

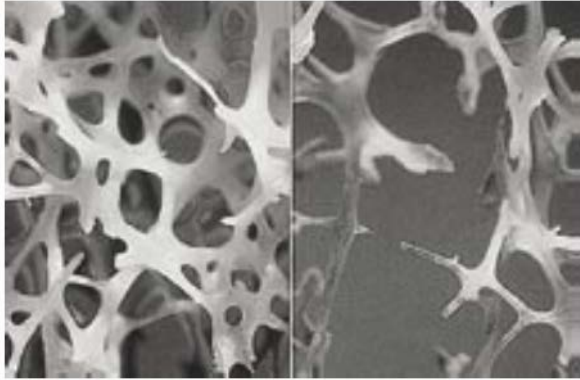


# How dairy products influence the bodies muscles and bones

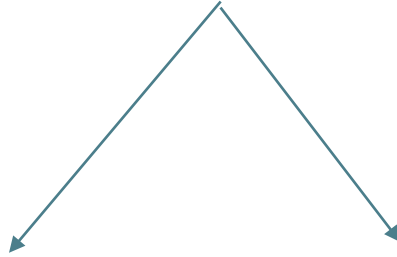
Lars Rejnmark

Aarhus University Hospital

2. marts 2017, Billund



## Osteoporose Risiko for knoglebrud



### Knogles styrke

- Mineralindhold (calcium og fosfat)
- Knoglernes struktur (geometri)
- Protein-sammensætning

### Fald episoder

- Muskelstyrke
- Balancefunktion
- Kognitiv formåen
- Mv.





## Osteoporose:

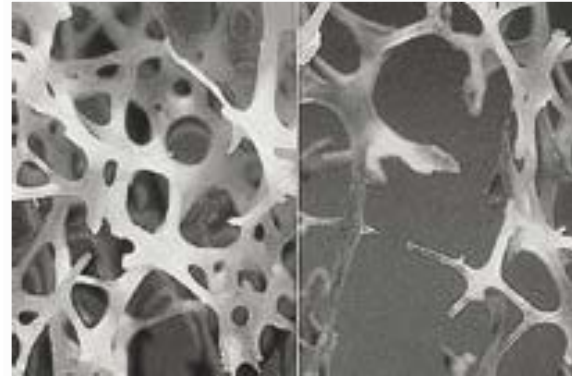
en systemisk knoglesygdom med:

- ↓ Knoglemasse (Osteopeni)
- Mikroarkitekturelle ændringer i knoglevævet



↓ **Knoglestyrke**

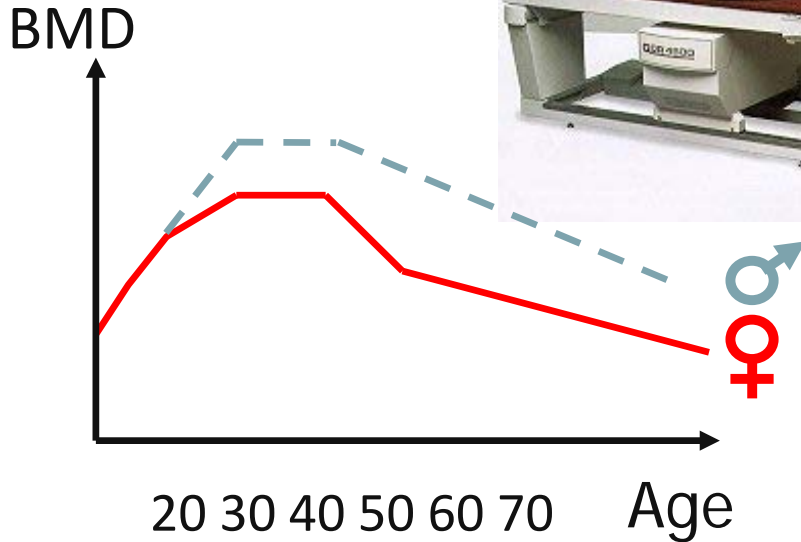
↓ **↑ Risiko for knoglebrud**



# Dual-Energy X-ray absorptiometry (DXA-scanning)



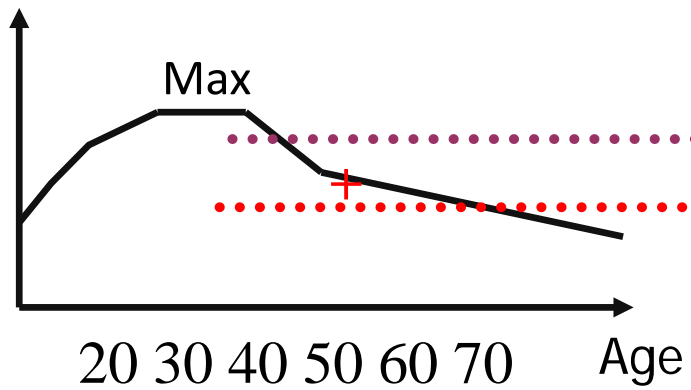
Ryg  
Hofte



BMD: (g/cm<sup>2</sup>)  
Bone mineral density



BMD



T- score: -1.0 to -2.5: osteopenia

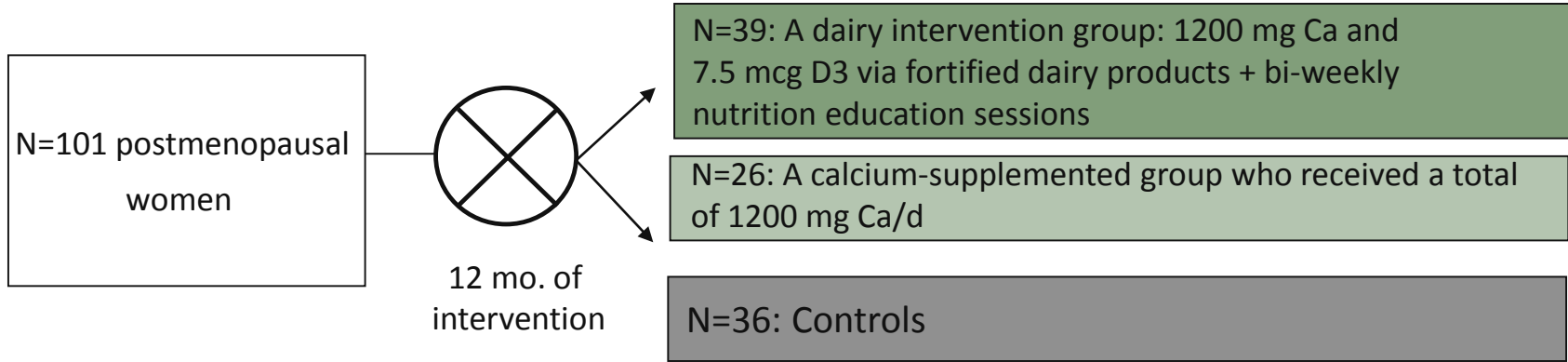
T- score: < -2.5: osteoporosis



**Aldersgr. T-score < -2,5**

|                 |            |
|-----------------|------------|
| <b>50-59 år</b> | <b>10%</b> |
| <b>60-69 år</b> | <b>30%</b> |
| <b>70-79 år</b> | <b>40%</b> |

## RCT on dairy intervention



Dairy intervention significantly (compared with the other 2 groups):

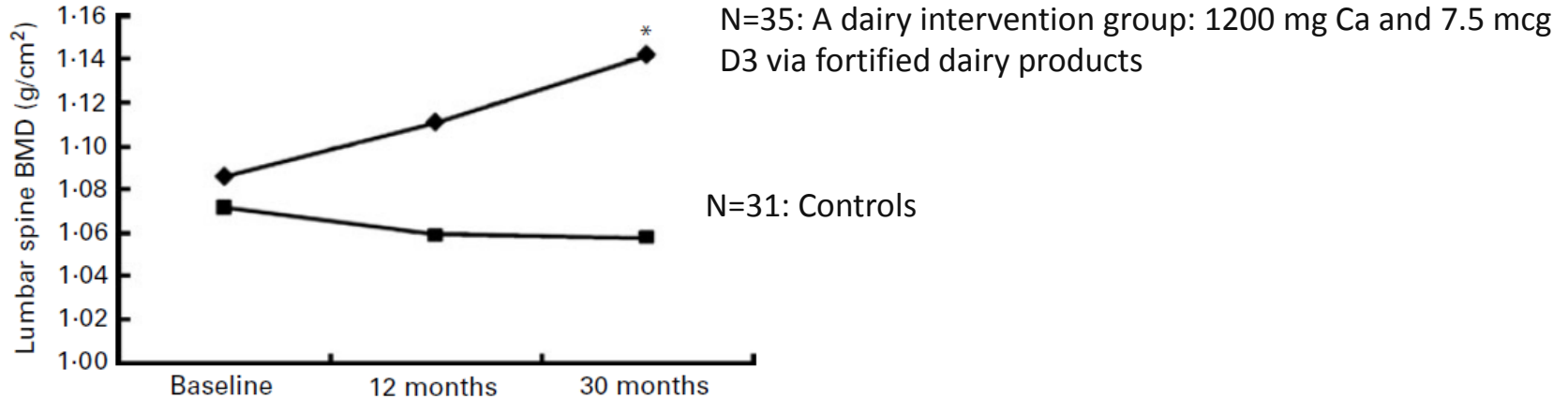
- ↑ BMD in pelvis, total spine, and total-body
- ↑ IGF-1
- ↓ PTH



