MILK NUTRITIOUS BY NATURE FROM MILK MATRIX TO HEALTH BENEFITS AN OVERVIEW

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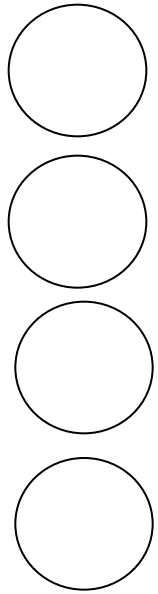
Fondation reconnue d'utilité publique

WE EAT FOODS
NOT NUTRIENTS

THE SUM OF

- **PROTEINS**
- **+ CALCIUM**
- **+ FATS**
- **+ VITAMINS**

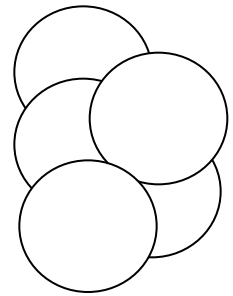


IS DIFFERENT

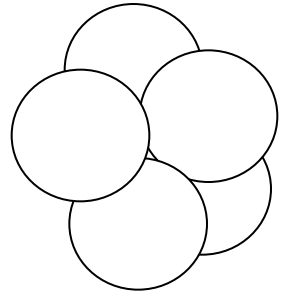
FROM

FOODS SUCH AS

DAIRY PRODUCTS



PRODUCTS WHOLE GRAINS



Fondation reconnue d'utilité publique

MATRIX EFFECT EXPLAINS

WHY - REFINED GRAINS

OR SKIMMED MILK

OR REFINED OILS

HAVE NOT THE SAME EFFECTS

THAN

WHOLE GRAINS

OR FULL-FAT MILK

OR VIRGIN OIL

WHY - THERE IS A DISCREPANCY BETWEEN

- EPIDEMIOLOGICAL DATA

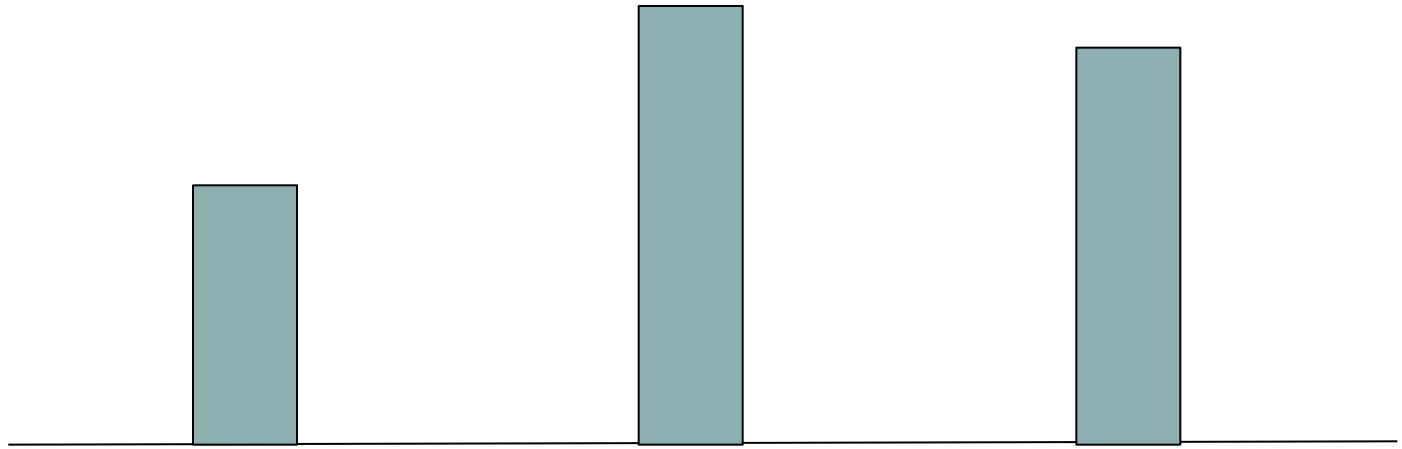
- AND CLINICAL TRIALS WITH DIETARY SUPPLEMENTS

WHY - THERE ARE SPECIFIC EFFECTS OF SOME NUTRIENTS SOURCES

CALCIUM SUPPLEMENTS AND CARDIOVASCULAR RISK

META ANALYSIS

TRIALS OF CALCIUM SUPPLEMENTS ≥ 500 mg/d



p = 0,057
MI
+ Stroke
+ Sudden death

p = 0,035
Myocardial Infarction
5 trials with patient level data
8157 participants

p = 0,038
Myocardial Infarction
11 trials with trial level data
11921 participants

