

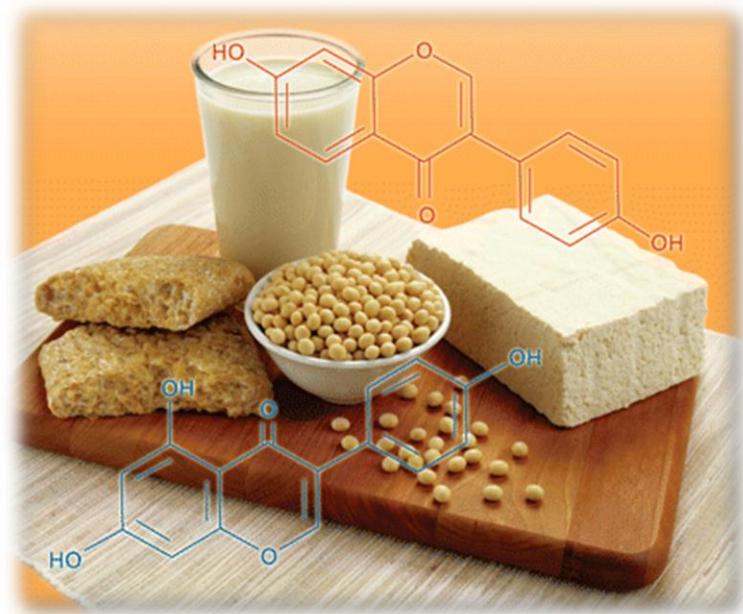
Soy Nutrition and Health: A Brief Research Update



Mark Messina, PhD

May 8, 2014

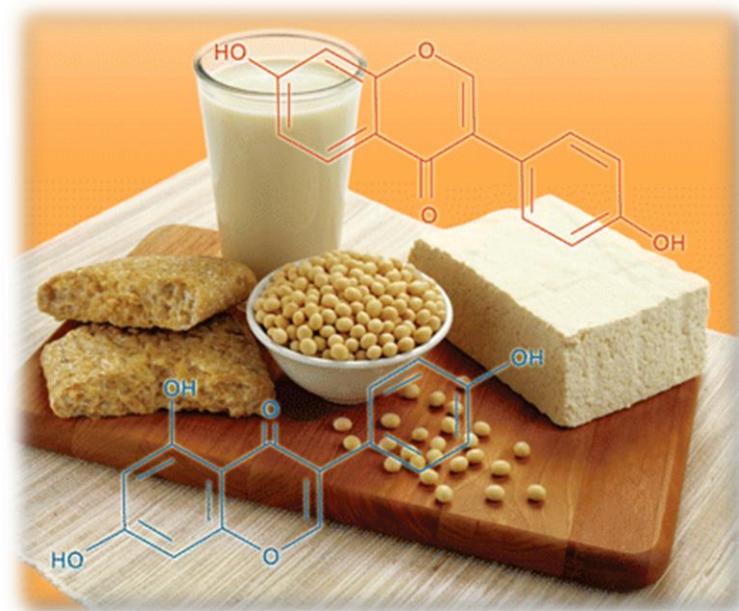
markjohnmessina@gmail.com



Soy Nutrition and Health: A Brief Research Update



- Isoflavones
- Breast cancer
- Heart disease



Macronutrient Composition



VS.



Macronutrient (% calories) Composition of Soybeans Differs from Common Beans

Macronutrient	Soybeans	Common beans
Carbohydrate	27 ¹	70
Protein ² (high quality)	33	27
Fat	40	3

¹Mostly oligosaccharides; capable of functioning as prebiotics

²Protein digestibility corrected amino acid score, 0.9 -1.0



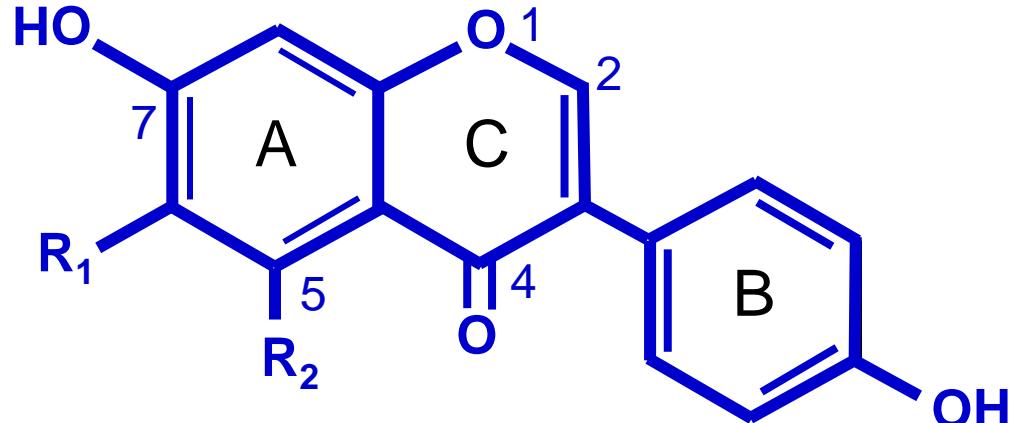
Fatty Acid Composition of Soybean Oil

Fatty acid	Percent
Saturated	12
Monounsaturated	29
Omega-6 PUFA (LA)*	53
Omega-3 PUFA (LNA)*	6

*Essential fatty acids. LA, linoleic acid; LNA, linolenic acid

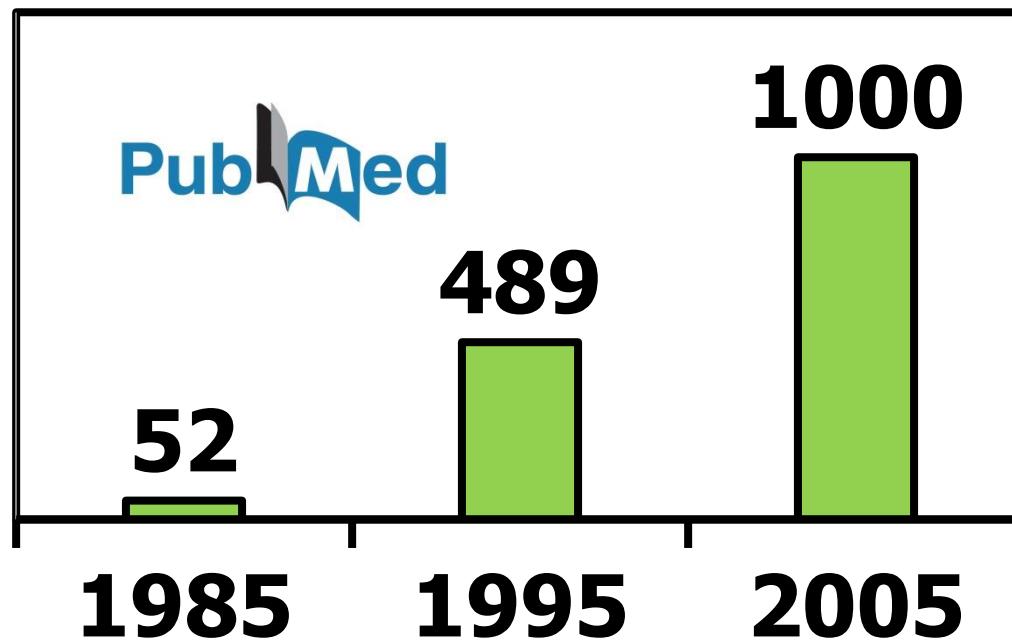
J. Agric. Food Chem. 2004
52, 5322; 57: 11174, 2009

Isoflavones



- Found primarily in soybeans

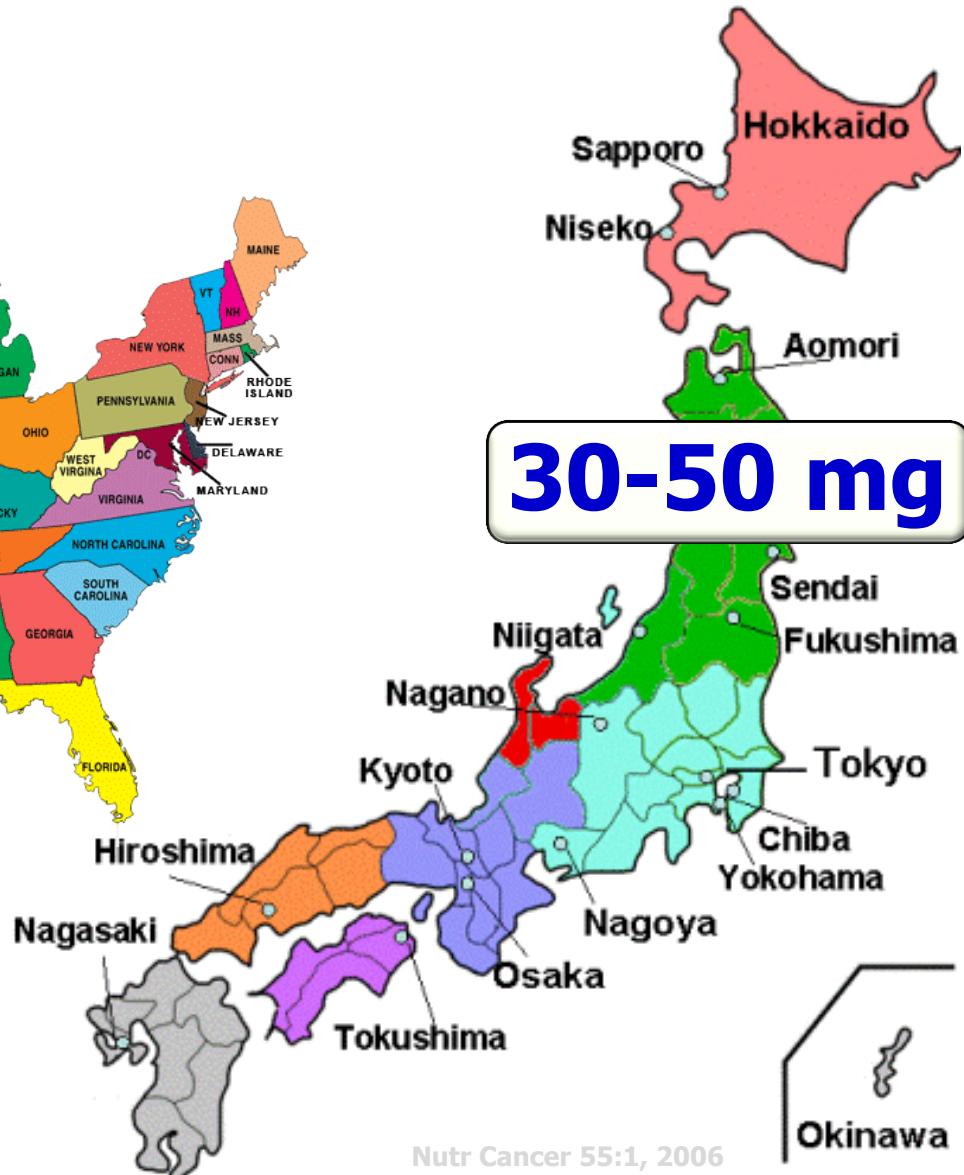
Annual
Number of
Publications
(1985-2005)



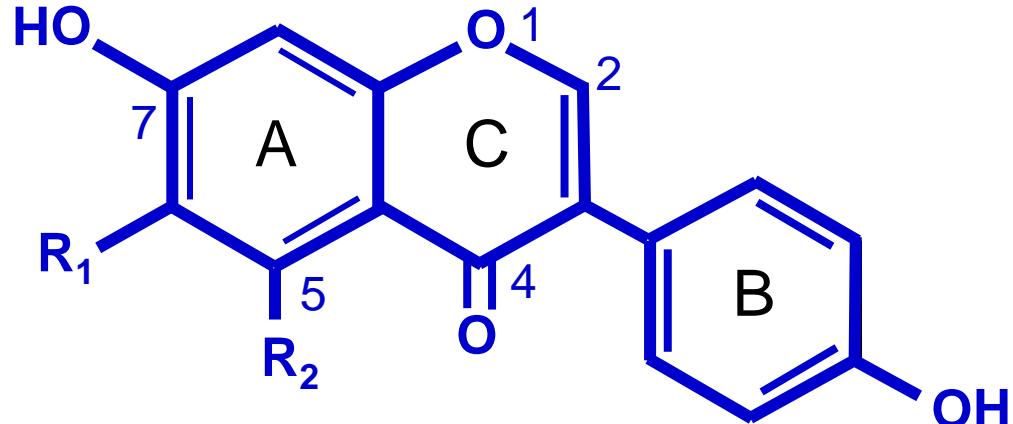
Mean Daily Isoflavone Intake



<3 mg

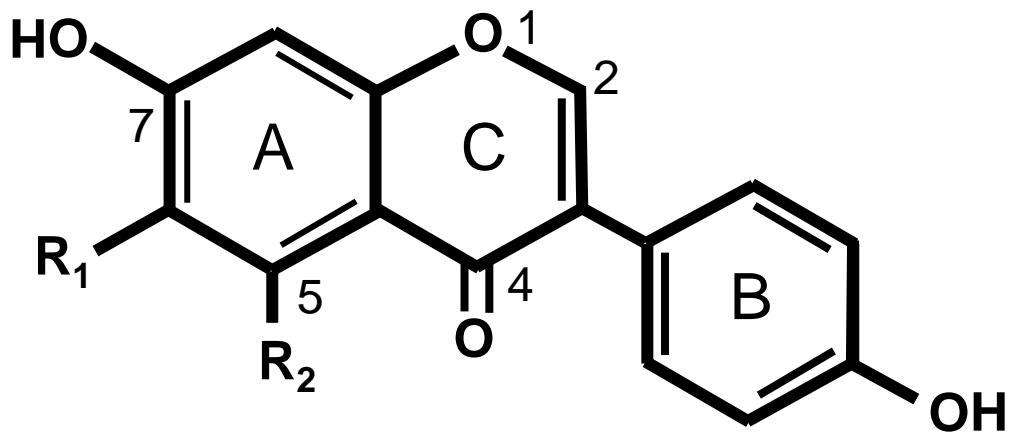


Isoflavones

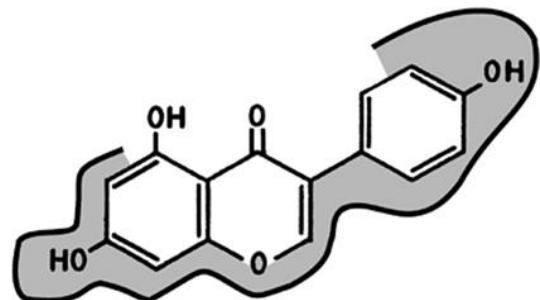


- Found primarily in soybeans
- Main isoflavone, genistein
- Similar chemical structure to estrogen

Soybean Isoflavone Aglycones

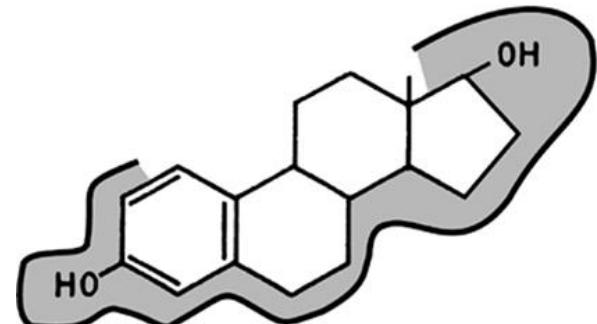


Phytoestrogens



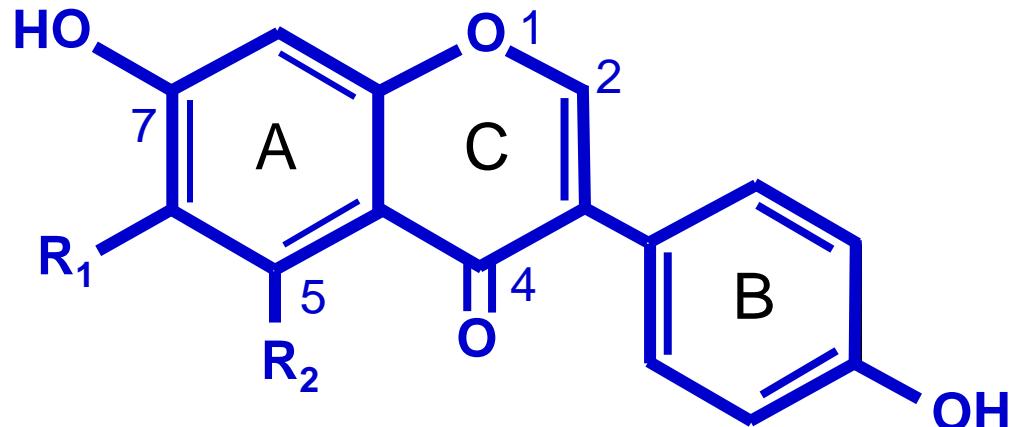
Genistein

Isoflavone	R ₁	R ₂	% of total
Genistein	H	OH	50
Daidzein	H	H	40
Glycitein	OCH ₃	H	10



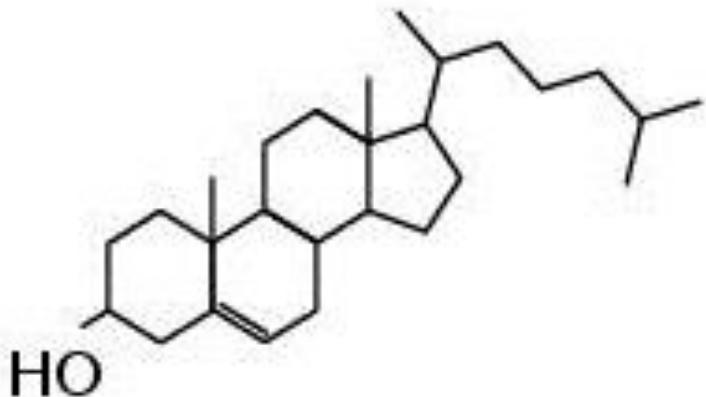
Estradiol

Isoflavones

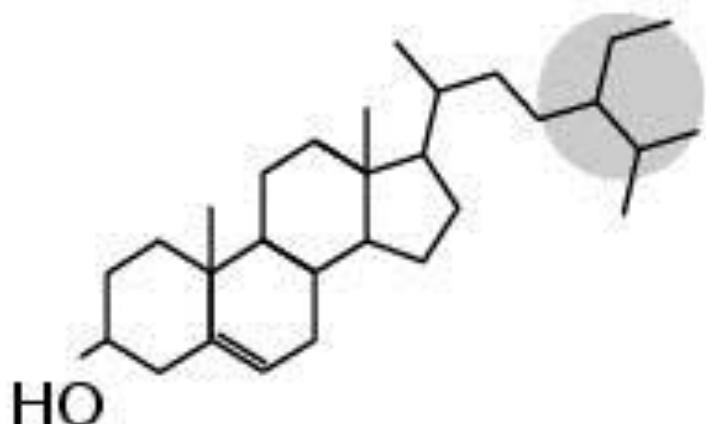


- Found primarily in soybeans
- Main isoflavone, genistein
- Similar chemical structure to estrogen
- Classified as **phytoestrogens** but
different from estrogen

