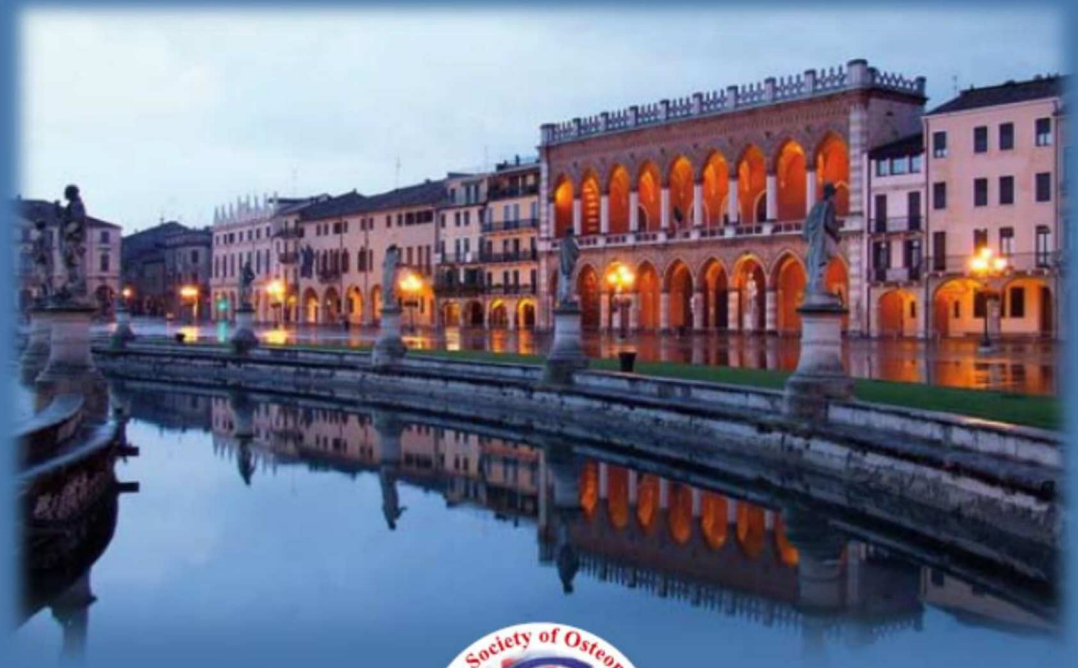


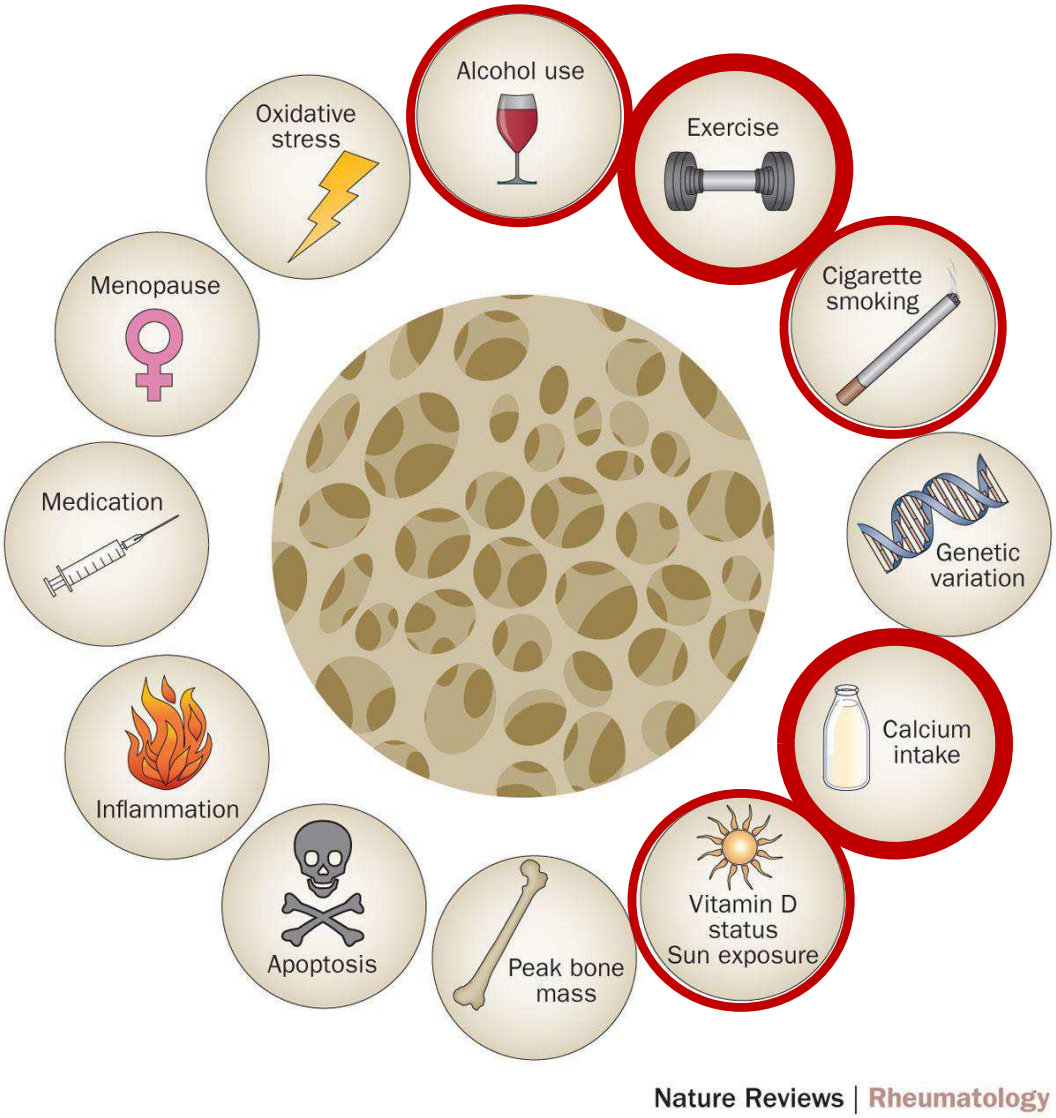
VI CONGRESSO NAZIONALE DELLA SOCIETÀ ITALIANA
DI OSTEONCOLOGIA (ISO)

Padova, 14-15 Novembre 2017
PALAZZO ZACCO

Ruolo della prevenzione non farmacologica sulla qualità dell'osso: Ruolo dell'alimentazione

M. Nardi

Figure 3 Factors that influence the development of osteoporosis



Hendrickx, G. *et al.* (2015) A look behind the scenes: the risk and pathogenesis of primary osteoporosis *Nat. Rev. Rheumatol.* doi:10.1038/nrrheum.2015.48

Use of calcium or calcium in combination with vitamin D supplementation to prevent fractures and bone loss in people aged 50 years and older: a meta-analysis