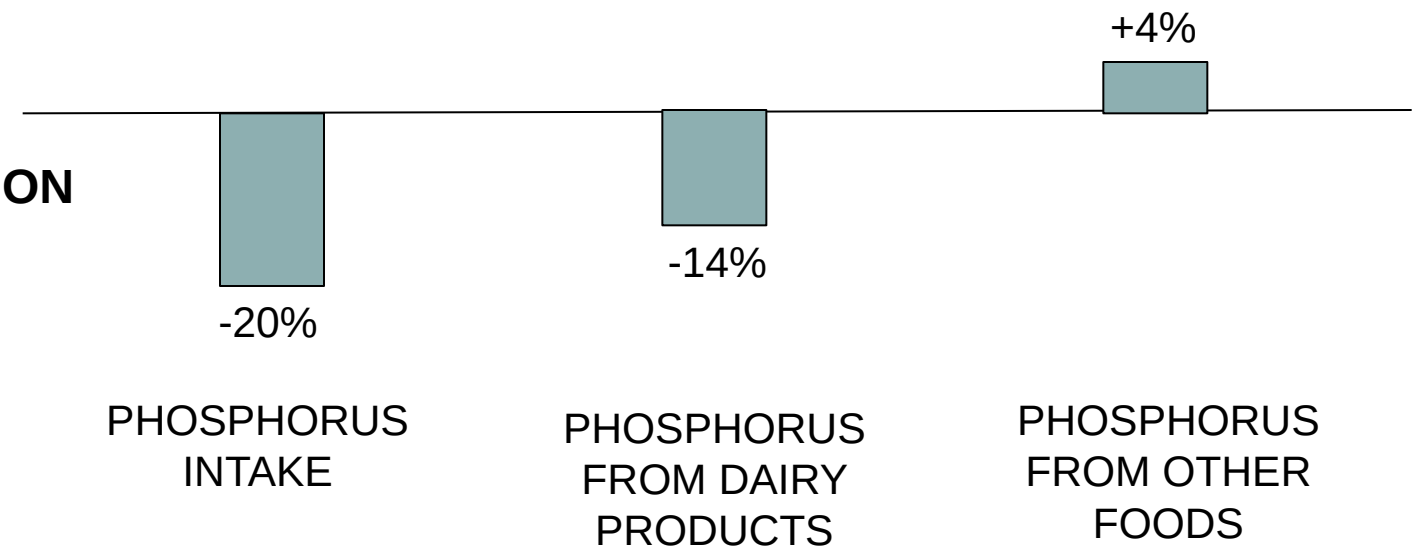
BMJ 2010, 341, c3691

DIETARY PHOSPHORUS AND BLOOD PRESSURE

13444 SUBJECTS — **ARIC COHORT**, **MESA STUDY**

6,2 YEARS FOLLOW-UP

RISK OF HYPERTENSION



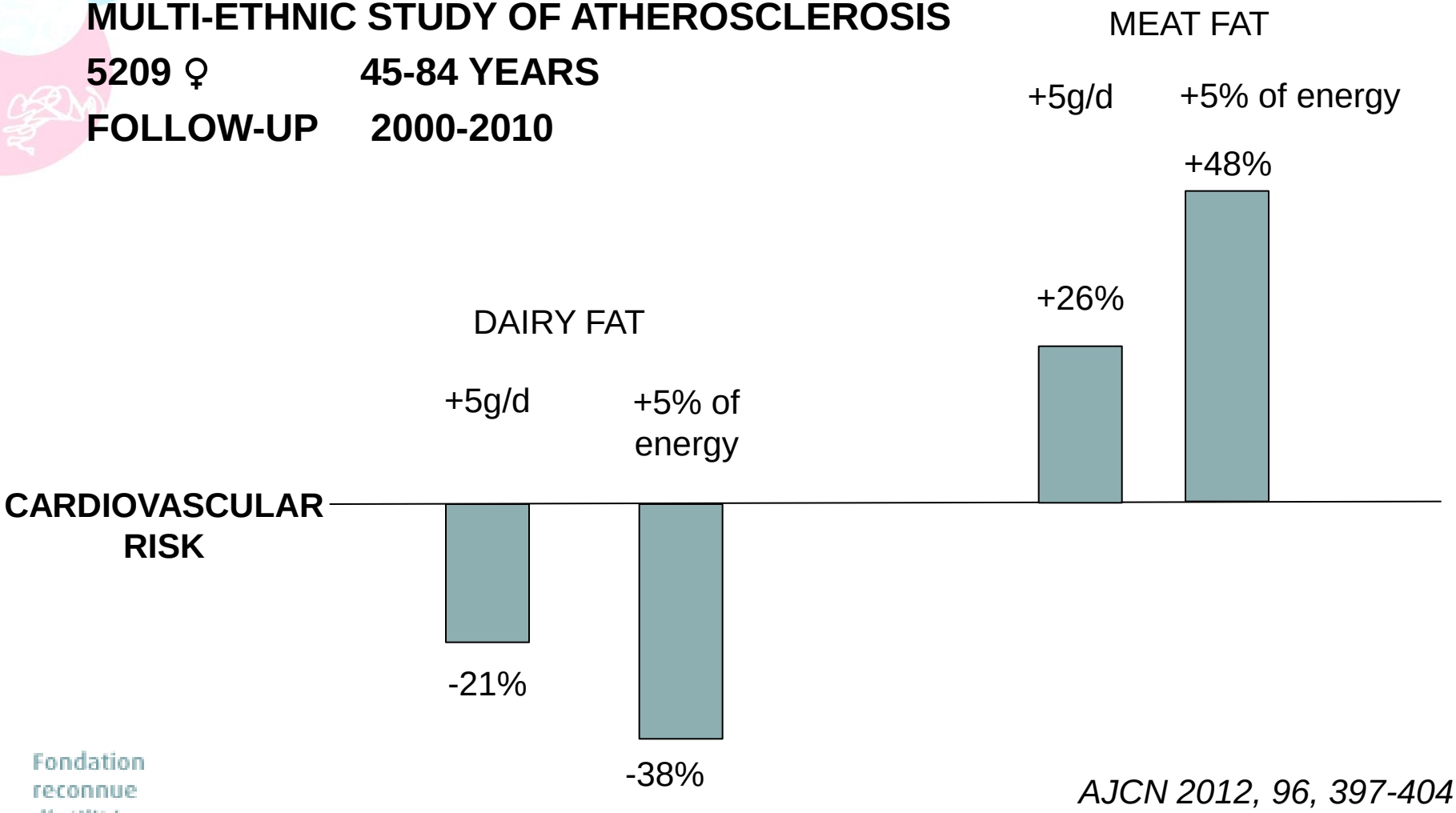
HYPERTENSION 2010, 55, 776-784

SATURATED FAT AND INCIDENT CARDIOVASCULAR DISEASE

MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

5209 ♀ 45-84 YEARS

FOLLOW-UP 2000-2010



AJCN 2012, 96, 397-404

WHY ?

IN FOODS

- **NUTRIENTS** **. ARE INTRICATED TOGETHER**

  PROTEINS + MINERALS

  . ARE ASSOCIATED WITH OTHER COMPONENTS

  IN FERMENTED DAIRY – *PROBIOTICS*

  IN PLANT FOODS – *POLYPHENOLS*

  . HAVE AN OTHER BIOAVAILABILITY

  CALCIUM + LACTOSE ↗

  ZINC/IRON + PROTEINS ↗

  PHYTATES + MINERAL ↘

  FATTY ACIDS + CALCIUM ↘

THE NEW MATRIX EFFECT

NOT ONLY THE SUM OF ITS NUTRIENTS

BUT ALSO THE NEW MATRIX EFFECT

→ **FAVOURABLE INTERACTIONS**

↓

EXAMPLES

SARCOPENIA
- Proteins
- Whey
- Casein
- Calcium
- Vit D

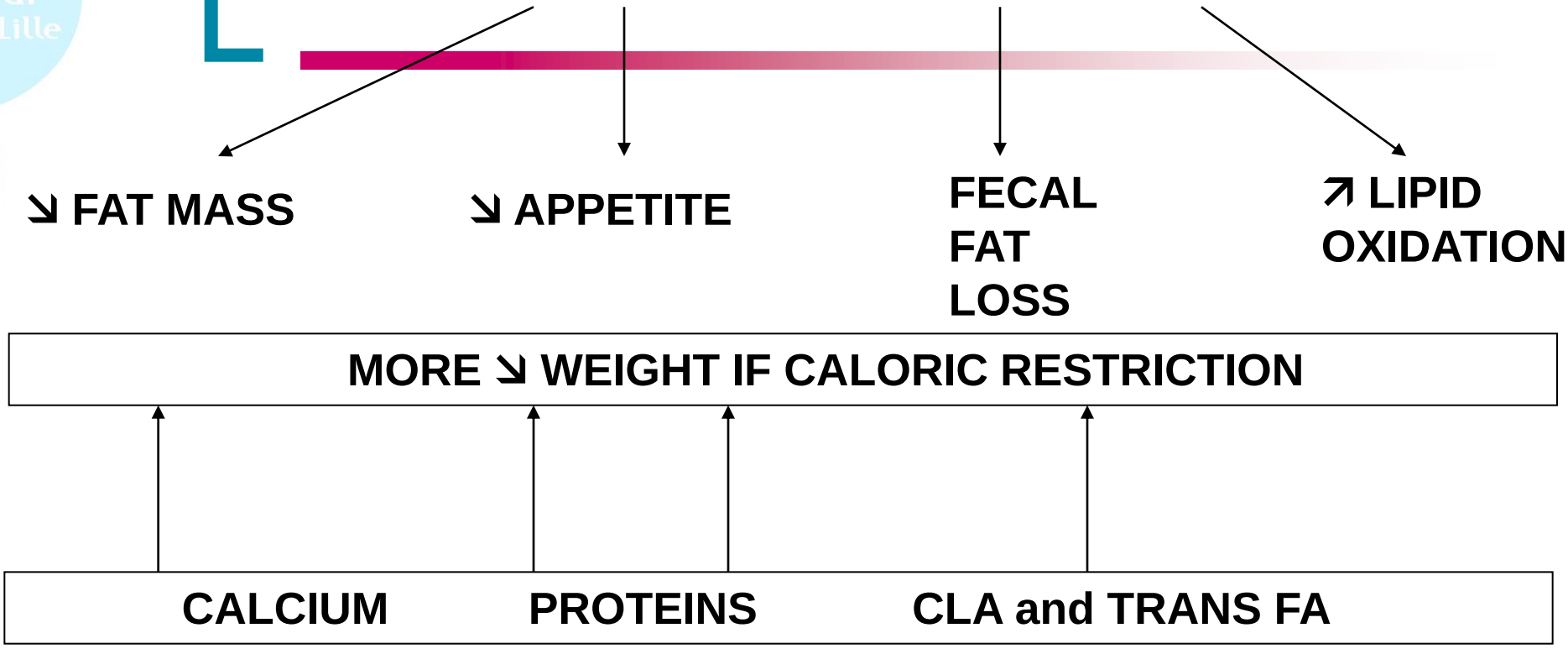
BONE METABOLISM
- Vitamin D
- Calcium
- Phosphorus
- IGF1
- Proteins

WEIGHT CONTROL
- Calcium
- Proteins
- CLA

CARDIOVASCULAR FUNCTION
- Calcium
- Fatty acids (CLA)
- Probiotics (yogurt)
- Bioactive peptides
- Vitamin D

COLORECTAL CANCER
- Calcium
- Probiotics

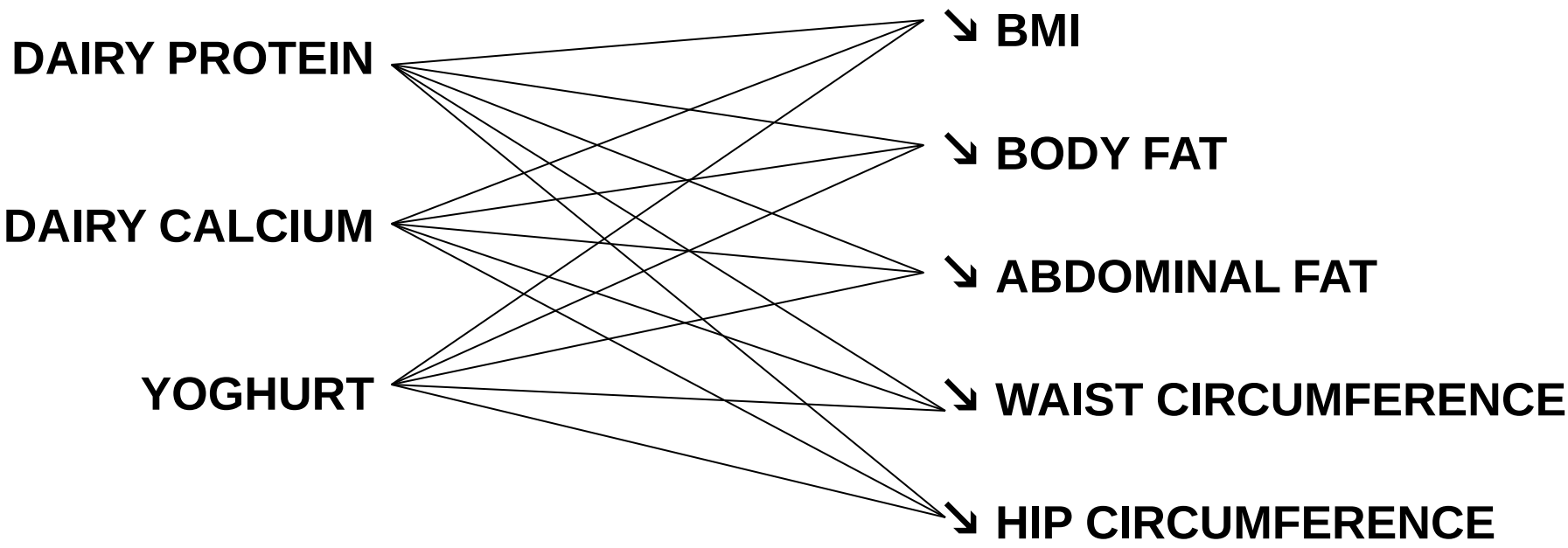
DAIRY PRODUCTS AND WEIGHT



Br J Nutr 2009, 101, 659-663
Br J Nutr 2011, 105, 133-143
EJCN 2012, 66, 622-7
EJCN 2012, 66, 1104-1109