Cholesterol **(animal foods)**



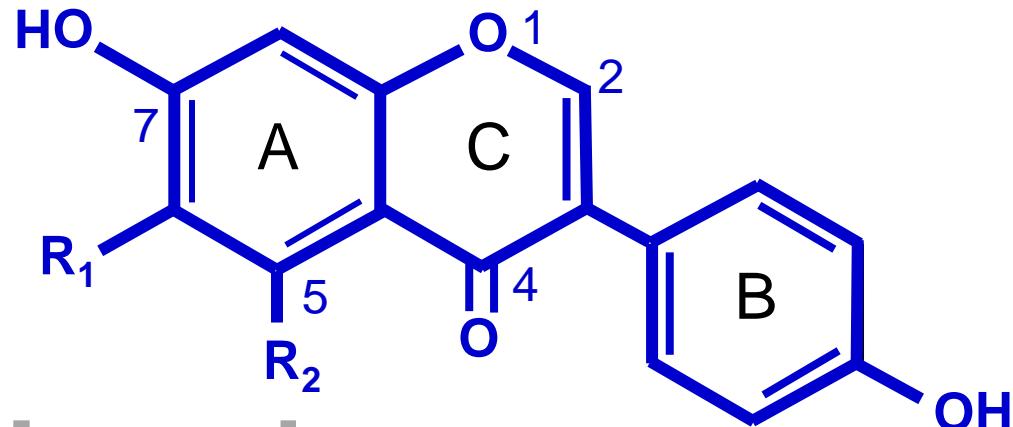
**↑ Blood
cholesterol**



**↓ Blood
cholesterol**

Phytosterols **(plant foods)**

Isoflavones



- Found primarily in soybeans
- Main isoflavone, genistein
- Similar chemical structure to estrogen
- Classified as phytoestrogens but *different* from estrogen
- Classified as selective estrogen receptor modulators (**SERMs**)

SERMs are Tissue Selective

Depending upon the tissue

- Estrogenic
- Anti-estrogenic
- No effects



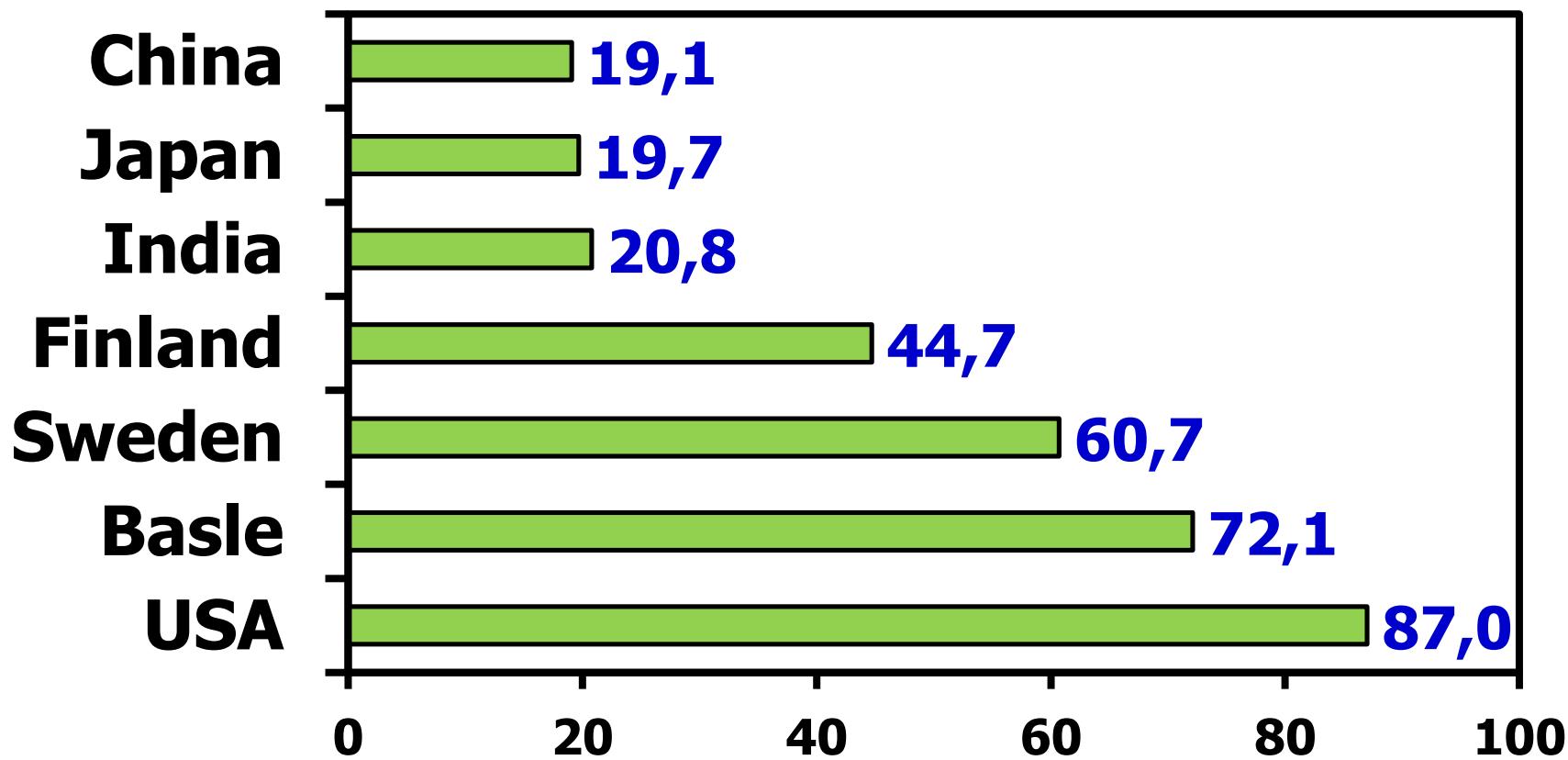
Breast: antiestrogen
Uterus: estrogen



Breast: antiestrogen
Bones: estrogen



Age-Adjusted Breast Cancer Incidence Rates (per 100,000) for Selected Countries



BCa: Shanghai, Osaka, Madras, Geneva, San Francisco (W).

Hypothesis Early Soy (Isoflavone) Intake Decreases Breast Cancer Risk



Hypothesis

Early Soy (Isoflavone)
Intake Decreases
Breast Cancer Risk

Support

- Rodent data
- Epidemiologic data
- Proposed mechanisms

Results of Population Studies Comparing High versus Low Soy Intake Early in Life on Breast Cancer Risk

Location	% ↓
Shanghai	49
Shanghai	43
United States	28
United States	60



1 oz (28 g)



½ cup (100 g)



1 cup (240 ml)



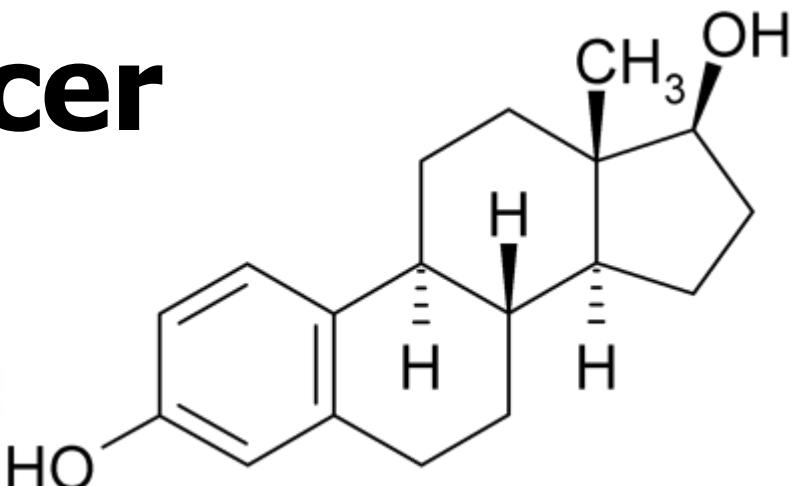
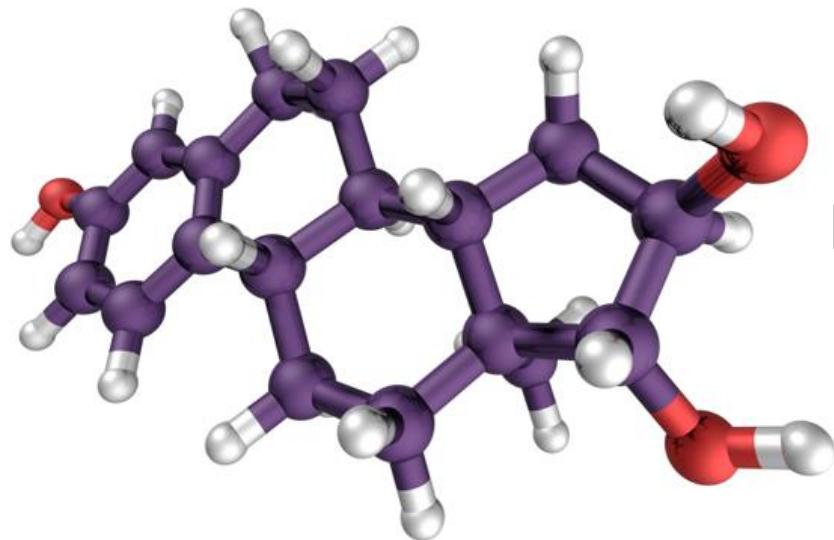
½ cup (100 g)

**Young
girls
should
be sure
to eat \geq 1
serving
per day**

**Can
soyfoods
be safely
consumed
by breast
cancer
patients?**



Estrogen and Breast Cancer



**Conceptual basis for concern
about isoflavones**

New Insight about Estrogen

“... the use of estrogen alone results in a small reduction in the risk for developing or dying of invasive breast cancer.”