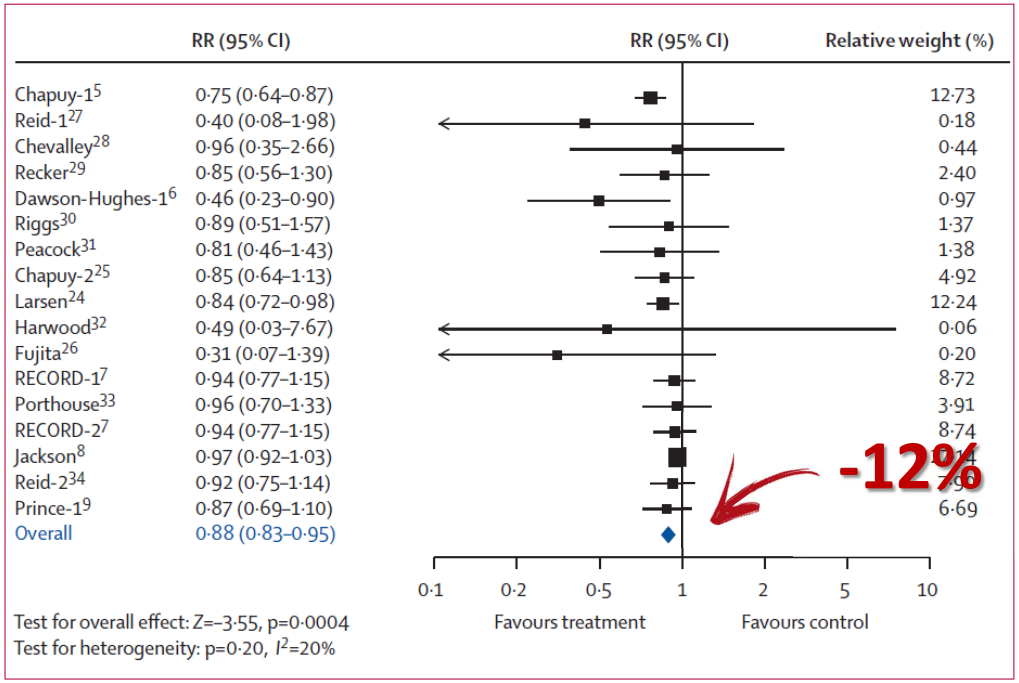


Figure 2: Effect of calcium and calcium in combination with vitamin D on fracture risk

52,625 subjects

Tang BMP Lancet 2007

A Pooled Analysis of Vitamin D Dose Requirements for Fracture Prevention

-30%

-14%

31,022 subjects

HA Bischoff-Ferrari, NEJM 2012

Table 2. Incidence of Fracture among 31,022 Participants, According to Vitamin D Treatment Dose and Actual Intake.*

Analysis	No. of Participants	Hip Fracture			Any Nonvertebral Fracture		
		No. of Fractures	Relative Risk (95% CI)	P Value	No. of Fractures	Relative Risk (95% CI)	P Value
Intention-to-treat analysis							
Control	15,495	586	1.00		1948	1.00	
Treatment	15,527	525	0.90 (0.80–1.01)	0.07	1822	0.93 (0.87–0.99)	0.03
Treatment-dose analysis							
Control	15,495	586	1.00		1948	1.00	
≤400 IU/day	10,111	255	0.89 (0.74–1.07)	0.20	1225	0.96 (0.89–1.05)	0.40
>400 IU/day†	5,416	270	0.91 (0.78–1.06)	0.22	597	0.89 (0.80–0.98)	0.02
Actual-intake analysis‡							
Control	15,495	586	1.00		1948	1.00	
0–360 IU/day	3,935	100	1.00 (0.79–1.26)	0.99	425	0.96 (0.86–1.07)	0.44
361–637 IU/day	3,836	110	1.03 (0.83–1.29)	0.78	520	1.01 (0.91–1.12)	0.85
638–791 IU/day	3,790	164	1.01 (0.83–1.23)	0.92	419	0.90 (0.80–1.01)	0.08
792–2000 IU/day	3,966	151	0.70 (0.58–0.86)	<0.001	458	0.86 (0.76–0.96)	0.007
Sensitivity analysis							
Control	15,495	586	1.00		1948	1.00	
0–337 IU/day	3,353	84	1.01 (0.79–1.30)	0.91	465	1.06 (0.95–1.17)	0.32
338–360 IU/day	5,652	114	0.83 (0.66–1.05)	0.11	619	0.89 (0.80–0.98)§	0.02
361–699 IU/day	2,640	180	1.14 (0.93–1.41)	0.21	326	1.05 (0.91–1.22)	0.52
700–2000 IU/day	3,882	147	0.71 (0.58–0.87)	0.001	412	0.81 (0.72–0.91)	<0.001
Internal validation							
0–360 IU/day	18,153	639	1.00		2193	1.00	
361–637 IU/day	4,976	150	1.03 (0.84–1.26)	0.80	681	1.04 (0.95–1.15)	0.37
638–791 IU/day	3,865	168	1.02 (0.84–1.24)	0.83	431	0.92 (0.82–1.03)	0.16
792–2000 IU/day	4,028	154	0.70 (0.58–0.86)	<0.001	465	0.86 (0.77–0.97)	0.01

FABBISOGNI DI CALCIO (LARN 2014)

LARN PER IL CALCIO (mg/die)				
		AR Fabbisogno medio	**PRI** Assunzione raccomandata per la popolazione	**UL** Livello massimo tollerabile di assunzione
Maschi	18-29 anni	800	1000	2500
	30-59 anni	800	1000	2500
	60-74 anni	1000	1200	2500
	≥ 75 anni	1000	1200	2500
Femmine*	18-29 anni	800	1000	2500
	30-59 anni	800	1000	2500
	60-74 anni	1000	1200	2500
	≥ 75 anni	1000	1200	2500
GRAVIDANZA		1000	1200	2500
ALLATTAMENTO		800	1000	2500

*** Nelle donne in menopausa che non sono in terapia estrogenica la PRI è di 1200 mg**

FABBISOGNI DI CALCIO (LARN 2014)

LARN PER IL CALCIO (mg/die)				
		AR Fabbisogno medio	**PRI** Assunzione raccomandata per la popolazione	**UL** Livello massimo tollerabile di assunzione
Maschi	18-29 anni	800	1000	2500

Table 1. Dietary reference intakes for calcium, vitamin D and protein in women over the age of 50 years.

Age	IOM[†]		European Guidance for the Diagnosis and Management of Osteoporosis in Postmenopausal Women[‡]		
	Calcium RDA (mg/day)	Vitamin D RDA (IU/day)	Calcium RDI (mg/day)	Vitamin D RDI (IU/day)	Protein RDI (g/kg body weight)
51–70 years	1000/1200	400/600	1000–1300	800	1
51–70 years with serum levels of vitamin D <50 nmol/l or <75 nmol/l in those with a high risk of falls and fractures	1000/1200	400/600	1000–1300	800–1000	1
70+ years	1000/1200	400/800	1000–1300	800–1000	1

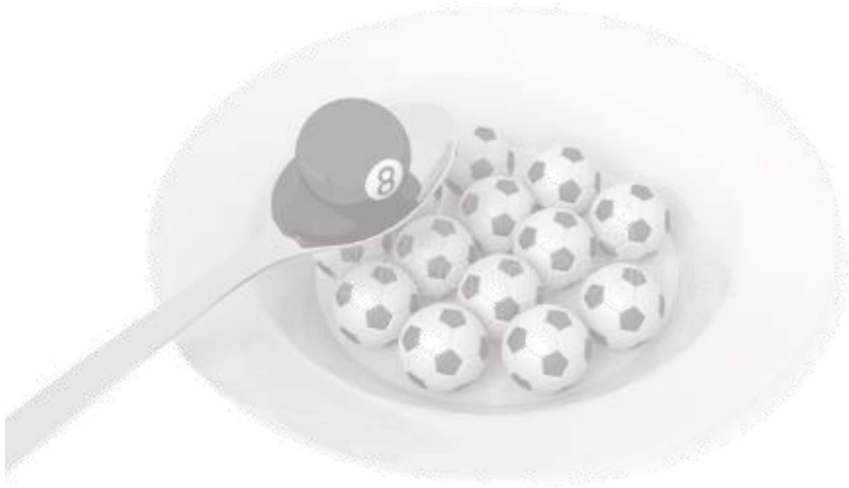
[†]Data taken from [58].
[‡]Data taken from [1].
IOM: Institute of Medicine; RDA: Recommended daily allowance; RDI: Recommended daily intake.