DAIRY FOODS AND DAIRY PROTEIN CONSUMPTION ARE INVERSELATY RELATED OF ADIPOSITY IN OBESE

720 OVER WEIGHT AND OBESE AUSTRALIAN MEN AND WOMEN



NUTRIENTS 2013, 5, 4665-84

SELF PERCEIVED LACTOSE INTOLERANCE IS ASSOCIATED WITH HYPERTENSION AND DIABETES

CROSS-SECTIONAL STUDY

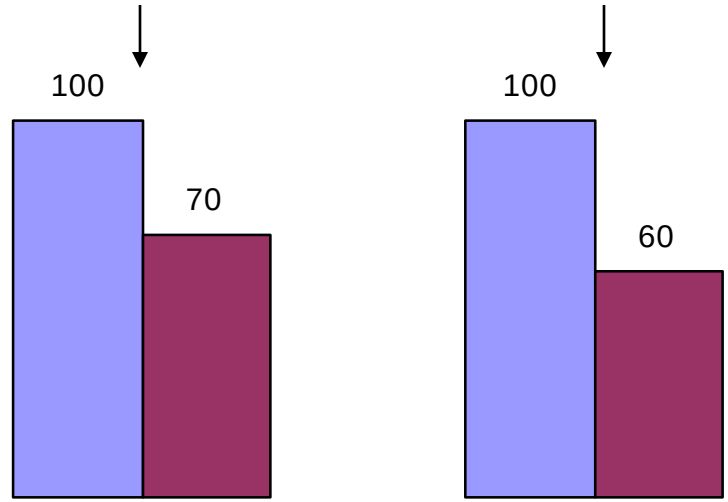
3452 ADULTS

12,3% PERCEIVED THEM SELVES TO BE LACTOSE INTOLERANT

HAD SIGNIFICANTLY LOWER (p <0,05) AVERAGE DAILY CALCIUM INTAKES FROM DAIRY FOODS

HIGHER PERCENTAGE HAVING PHYSICIAN DIAGNOSED DIABETES AND HYPERTENSION

For a 1000 mg increase in calcium intake from dairy foods per day



AJCN 2011, 94, 191-8

DAIRY AND CARDIOVASCULAR DISEASE

DESPITE THAT 60% OF THE FAT PHASE OF DAIRY PRODUCTS IS SATURATED FATTY ACIDS

ALL EPIDEMIOLOGICAL STUDIES SHOW THAT DAIRY PRODUCTS (MILK – FERMENTED, MILK AND YOGURT, CHEESE) CONSUMPTION IS NOT ASSOCIATED WITH AN INCREASE OF CVD INCIDENCE OR CORONARY HEART DISEASE INCIDENCE, BUT WITH NEUTRAL EFFECT OR DECREASE OF THAT INCIDENCE