U.S. Preventive Services Task Force

Annals Intern Med 158: 47, 2013

Isoflavone Intake & Breast Cancer Prognosis: Pooled Analysis

- **Shanghai Breast Cancer Survival Study**
 - **Life After Cancer Epidemiology (USA)**
 - **Women's Healthy Eating & Living (USA)**
-
-

Isoflavone Intake & Breast Cancer Prognosis: Pooled Analysis

- Shanghai Breast Cancer Survival Study
 - Life After Cancer Epidemiology (USA)
 - Women's Healthy Eating & Living (USA)
-
-

N=9514
½ postM
½ White

Median follow up, 7.4 years

1171 Deaths
881 BCa-specific deaths
1348 Recurrences

Soy Intake and Breast Cancer Prognosis: Pooled Analysis Results

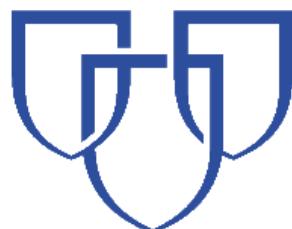
High vs low soy intake:

- 13% ↓ all cause mortality
- 17% ↓ breast cancer-specific mortality
- 25% ↓ breast cancer recurrence



American Institute
for Cancer Research

THE UNIVERSITY OF TEXAS
MD ANDERSON
CANCER CENTER



MAYO CLINIC

**Soyfoods are safe for
breast cancer patients**

Soyfoods and Risk of Coronary Heart Disease



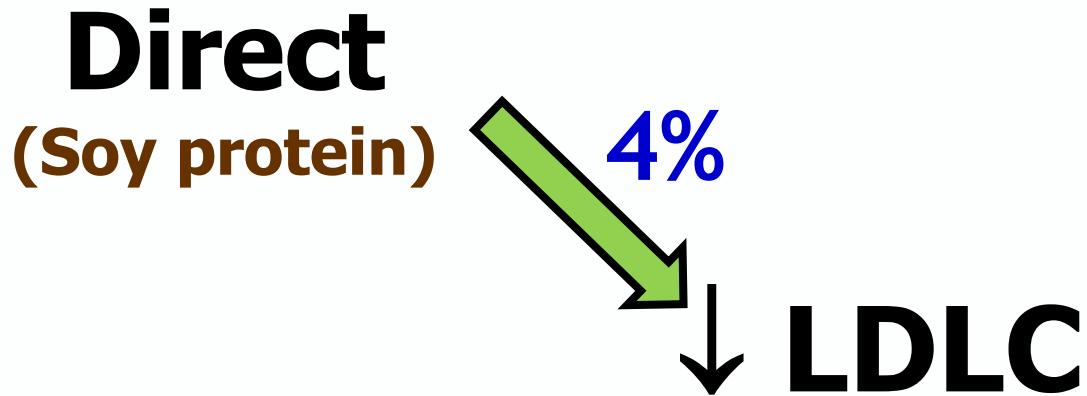


"25 grams of soy protein per day ... may reduce risk of heart disease"

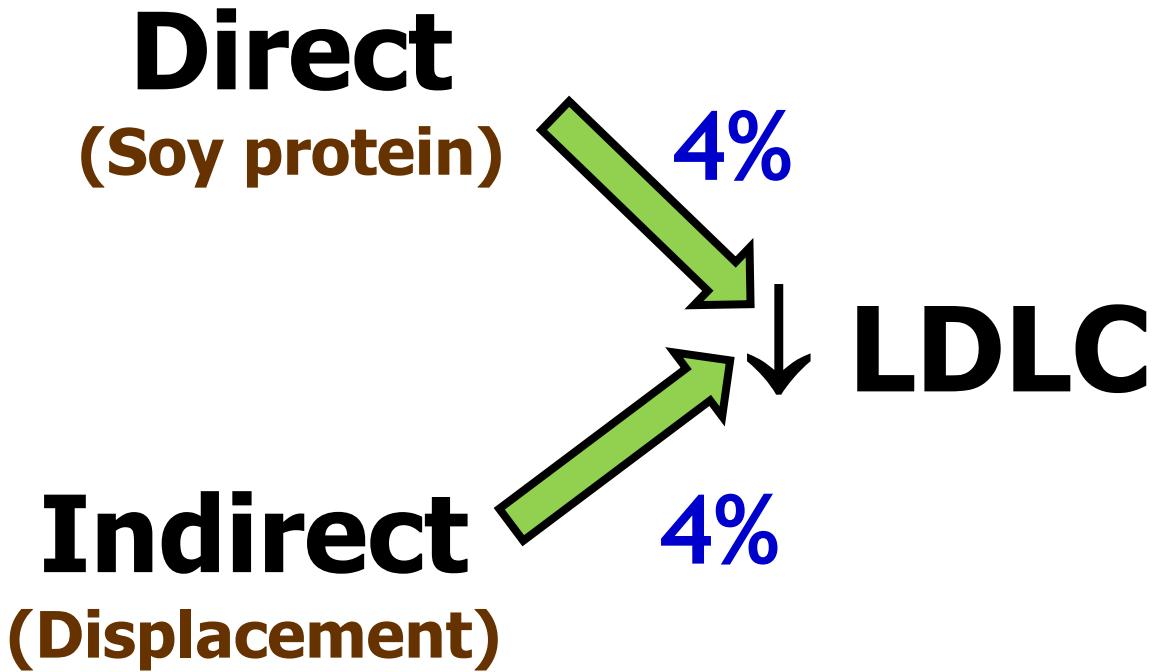
Countries with approved health claims

- Brazil
- Indonesia
- Japan
- Korea
- Chile
- Turkey
- Malaysia
- Philippines
- United Kingdom*
- United States
- Columbia
- South Africa

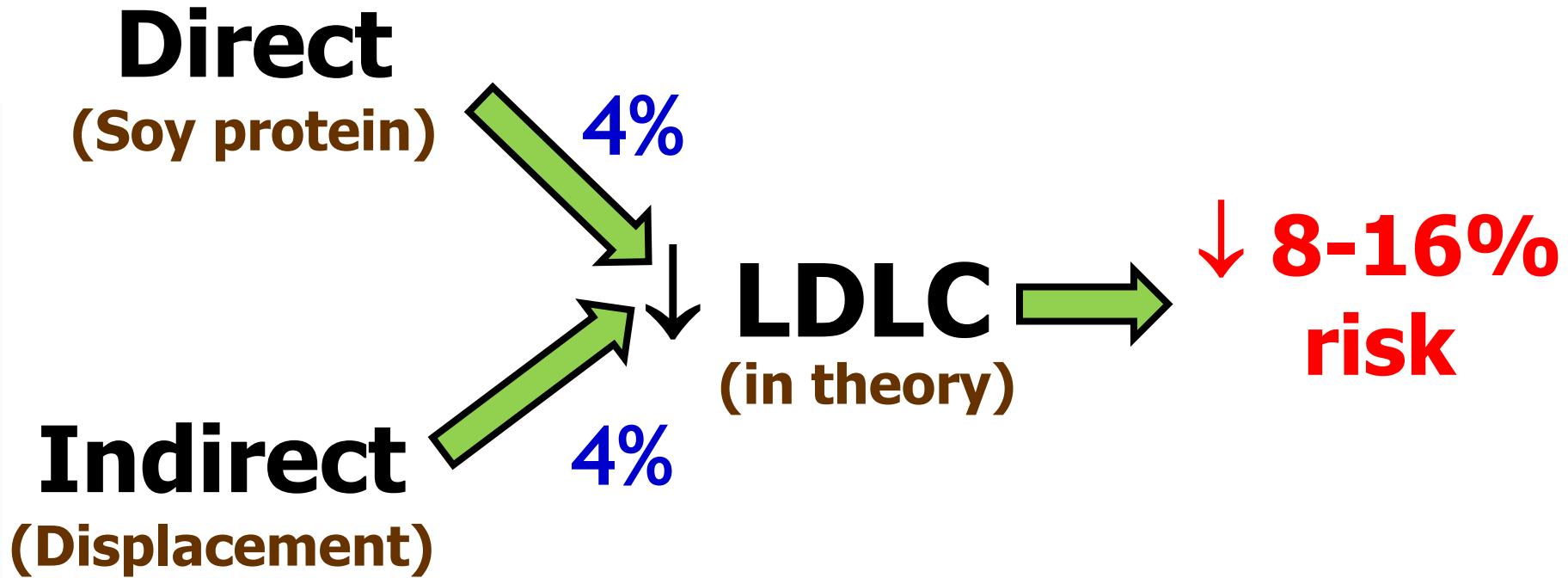
The combined effects of soy on LDLC and risk of coronary heart disease



The combined effects of soy on LDLC and risk of coronary heart disease



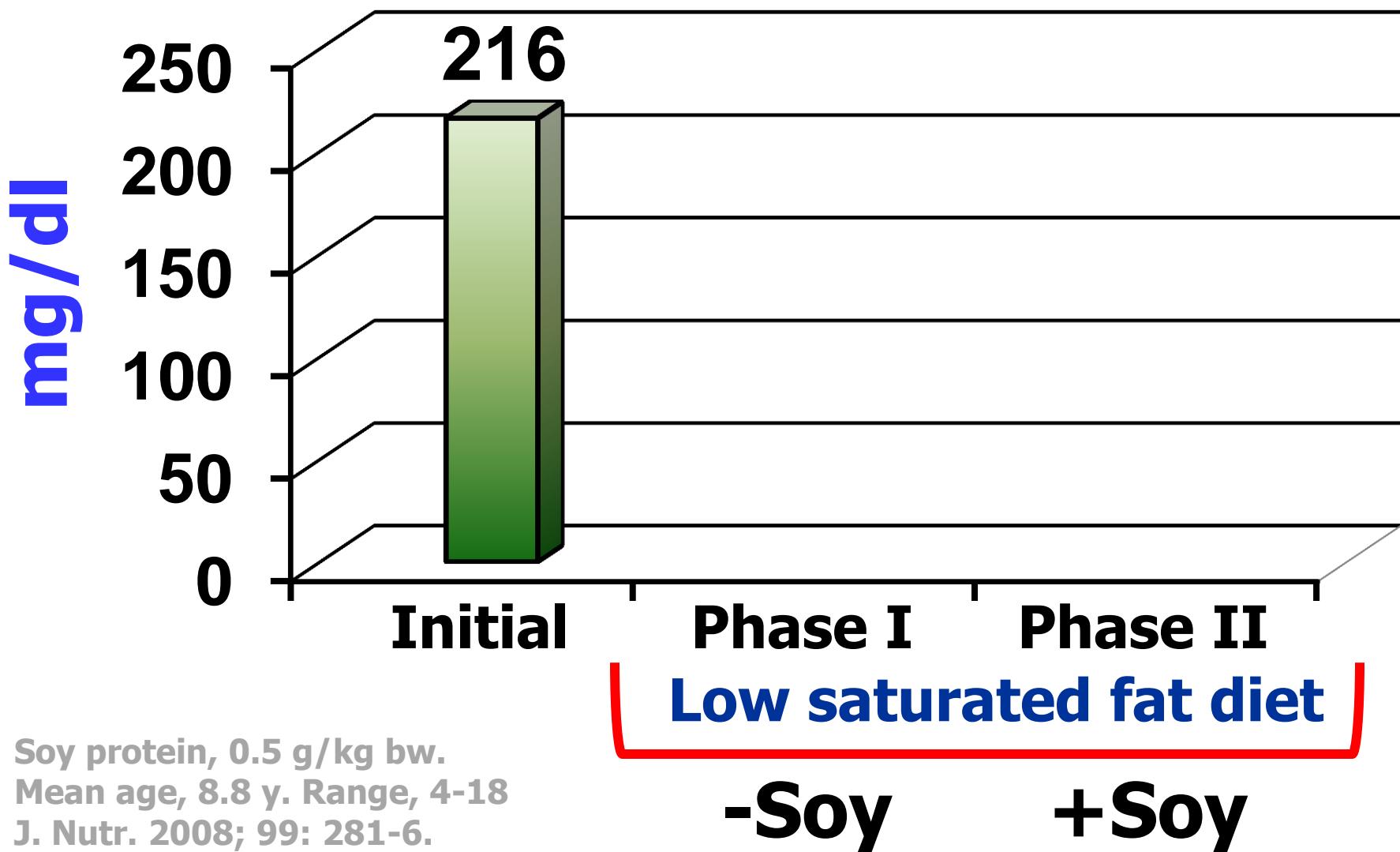
The combined effects of soy on LDLC and risk of coronary heart disease



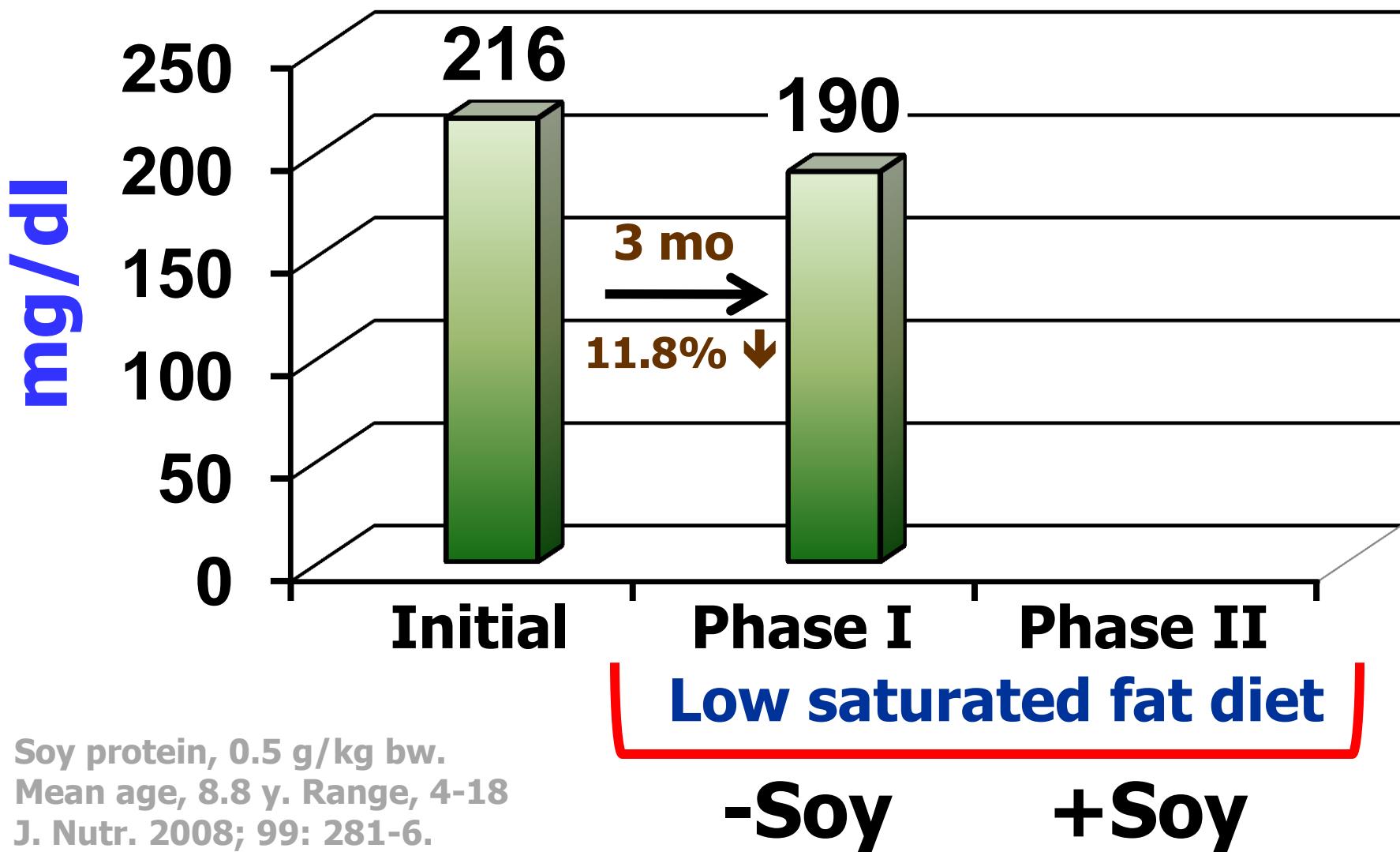
Details of Studies in Children Showing Soy Protein Lowers Blood Cholesterol

Author	Country	Duration (weeks)	(N)	Age (years)
Gaddy	Italy	18	16	3-12
Blumenschein	USA	?	20	5-12
Laurin	Canada	4	12	6-12
Widhalm	Austria	8	23	~9.3
Weghuber	Austria	12	16	~8.8
Kreissl	Austria	78	10	~10.1

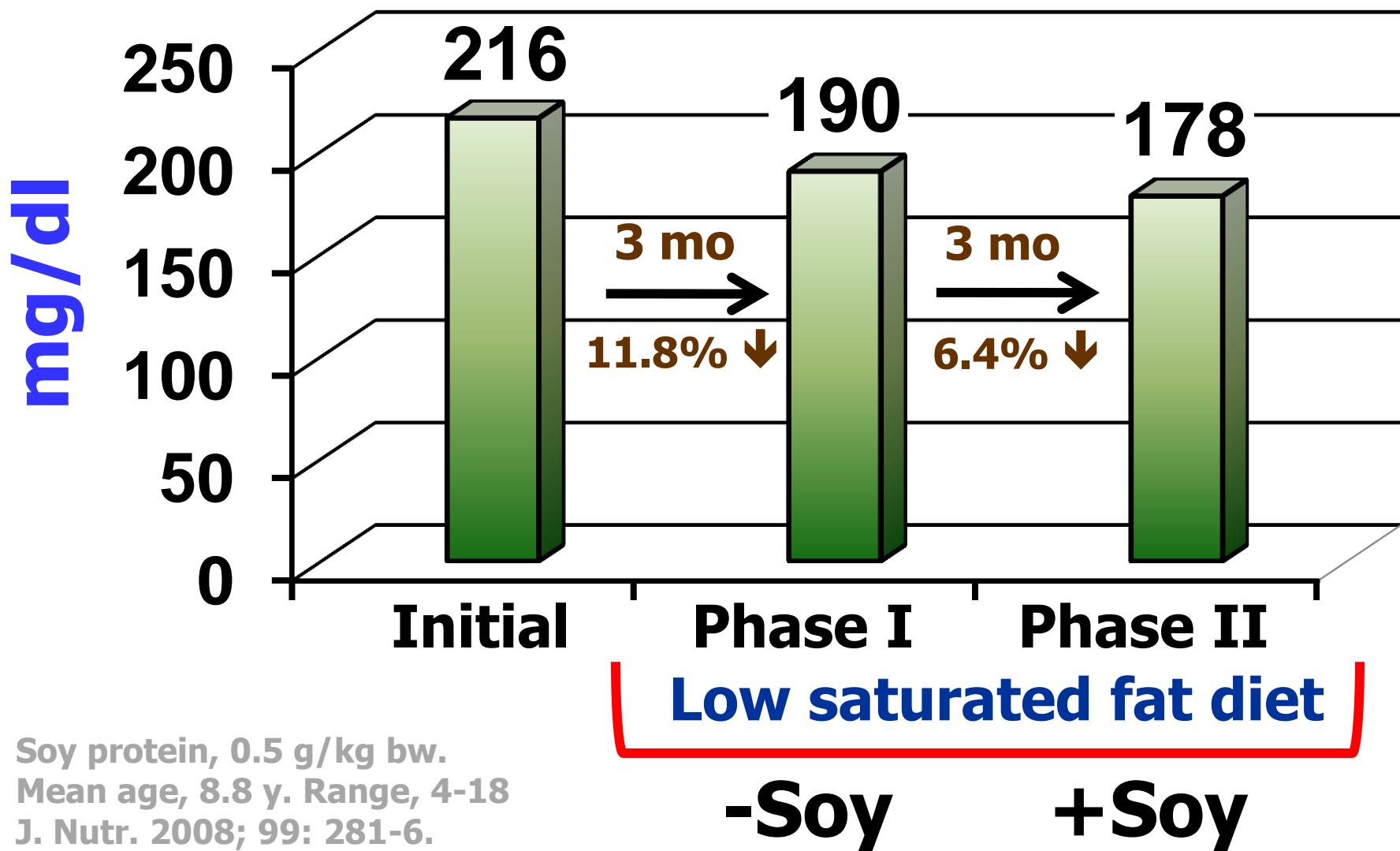
Effects of Soy Protein on LDLC in Hypercholesterolemic Children (N = 16)