*** Nelle donne in menopausa che non sono in terapia estrogenica la PRI è di 1200 mg**

Il modo migliore per raggiungere i fabbisogni è tramite la dieta……

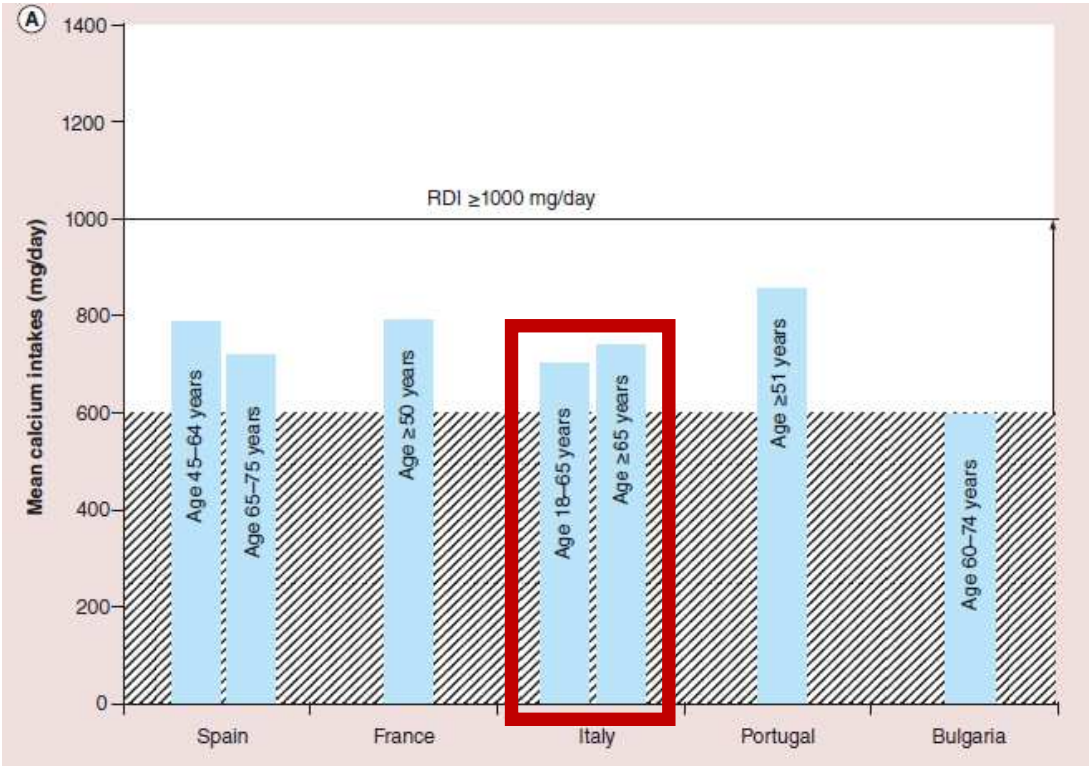
da “Table 4 **Mean daily energy and nutrient intakes from food in adults (18-64.9 years) according to sex e Italian National Food Consumption Survey INRAN-SCAI 2005-06**»

	Females (n. 1245)	
	Mean	SD
Energy (kcal)	1939	526
Protein (g/kg body weight)	1.25	0.36
Calcium (mg)	730	277
Vitamin D (mg)	2.3	2.2



Introiti alimentari Calcio

da “**Calcium intakes among women aged over 50 years from selected European countries**” Rizzoli E, Womens Health 2014



FONTI ALIMENTARI DI CALCIO

	Per 100 gr	Per porzione (LARN 2014)
Formaggi stagionati/pasta dura (grana, pecorino, parmigiano, emmenthal, groviera)	1200-1000 mg	50 gr: 600-500 mg 1 cucchiaio (10 gr): 120-100 mg
Formaggi molli (taleggio, brie)	500 mg	100 gr: 500 mg
Formaggi freschi (caciotta, mozzarella)	300-160 mg	100 gr: 300-160 mg
Yogurt	120 mg	125 gr: 150 mg
Latte (bufala-vaccino)	198-125 mg	1 bicchiere (125 ml): 247-156 mg
Legumi secchi	257-57 mg	50 gr: 128-28 mg
Frutta secca e oleosa	240-130 mg	30 gr: 72-39 mg
Crusca di grano	110 mg	30 gr: 33 mg
Alcune verdure (tarassaco e rucola-cicoria e bieta)	309-170 mg	80 gr: 247-136 mg
Pesce	40 mg	150 gr: 60 mg
Carne	10 mg	100 gr: 10 mg
Altri vegetali	10 mg	200 gr: 20 mg

FONTI ALIMENTARI DI CALCIO

La quantità di calcio nell'acqua potabile può variare da 60 a 200 mg/l (corrispondenti a 150-500 mg/l di calcio carbonato)

D.Lgs. n. 31/2001

Acqua potabile in Veneto

Belluno	31 mg/l
Padova	76 mg/l
Rovigo	65 mg/l
Treviso	70 mg/l
Venezia	58 mg/l
Verona	89 mg/l
Vicenza	64 mg/l

Acque calciche > 150 mg/l

D.Lgs. n. 105/1992

Levissima	Goccia di Carnia	Panna	Guizza	Rocchetta	Boario	Lete	Sangemini	Ferrarelle
19.8 mg/l	20.5 mg/l	32.9 mg/l	46.0 mg/l	57.4 mg/l	131 mg/l	325 mg/l	326 mg/l	400 mg/l

BIODISPONIBILITÀ DI CALCIO

LARN 2014

Calcium: Chemistry, Analysis, Function and Effects, School of Medicine King's College London. 2015

età

ASSORBIMENTO FRAZIONALE= $\frac{\text{Calcio assorbito}}{\text{Calcio assunto}}$

fattori genetici

fattori ormonali:

- vitamina D
- estrogeni - menopausa

fattori dietetici:

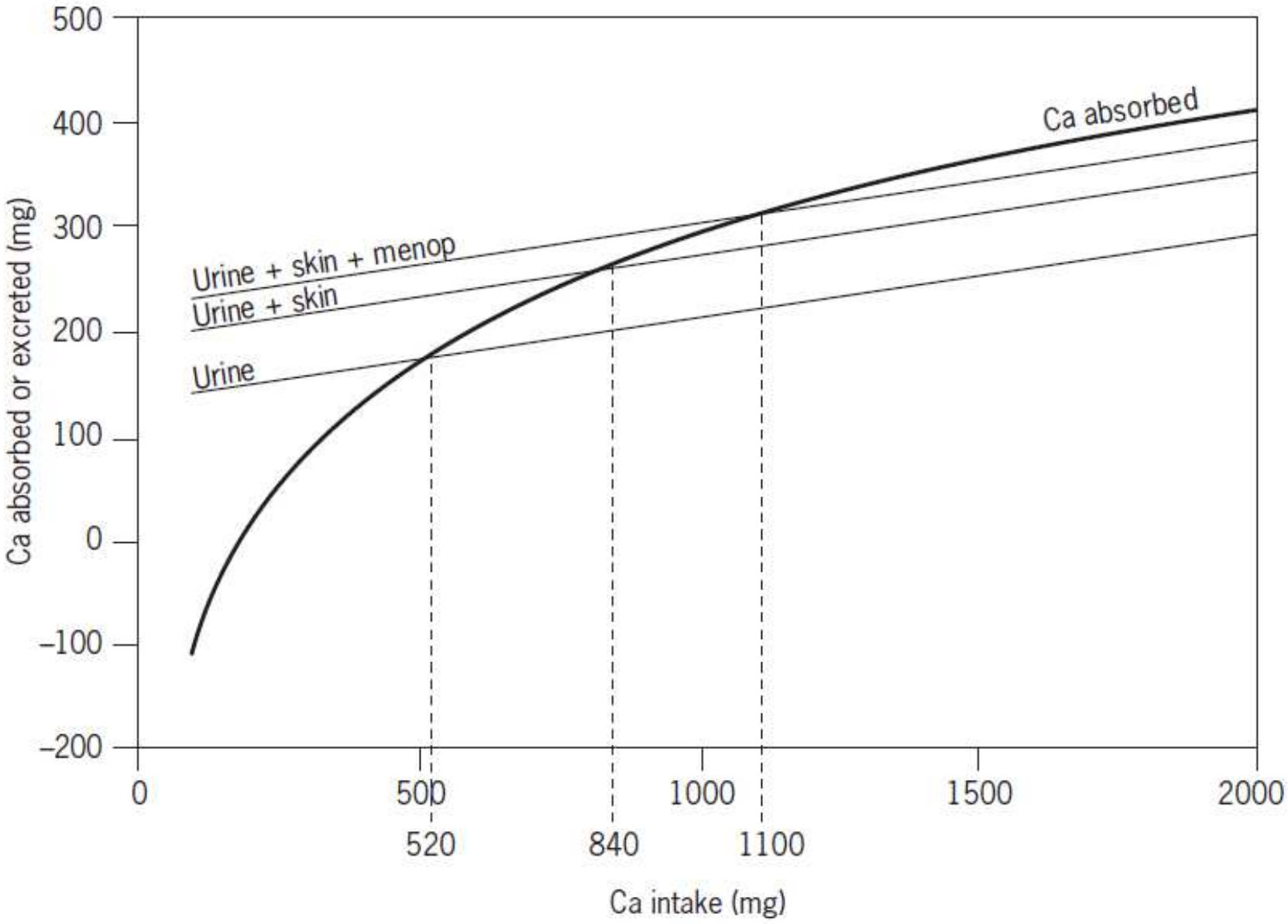
- ossalati *(spinaci, biete, pomodori, cioccolata…)*
- fitati *(cereali integrali, legumi, frutta secca con guscio)*
- urati *(spto frutta)*

~ 5% **~ 20%** **30% - 40%**

spinaci — frutta secca, legumi — brassicacee — latte, prodotti latto-caseari

FIGURE 4.3

The relationship between calcium intake and calcium absorbed (or excreted) calculated from 210 balance experiments in 81 subjects



Calcium plus Vitamin D Supplementation and the Risk of Fractures

The NEW ENGLAND JOURNAL of MEDICINE

Jackson R, N Engl J Med 2006

BACKGROUND

The efficacy of calcium with vitamin D supplementation for preventing hip and other fractures in healthy postmenopausal women remains equivocal.

METHODS

We recruited 36,282 postmenopausal women, 50 to 79 years of age, who were already
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RES

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resulted in a small but significant improvement in hip bone density, did not signifi-
cantly reduce hip fracture, and increased the risk of kidney stones. (ClinicalTrials.gov
number, NCT00000611.)

efsa
European Food Safety Authority

Scientific Opinion on the Tolerable Upper Intake Level of calcium

EFSA Journal 2012

The Panel considers that this study does not provide evidence for an increased risk of kidney stones which could be attributed to high calcium intakes.

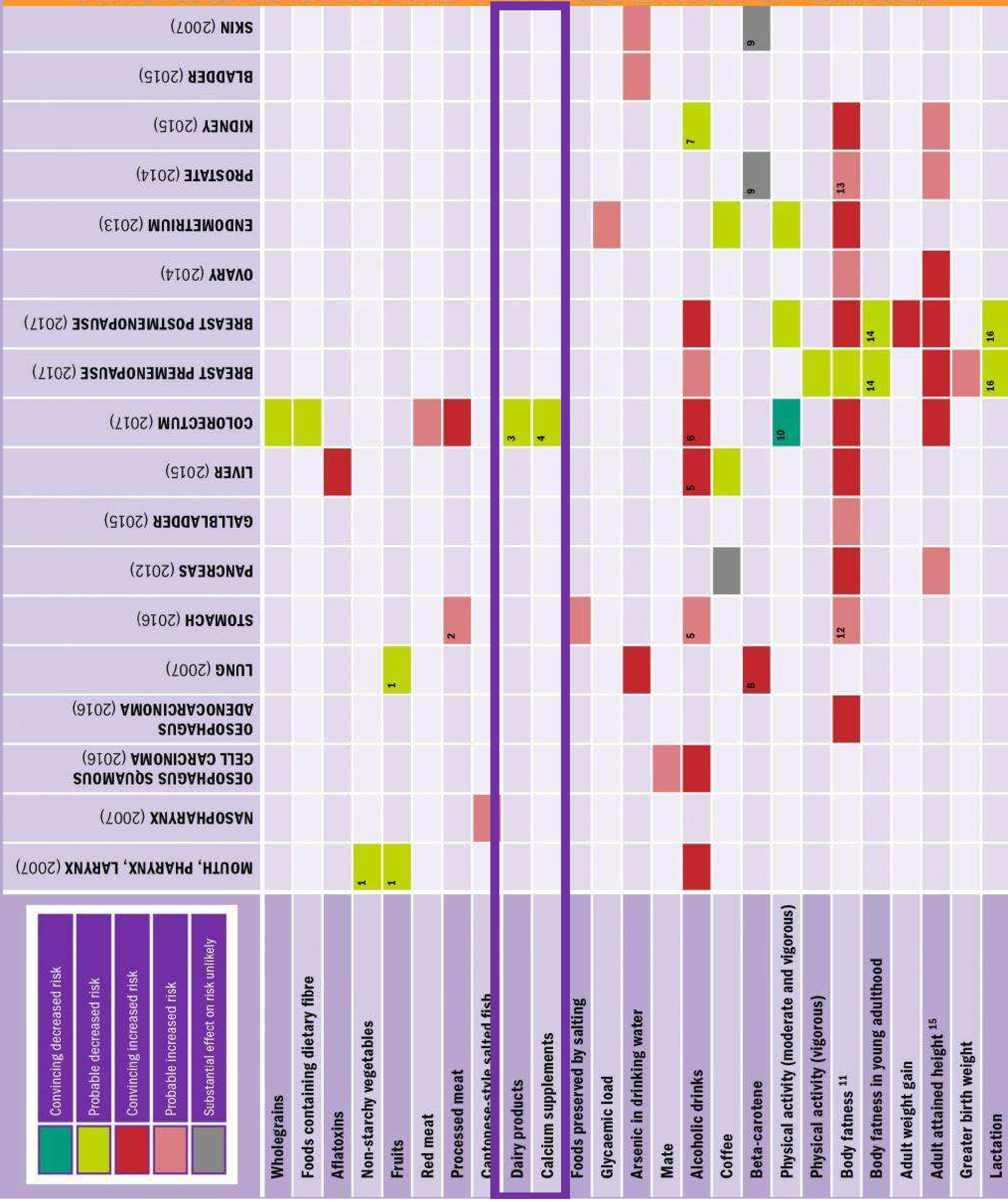
The Panel notes that calcium intakes up to about 2,400 mg/day have not been associated with an increased risk of chronic hypercalciuria or impaired kidney function.

World Cancer Research Fund International

CUP Continuous Update Project

Analysing research on cancer prevention and survival

SUMMARY OF STRONG EVIDENCE ON DIET, NUTRITION, PHYSICAL ACTIVITY AND THE PREVENTION OF CANCER



Diet, nutrition, physical activity and **breast cancer survivors**

2014

DIET, NUTRITION, PHYSICAL ACTIVITY AND BREAST CANCER SURVIVAL (BY OUTCOME)

	Outcome	ALL CAUSE MORTALITY				BREAST CANCER MORTALITY				SECOND PRIMARY BREAST CANCER			
		DECREASED RISK		INCREASED RISK		DECREASED RISK		INCREASED RISK		DECREASED RISK		INCREASED RISK	
		Exposure	Timeframe	Exposure	Timeframe	Exposure	Timeframe	Exposure	Timeframe	Exposure	Timeframe	Exposure	Timeframe
STRONG EVIDENCE	Convincing												
	Probable												
LIMITED EVIDENCE	Limited-suggestive	Physical activity	Before diagnosis ≥12 months after diagnosis	Body fatness	Before diagnosis <12 months after diagnosis ≥12 months after diagnosis	Physical activity	Before diagnosis	Body fatness[1]	Before diagnosis <12 months after diagnosis			Body fatness	Before diagnosis <12 months after diagnosis
		Foods containing fibre	Before diagnosis ≥12 months after diagnosis	Total fat	Before diagnosis								
		Foods containing soy	≥12 months after diagnosis	Saturated fatty acids	Before diagnosis								
STRONG EVIDENCE	Substantial effect on risk unlikely												

High- and low-Fat Dairy intake, recurrence, and Mortality After Breast cancer Diagnosis

Kroenke CH, J Natl Cancer Inst, 2013

BREAST CANCER SURVIVORS – LACE Study

	Average dairy intake per day, svg/d			
	0 to <0.5	0.5 to <1.0	≥1.0	P_{trend}†
High-fat dairy intake, No.	1002	468	423	
Recurrence	176	88	85	
HR, age-adjusted*	1.00	1.11	1.20	.14
(95% CI)	(referent)	(0.86 to 1.43)	(0.92 to 1.55)	
HR, multivariable-adjusted model	1.00	1.22	1.22	.18
(95% CI)	(referent)	(0.92 to 1.65)	(0.91 to 1.65)	
Breast cancer deaths	94	45	50	
HR, age-adjusted	1.00	1.13	1.39	.06
(95% CI)	(referent)	(0.79 to 1.61)	(0.99 to 1.96)	
HR, multivariable-adjusted model	1.00	1.20	1.49	.05
(95% CI)	(referent)	(0.82 to 1.77)	(1.00 to 2.24)	
Deaths from all causes	183	82	107	
HR, age-adjusted	1.00	1.05	1.55	<.001
(95% CI)	(referent)	(0.81 to 1.36)	(1.22 to 1.97)	
HR, multivariable-adjusted model	1.00	1.16	1.64	<.001
(95% CI)	(referent)	(0.88 to 1.53)	(1.24 to 2.17)	
Deaths from non–breast cancer causes	89	37	57	
HR, age-adjusted	1.00	0.96	1.69	.002
(95% CI)	(referent)	(0.65 to 1.40)	(1.21 to 2.36)	
HR, multivariable-adjusted model	1.00	1.06	1.67	.007
(95% CI)	(referent)	(0.71 to 1.59)	(1.13 to 2.47)	
Low-fat dairy intake, No.	722	470	701	
Recurrence	154	71	124	
HR, age-adjusted*	1.00	0.68	0.81	.13
(95% CI)	(referent)	(0.52 to 0.90)	(0.64 to 1.03)	
HR, multivariable-adjusted model	1.00	.81	1.01	.85
(95% CI)	(referent)	(0.61 to 1.09)	(0.78 to 1.32)	
Breast cancer deaths	87	44	58	
HR, age-adjusted	1.00	0.79	0.72	.06
(95% CI)	(referent)	(0.55 to 1.13)	(0.51 to 1.00)	
HR, multivariable-adjusted model	1.00	1.06	1.03	.89
(95% CI)	(referent)	(0.73 to 1.55)	(0.71 to 1.49)	
Deaths fro				
HR, age-				.01
(95% CI)				
HR, mult				.76
(95% CI)				
Deaths fro				
HR, age-				.11
(95% CI)				
HR, mult				.83
(95% CI)	(referent)	(0.82 to 1.75)	(0.71 to 1.55)	

Intake of high-fat dairy, but not low-fat dairy, was related to a higher risk of mortality after breast cancer diagnosis.

Diet, nutrition, physical activity and **prostate cancer**

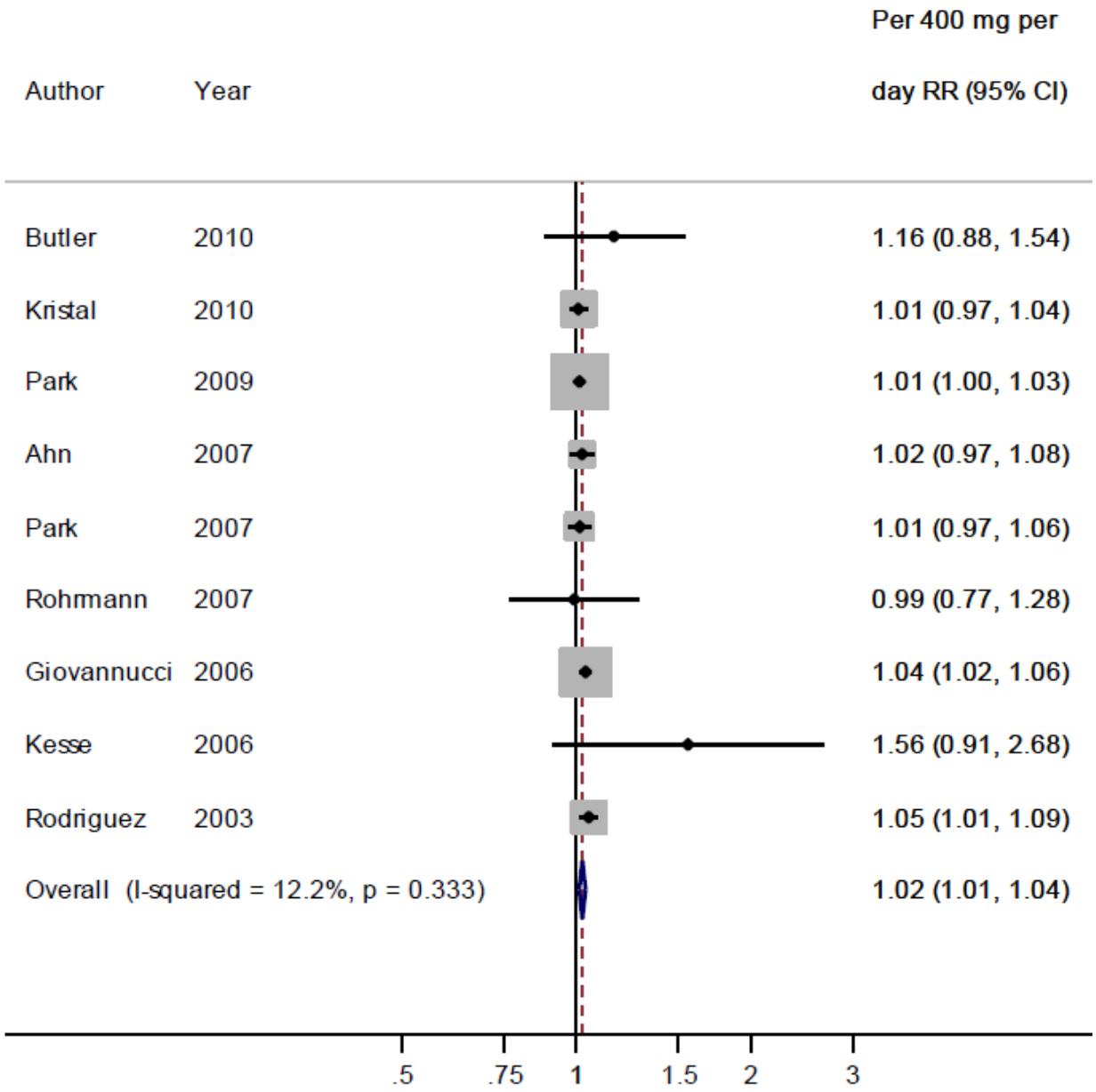
2014

		DECREASES RISK	INCREASES RISK
STRONG EVIDENCE	Convincing		
	Probable		Body fatness (advanced prostate cancer)[1,2] Adult attained height[3]
LIMITED EVIDENCE	Limited-suggestive		Dairy products Diets high in calcium Low plasma alpha-tocopherol concentrations Low plasma selenium concentrations

Limited evidence

- The evidence that a higher consumption of dairy products increases the risk of prostate cancer is limited.
- The evidence that diets high in calcium increase the risk of prostate cancer is limited.