IN JAPAN
CARDIOVASCULAR DEATH

9243 male and female

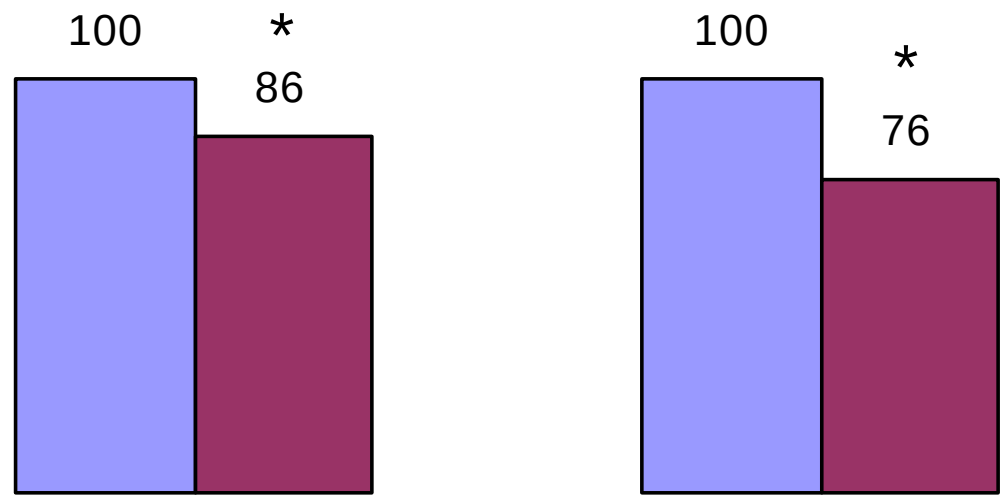
> 30 years old

Follow-up : 24 years

AFTER ADJUSTMENT ON CONFOUNDERS

FEMALE

* FOR EACH 100g MILK INCREASED CONSUMPTION



J Epidemiol 2013

IN THE NETHERLANDS
DEATH DUE TO STROKE

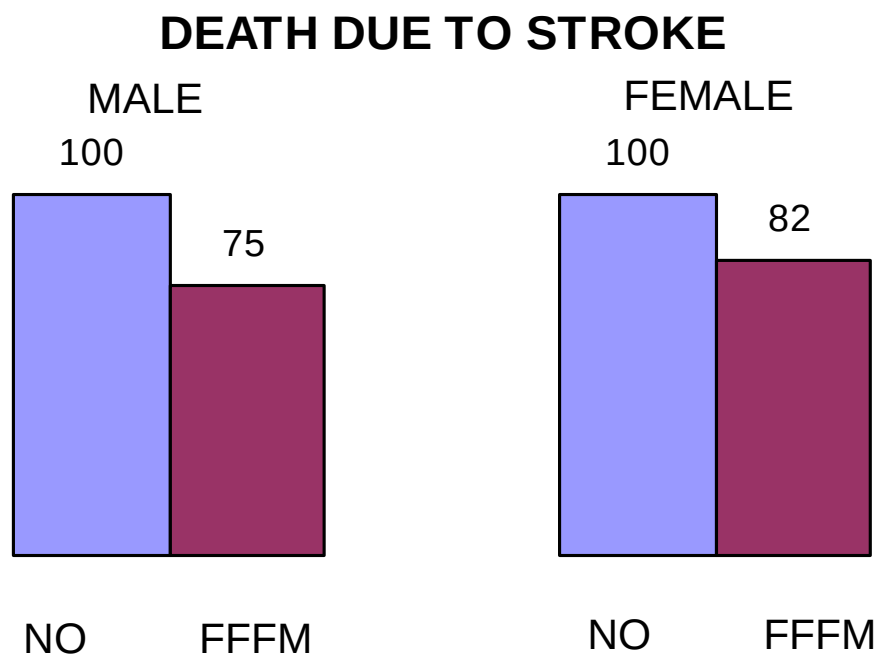
120 852 male and female

55 – 69 years at baseline

10 years follow-up

Food Frequency Questionnaire

FFFM = Fermented Full Fat Milk



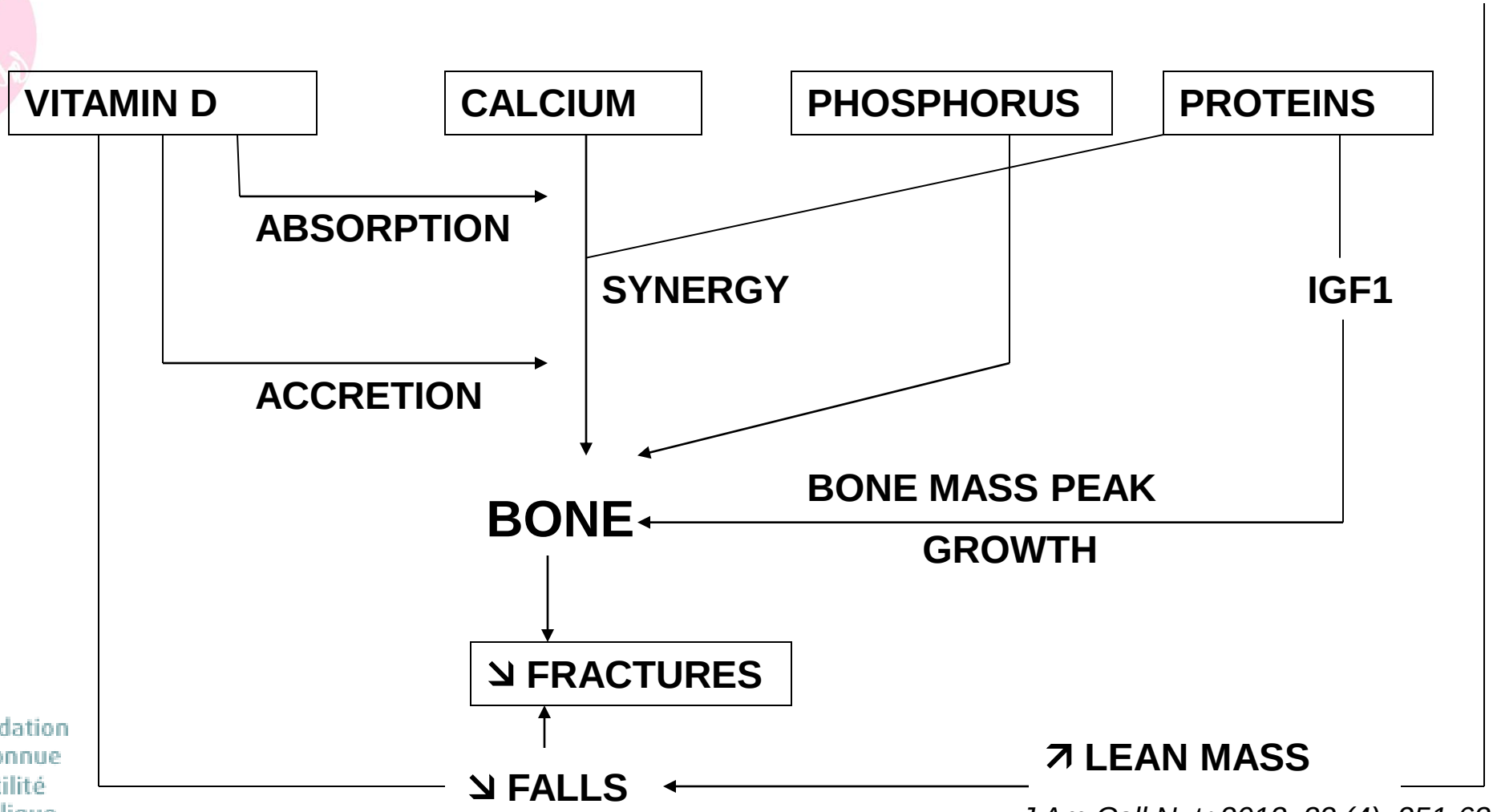
AJCN 2011, 93, 615-27

WHY ?

BECAUSE OF PROTECTIVE NUTRIENTS AGAINST CARDIOVASCULAR RISK IN DAIRY

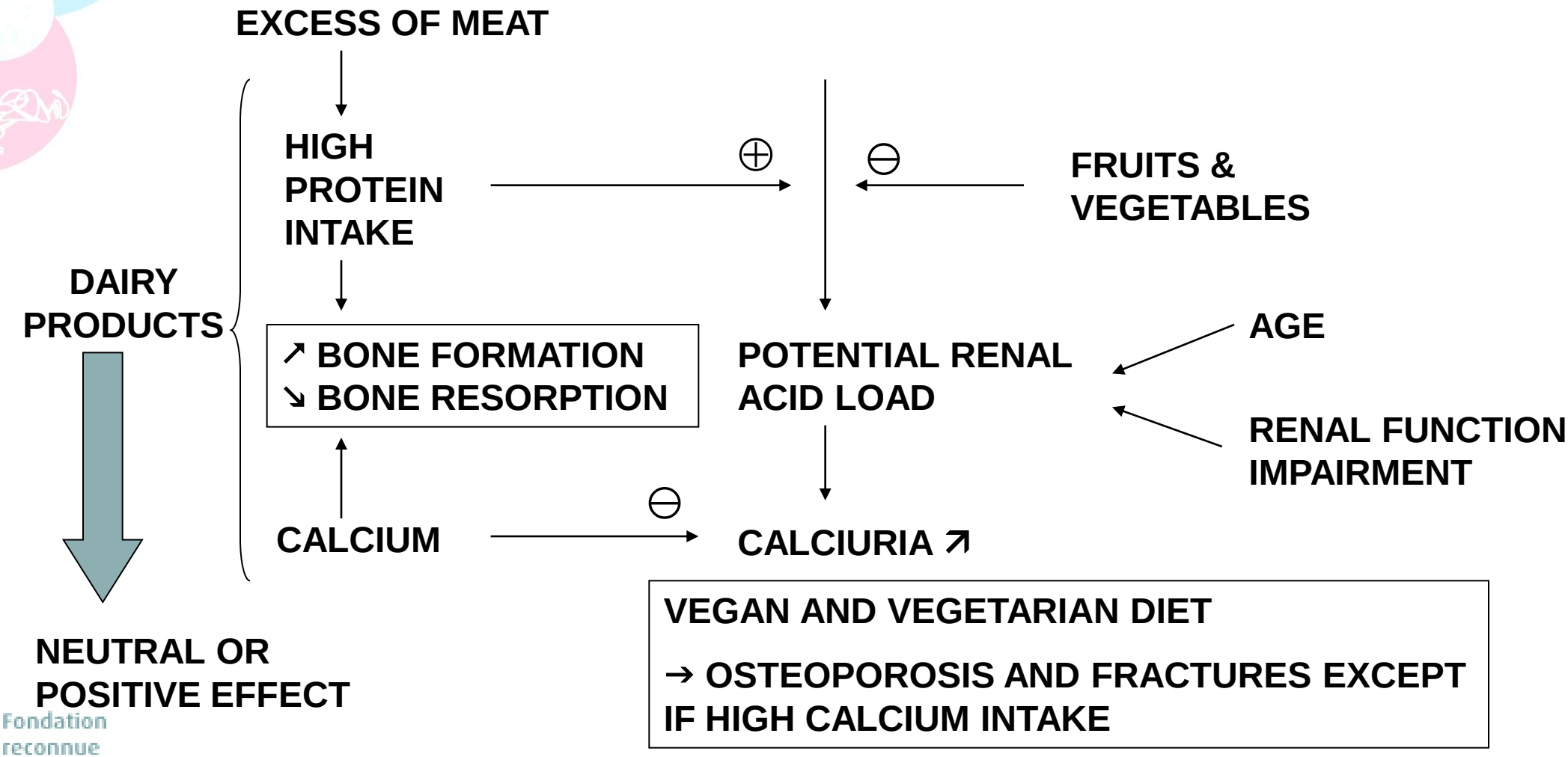
→ CALCIUM	EFFECTS ON WEIGHT CONTROL CHOLESTEROL
→ MILK-DERIVED BIOACTIVE PEPTIDES	BLOOD PRESSURE
→ SPECIFIC FATTY ACIDS RUMENIC ACID	VISCERAL FAT AND WAIST CIRCUMFERENCE
→ PROBIOTICS	INFLAMMATION AND MICROBIOTA
→ LACTOSE	GLYCEMIC INDEX

THEIR INTEREST FOR THE PREVENTION OF OSTEOPOROSIS



J Am Coll Nutr 2013, 32 (4), 251-63

THE ACID-BASE LOAD AND DAIRY PRODUCTS



EJCN 2007, 61, 1400-6
EJCN 2012,66, 281-95

RECENT STUDIES

ICELAND

4797 MEN 66-96 YEARS

MILK ≥ ONCE/DAY

DURING MIDLIFE

↓

↗Z SCORE — **BMD (+0,21)**

BMC (+0,18)

- FEMORAL NECK

- TROCHANTER

Osteoporosis Int 2014, 25, 663-72

POLAND

712 (170) WOMEN 32-59 YEARS

UPPER BMD TERTILE

IN COMPARISON TO BOTTOM TERTILE

MILK CONSUMPTION

DURING PRE SCHOOL PERIOD X 2,73

DURING SCHOOL PERIOD X 2,40

Nutrients 2013, 5(7), 2684-2707

EFFECTS OF DAIRY PRODUCTS ON BONE MASS ACCUMULATION

Effect of dairy product on bone mineral mass accrual (randomized controlled trials)

Study	Intervention	Mean age (years)	Duration (months)	Sex	Skeletal site*	Difference (%) between intervention and control groups
Cadogan et al. (94)	Milk (568 ml)	12,2	18	F	Whole body	2,9
Chan et al. (80)	Dairy	11	12	F	Spine/whole body	9,9/6,6
Cheng et al. (95)	Cheese (equivalent to 1000 mg Ca)	11,3	24	F	Tibia shaft	4,4
Du et al. (96)	Milk (330 ml)	10,1	24	F	Whole body	4,2
Lau et al (159)	Milk powder (equivalent to 650 mg Ca)	10,0	18	F/M	Spine/hip	1,4/1,1
Merrilees et al (160)	Milk (equivalent to 1160 mg Ca)	16	24	F	Spine/femoral neck/trochanter	1,5/4,8/4,8
Zhu et al (97)	Milk (330 ml)	10,1	24	F	Metacarpal cortical thickness, periosteal diameter	5,7/1,2

*BMC/BMD assessed by DXA, X-ray or pQCT

Rizzoli et al Bone 2010

Conclusion : Increased dietary calcium/dairy products, with and without vitamin D, significantly increases total body and lumbar spine BMC in children with low base-line intakes

Huncharek et al Bone 2008

DAIRY PRODUCTS AND FRACTURE RISK

1. **Children who avoid drinking cow's milk are at increased risk for prepubertal bone fractures**
   Goulding et al JADA 2004

→ 0-13 yrs / 22 observed fractures vs 8,4 expected

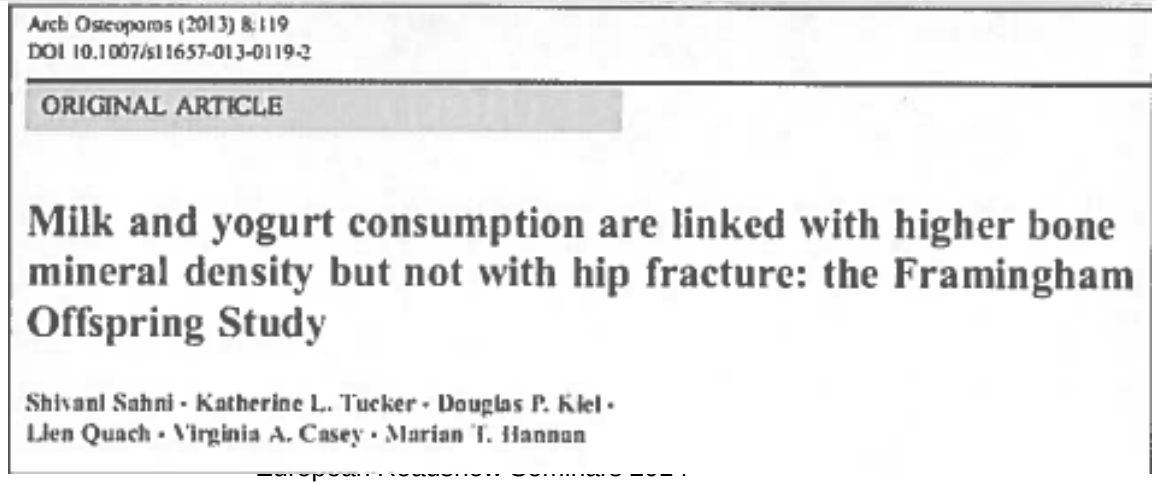
2. Fractures during growth : potential role of a milk-free diet
Konstantynowicz et al, Osteoporos Int 2007

→ 2-20 yrs : OR 4,6 in girls and 1,3 (NS) in boys

BONE STATUS AND FRACTURE RATES IN TWO REGIONS OF YUGOSLAVIA (= According to Dairy Product Intake)

Matkovic et al., Am J Clin Nutr 32:540-549, 1979

	Hip Fracture	Intakes	
	Incidence	Calcium (mg/d)	Proteins (g/d)
Males	High Low	517 1087	78,5 110,0
Females	High Low	445 940	63,7 94,7



Arch Osteoporos (2013) 8:119
DOI 10.1007/s11657-013-0119-2

ORIGINAL ARTICLE

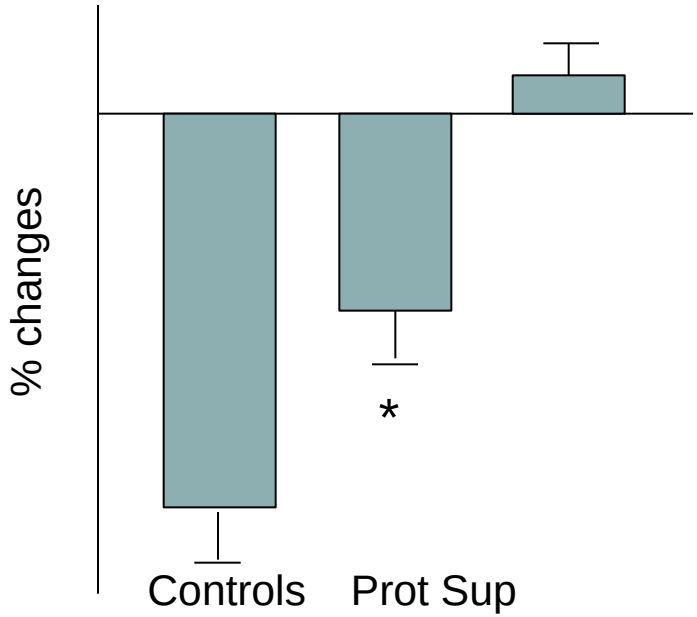
Milk and yogurt consumption are linked with higher bone mineral density but not with hip fracture: the Framingham Offspring Study

Shivani Sahni · Katherine L. Tucker · Douglas P. Kiel · Lien Quach · Virginia A. Casey · Marian T. Hannan

EFFECT OF PROTEIN SUPPLEMENT IN PATIENTS WITH A RECENT HIP FRACTURE

Schürch et al, Ann Int med 1998

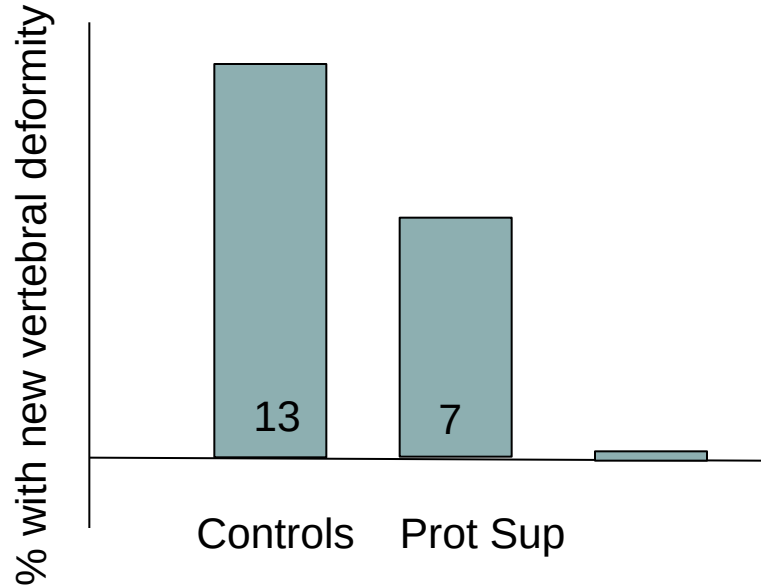
Proximal Femur BMD
(% changes from baseline)



p<0,05

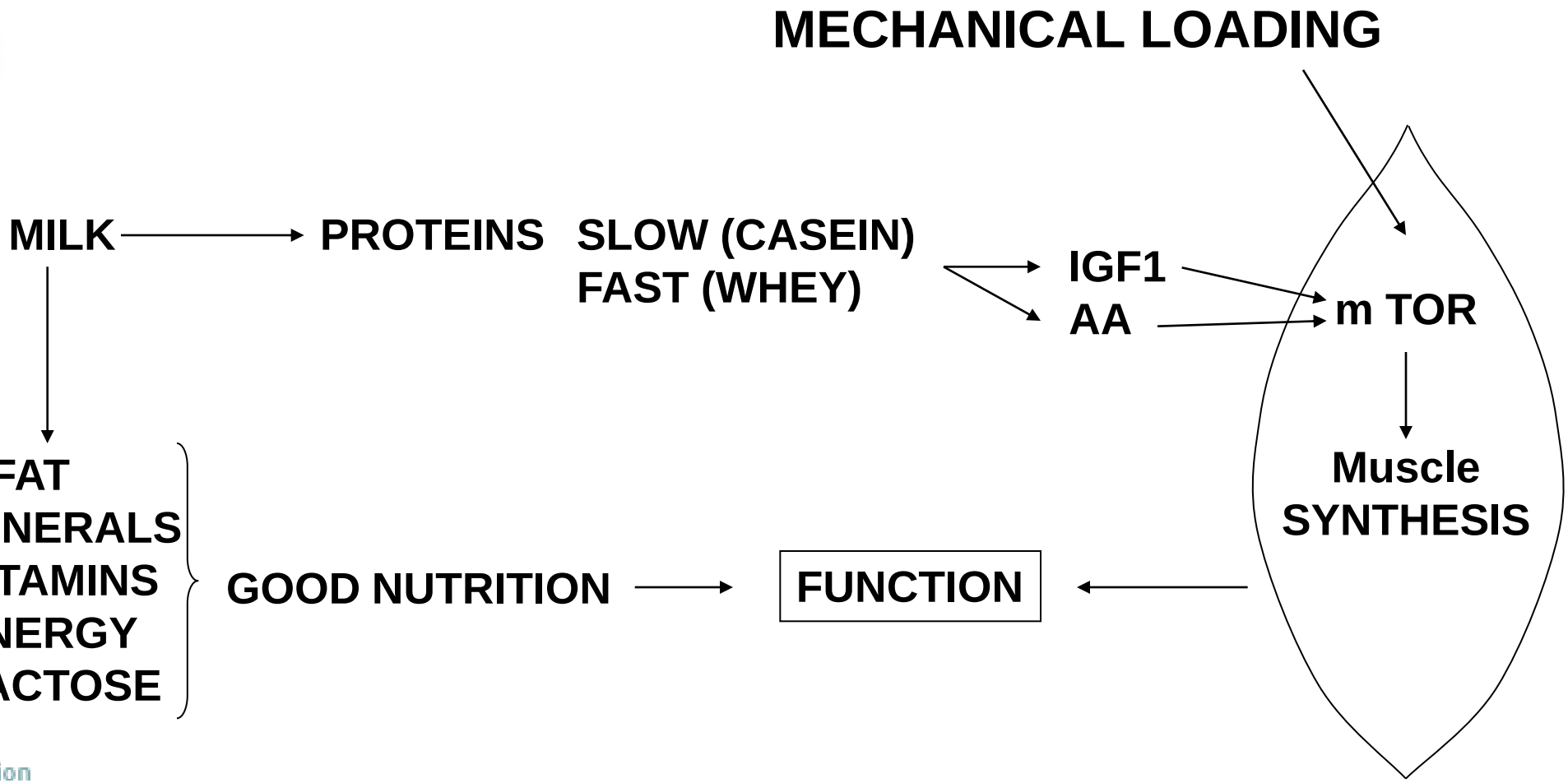
Hip fractured Healthy

Vertebral Fracture
(%patients with new vertebral deformity)