Effects of Soy Protein on LDLC in Hypercholesterolemic Children (N = 16)



Effects of Soy Protein on LDLC in Hypercholesterolemic Children (N = 16)



Soy and Blood Pressure: Meta-analyses of Clinical Trials



27 studies

11 studies

2.2 mm ↓ SBP

1.4 mm ↓ DBP

BJN 106:317, 2011

2.5 mm ↓ SBP

1.5 mm ↓ DBP

Nutr Metab CVD 22:463, 2012

Soy, Blood Pressure and Cardiovascular Disease



J Hypertens Suppl 23, S3–S8., 2005

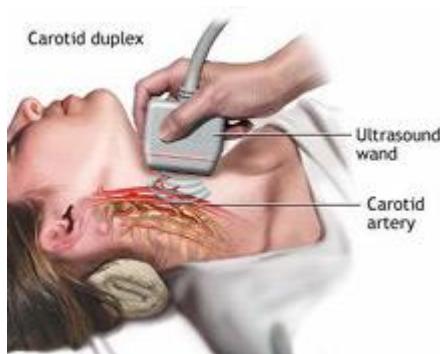
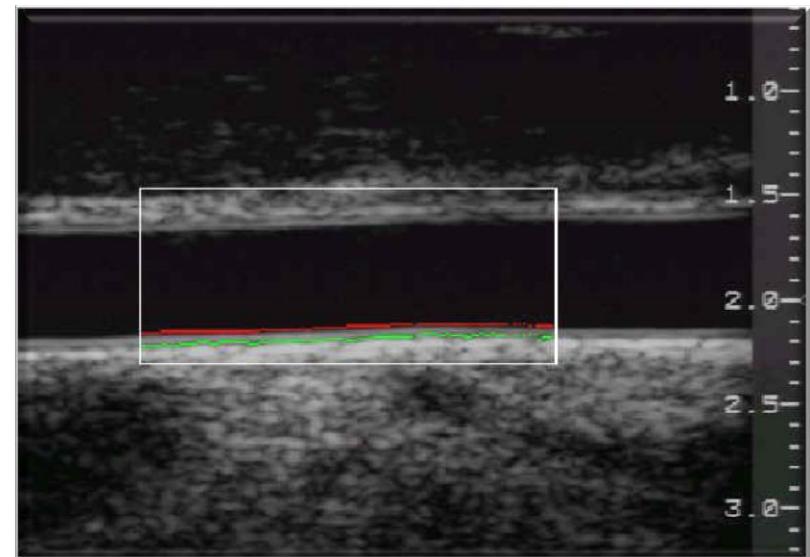
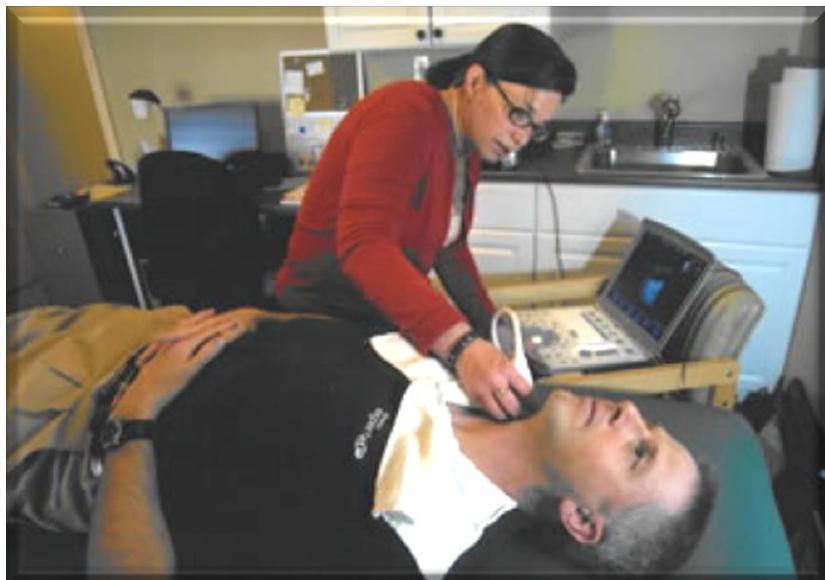
- ↓ 2.5 mm Hg SBP
 - ↓ 1.5 mm Hg DBP
- ↓
- ↓ 10% stroke
 - ↓ 5% CHD
 - ↓ 4% mortality



No studies have evaluated the hypotensive effects of soy protein in children



Carotid Intima-Media Thickness



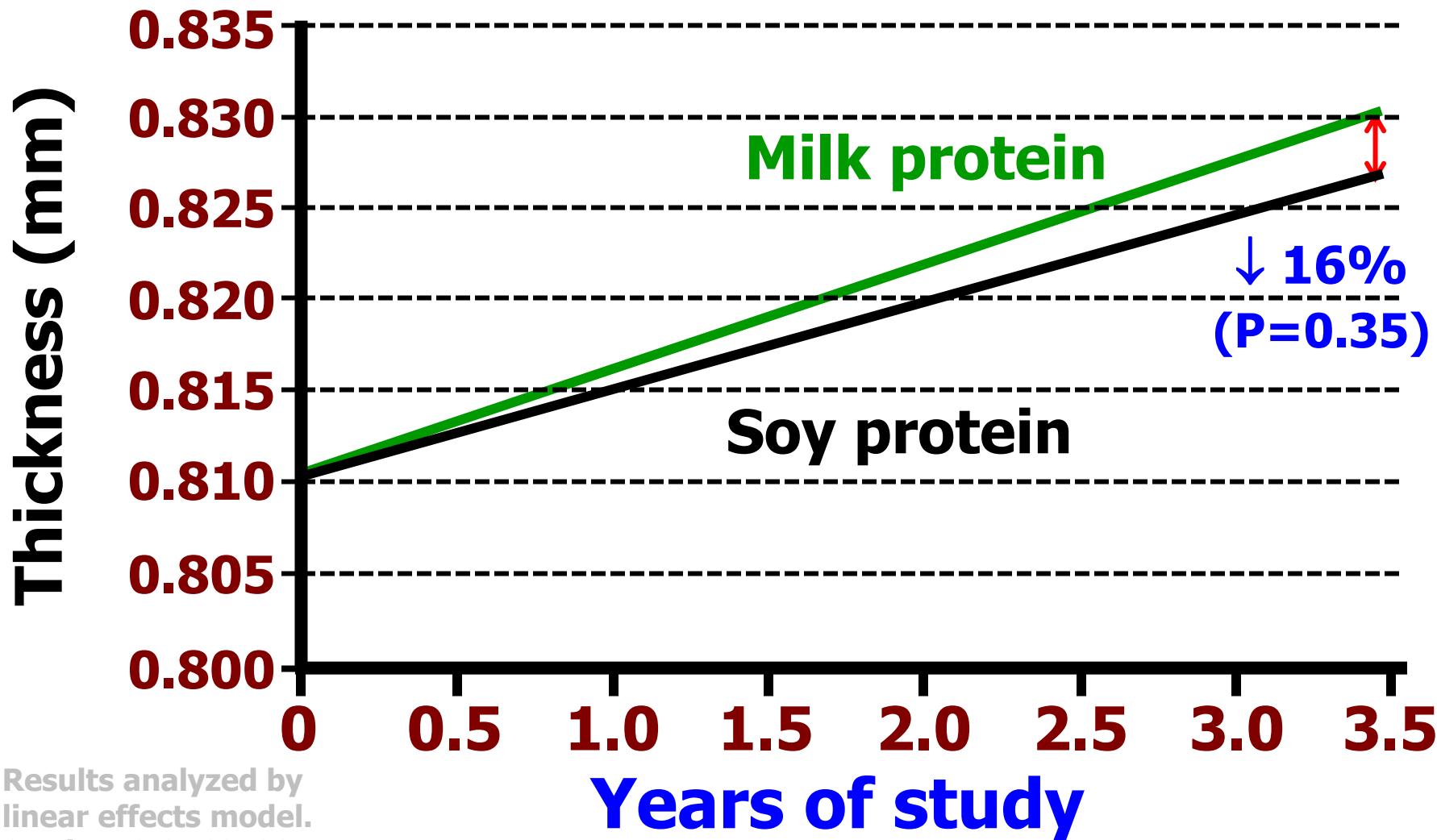
Measurement
of the thickness
of the artery wall

Progression predicts coronary events

Soy and Arterial Wall Thickness: A Randomized Controlled Trial

- **350 postmenopausal women**
- **3 year study**
- **Age: average, 60.9 years**
- **Diets**
 - Milk protein (**25 grams per day**)
 - Soy protein (**25 grams, 91 mg isofl.**)

Carotid artery intima-media thickness progression rates



Carotid Artery Intima-Media Thickness Progression Rates¹ in the Soy Compared to the Milk Group

Group	% decrease
All	16
Age (years)	
50-55	
55-60	
>60	

¹µm/year ²p=0.05 (analyzed by linear mixed effects model
adjusted for CIMT randomization strata Stroke 42: 3168, 2011

Carotid Artery Intima-Media Thickness Progression Rates¹ in the Soy Compared to the Milk Group