DOSE-RESPONSE META-ANALYSIS OF TOTAL CALCIUM AND PROSTATE CANCER, per 400 mg/day



Calcio da latticini
1.06 (1.02–1.09)

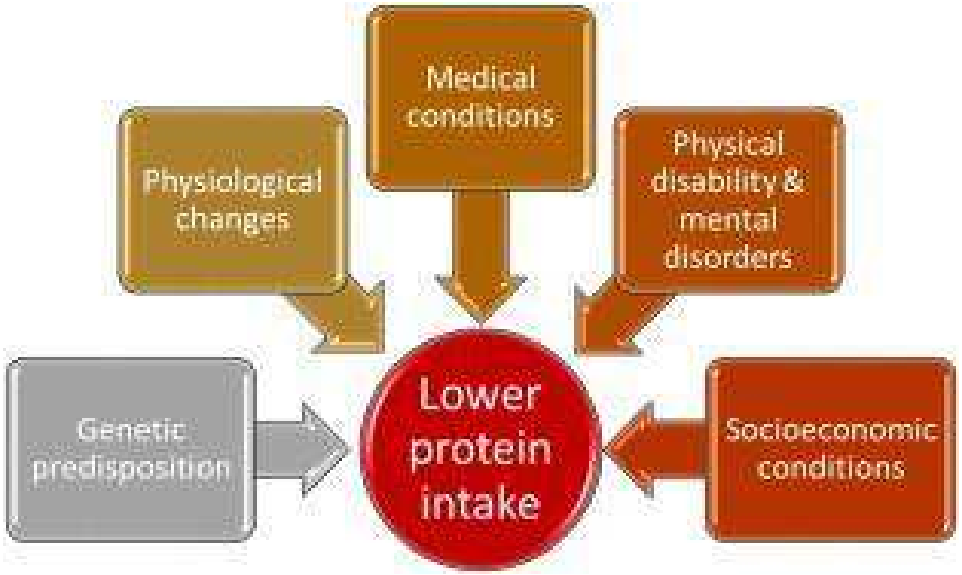
PROTEINE

Invecchiando si tende a mangiare meno proteine

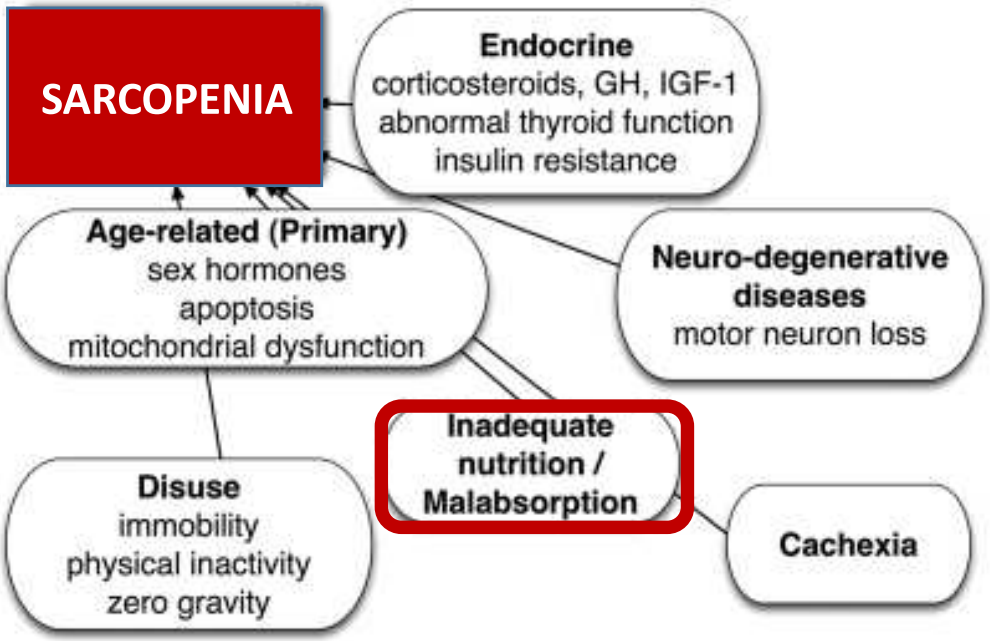
- *V.L. Fulgoni, The national health and nutrition examination Survey, 2003–2004 Am J Clin Nutr, 2008*
- *E. Volpi, Is the optimal level of protein intake for older adults greater than the recommended dietary allowance? J Gerontol A Biol Sci Med Sci, 2013*

In Europa, fino al 10% degli anziani e 35% degli anziani istituzionalizzati non raggiunge il minimo apporto proteico di 0.7 g/kg/die

- *M. Tieland, Dietary protein intake in community-dwelling, frail, and institutionalized elderly people: scope for improvement Eur J Nutr, 2012*