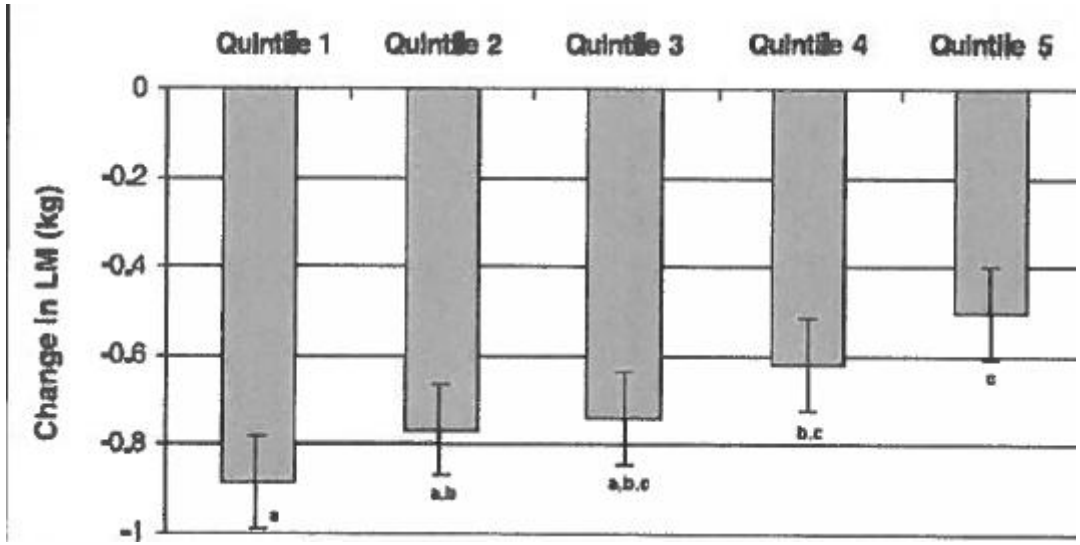
Hip fractured Healthy

THEIR INTEREST FOR THE PREVENTION OF SARCOPENIA



J Am Coll Nutr 2013, 32, 251-63

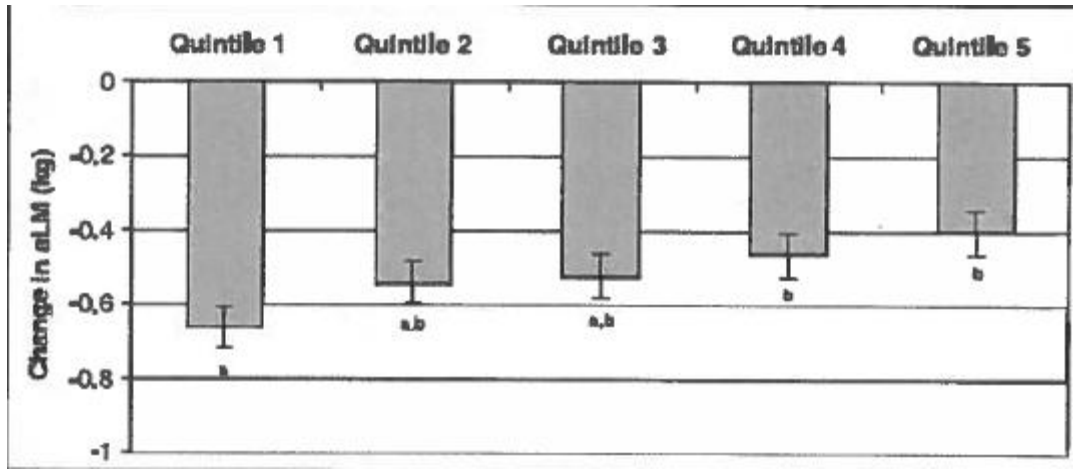
DIETARY PROTEIN AND LEAN MASS



Whole Body

Houston et al. AJCN, 2008

Health ABC Study 3 years of follow-up

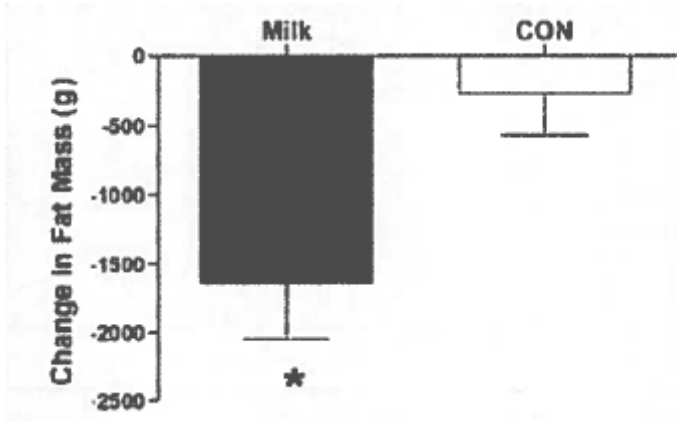


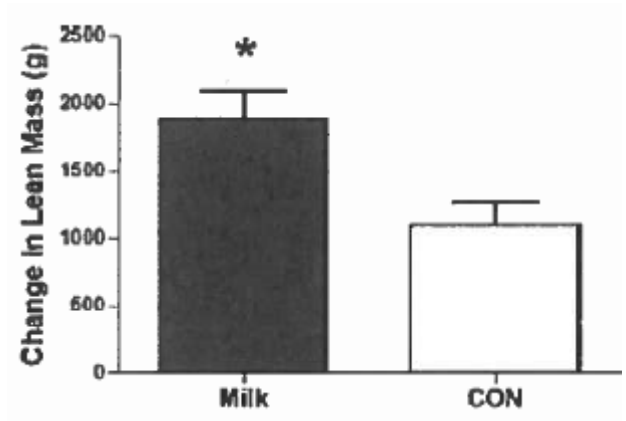
Appendicular

Median Protein Intake 0,7

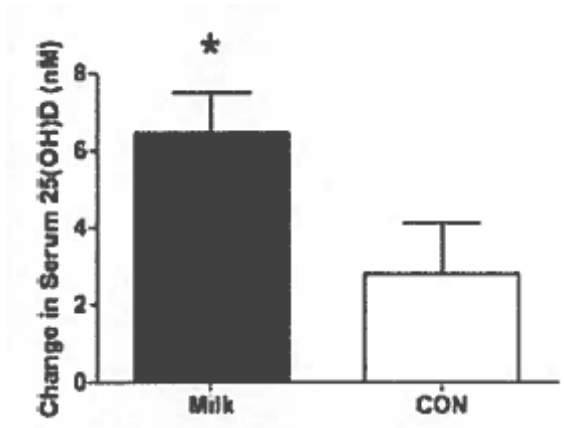
1,1 g/kg BW

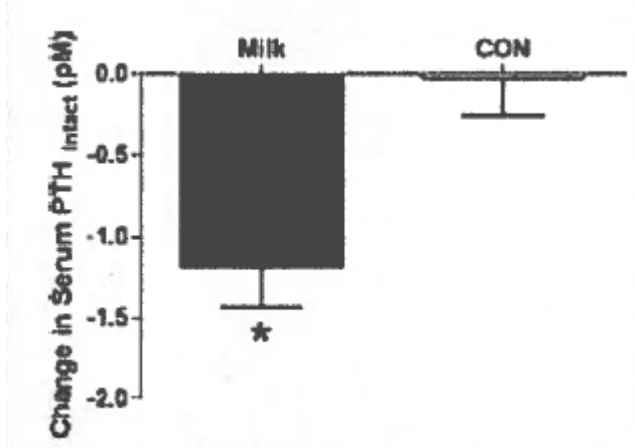
MILK AND RESISTANCE EXCERCISE IN YOUNG WOMEN