## The effects of a 30-month dietary intervention on bone mineral density: The Postmenopausal Health Study

George Moschonis<sup>1</sup>, Ioanna Katsaroli<sup>1</sup>, George P. Lyritis<sup>2</sup> and Yannis Manios<sup>1\*</sup>

### 30 mo. of intervention



**Fig. 1.** Changes in lumbar spine bone mineral density (BMD) in the dietary group (—◆—) and the control group (—■—). Values are means. \* Mean value was significantly different from that at baseline ( $P < 0.05$ ). There was a treatment  $\times$  time interaction effect ( $P = 0.075$ ).

# Dairy and fracture risk – observational studies (>14 published)



## Nurses' Health Study

> 77,000 women aged 34–59 years followed for 12 years (FFQ every 2–4 year)

A high intake of milk or calcium from food sources **did not** reduce fracture risk:

Women drinking two or more glasses of milk per day

Vs.

Women consuming one glass or less per week

|            |                             |
|------------|-----------------------------|
| Hip Fx     | RR 1.45 (95 % CI 0.87–2.43) |
| Forearm Fx | RR 1.05 (95 % CI 0.88–1.25) |

(Feskanich et al. Am J Public Health. 1997)

## Swedish Mammography cohort

61,433 women (aged 39–74 years at baseline) with mean follow-up of 20.1 years

- High milk intake: ↑risk of Fx
- High intake of cheese or fermented milk products: ↓ risk of Fx

(Michaëlsson et al. BMJ. 2014)



## Dairy and fracture risk – meta-analyses



### **Kanis et al (Osteoporosis Int. 2005)**

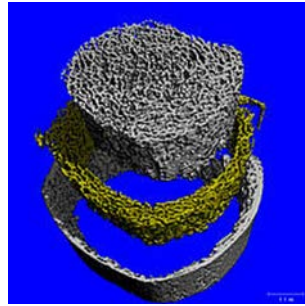
6 prospective cohort studies including 39,563 men and women (69% female)

- Low intake of calcium (less than 1 glass of milk daily) was not associated with a significantly increased risk of any fracture, osteoporotic fracture or hip fracture.
- No difference in risk ratio between men and women

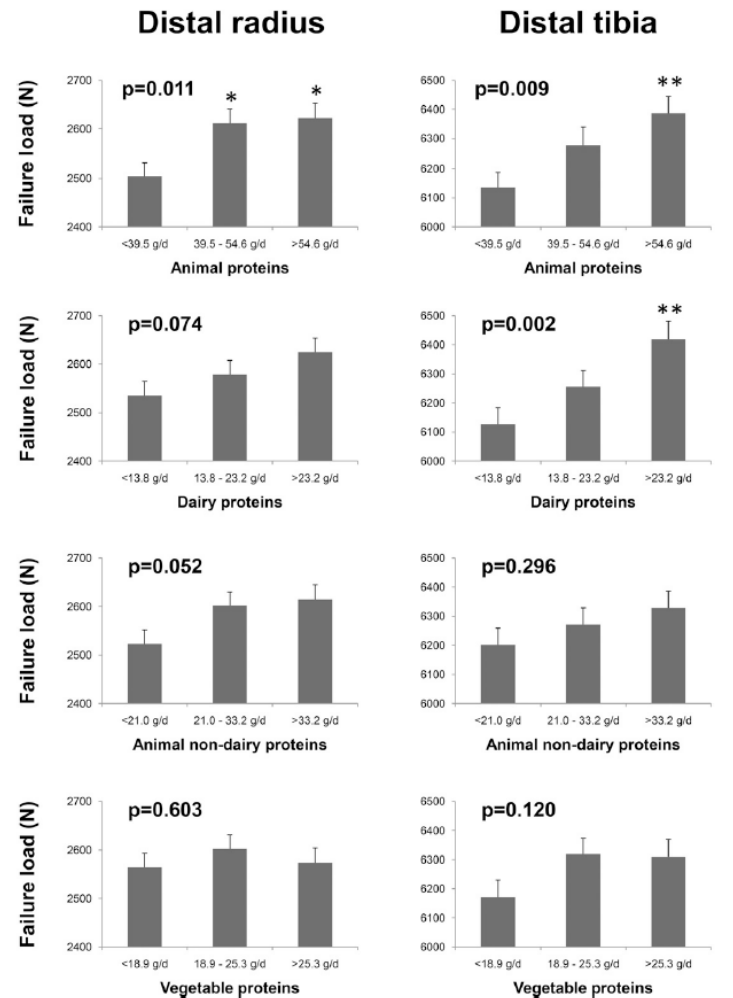
### **Bischoff-Ferrari et al (J Bone Miner Res. 2011)**

7 prospective cohort studies (195,102 elderly women and 75,149 elderly men)

- Low dairy intake (< 1 glass of milk daily) was not associated with a significantly increased risk of fracture



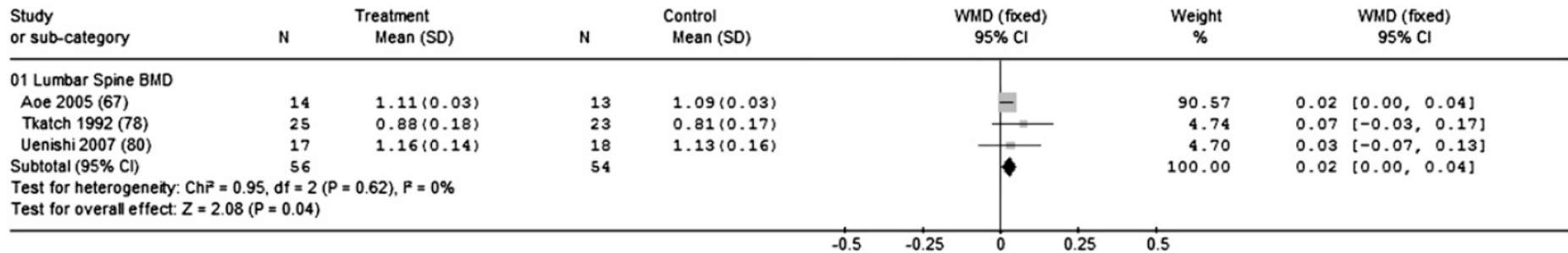
Cross-sectional study: 746 Caucasian women aged 65.0  $\pm$  1.4 y



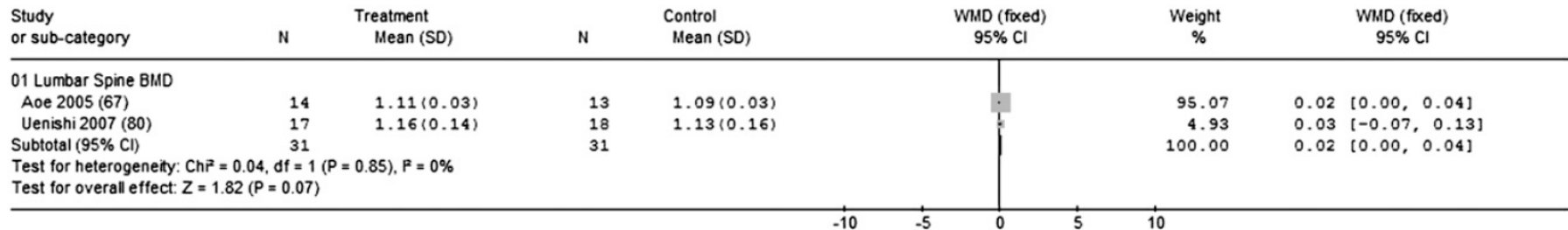
(Durosier-Izart et al. AM J Clin Nutr, 2017)



## Protein intake and BMD – meta-analysis of observational studies:



**FIGURE 3.** The effect of protein supplementation on lumbar spine bone mineral density (BMD). WMD, weighted mean difference.