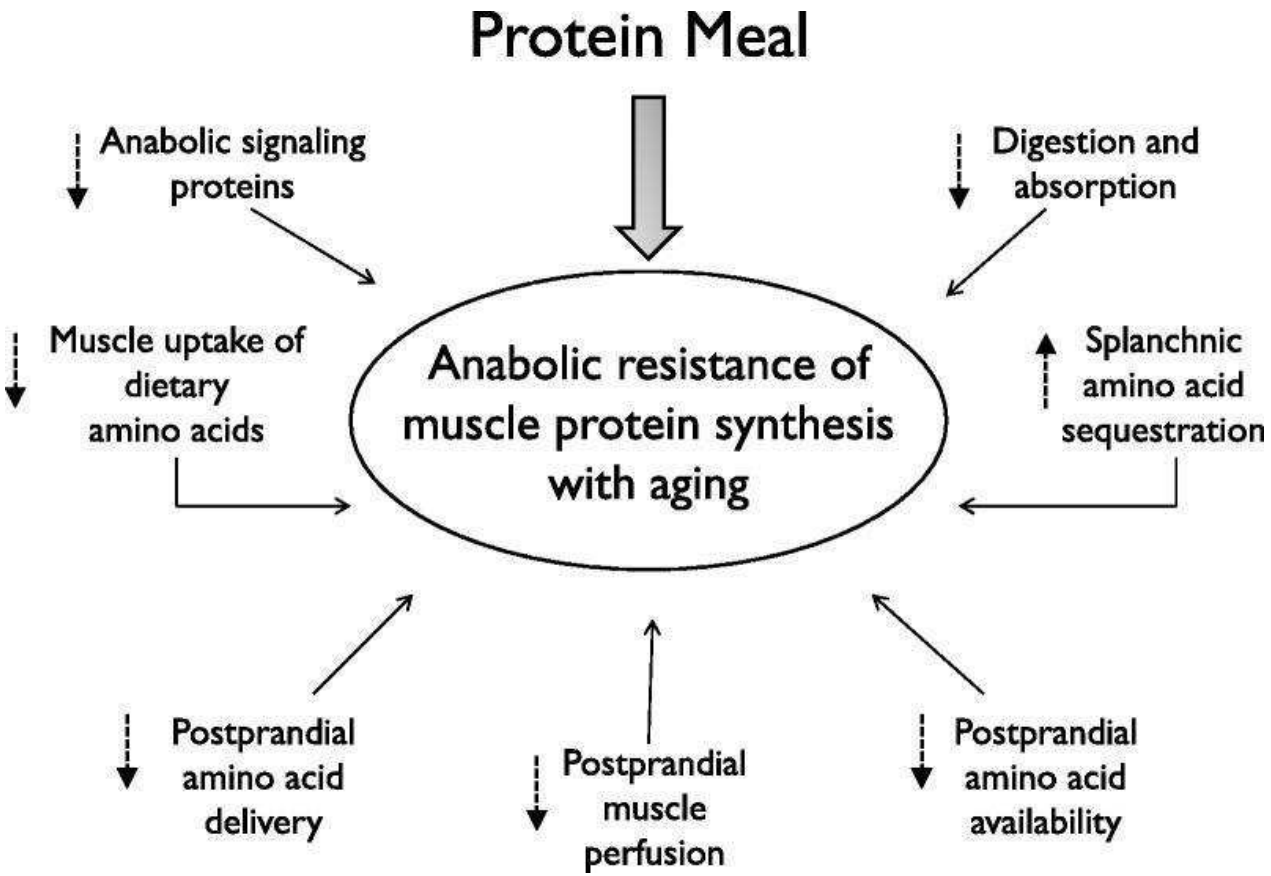


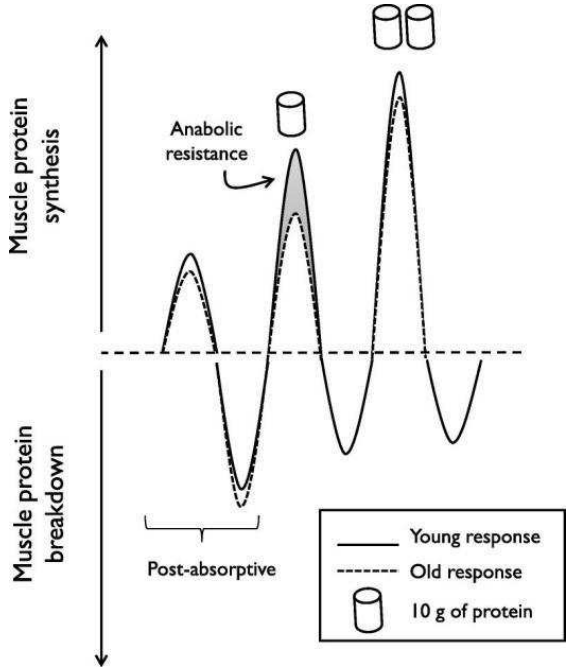
Deutz NE. Clin Nutr, 2014

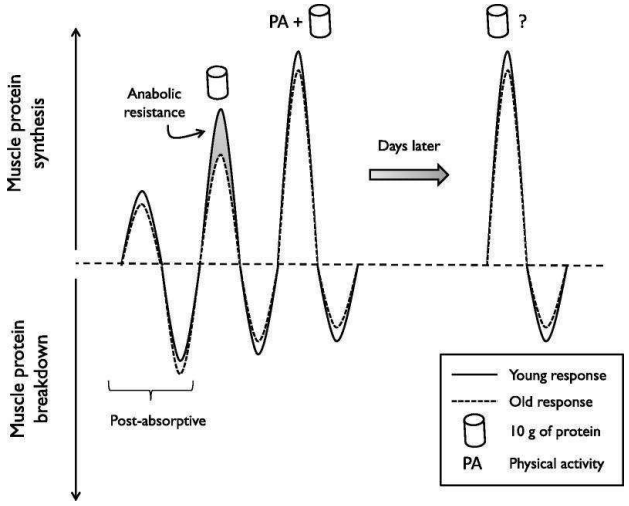


A.J. Cruz-Jentoft. Age Ageing, 2010

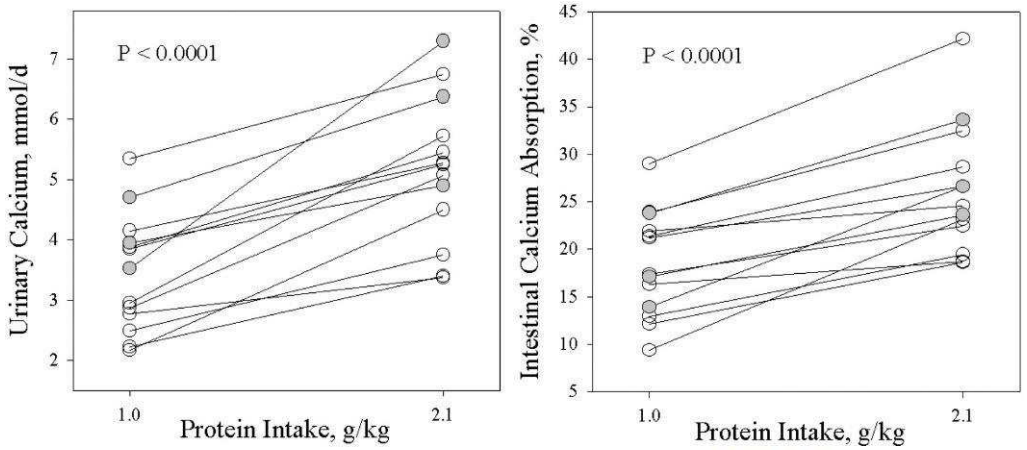
Anabolic Resistance of Muscle Protein Synthesis with Aging







Burd, NA. Exercise & Sport Sciences Reviews, 2013



The Impact of Dietary Protein on Calcium Absorption and Kinetic Measures of Bone Turnover in Women

Kerstetter JE 2005
The Journal of Clinical Endocrinology & Metabolism

A diet high in meat protein and potential renal acid load increases fractional calcium absorption and urinary calcium excretion without affecting markers of bone resorption or formation in postmenopausal women

TABLE 5 Serum biochemistry in healthy postmenopausal women consuming controlled LPLP and HPHP diets for 7 wk each in a crossover design[1]

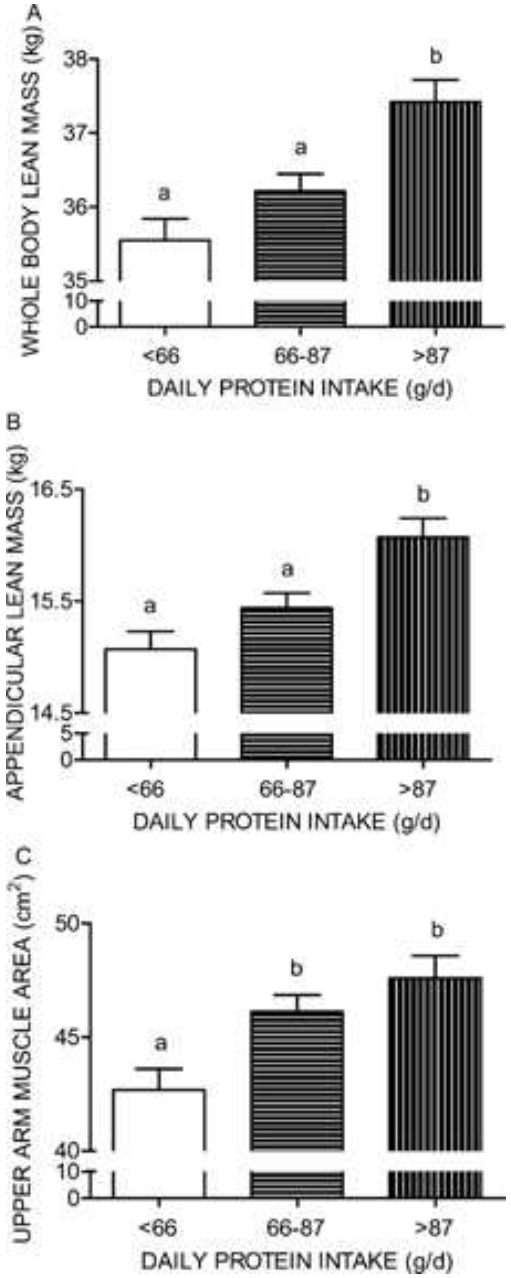
						ANCOVA *P*-values		
	wk 0[2]	wk 3	wk 5	wk 7	Pooled SD	Diet	Week	Diet × week
Ionic Ca, *mmol/L*					0.003	0.11	0.16	0.72
LPLP	1.20	1.19	1.20	1.21				
HPHP	1.19	1.21	1.21	1.22				
TRAP, *U/L*					0.49	0.44	0.30	0.90
LPLP	5.46	4.83	4.95	5.07				
HPHP	5.21	4.95	5.07	5.09				
Creatinine, *μmol/L*					6	0.82	0.0005	0.44
LPLP	63.9	71	65	66				
HPHP	63.9	70	67	66				
Ln (CTX),[3] *pmol/L*					0.25	0.87	0.001	0.58
LPLP	2.11 (8.3)	2.15 (8.6)	2.05 (7.8)	2.09 (8.1)				
HPHP	2.09 (8.1)	2.21 (9.1)	2.05 (7.8)	2.04 (7.7)				
Ln (intact PTH),[3] *pmol/L*					0.25	0.001	0.34	0.06
LPLP	1.8 (5.8)	1.8 (6.0)	1.8 (6.3)	1.8 (6.2)				
HPHP	1.8 (6.0)	1.7 (5.6)	1.6 (4.7)	1.6 (4.9)				
Ln (OC),[3] *nmol/L*					0.44	0.88	0.99	0.41
LPLP	0.27 (1.31)	0.14 (1.16)	0.28 (1.33)	0.26 (1.30)				
HPHP	0.18 (1.20)	0.32 (1.37)	0.20 (1.22)	0.22 (1.24)				
Ln (IGF-I),[3] *nmol/L*					0.22	0.0001	0.32	0.55
LPLP	2.85 (17.4)	2.87 (17.7)	2.90 (18.2)	2.89 (18.0)				
HPHP	2.85 (17.4)	3.09 (21.9)	3.12 (22.7)	3.20 (24.5)				
OPG, *pmol/L*					0.53	0.38	<0.0001	0.87
LPLP	5.41	5.13	5.17	4.72				
HPHP	5.45	5.00	5.12	4.58				