23 Yrs Women
12 Wks
1 Hr/d Exercise
5 days/Wk
+ 2 x 500 ml Milk





Josse et al Med Ex Sport Exercise 2010

THEIR INTEREST FOR THE PREVENTION OF COLO-RECTAL CANCER

COLO-RECTAL CANCER

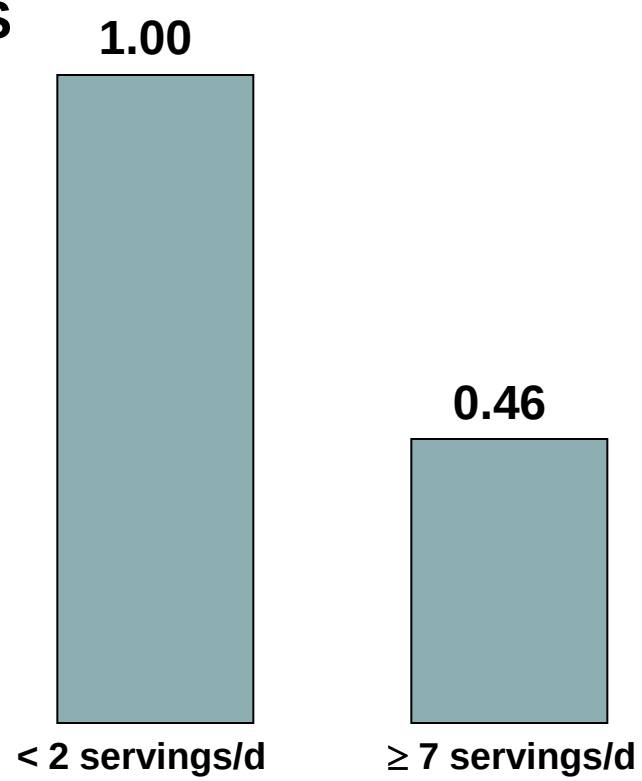
COHORT OF SWEDISH MEN

45306 MEN 45-79 YEARS

FOLLOW-UP 6,7 YEARS

MULTIVARIATE

RISK OF COLON CANCER



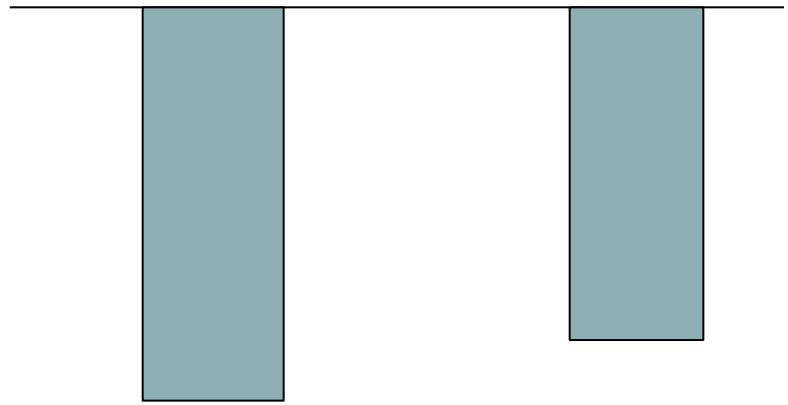
EJCN 2003, 57, 1-17
AJCN 2006, 83, 667-73
AJCN 2008, 1576-83

YOGURT CONSUMPTION AND THE RISK OF COLORECTAL CANCER

ITALIAN E.P.I.C.
45 241 SUBJECTS

HIGHEST 85g/day (Men) – 98 g/d (women) VERSUS LOWEST (0g/day) TERTILES OF YOGURT INTAKE

COLORECTAL CANCER RISK



-38%
Energy – adjusted model
Total 0,62
HR Men 0,47
Women 0,72

-35%
Full model adjusted
Total 0,65
HR Men 0,47
Women 0,69

Int J Cancer 2010, 129, 2712-19

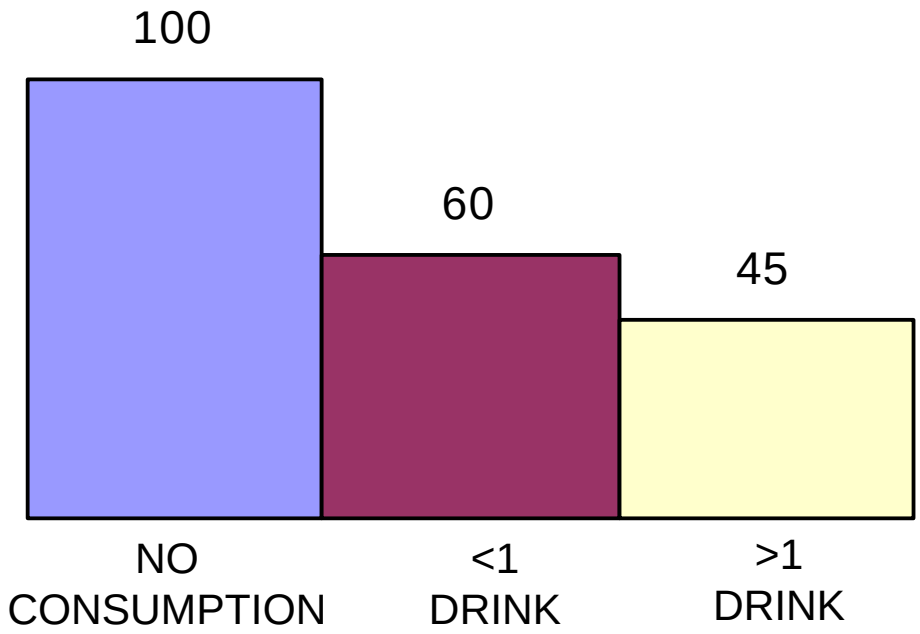
MORTALITY

MONICA STUDY

897 french people (45 – 65 years old)

Follow-up 14 years

MORTALITY



Bongard V

MATRIX EFFECT REFLECTS

THE FOOD COMPLEXITY

EXAMPLES

WHOLE GRAINS

CARBOHYDRATES
PLAN PROTEINS
SOME FATTY ACIDS
FIBERS
LIGNANS
VITAMINS
POLYPHENOLS

MILK AND DAIRY PRODUCTS

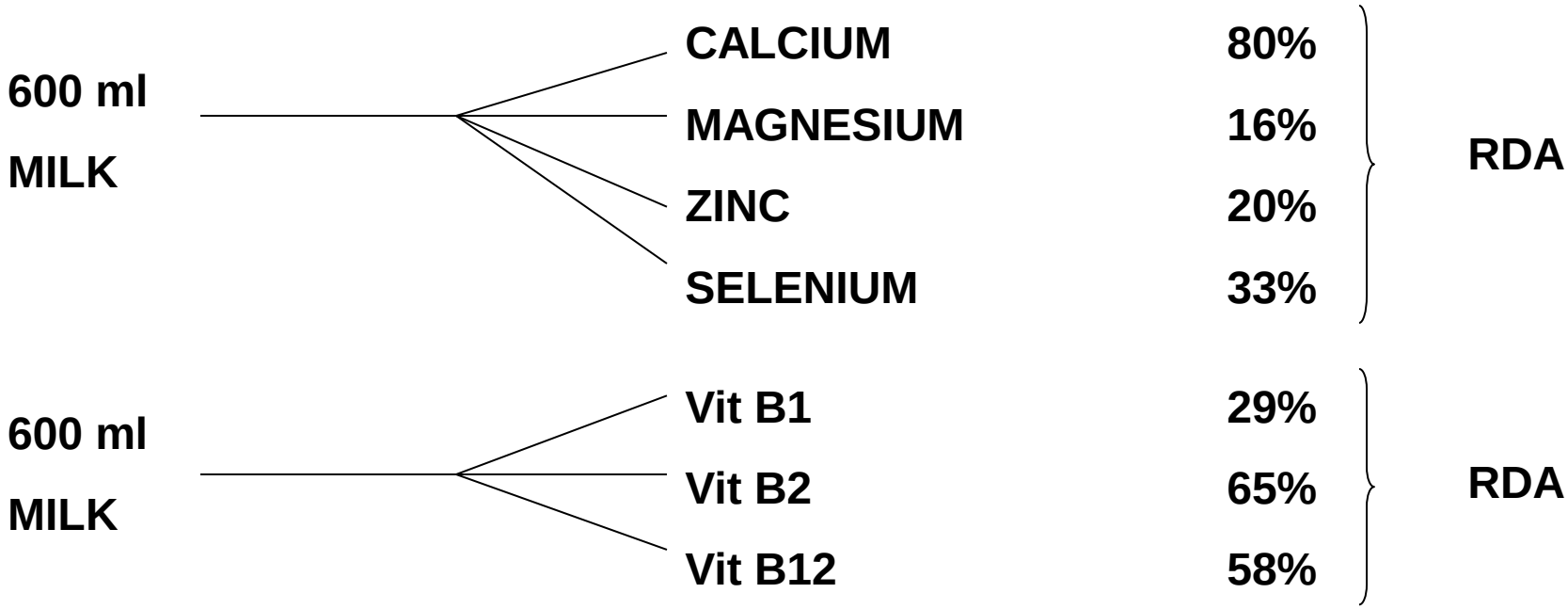
ALMOST ALL NUTRIENTS ESSENTIALS FOR LIFE

LACTOSE
NUMEROUS HIGH QUALITY PROTEINS
400 DIFFERENT AND SPECIFIC FATTY ACIDS
5 MAJOR MINERALS IN HIGH LEVEL
CALCIUM, PHOSPHORUS, IODIN, MAGNESIUM, SELENIUM
8 VITAMINS