Group	% decrease
All	16
Age (years)	
50-55	68 ²
55-60	17
>60	9

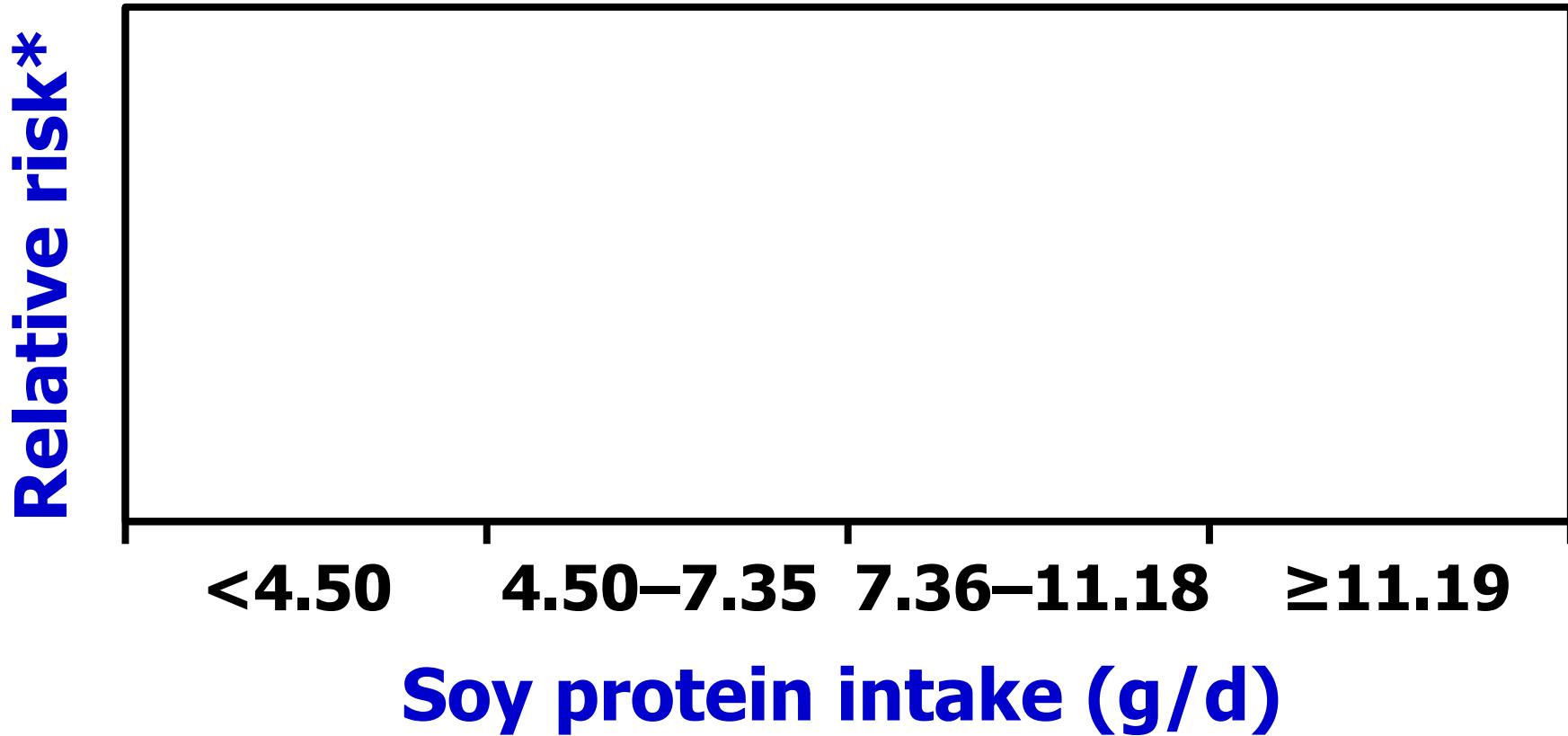
¹µm/year ²p=0.05 (analyzed by linear mixed effects model adjusted for CIMT randomization strata Stroke 42: 3168, 2011

Prospective Epidemiologic Data



**Soyfoods
and
Coronary
Events**

CHD Risk and Soy Protein Intake among Shanghai Women (40-70 y)

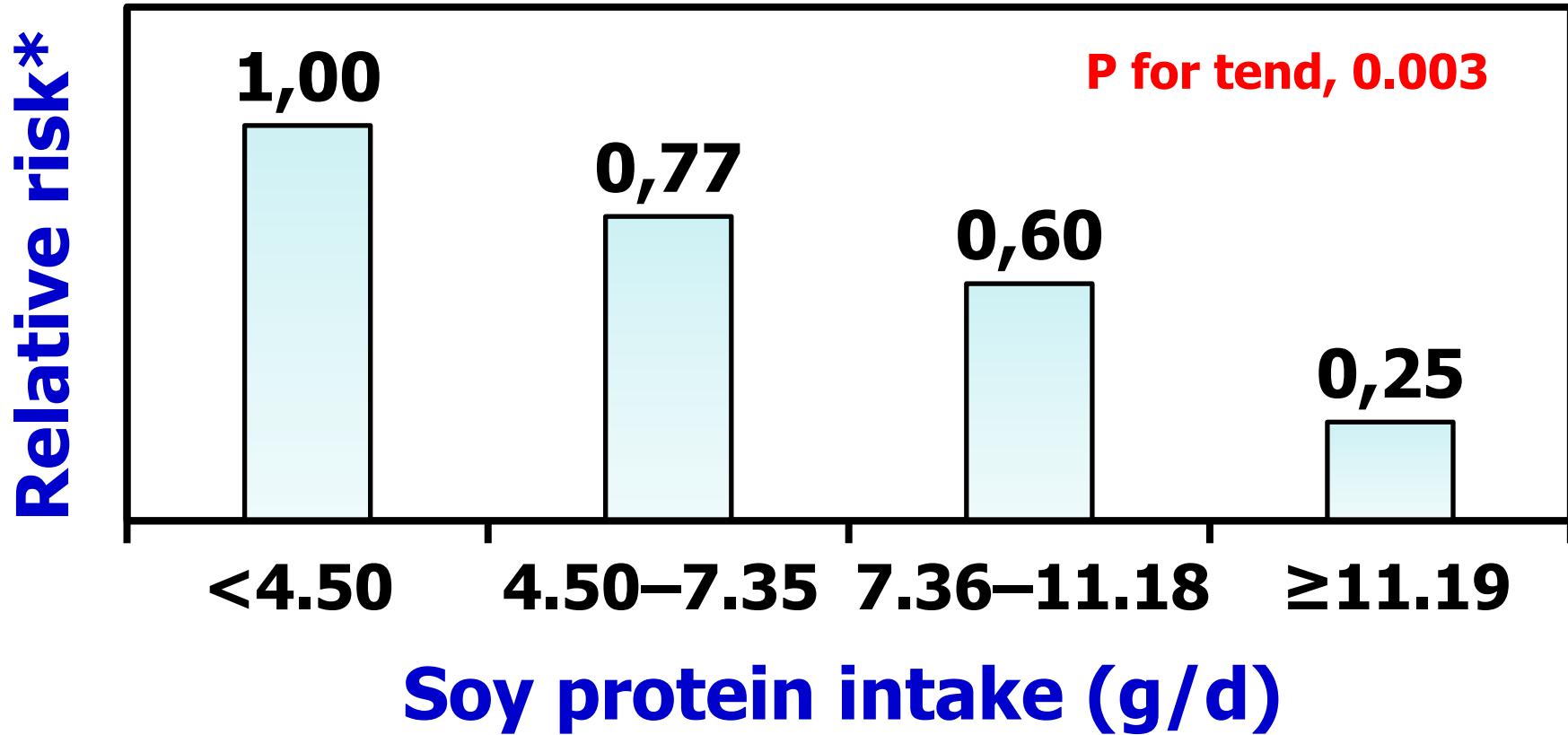


*adjusted for 15 variables

J Nutr. 133: 2874, 2003.

**N = ~75,000, 2.5 year follow up
62 cases (43 nonfatal MI, 19 fatal)**

CHD Risk and Soy Protein Intake among Shanghai Women (40-70 y)

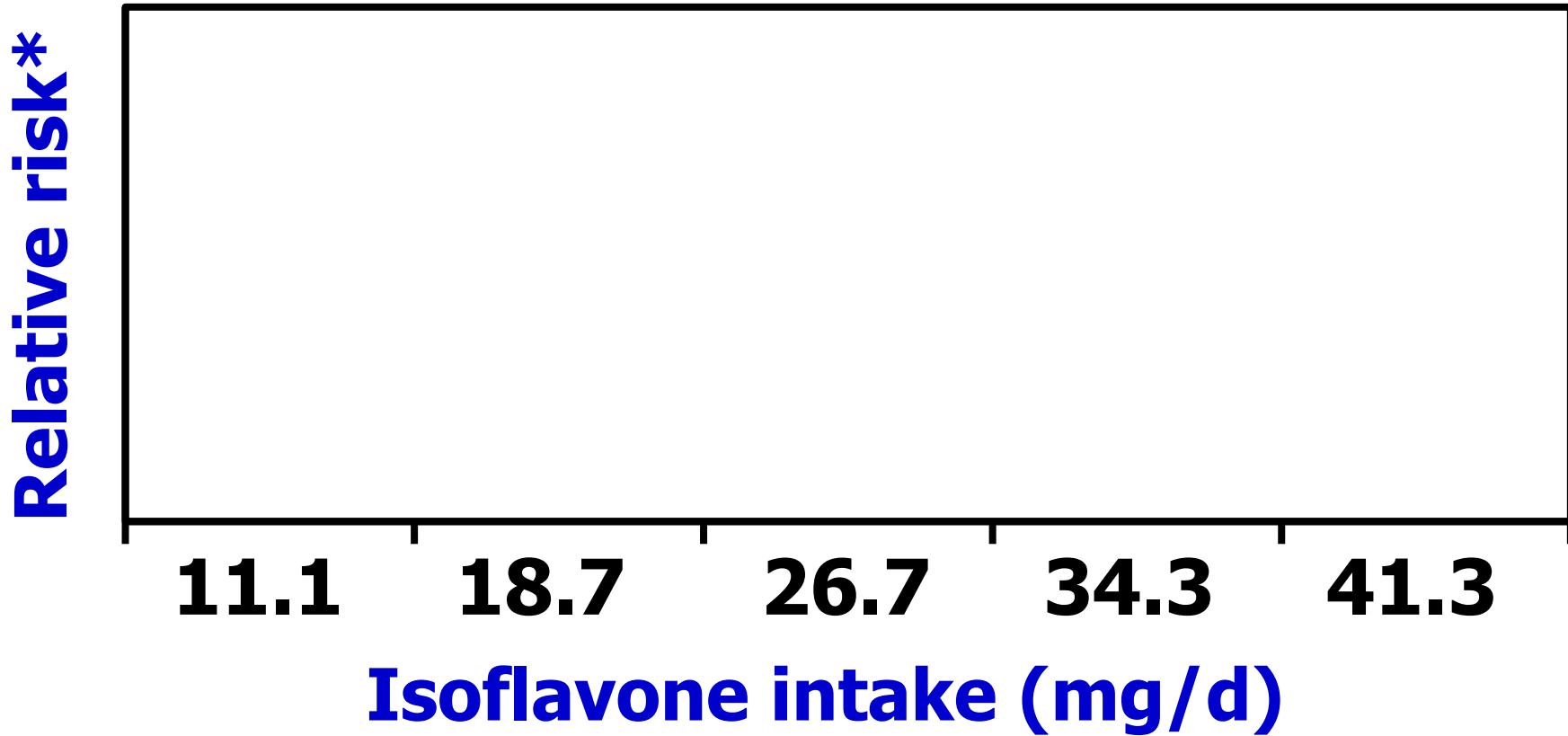


*adjusted for 15 variables

J Nutr. 133: 2874, 2003.