Cao JJ, J Nutr 2011

Journal of Bone and Mineral Research
JBMR

A 5-Year Cohort Study of the Effects of High Protein Intake on Lean Mass and BMC in Elderly Postmenopausal Women

ASBMR
The American Society for Bone and Mineral Research



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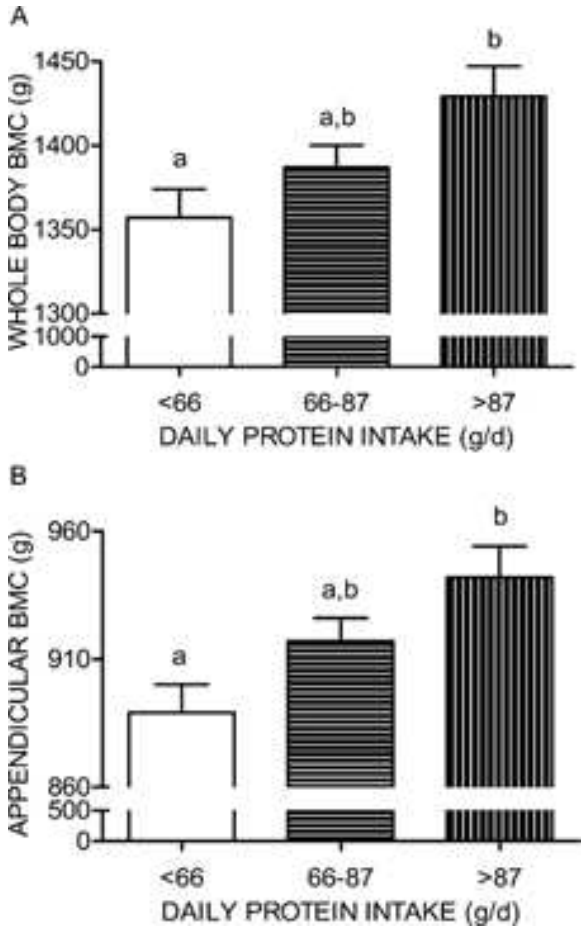
5 aa fu



Meng X, 2009

Does Dietary Protein Reduce Hip Fracture Risk in Elders? The Framingham Osteoporosis Study

Misra D, Osteoporos Int. 2011

Background—Studies of the association between dietary protein intake and hip fracture risk are conflicting. Therefore, we examined protein intake and hip fracture risk in a population-based group of elderly men and women.

Methods—576 women and 370 men from the Framingham Osteoporosis Study with no previous history of hip fracture completed Food Frequency Questionnaires. Energy-adjusted protein intake was evaluated as a continuous variable and as quartiles. Incidence Rates and Hazard Ratios were calculated, adjusting for age, BMI, sex and energy intake.

Results—Among 946 participants (mean age 75yrs), mean protein intake was found to be 68 gr/d. Increased protein intake was associated with a decreased risk of hip fracture compared to those in the lowest quartile of protein intake (Q2 HR=0.70; Q3 HR= 0.56; Q4 HR=0.63, all pvalues≥0.044), p for trend was 0.07. When a threshold effect was considered (Q2–4 vs Q1), intakes in the higher quartiles combined were associated with a significantly lower risk for hip fracture (HR=0.63; p=0.04).

Conclusion—Our results are consistent with reduced risk of hip fracture with higher dietary protein intake. Larger prospective studies are needed to confirm and extend this finding in elderly men and women

Energy-adjusted protein quartiles (mean protein intake in g/d± SD)	No. of incident hip fractures/person-years	Incidence rate	Hazard ratios (95% CI) for all participants (n=100)	Hazard ratios (95% CI) for women only (n=80)
Q1 (46.45±7.29)	31/2366.37	13.10	1 (ref)	1.0 (ref)
Q2 (59.61±2.24)	25/2580.46	9.69	0.70 (0.41–1.19)	0.75 (0.40–1.40)
Q3 (67.70± 2.43)	21/2653.45	7.91	0.56 (0.32–1.0)	0.71 (0.37–1.35)
Q4 (82.74±10.27)	23/2644.38	8.70	0.63 (0.37–1.09)	0.82 (0.44–1.51)

FABBISOGNI DI PROTEINE (LARN 2014)

LARN PER LE PROTEINE				
		AR Fabbisogno medio	**PRI** Assunzione raccomandata per la popolazione	**STD** Obiettivo nutrizionale per la prevenzione
		g/kg/die	g/kg/die	g/kg/die
Maschi	18-29 anni	0,71	0,90	
	30-59 anni	0,71	0,90	
	60-74 anni			1,1
	≥ 75 anni			1,1
Femmine	18-29 anni	0,71	0,90	
	30-59 anni	0,71	0,90	
	60-74 anni			1,1
	≥ 75 anni			1,1
GRAVIDANZA	I trimestre	+0,5 g/die	+1 g/die	
	II trimestre	+7 g/die	+8 g/die	
	III trimestre	+21 g/die	+26 g/die	
ALLATTAMENTO	I semestre	+17 g/die	+21 g/die	
	II semestre	+11 g/die	+14 g/die	

125 ml- 4 gr prot

150 gr - 18 gr prot

120 gr – 27 gr prot

100 gr – 18-20 gr prot

180 gr – 30 gr prot

10 gr – 3,3 gr prot

	Media	D.S.
Età	47	9
Peso (kg)	62,2	4,9
Altezza (cm)	166	4
BMI (kg/mq)	22,57	2,43
Circ. addome (cm)	82	7
Introiti alimentari		
Calorie (kcal)	1458	393
Proteine (%)	15	4
di cui animali (%)	56	22
Proteine g/kg	0,87	0,28
Lipidi (%)	39	6
Carboidrati (%)	45	6
Calcio (mg)	585	284

Take Home Message

- La nutrizione unita all'attività fisica e a sani stili di vita rappresenta un fattore importante per il mantenimento della salute dell'osso.
- Il calcio e la vitamina D riducono il rischio di fratture
- Un adeguato apporto proteico è importante per il mantenimento della salute dell'osso
- I derivati del latte apportano più calcio, proteine e altri minerali rispetto alle altre fonti alimentari
- È importante promuovere strategie di educazione alimentare volte al miglioramento degli apporti di calcio, vitamina D e proteine

FABBISOGNI DI VITAMINA D (LARN 2014)

LARN PER LA VITAMINA D (µg/die)				
		AR Fabbisogno medio	**PRI** Assunzione raccomandata per la popolazione	**UL** Livello massimo tollerabile di assunzione
Maschi	18-29 anni	10	15	100
	30-59 anni	10	15	100
	60-74 anni	10	15	100
	≥ 75 anni	10	20	100
Femmine	18-29 anni	10	15	100
	30-59 anni	10	15	100
	60-74 anni	10	15	100
	≥ 75 anni	10	20	100
GRAVIDANZA		10	15	100
ALLATTAMENTO		10	15	100