

# Frutta e verdura

## Cardini della Dieta Mediterranea

### Fabio Galvano



# Struttura della presentazione

## Effetti benefici dell'intake di Frutta e Verdure

- Evidenze indirette: Dieta Mediterranea
- