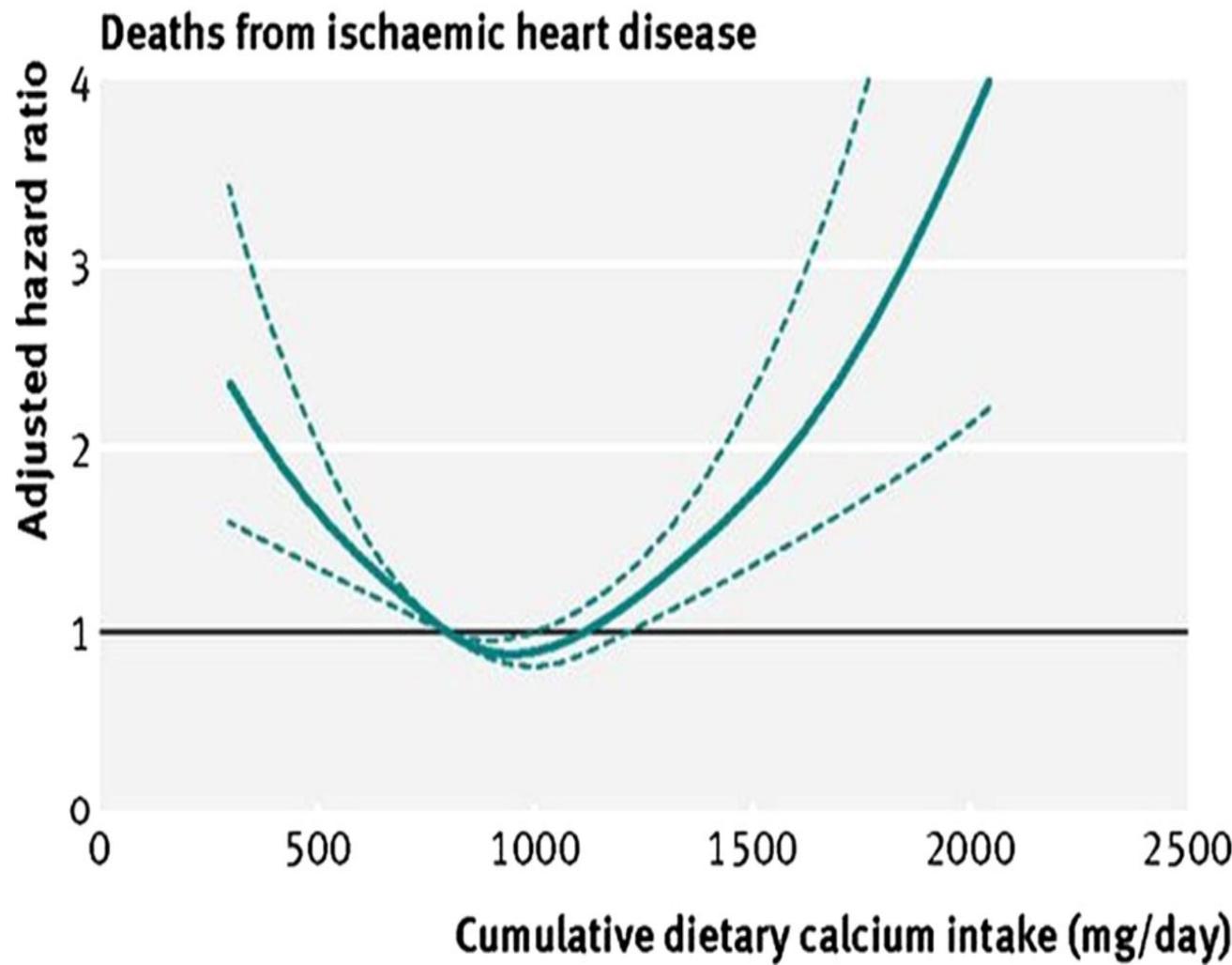
- trūkst uzturā
- saņem osteoporozes terapiju

- Priekšdziedzera vēzis
- Preparāti: ↑ k-vask risks, MI risks vecākiem cilvēkiem
- ↓uzsūkšanos
 - *Fe*
 - *Tetraciklīns*
 - *Zn*
 - *Mg*
 - *Fitīnskābe*
- Aizcietējumi
- Nierakmeņi

Harvey, N. C., et.al.C. (2017). The role of calcium supplementation in healthy musculoskeletal ageing: An expert consensus meeting of the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO) and the International Foundat. *Osteoporosis International*

Cormick, G., & Belizán, J. M. (2019). Calcium Intake and Health. *Nutrients*, 11(7), 1–16.

Yang, Chao, et al. "The Evidence and Controversy Between Dietary Calcium Intake and Calcium Supplementation and the Risk of Cardiovascular Disease: A Systematic Review and Meta-Analysis of Cohort Studies and Randomized Controlled Trials." *Journal of the American College of Nutrition* (2019): 1-19.



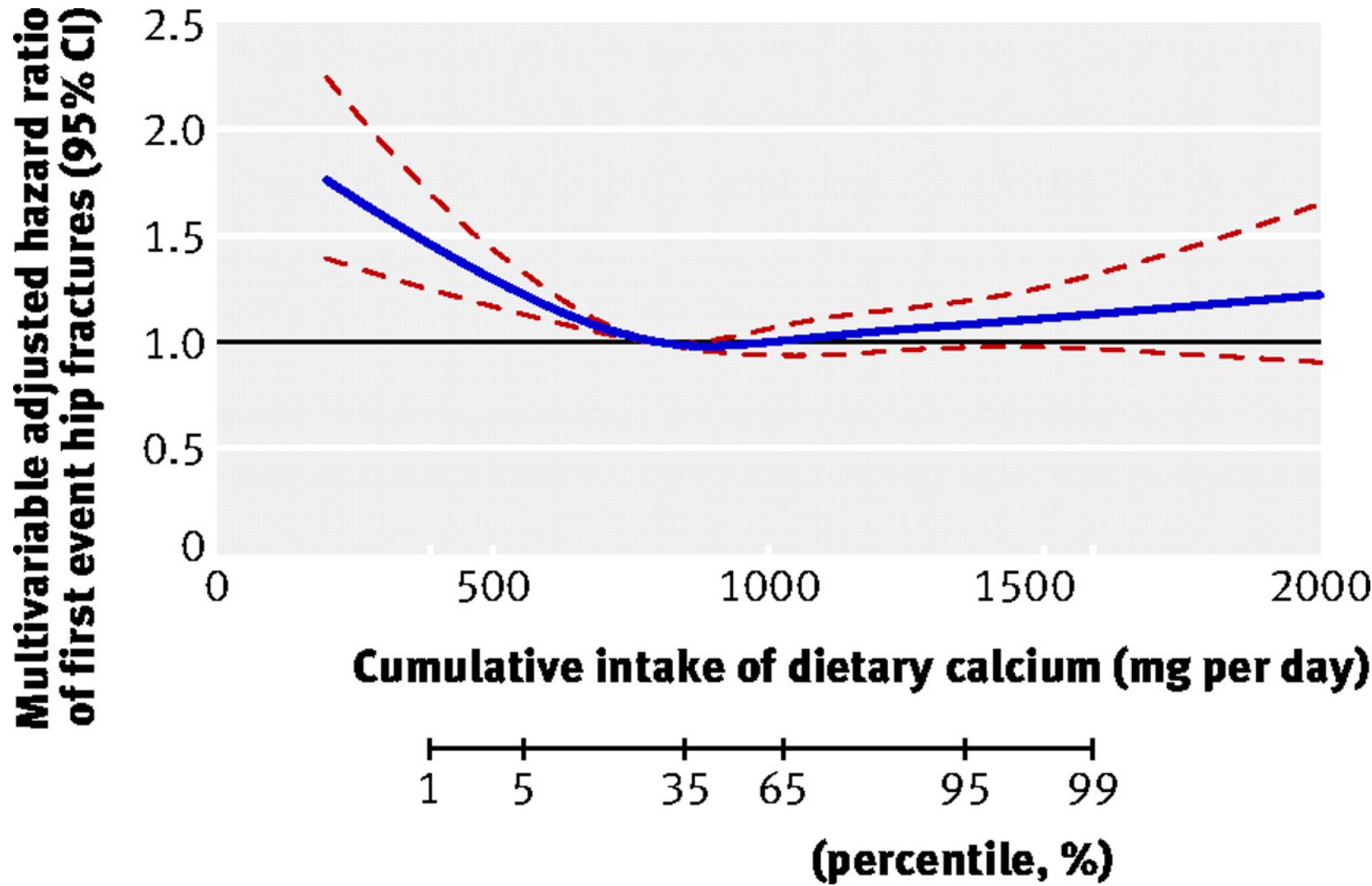
O'Keefe, James H., et al.

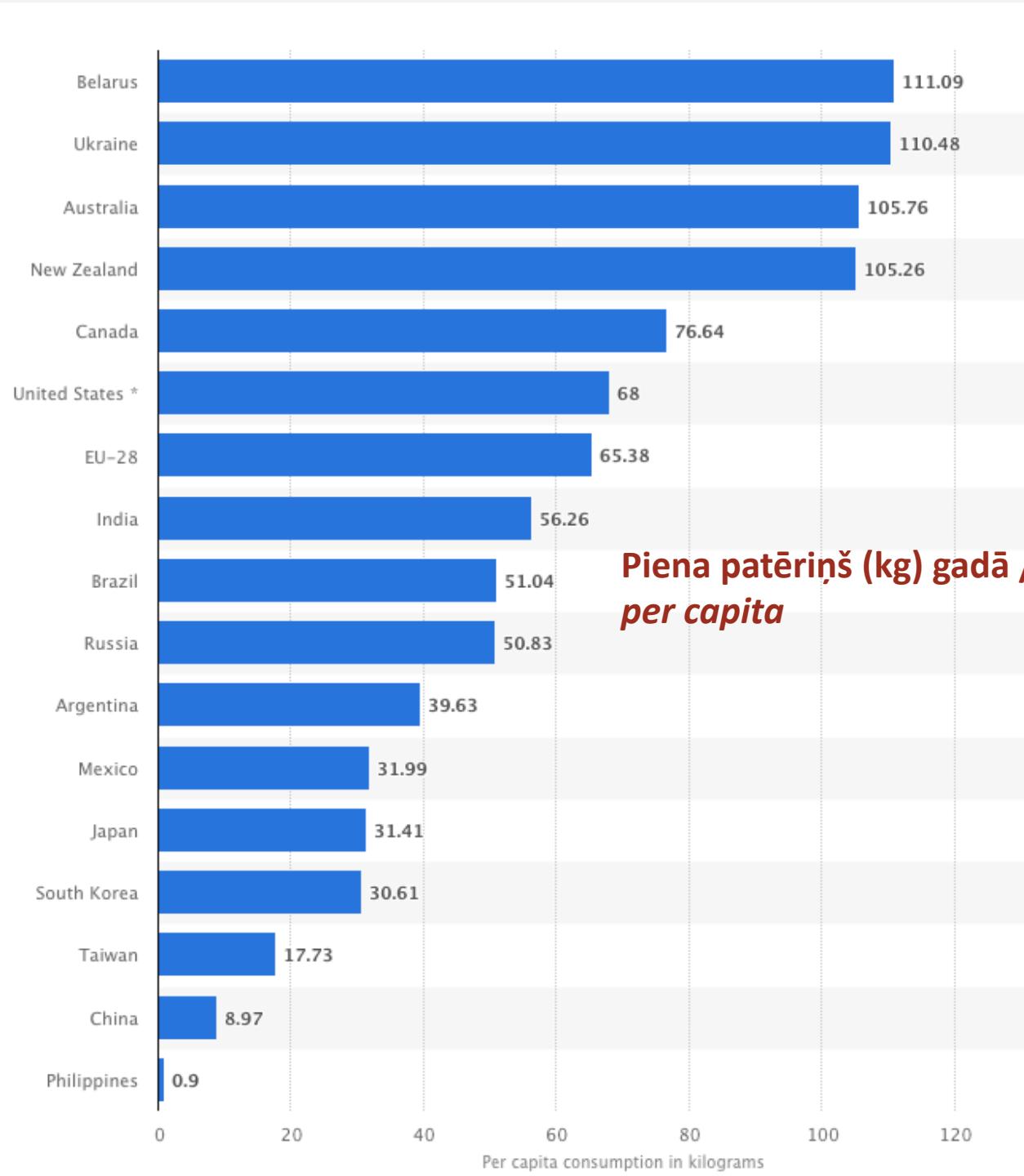
Nutritional strategies for skeletal and cardiovascular health: hard bones, soft arteries, rather than vice versa.

Open Heart 3.1 (2016)

openheart

Optimāls kalcija daudzums

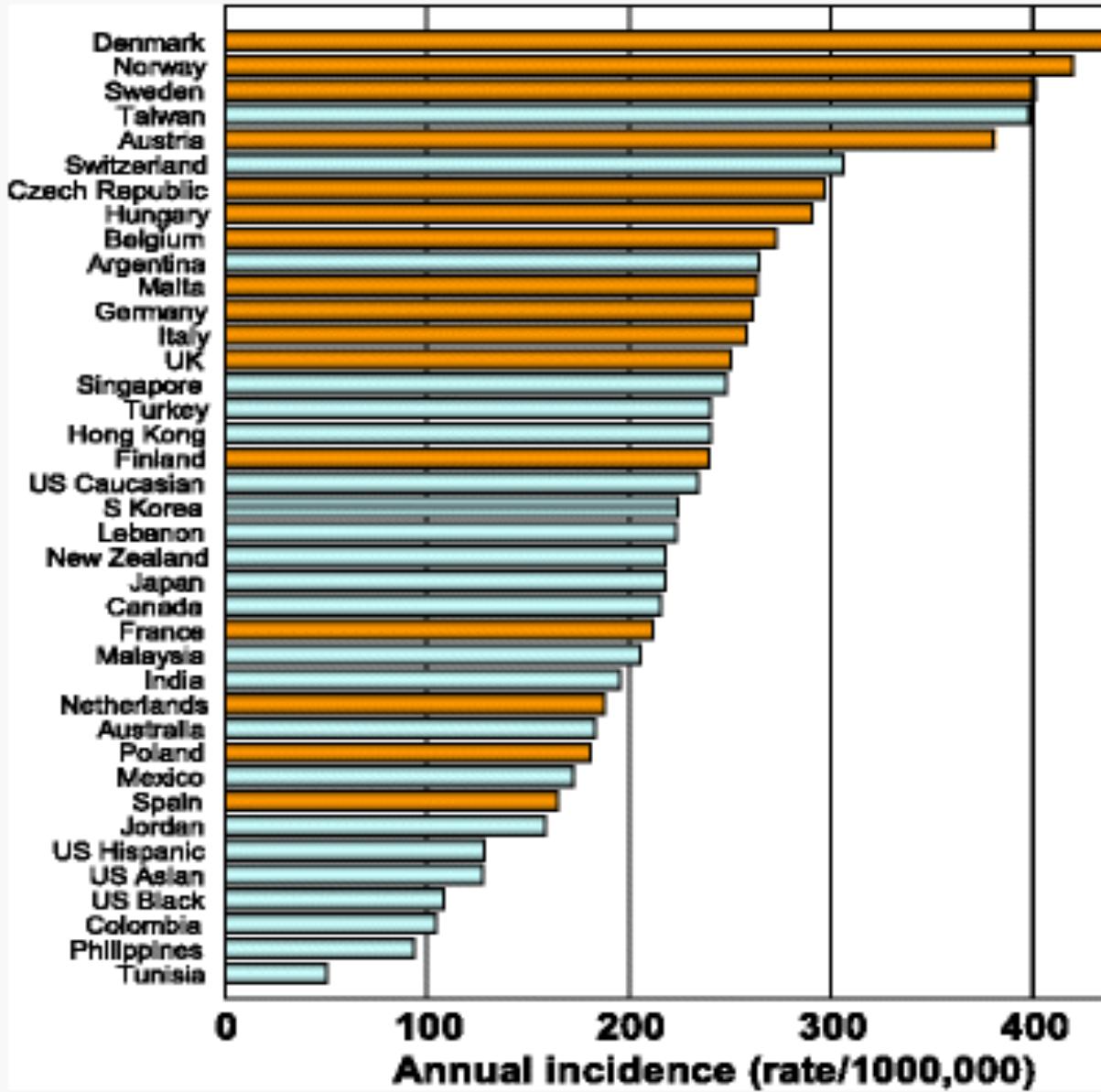




Rank	Country	Cheese Consumption (kg Per Capita)
1	Denmark	28.1
2	Iceland	27.7
3	Finland	27.3
4	France	27.2
5	Cyprus	26.7
6	Germany	24.7
7	Switzerland	22.2
8	Netherlands	21.6
9	Italy	21.5
10	Austria	21.1
11	Sweden	20.5
12	Estonia	20
13	Latvia	19.8
14	Norway	19.8
15	Israel	18.9

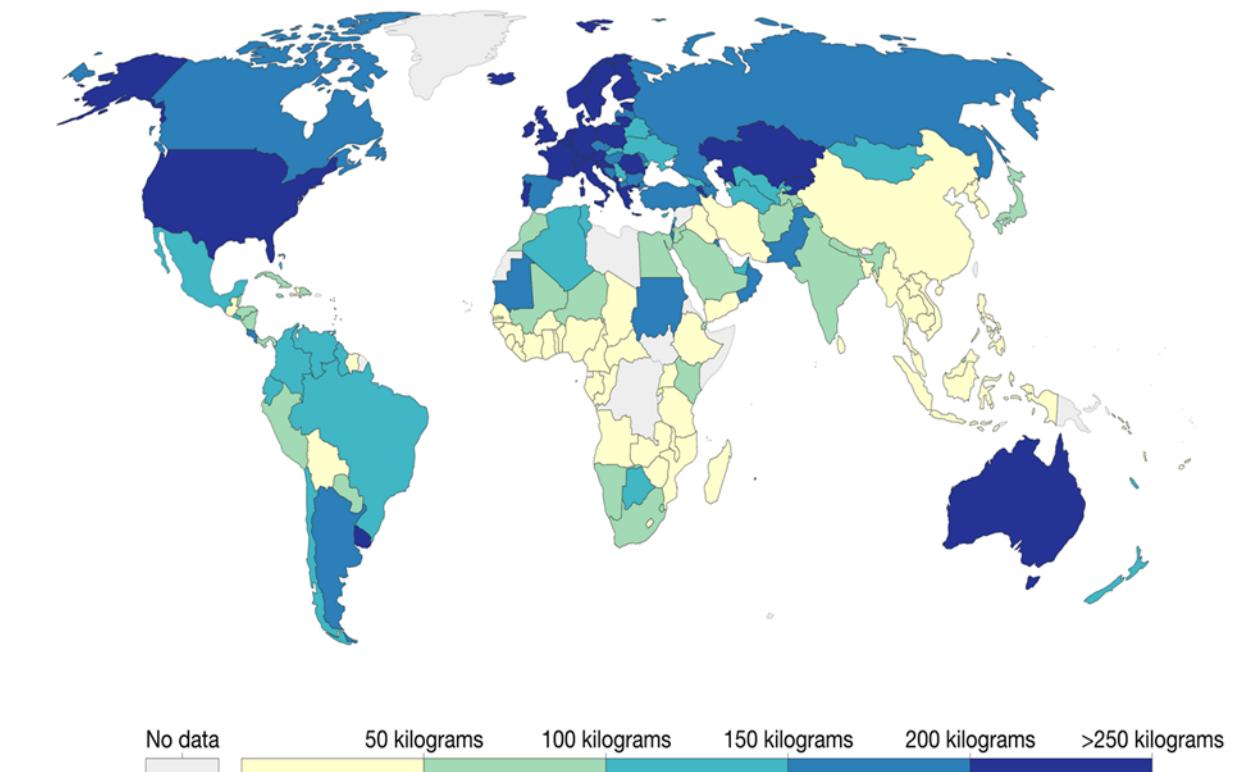
Siera patēriņš (kg) gadā / per capita

Osteoporosis is not related to the milk consumption



Per capita milk consumption, 2013

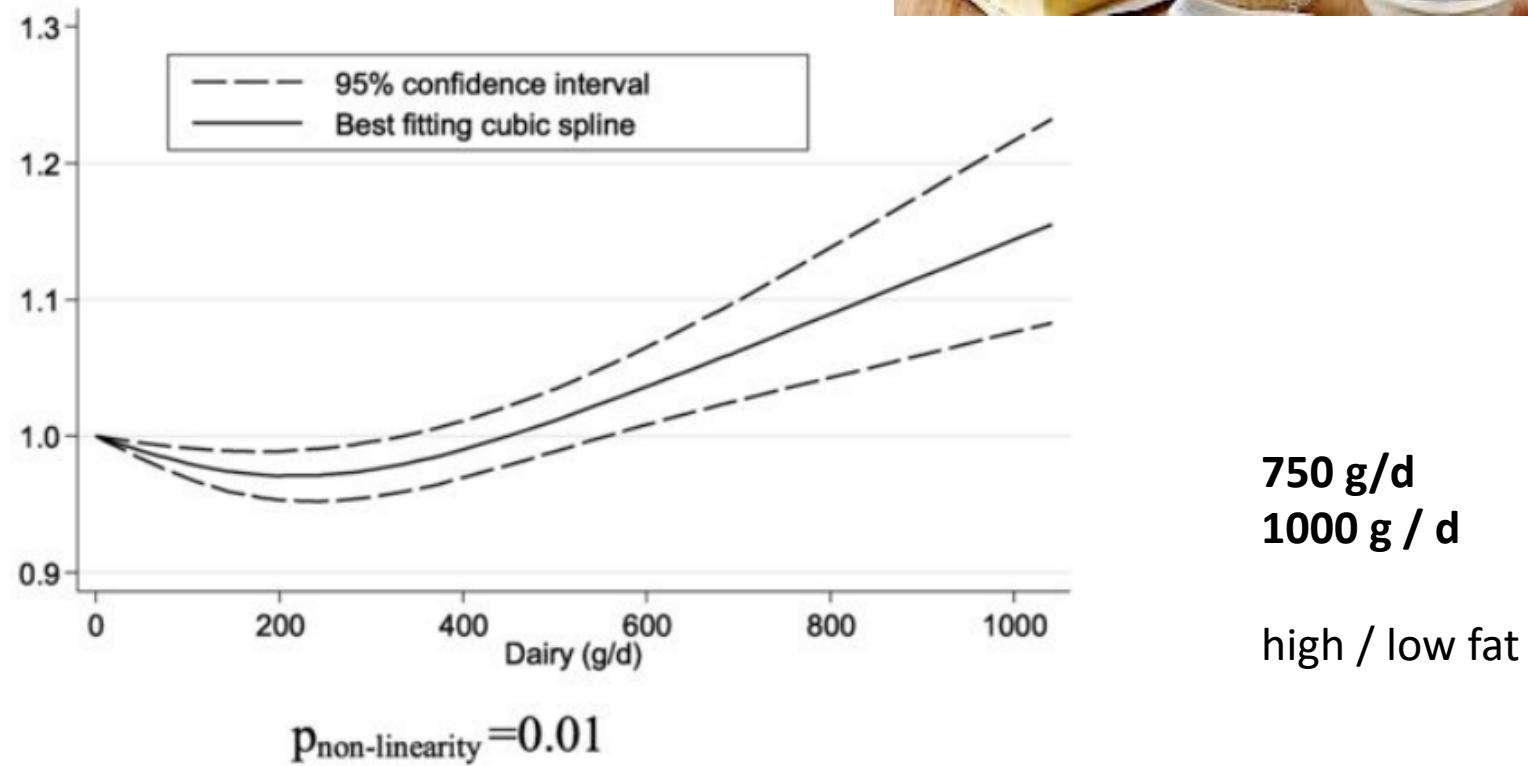
Average per capita milk consumption, measured in kilograms per person per year. This includes the milk equivalents of dairy products made from milk ingredients, but excludes butter. Data is based on per capita food supply at the consumer level, but does not account for food waste at the consumer level.



Source: UN Food and Agricultural Organization (FAO)

OurWorldInData.org/meat-and-seafood-production-consumption/ • CC BY

Piena produkti / kopējā mirstība



Nonlinear dose-response relation between daily intakes of whole grains, refined grains, vegetables, fruits, nuts, legumes, eggs, dairy, fish, red meat, processed meat, and sugar-sweetened beverages and risk of all-cause mortality.

Schwingshackl, Lukas, et al. "Food groups and risk of all-cause mortality: a systematic review and meta-analysis of prospective studies, 2" *The American Journal of Clinical Nutrition* 105.6 (2017): 1462-1473.

Piena produkti un kaulu mineralizācija

- ↑ kaulu mineralizāciju
 - bērniem un pieaugušajiem ar zemu Ca uzturā
 - Pēc 50 g.v.
- Sievietes menopauzē -dzīvnieku un piena produktu olb
 - Kaulu blīvums & mikrostruktūra
- Seniori
 - Osteoporoze
 - CD, sirds un asinsvadu slimības
 - Malnutrīcija, sarkopēnija
 - Aptaukošanās, sarkopēniska aptaukošanās

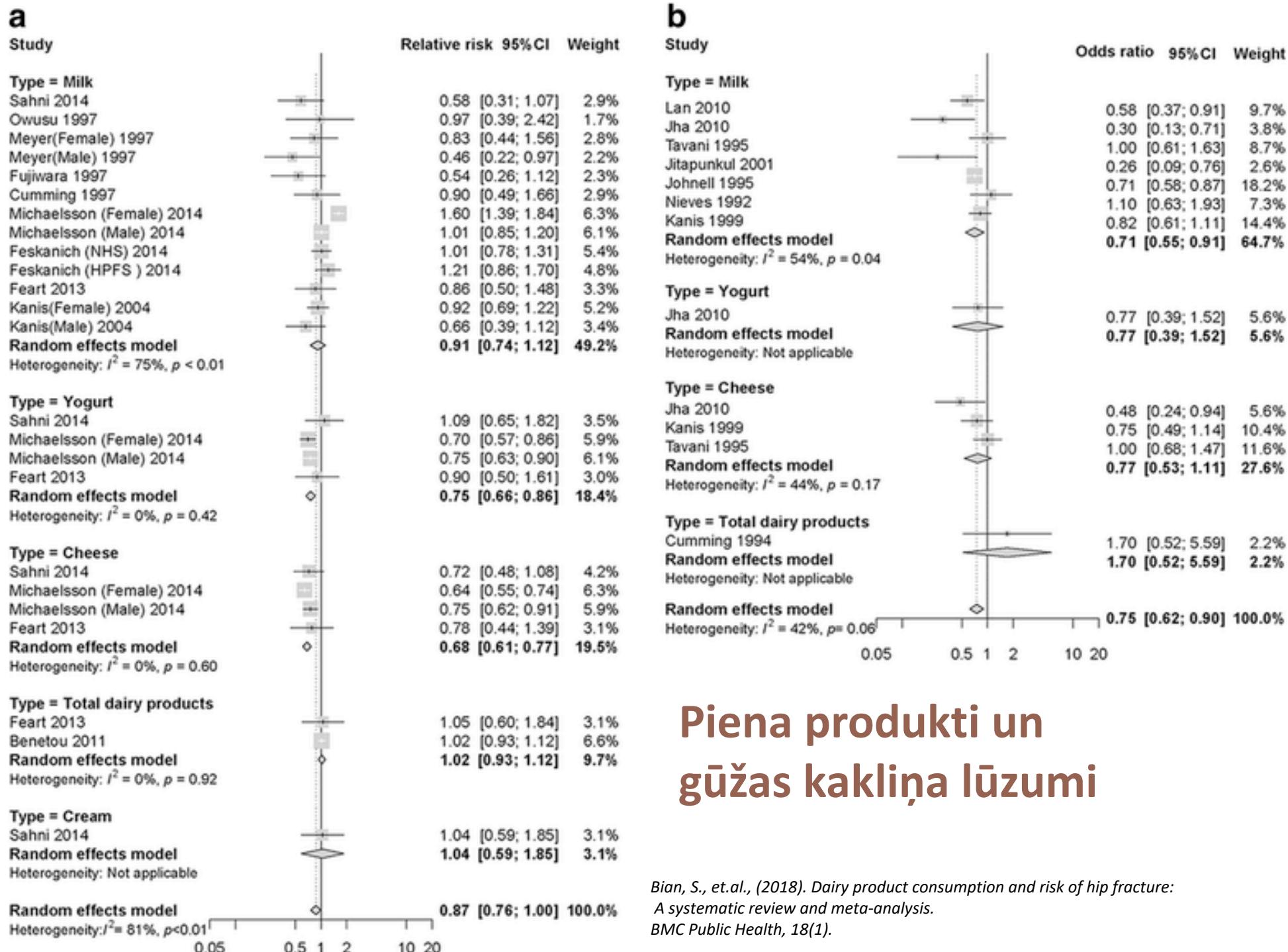
Van Den Heuvel, E. G. H. M., & Steijns, J. M. J. M. (2018).

Dairy products and bone health: How strong is the scientific evidence? *Nutrition Research Reviews*, 31(2), 164–178n

Piens 200 -250 ml
↓lūzumu risks 0-5%

Jogurts
Siers
↓risks 25-32%

Van Den Heuvel, E. G. H. M., & Steijns, J. M. J. M. (2018). *Dairy products and bone health: How strong is the scientific evidence?* *Nutrition Research Reviews*, 31(2), 164–178n



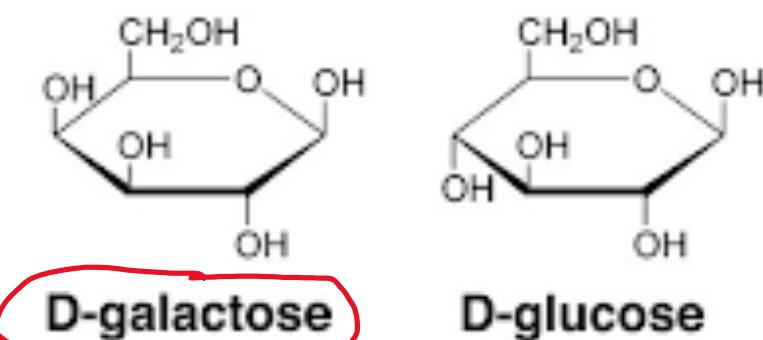
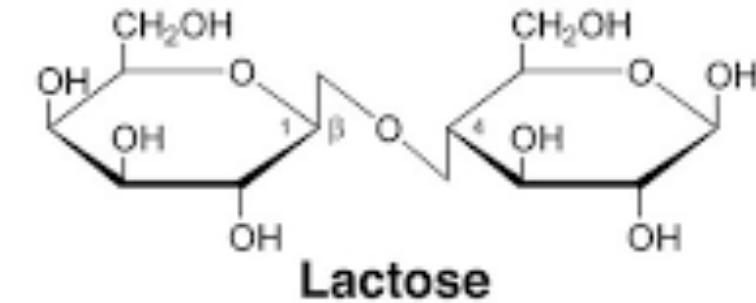
Piena produkti un gūžas kakliņa lūzumi

Bian, S., et.al., (2018). *Dairy product consumption and risk of hip fracture: A systematic review and meta-analysis.* *BMC Public Health*, 18(1).

Piens

- D- galaktose
 - Oksidatīvs stress
(urīnā 8-iso-PGF α)
 - Hronisks iekaisums (IL 6)
 - Neirodegenaratīvi procesi
 - Imūnās atbildes ↓
 - Novecošanās

(pelēm, žurkām, drozofilām)



Bian, S., et.al., (2018). Dairy product consumption and risk of hip fracture: A systematic review and meta-analysis. *BMC Public Health*, 18(1)
Michaëlsson, K., et.al., (2014). Milk intake and risk of mortality and fractures in women and men: Cohort studies. *BMJ (Online)*, 349(October)



5g /glāzē

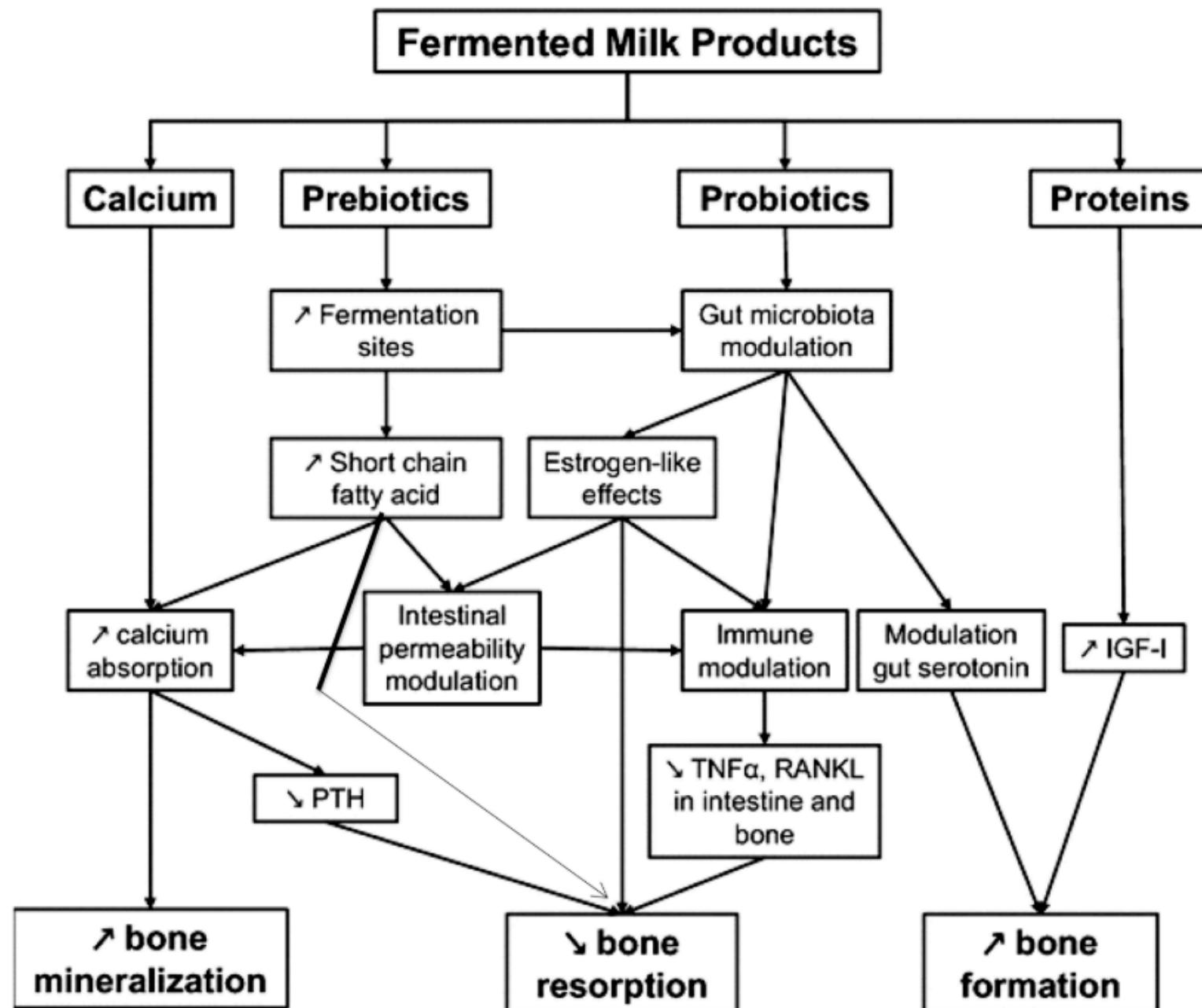
Top 10 Foods Highest in Galactose	
1 Dulce De Leche	2 Low-Fat Greek Yogurt
3.1g galactose per cup 1g per 100 grams	1.3g galactose per 7oz container 0.6g per 100 grams
3 Cherries	4 Honey
0.9g galactose per cup 0.6g per 100 grams	0.7g galactose per 1tbsp 3.1g per 100 grams
5 Celery	6 Kiwifruit
0.3g galactose per cup raw 0.5g per 100 grams	0.3g galactose per cup 0.2g per 100 grams
7 Hamburger with Condiments	8 Plums
0.3g galactose per burger 0.1g per 100 grams	0.2g galactose per cup 0.1g per 100 grams
9 Low-Fat Mozzarella	10 Avocados
0.2g galactose per ounce 0.8g per 100 grams	0.2g galactose per avocado 0.1g per 100 grams

Fermentēta piena produkti



- K2 vitamīns
- Probiotiki
 - Kaulaudu veidošanās ↑
 - Kaulu blīvums ↑
 - Kaulaudu zudumi ↓
- Iedarbība
 - Pretiekaisuma
 - Antioksidatīva

Bian, S., et.al., (2018). *Dairy product consumption and risk of hip fracture:A systematic review and meta-analysis*. BMC Public Health, 18(1).
Michaëlsson, K., et.al., (2014). *Milk intake and risk of mortality and fractures in women and men: Cohort studies*. BMJ (Online), 349(October),



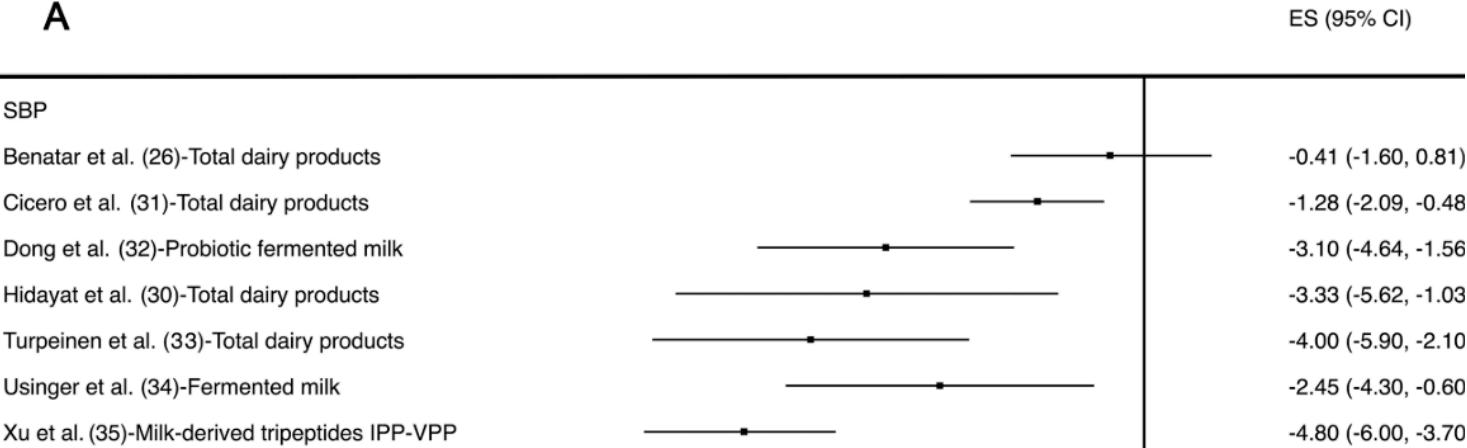
Sirds un asinsvadu slimības

Pienā produkti ar "normālu" vai zemu tauku saturu

! Nav negatīvas ietekmes:

- kardiovaskulāro slimību risks;
- sistoliskais / diastoliskais asinsspiediens;
- plazmas lipīdi (KH, ZBLH)

A



B



Sistoliskais un diastoliskais asinsspiediens

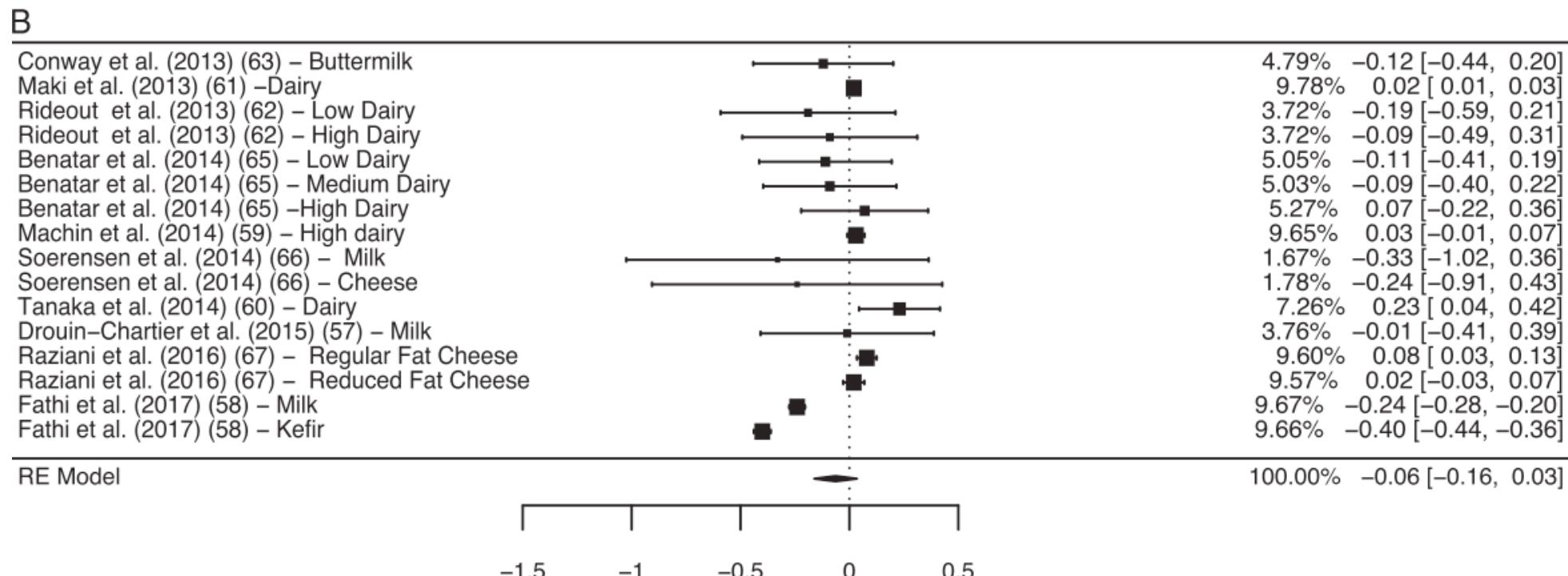
Javier Fontechea, et.al. (2019). Milk and Dairy Product Consumption and Cardiovascular Diseases: An Overview of Systematic Reviews and Meta-Analyses. American Society for Nutrition, 10, 164–189.

Sirds un asinsvadu slimības

Mazāks SIS un MI risks

Siers, fermentēti piena produkti ↓ insulta risku

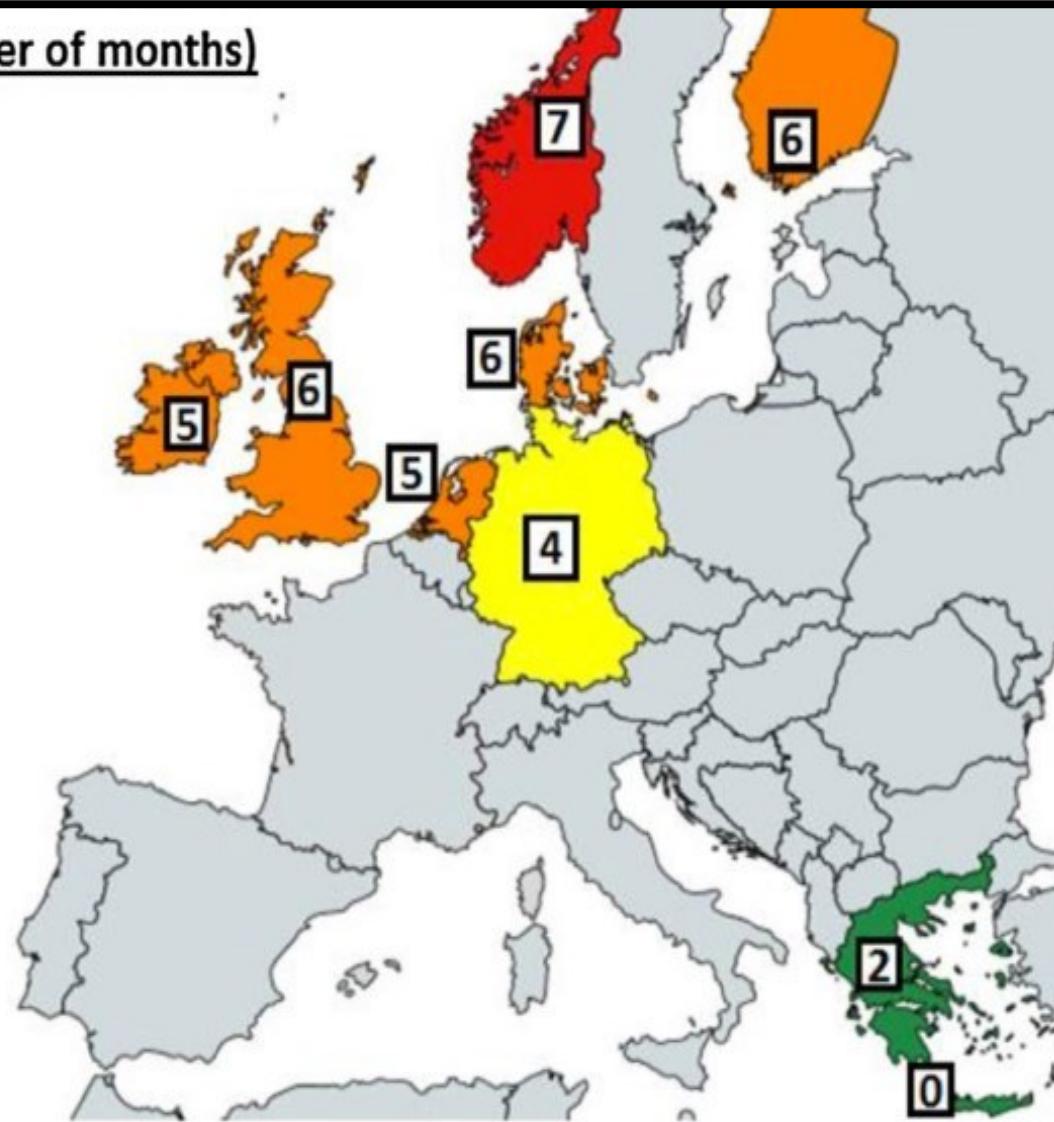
Piens – nav saistības



Number of months in different countries with no vitamin D production by sunshine exposure.

Vitamin D winter (number of months)

- [Green square] 0-2 months
- [Yellow square] 3-4 months
- [Orange square] 5-6 months
- [Red square] 7+ months
- [Grey square] Not assessed



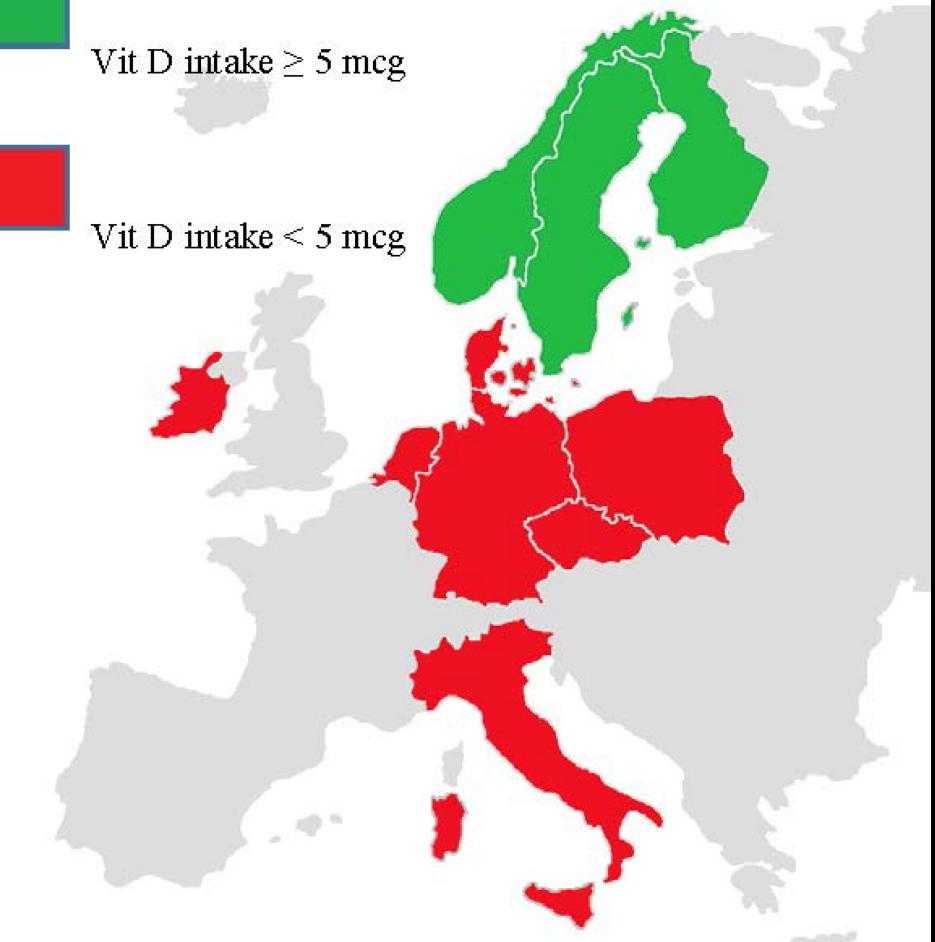
Intake of vitamin D (compensation for sunshine)



Vit D intake \geq 5 mcg



Vit D intake < 5 mcg



Vitamin D reference intake = 5 mcg



D vitamīns uzturā (D3)

Produkts	Daudzums	SV	µg
Vistas aknas, pagatavotas	85g	34	0.85
Liellopa aknas, pagatavotas	85g	68	1.7
Vistas ola (dzeltenums)	1 gab.	40	1
Cūku tauki	šķēle (50g)	12	0.3
Sviests	10g	4	0.1
Piens 2.5%	glāze 250ml	5	0.13
Mātes piens	250ml	0-24	0-0.6
Siļķe, marinēta	85g	680	17
Lasis, svaigs, mazsālīts	85g	612	15.3
Lasis, konservēts ar asakām	85g	520	13
Sardīnes	85g	340	8.5
Tuncis, konservēts eļļā	85g	200	5
Mencas ikri	85g	136	3.4
Siļķu, laša ikri	85g	68	1.7
Valis, pagatavots	85g	204	5.1
Garneles, vārītas	85g	34	0.85
Mencu aknu eļļa	1g	118	2.95

Augu valsts (D2)

Produkts	Daudzums	SV	µg
Kultivētās sēnes, svaigas	100g	76	1.9
Baravikas, svaigas	100g	124	3.1
Baravikas, žāvētas, saldētas	100g	160	4
Baravikas, žāvētas	100g	920	23



Vācijas BLS, Max Rubner institūta izveidotā pārtikas sastāva datu bāze

Kaulu uzturvielas rekomendētie daudzumi

International Osteoporosis Foundation and
National Osteoporosis Foundation 2018 (IOF)

Kalcijs

1000 -1200 g (ideāli ar uzturu)

Preparāti, ja uzturā < 800mg/d

D vitamīns

800 SV sievietēm menopauzē ar paaugstinātu
lūzumu risku

Riska pacientiem

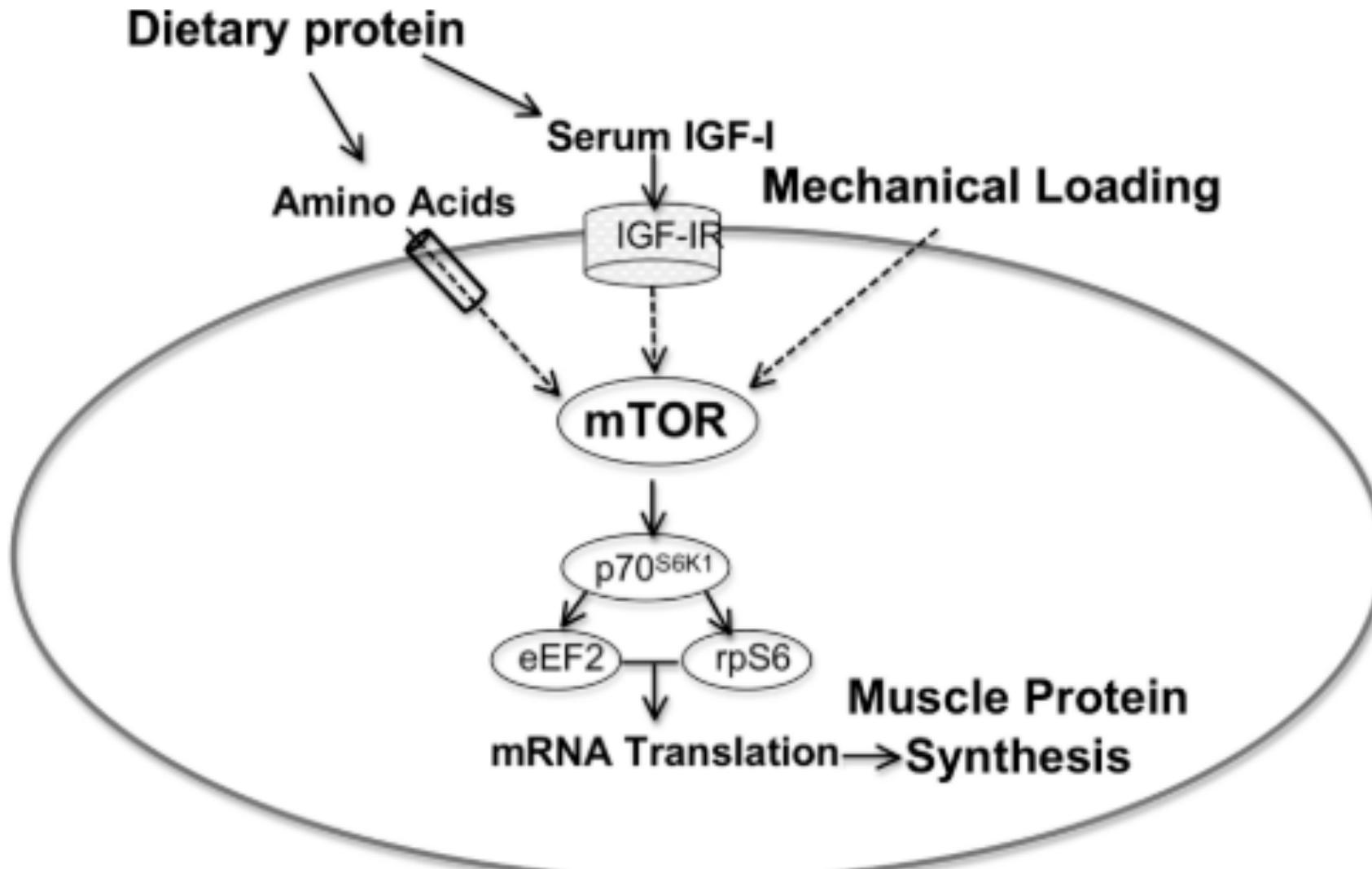
Bone Nutrients	
Calcium (mg/d)	
France ANC	1200
UK RNI	700
United States and Canada RDA	1200 (F; M > 70 years) 1000 (M 50–70 years)
Phosphorus (mg/d)	
France ANC	750
UK RNI	550
United States and Canada RDA	700
Vitamin D (IU/d)	
France ANC	200 (51–75 years) 400–600 (75 + years)
UK DRV	ND (51–65 years) 400 (65 + years)
United States and Canada RDA	600 (51–70 years) 800 (71 + years)
Protein	
France ANC (g/kg b.w./d)	1.0
UK RNI (g/d)	53.3 (M 50 + years) 46.5 (W 50 + years)
United States and Canada RDA (g/kg b.w./d)	0.8

Kanis, J. A., et.al. (2019). European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporosis International*
P. Bonjour, et.al., *Dairy in Adulthood: From Foods to Nutrient Interactions on Bone and Skeletal Muscle Health Journal of the American College of Nutrition 2013*

ANC = Apports nutritionnels conseillés, RNI = reference nutrient intake, RDA = recommended dietary allowance, DRV = dietary reference value, b.w. = body weight.

^aSee text for references to the listed country-specified nutrient requirements.

Olbaltumvielas uzturā – mehāniskā slodze – muskuļu olbaltumvielu sintēze



Senioriem olb.:

- Kaulaudu zudumus ↓
- Lūzumu risks ↓

Bonjour, J. P., et.al. (2013). Dairy in Adulthood: From Foods to Nutrient Interactions on Bone and Skeletal Muscle Health. *Journal of the American College of Nutrition*

Rizzoli, R., et.al. (2018). Benefits and safety of dietary protein for bone health—an expert consensus paper endorsed by the European Society for Clinical and Economical Aspects of Osteoporosis, Osteoarthritis, and Musculoskeletal Diseases and by the International Osteoporosis Fou. *Osteoporosis International*, 29(9), 1933–1948.

Malnutrīcija senioriem

Dg:

- $\text{ĶMI} < 18.5 \text{ kg/m}^2$
- **Neplānots svara zudums** $>10\%$ nenoteiktā laika posmā vai $>5\%$ pēdējo 3 mēn. laikā +
 $\text{ĶMI} < 20 \text{ kg/m}^2$ ja $< 70 \text{ g}$. vai $< 22 \text{ kg/m}^2$ ja $\geq 70 \text{ g}$.

PVO

normāls ĶMI $18,5 - 24,9 \text{ kg/m}^2$

- 5 -10 % mājās dzīvojošiem
 - Par 65% biežākas GĀ vizītes
- **20 – 60 %** aprūpes iestādēs, slimnīcās.
 - Par 30% ilgāks hospitalizācijas laiks
- Vecums, sociālie faktori
- Slimība, iekaisums
- Kognitīvais stāvoklis, depresija

Skrīnings

- $\text{ĶMI} < 20.5 \text{ kg/m}^2$
- Svara zudums
- Mazāk ēd
- Smagi slims
- Vecums $\geq 70 \text{ g}$

Siddique, N., et.al.(2017). Malnutrition in the elderly and its effects on bone health – A review. Clinical Nutrition ESPEN,

Olbaltumvielas senioreim

1- 1,2 g /kg (slimība 1,2 -1,5 g/kg)

Ēdienreizē 25 -30 g

**100g pagatvota gaļa 25-35g
Ola - 6g**



**Glāze 8g
100g biezpiena 18g
Siera šķēle 10g**



Vistas buljons 0,3 g



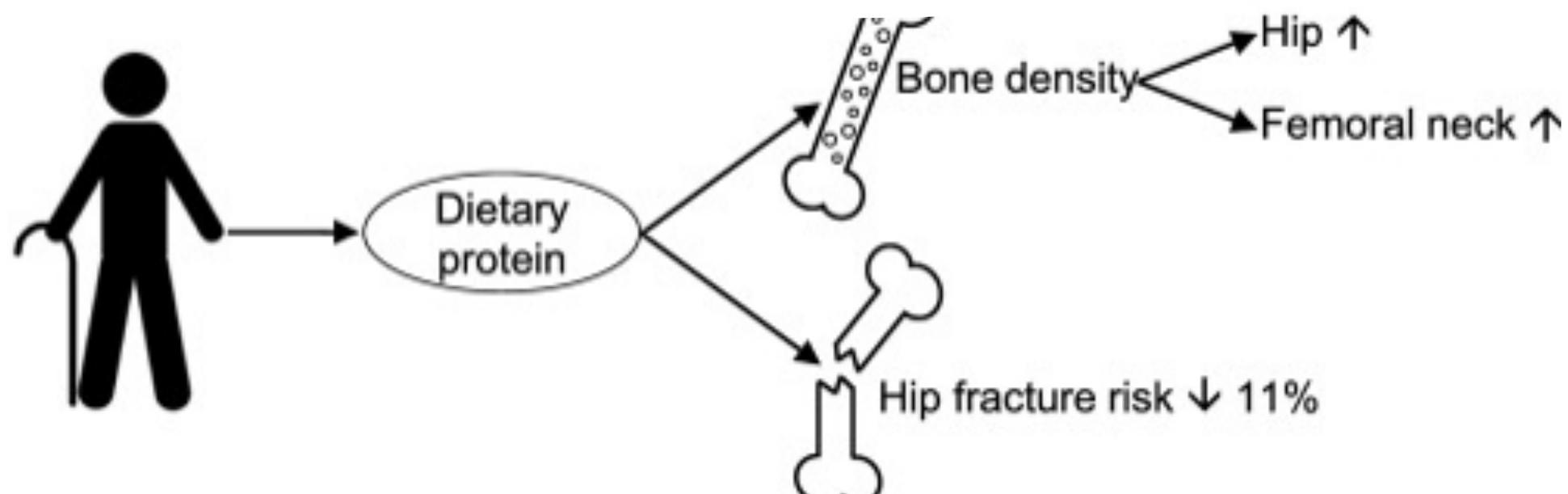
150g vārītas pupīnas 10 - 15g

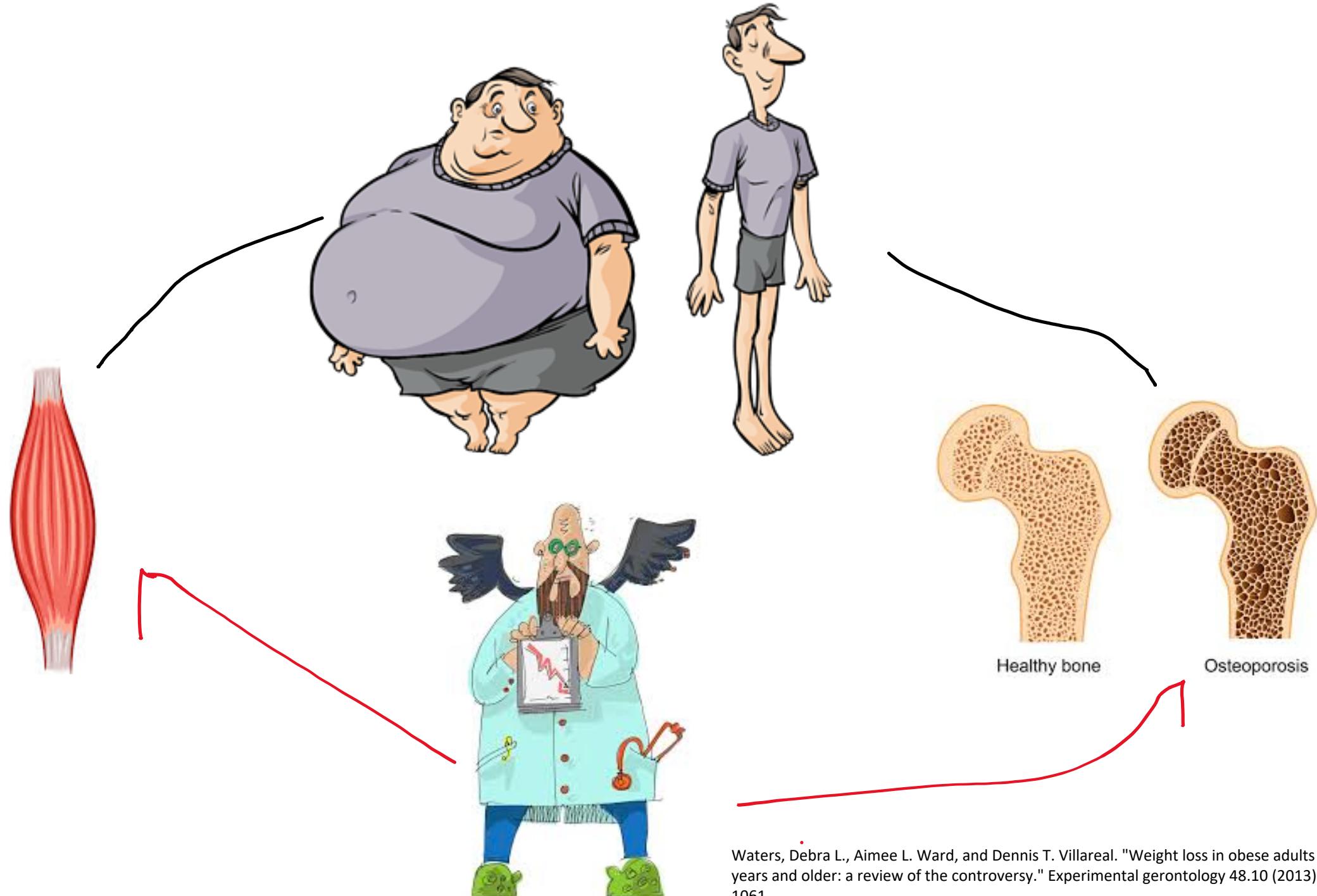


100g rieksti, sēklas 20-25g

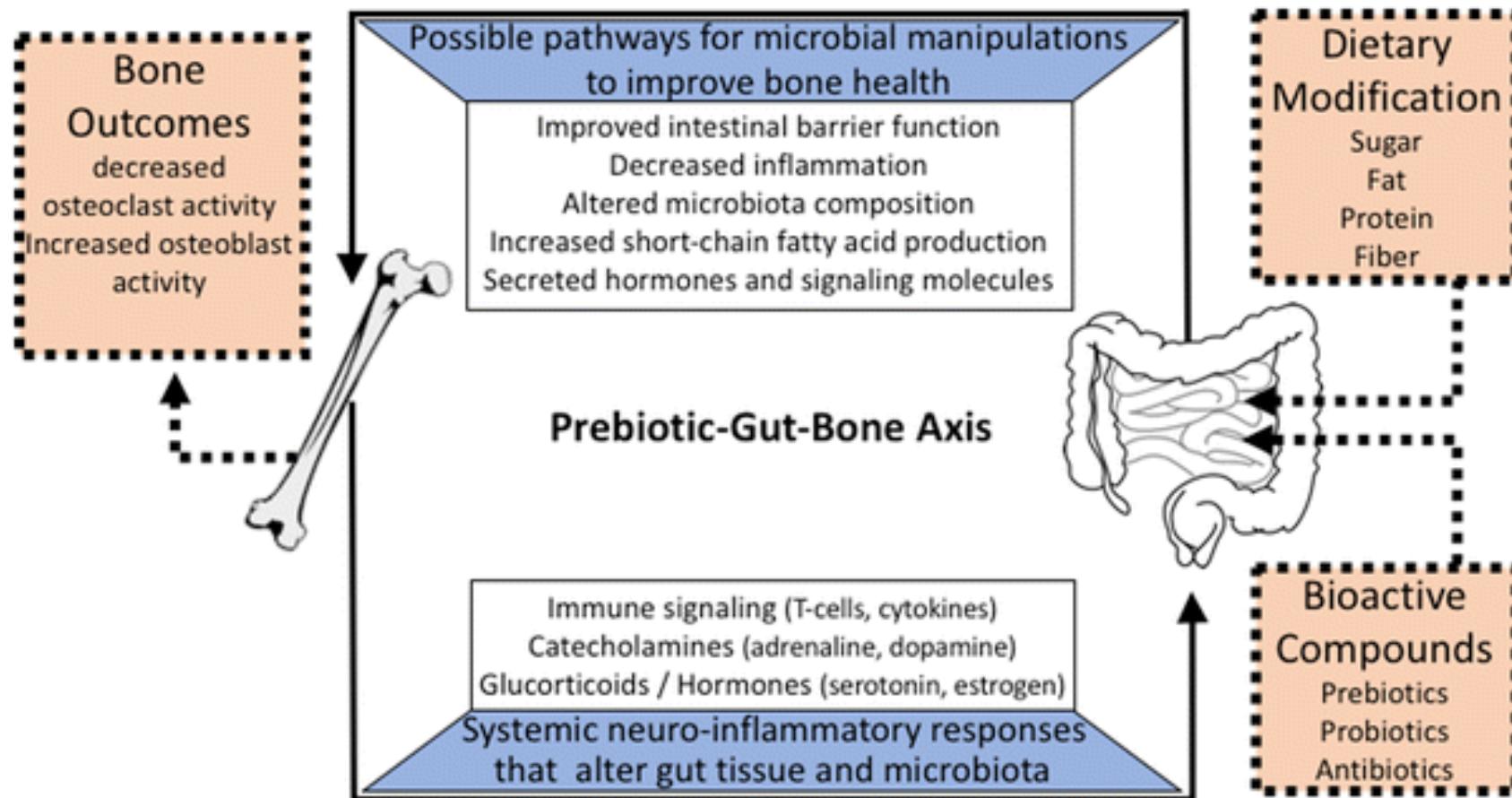
Olbaltumvielas senioriem

- Pacientiem ar gūžas kakliņa lūzumu
 - ↓ hospitalizācijas laiks
 - Infekcīozās komplikācijas
- Populācijā
 - ↓ kaula blīvuma mazināšanās
 - ↑ muskuļu spēks



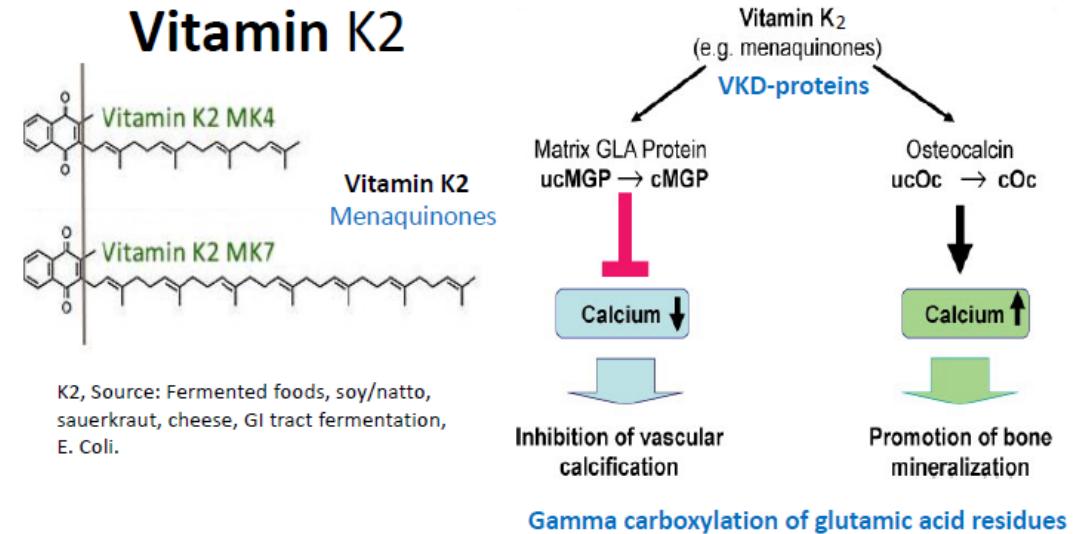


Prebiotiku – zarnas –kaulu ass

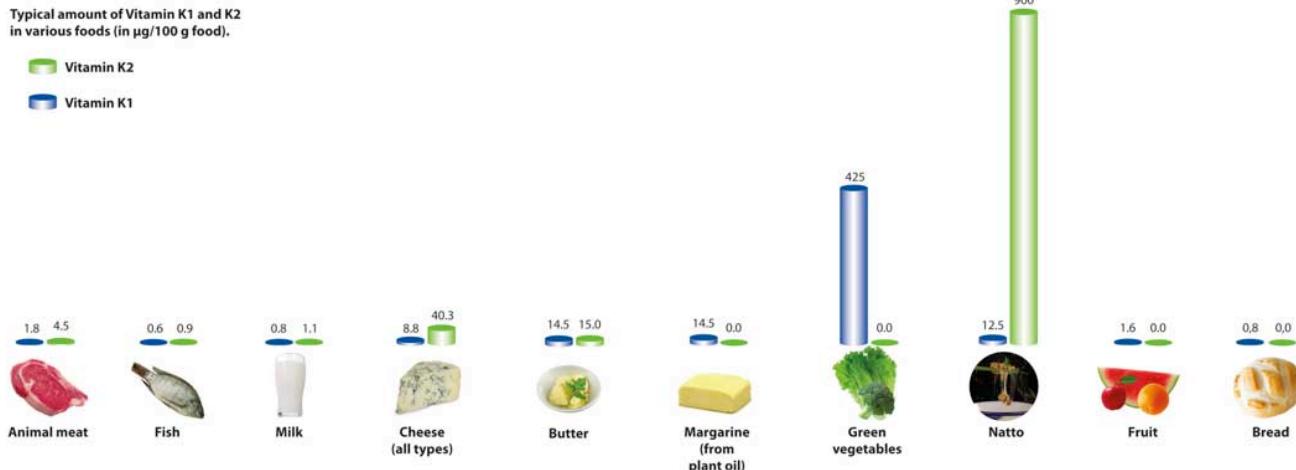


K2 vitamīns

- K2 menakvinons 4
- Aktivē olb., kas saista kalciju kaulā
- Osteoblastu stimulācija
- Regulē ekstracelulārās matricas mineralizāciju, inhibē osteoklastu ģenēzi

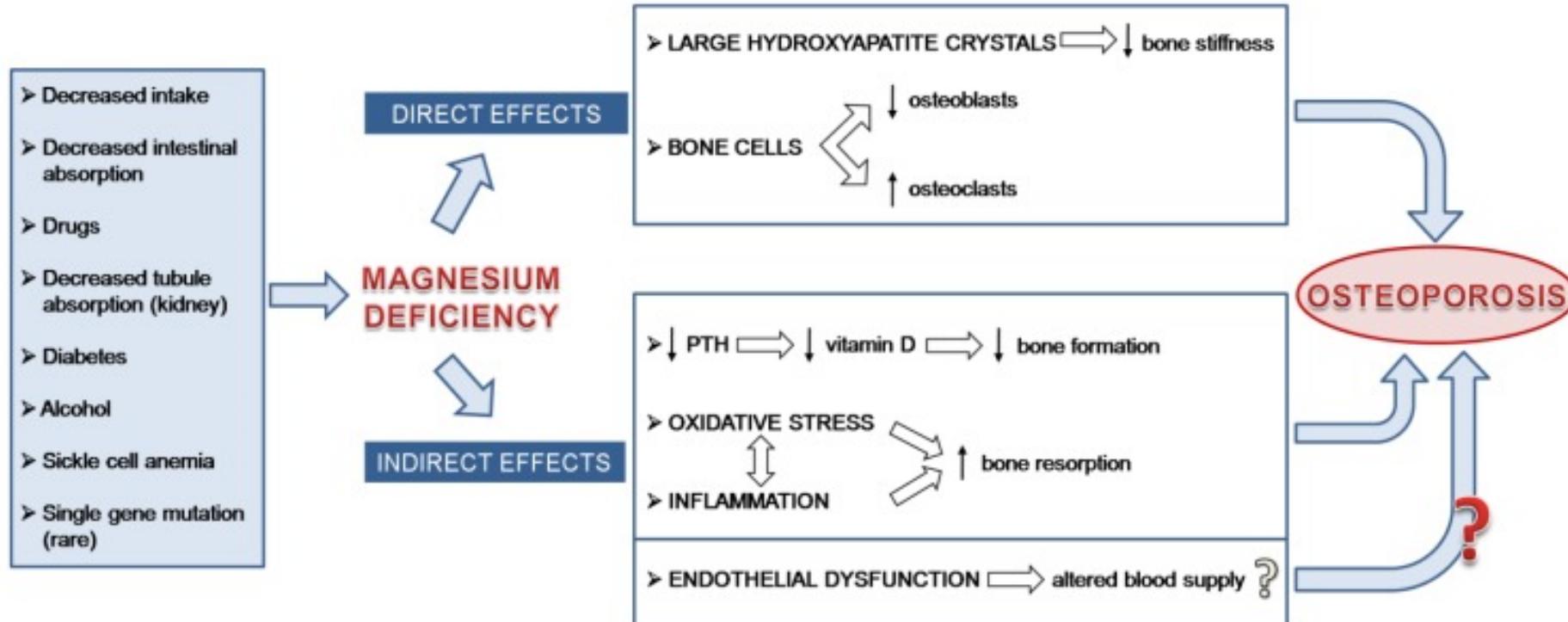


Frontiers CVD Medicine, Feb, 2019 The Bone—Vasculature Axis: Calcium Supplementation and the Role of Vitamin K

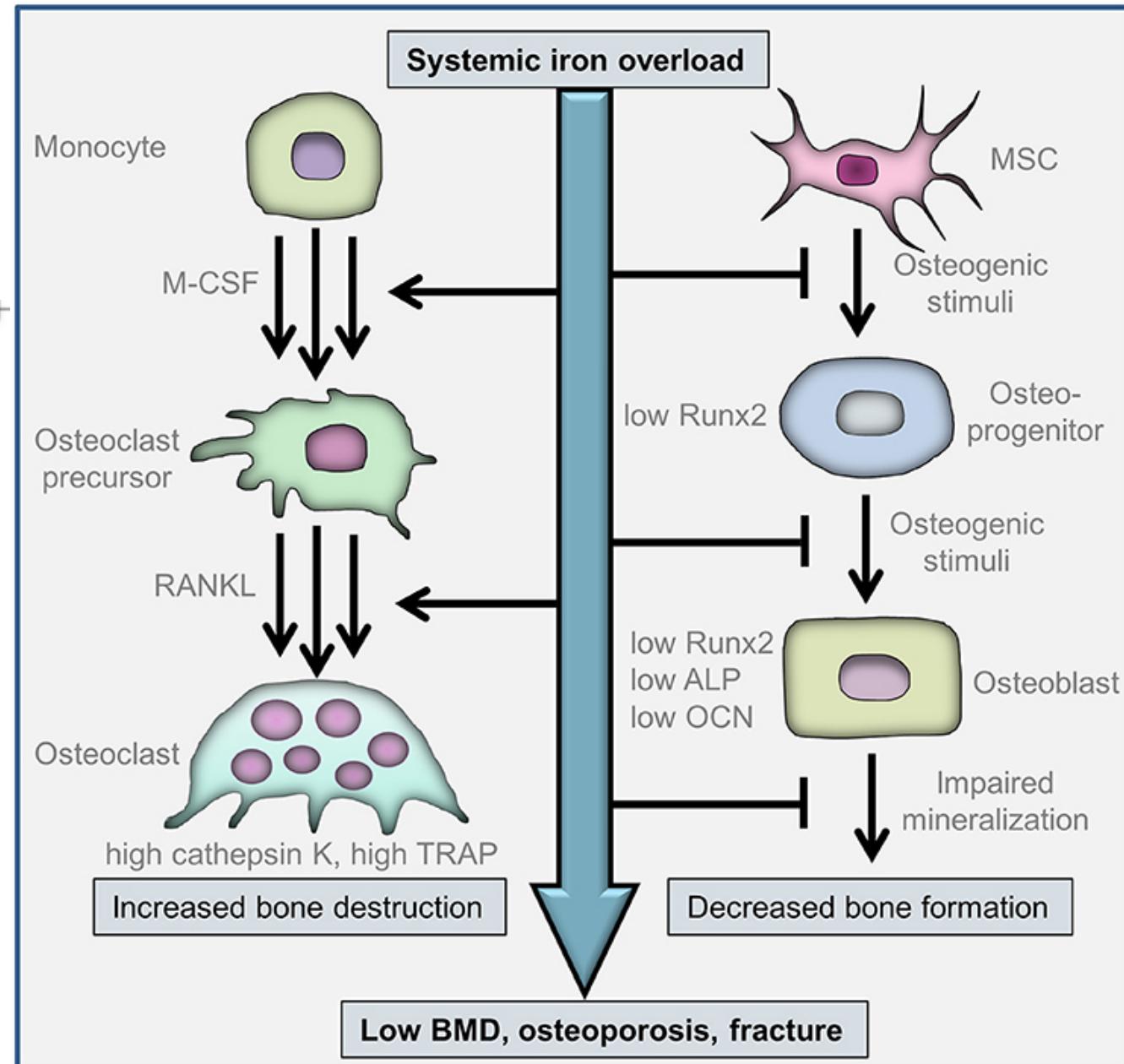
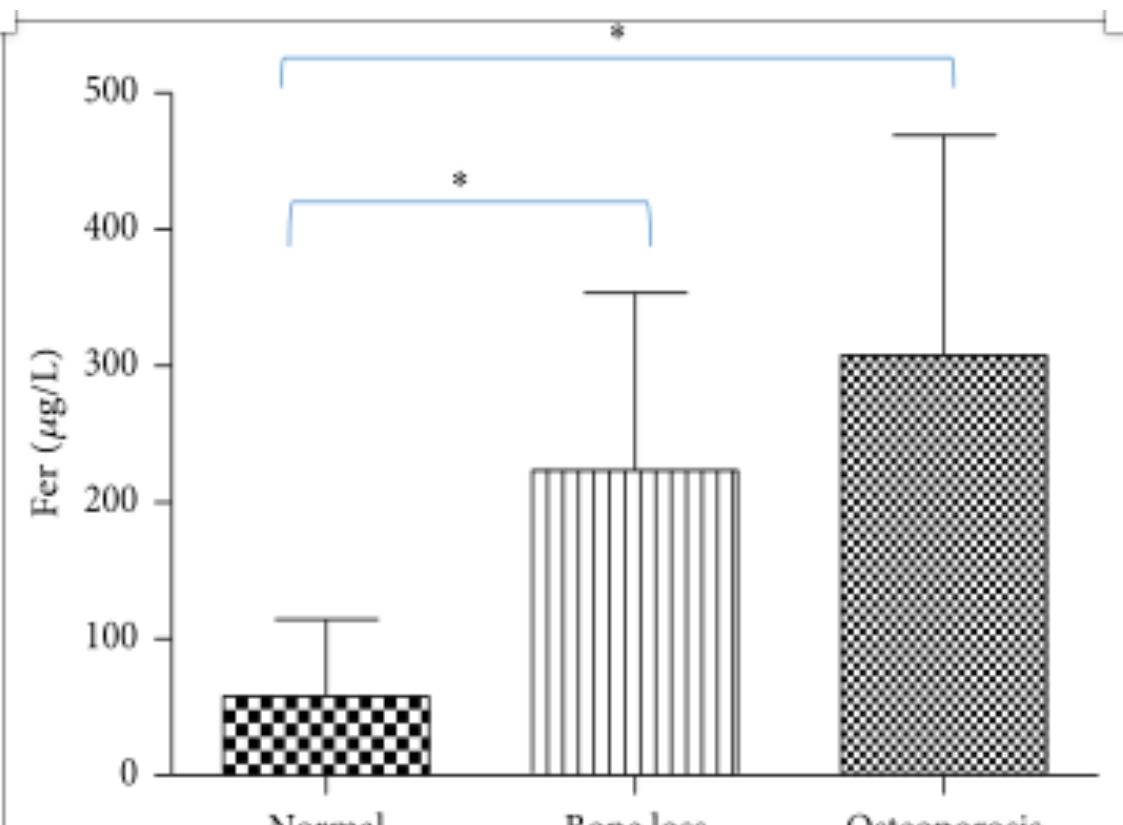


Mg

- Neietekmē lūzumu risku
- Nedaudz↑ kaulu blīvumu
- Homeostāze!

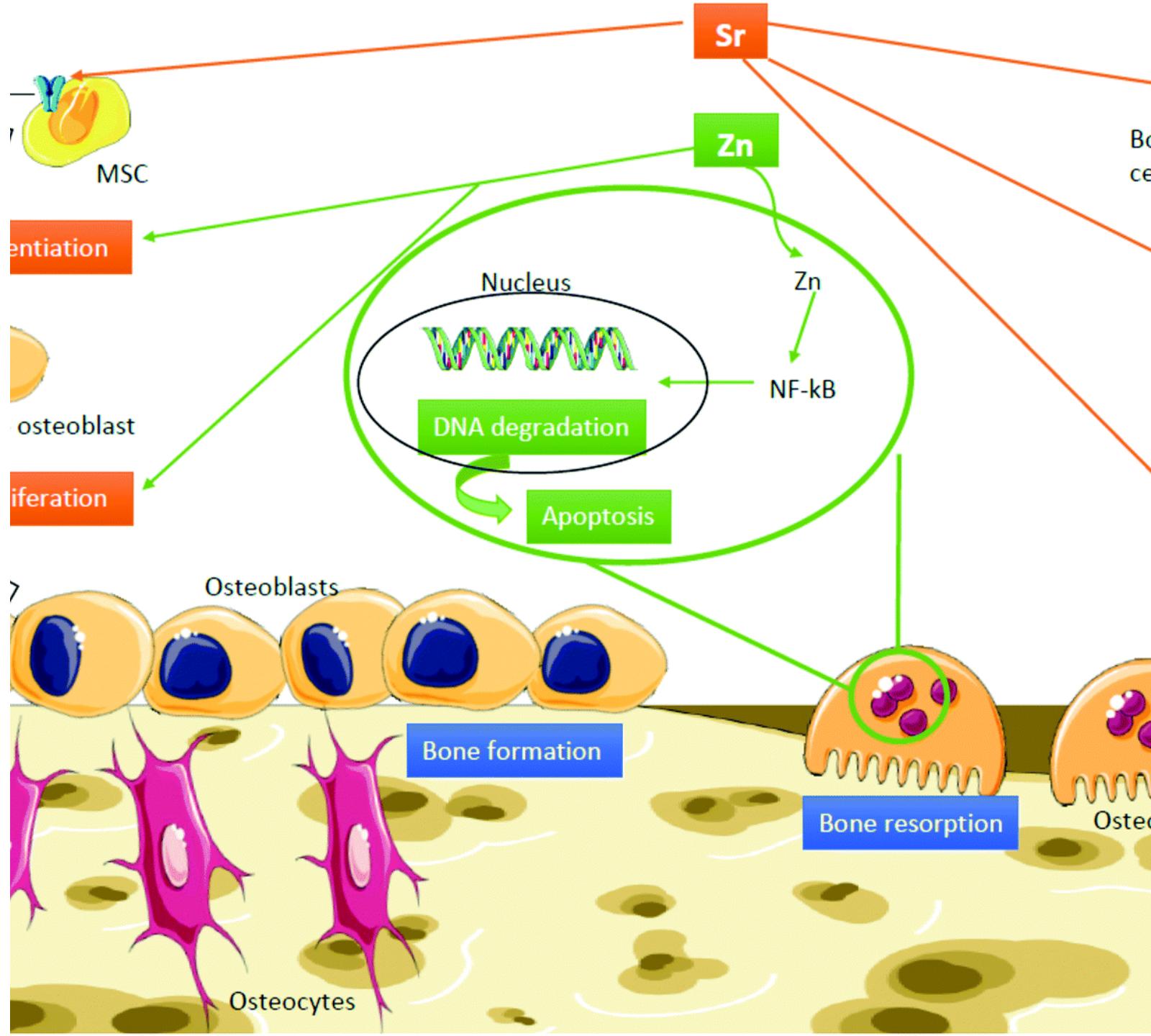


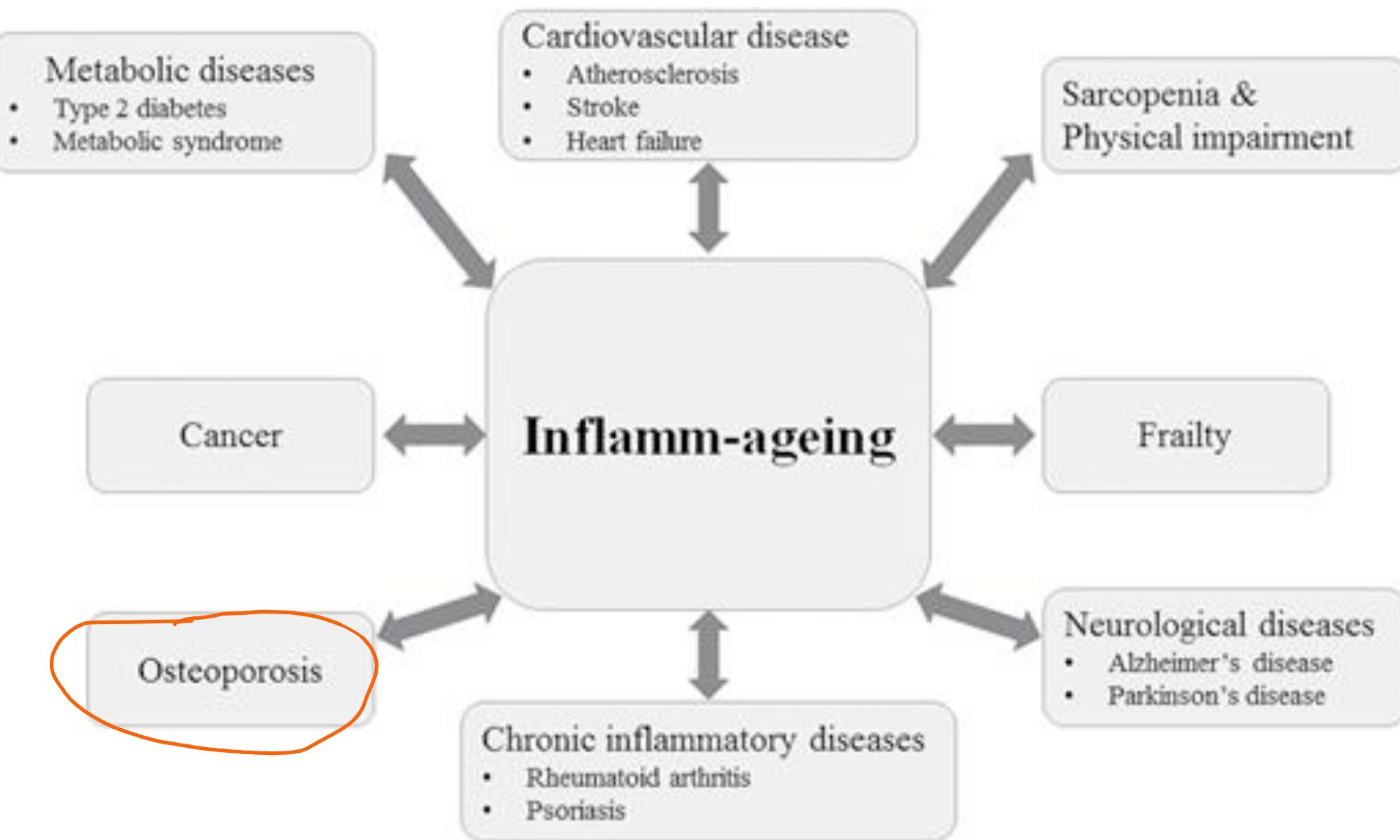
Fe “pārslodze”



Zn

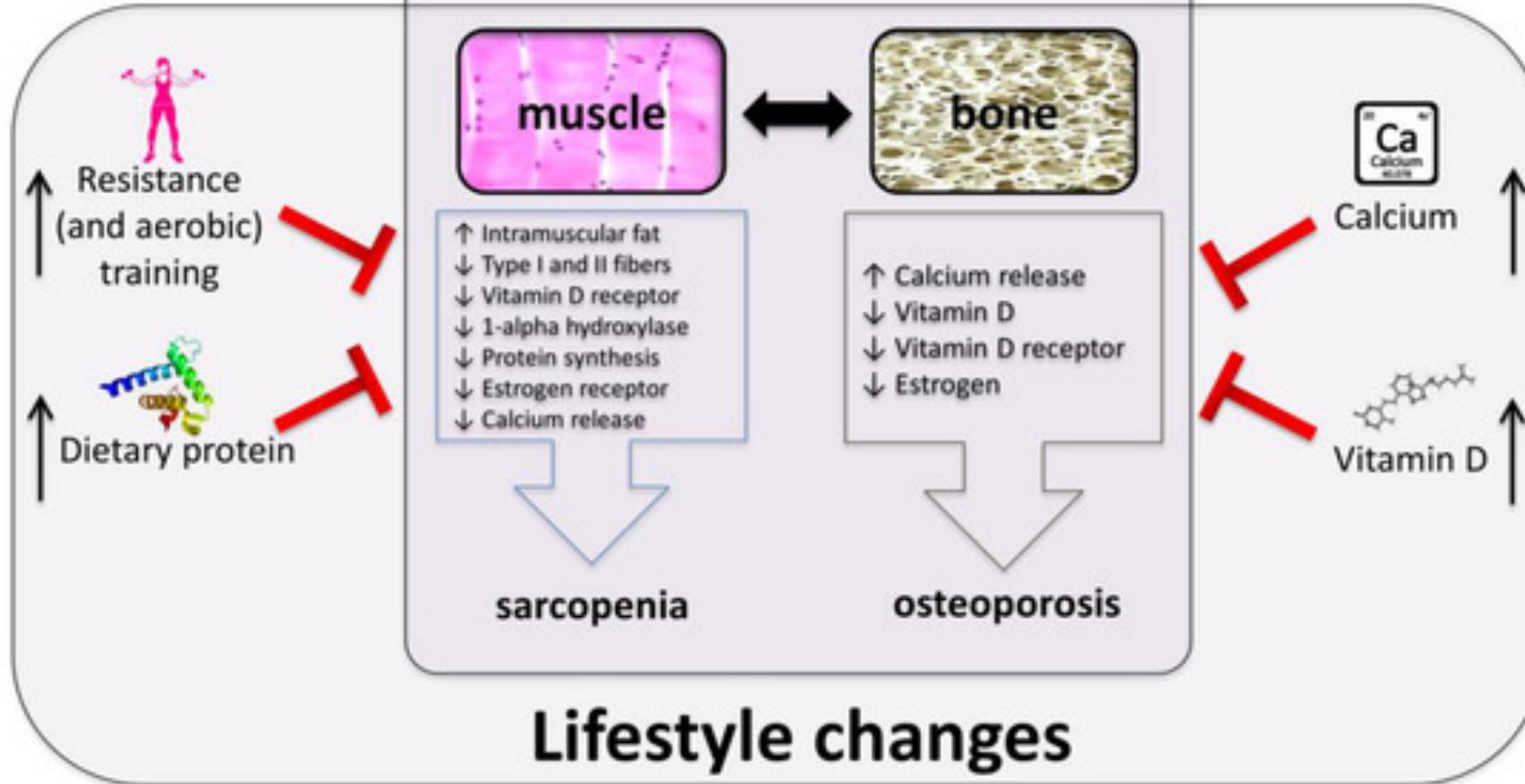
- C vitamīns
- B6, B12 vitamins
- Folskābe





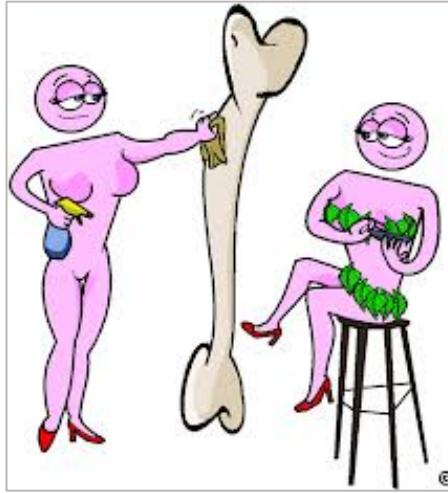
Menopause

↓ Sex hormones ↓ Anabolic hormones



Fitoestrogēni

- Osteoporoze
 - Estrogēni
 - Osteoklasti/osteoblasti/IGF-1
 - Ca saglabājoši
 - ↓ kaulu resorbciju
 - Nav blakusefektu



Kauli / Osteoporoze

- D vit 800 SV- 2000 SV
- Ca 1200 mg (max 2000 mg)
pārtika
- K vitamīns
- B12 vitamīns
- Nepārdozēt A vit. (retinolu)
(max 10 000SV (3000 mkg)
- Olbaltumvielas, K, Mg, P
- Ierobežot sāli, kafiju (2 tases)
- Dārzeni, augļi, pākšaugi
- Sojas izoflavoni



- Ca preparātu efektivitāte – līdzīga
- Polifenoli zaļajā tējā
- 1-2 alkohola devas -nekaitē
- Mieži (Si)
- Žāvētas plūmes

**Fiziskā aktivitāte
Nesmēķēt**

Ceļa maize

- Pilvērtīgs uzturs
 - Skābpiena produkti
 - Olbaltumvielas (augu)
 - Dārzeņi
 - Augļi
 - Pākšaugi
 - Sāls
-
- D vitamīns
 - Kalcījs?
 - Līdzsvars