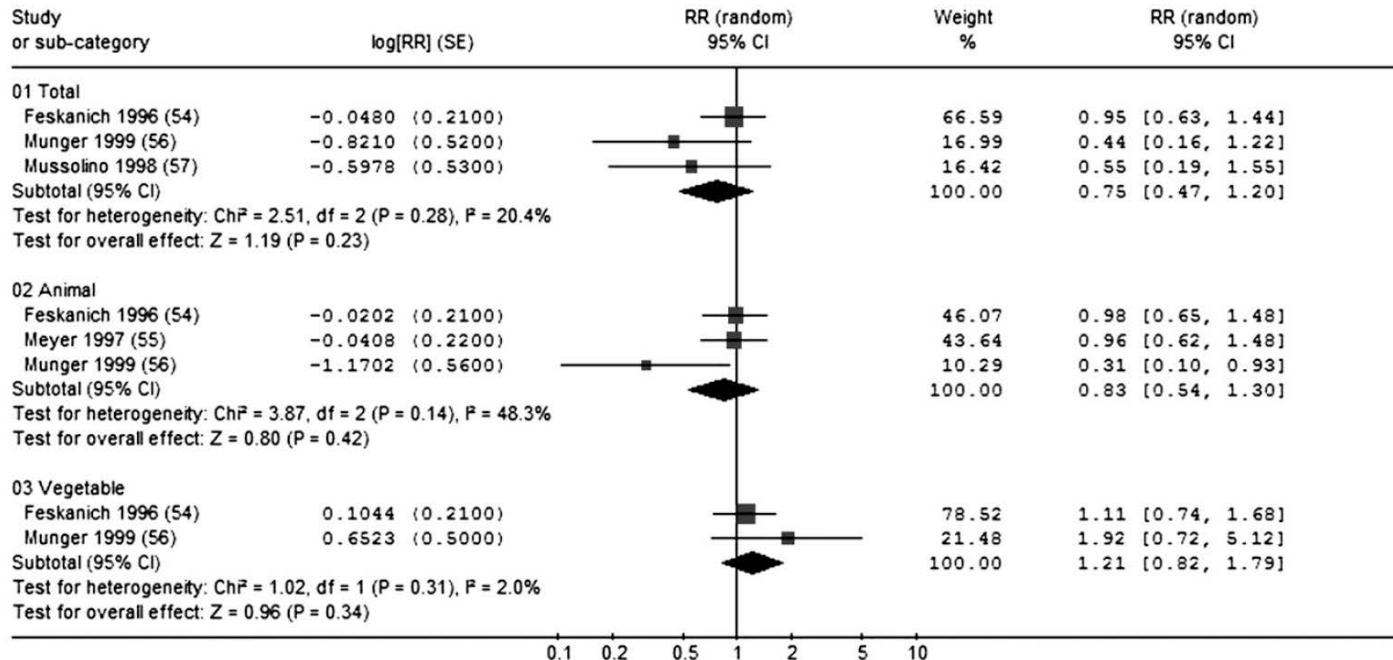
**FIGURE 5.** The effect of milk basic protein (MBP) supplementation on indexes of lumbar spine bone mineral density (BMD). WMD, weighted mean difference.

NO effect of soy protein

(Darling et al Am J Clin Nutr 2009)



## Protein intake and Hip Fracture risk – meta-analysis of observational studies:



**FIGURE 2.** The effect of protein intake on hip fractures. Random-effects pooled relative risk (RR) analysis was used to compare highest with lowest intile/quartile of protein intake.

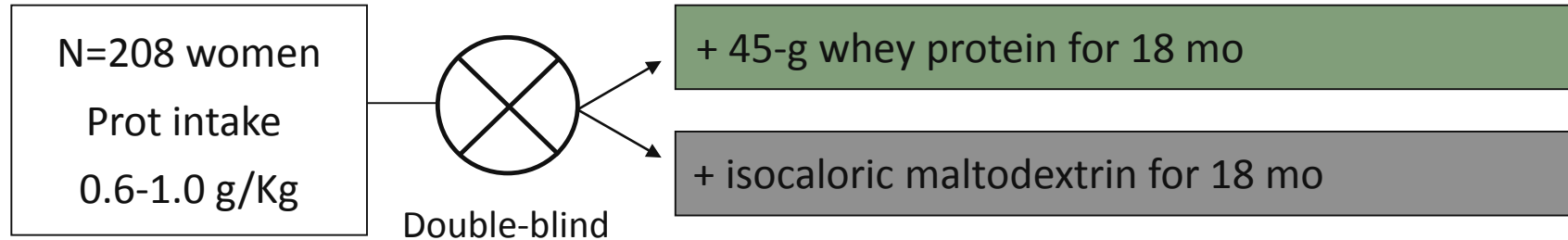
(Darling et al Am J Clin Nutr 2009)



## The Effect of a Whey Protein Supplement on Bone Mass in Older Caucasian Adults

Jane E. Kerstetter,\* Jessica D. Bihuniak,\* Jennifer Brindisi, Rebecca R. Sullivan, Kelsey M. Mangano, Sarah Larocque, Belinda M. Kotler, Christine A. Simpson, Anna Maria Cusano, Erin Gaffney-Stomberg, Alison Kleppinger, Jesse Reynolds, James Dziura, Anne M. Kenny,\* and Karl L. Insogna\*

(JCEM, 2015)



- No effect on lumbar spine BMD (primary outcome) or the other skeletal sites.
- Truncal lean mass increased significantly in the protein group.
- Protein caused a significant increase in CTX (resorptive bone marker) and IGF-1

**Conclusion:** protein supplementation above the recommended dietary allowance (0.8 g/kg) may preserve fat-free mass without adversely affecting skeletal health

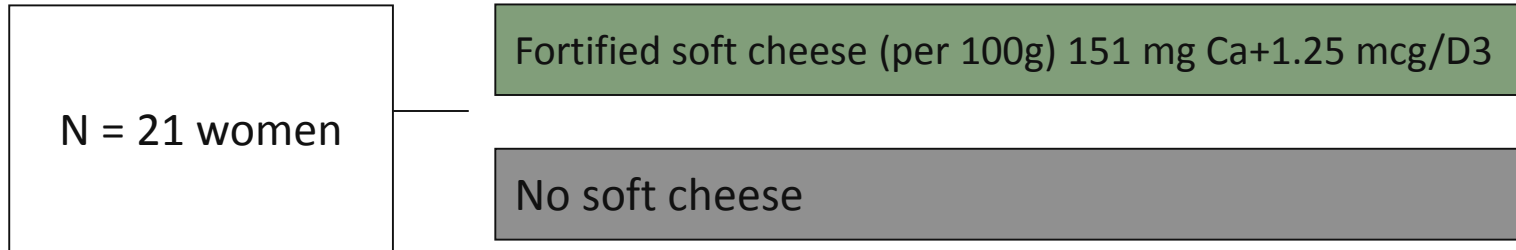
**NUTRITIONAL APPROACH FOR INHIBITING BONE RESORPTION  
IN INSTITUTIONALIZED ELDERLY WOMEN WITH VITAMIN D  
INSUFFICIENCY AND HIGH PREVALENCE OF FRACTURE**

J.-P. BONJOUR<sup>1</sup>, V. BENOIT<sup>2</sup>, O. POURCHAIRE<sup>3</sup>, B. ROUSSEAU<sup>2</sup>, J.-C. SOUBERBIELLE<sup>4</sup>



A randomized cross-over trial

Elderly women living in nursing homes with low (<700 mg/d) calcium intake

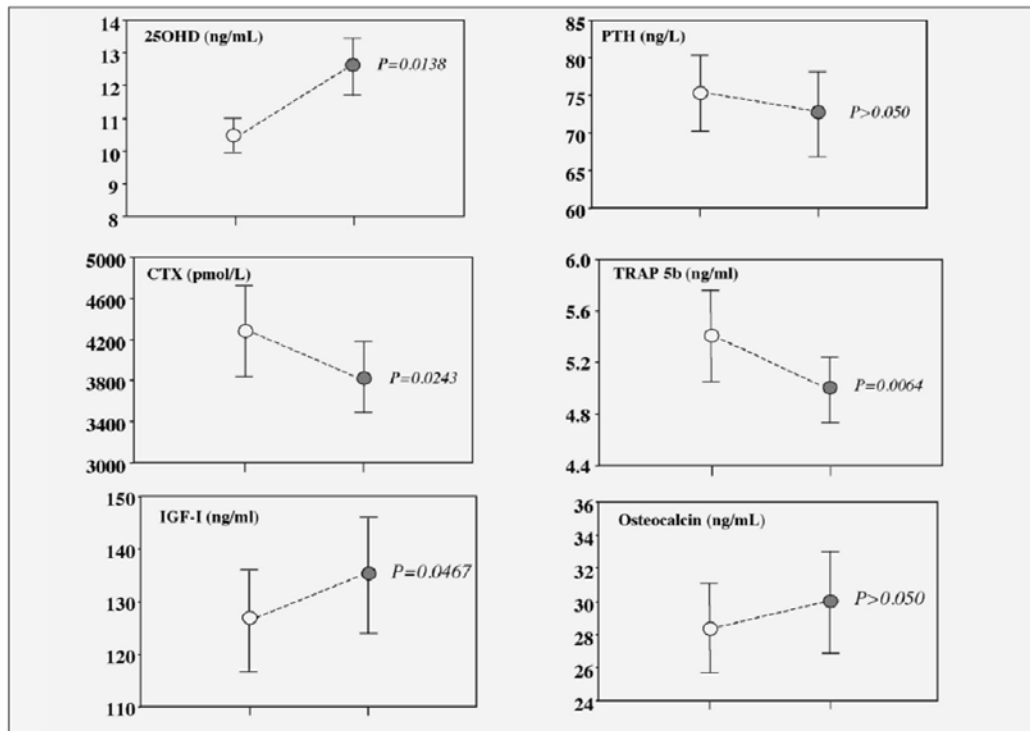




NUTRITIONAL INTERVENTION ON BONE RESORPTION IN ELDERLY WOMEN

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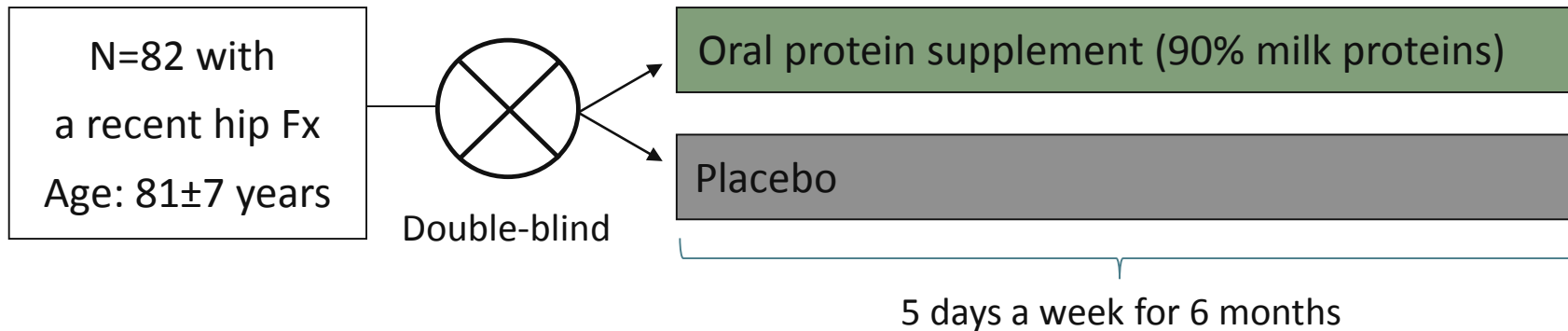


# Protein Supplements Increase Serum Insulin-Like Growth Factor-I Levels and Attenuate Proximal Femur Bone Loss in Patients with Recent Hip Fracture