**N = ~75,000, 2.5 year follow up
62 cases (43 nonfatal MI, 19 fatal)**

CHD Risk and Isoflavone Intake among Japanese Women (40-59 y)

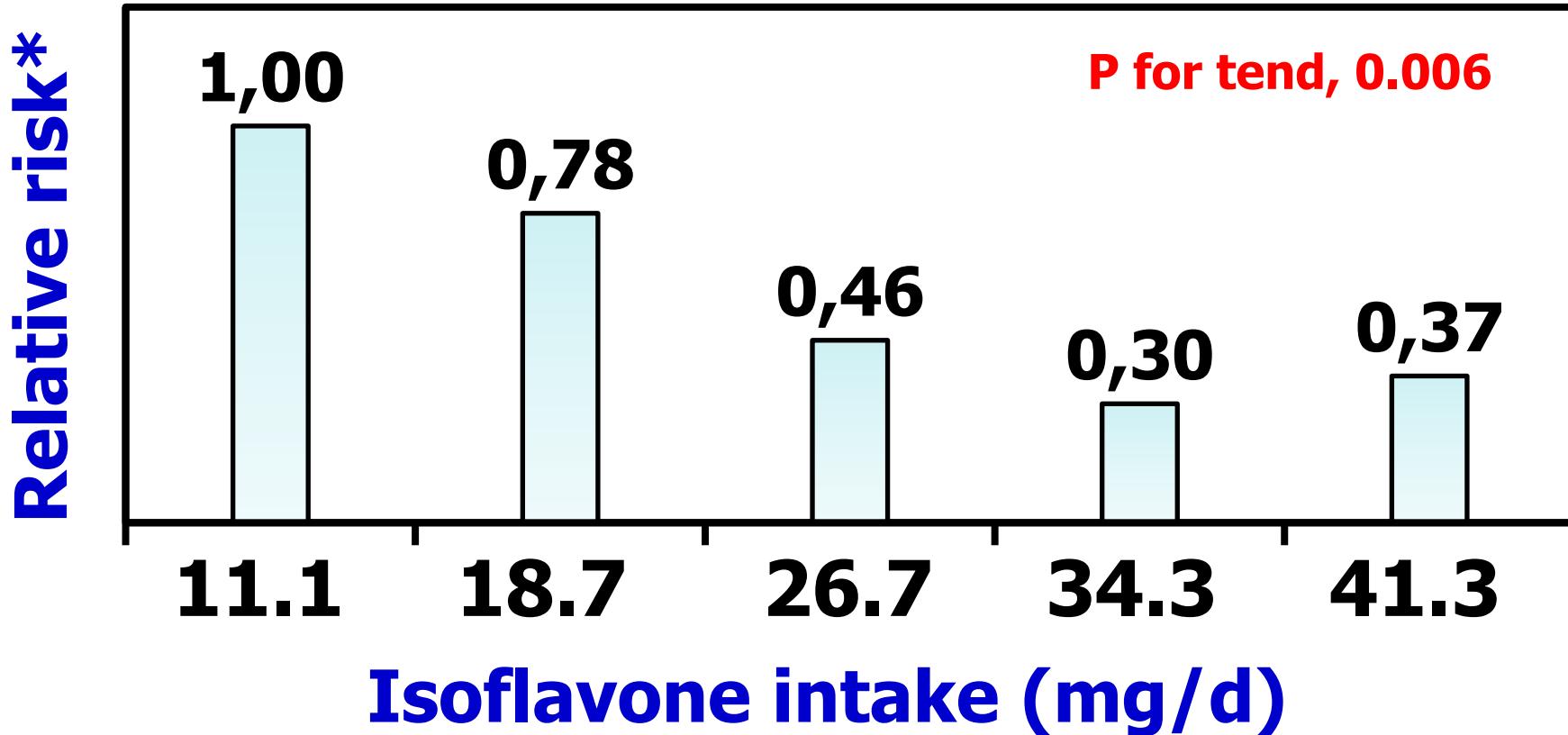


*adjusted for 17 variables

Circulation. 2007;116:2553-2562

**N = ~20,984, 13 year follow up
66 cases (nonfatal and fatal)**

CHD Risk and Isoflavone Intake among Japanese Women (40-59 y)

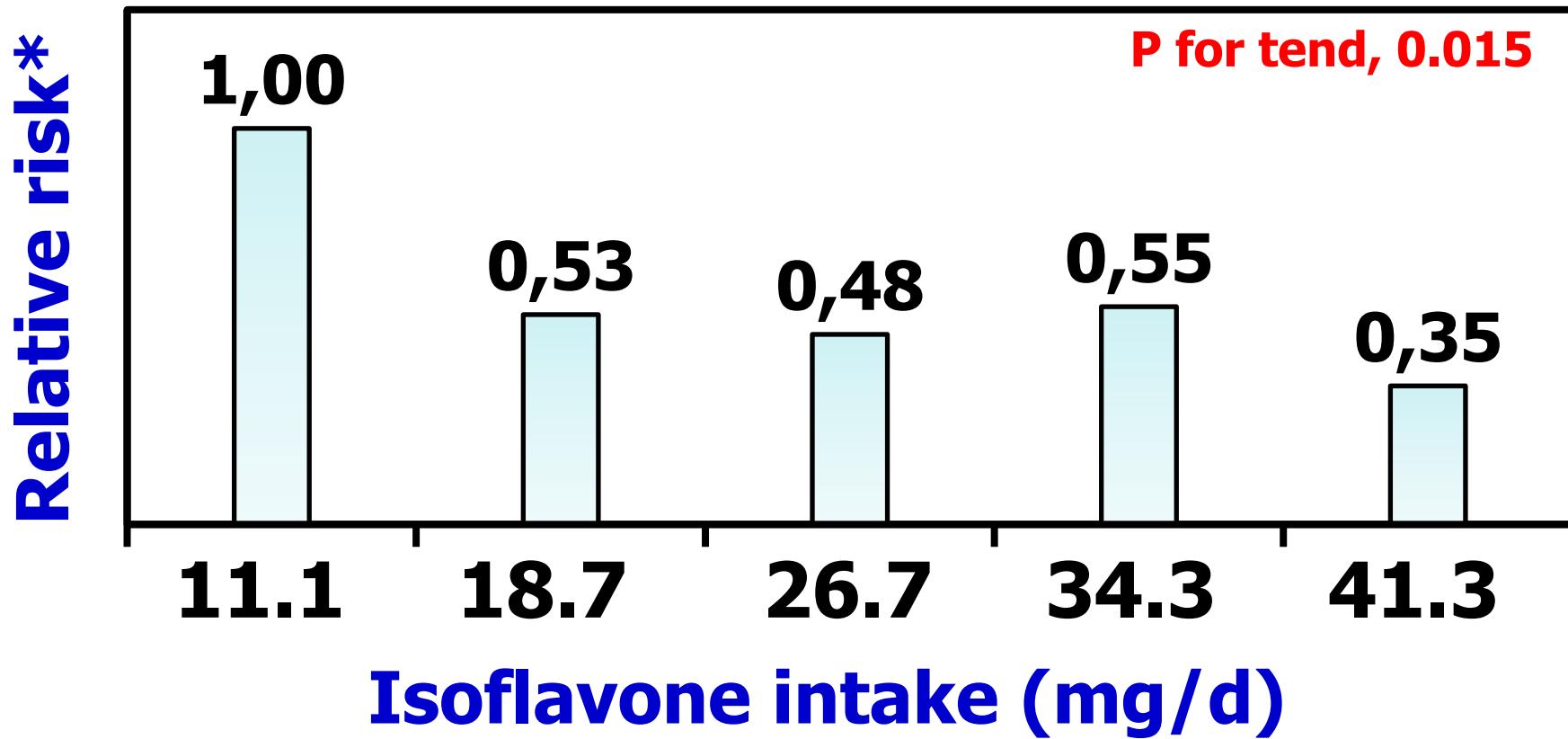


*adjusted for 17 variables

Circulation. 2007;116:2553-2562

N = ~20,984, 13 year follow up
66 cases (nonfatal and fatal)

Stroke Risk & Isoflavone Intake (mg/d) among Japanese Women (40-59 y)



*adjusted for 17 variables

Circulation. 2007;116:2553-2562

**N = ~20,984, 13 year follow up
120 cases (nonfatal and fatal)**

Suggested Intakes

- Children
1 serving/d
- Adults (general)
2 servings/d
- Heart health
2 – 4 servings/d

**1 serving = 1 cup (250 ml) soymilk,
100 g tofu, 28 g soybeans**



**Gracias por
su atención**



markjohnmessina@gmail.com