THE LARGEST NUTRIENT DIVERSITY AMONG ALL AVAILABLE FOR HUMAN NUTRITION

MILK AND DAIRY PRODUCTS
A UNIQUE MICRONUTRIENT COMBINATION

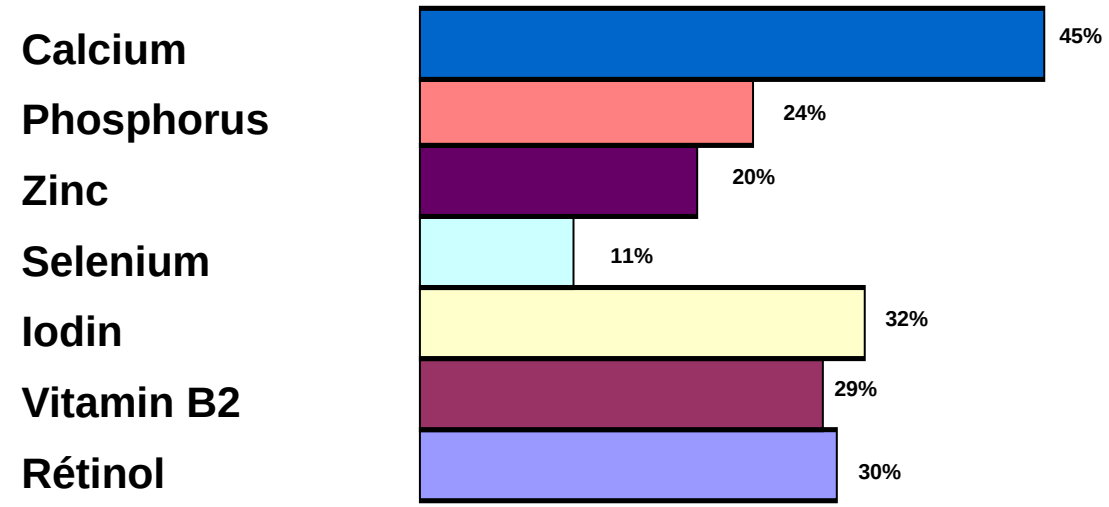
IMPORTANT SOURCES OF



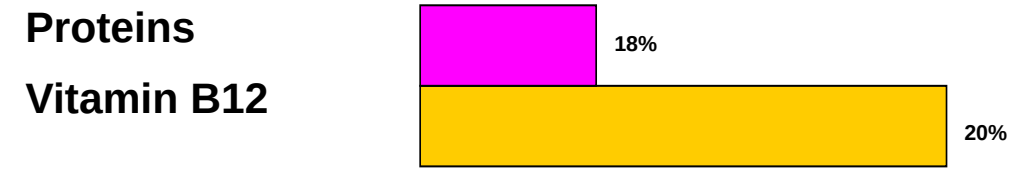
DAIRY PRODUCTS HAVE A GREAT CONTRIBUTION TO THE INTAKE OF A LARGE NUMBER OF NUTRIENTS

ADULTS

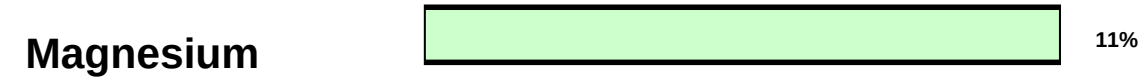
FIRST CONTRIBUTION



SECOND CONTRIBUTION



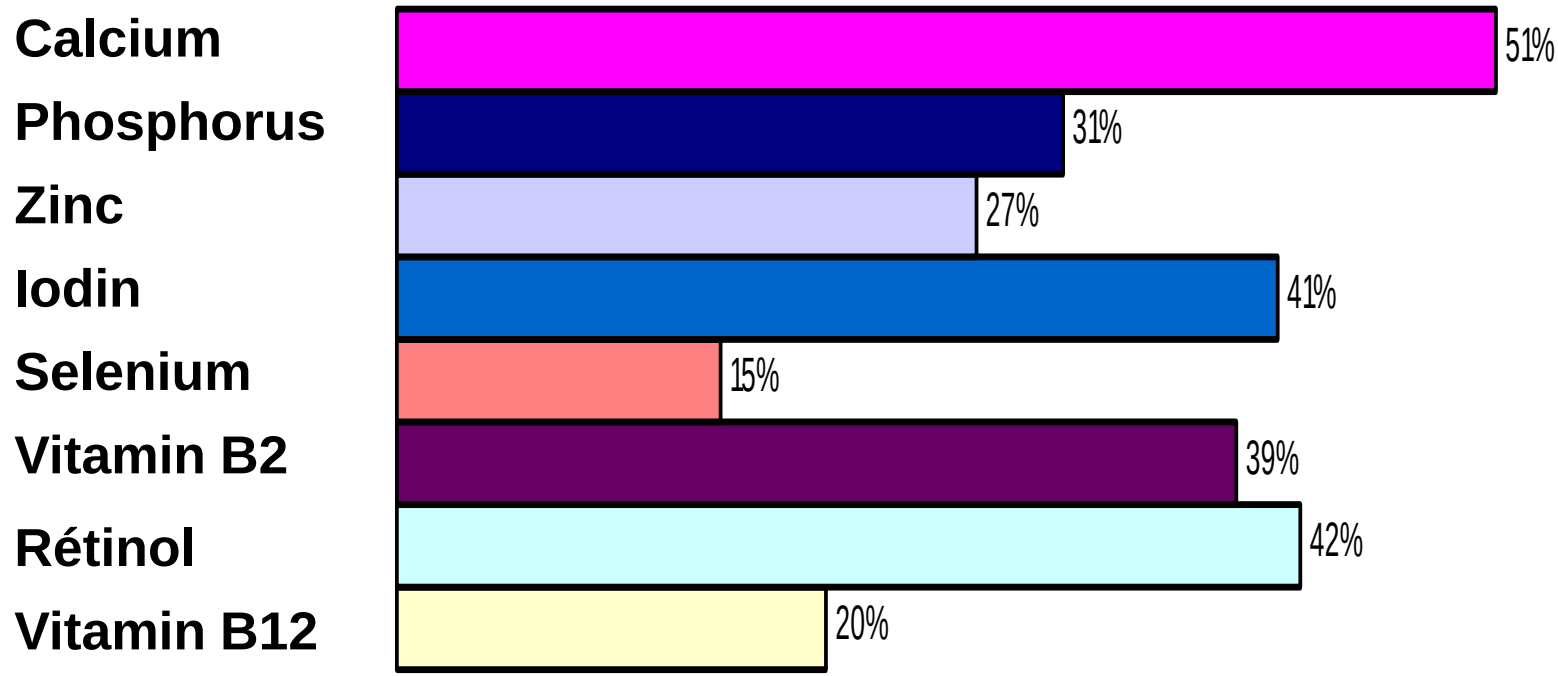
THIRD CONTRIBUTION



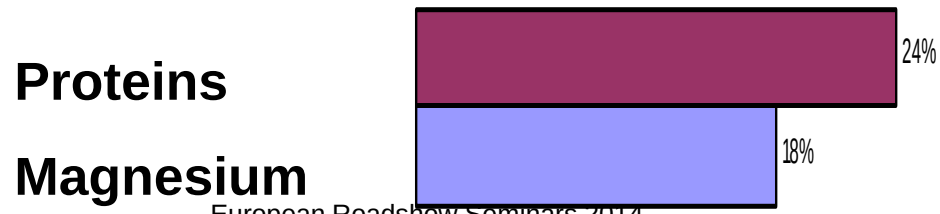
DAIRY PRODUCTS ARE THE BEST MEAN TO ACHIEVE THE RECOMMENDED DIETARY INTAKES

CHILDREN

FIRST CONTRIBUTION



SECOND CONTRIBUTION



OVER ALL AGES

INFANT	CHILDREN	ADOLESCENTS	ADULTS	ELDERLY
GROWTH	GROWTH	GROWTH		
		WEIGHT CONTROL	WEIGHT CONTROL	
DIETARY DIVERSITY	DIETARY DIVERSITY	DIETARY DIVERSITY	DIETARY DIVERSITY	DIETARY DIVERSITY
		OSTEOPOROSIS	OSTEOPOROSIS	OSTEOPOROSIS
			DIABETES AND METABOLIC SD	DIABETES
			CARDIOVASCULAR DISEASE	CARDIOVASCULAR DISEASE
			CANCER	CANCER
				SARCOPENIA

THE NUTRIENT RICHNESS OF MILK AND DAIRY PRODUCTS

- NEARLY A COMPLETE FOOD WITH ALMOST
  - ALL MACRONUTRIENTS
  - ALL MICRONUTRIENTS
  - ESSENTIAL FOR LIFE

} THE ONLY NUTRITIONNALLY COMPLETE FOODS

- THE NATURAL FOOD WHICH HAVE THE MOST NUTRIENT DIVERSITY AMONG ALL HUMAN AVAILABLE FOOD

  FOR EXAMPLE GREAT DIVERSITY OF FATTY ACIDS WITH ABOUT 400 KINDS OF FATTY ACIDS (NOT ONLY SATURATED FATTY ACIDS)

CONCLUSION (1)

DAIRY PRODUCTS ARE VERY GOOD SOURCES AND LOW COST SOURCES OF MANY MICRONUTRIENTS

MOREOVER THEY HAVE FAVORABLE EFFECTS ON WEIGHT MANAGEMENT, METABOLIC SYNDROME, COLORECTAL CANCER INCIDENCE, BONE HEALTH, CARDIOVASCULAR DISEASES

CONCLUSION (2)

DAIRY PRODUCTS ARE USEFUL FOR HEALTH AND NUTRITION AT ANY AGE

NOT ONLY FOR CHILDREN

NOT ONLY FOR OSTEOPOROSIS

MILK AND DAIRY PRODUCTS ARE NOT ONLY ABLE TO CONTRIBUTE TO THE RECOMMENDED DIETARY ALLOWANCES WHATEVER AGE BUT THEY HAVE AN INCREDIBLE NUTRIENT RICHNESS, ARE NUTRITIOUS BY NATURE, AND THEY HAVE A SPECIFICITY THROUGH THE MATRIX EFFECT