A Randomized, Double-Blind, Placebo-Controlled Trial

Marc-André Schürch, MD; René Rizzoli, MD; Daniel Slosman, MD; Laszlo Vadas, PhD; Philippe Vergnaud, PhD; and Jean-Philippe Bonjour, MD

(Ann Intern Med. 1998)





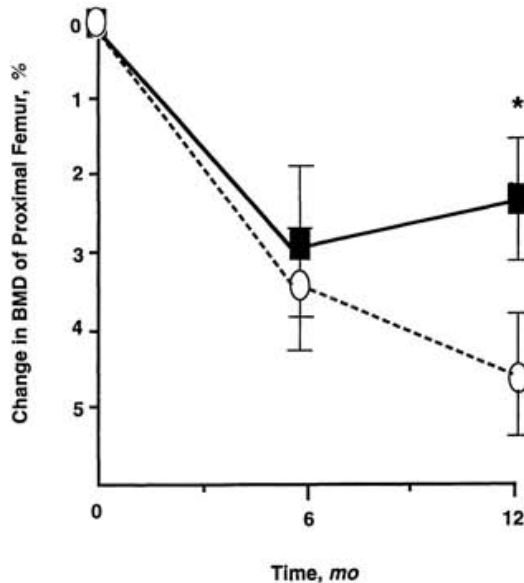
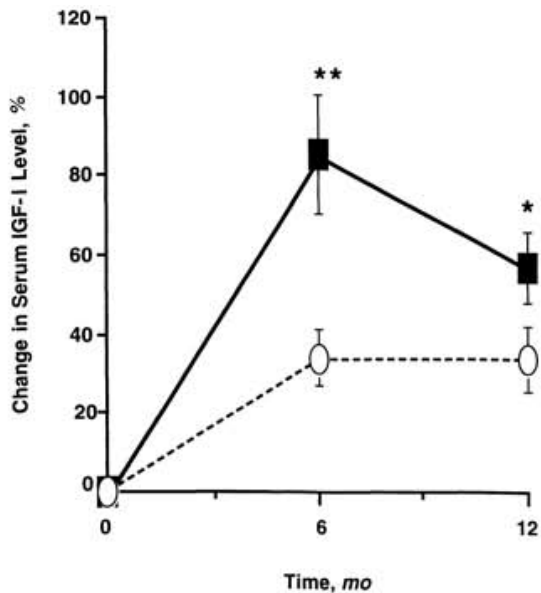


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## The North–South dilemma

Caucasian women living in temperate climates have the highest dairy intake and the highest rate of hip fracture, while rates are somewhat lower in Mediterranean and Asian women and lowest in African women

## The ‘acid-ash hypothesis’

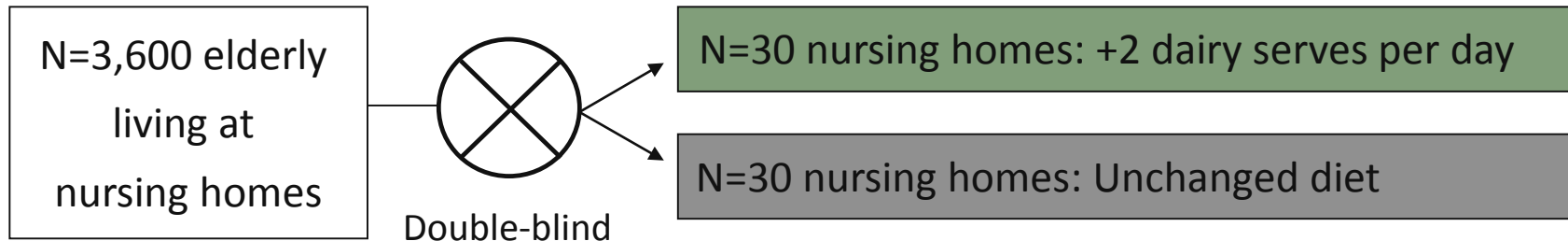
.... first proposed 40 years ago:

- Diets high in animal protein (and sodium) have been linked to increased urinary calcium excretion with increased risk of osteoporosis
- Recent data, however, do not support such relationships!



# Correcting the Deficiency of Dietary Dairy Produce in the Elderly Reduces Fractures and Preserves Bone Strength .... The Melbourne study

A cluster-randomized population-based intervention study



## Outcomes:

- Risk of Fx
- Risk of CVS

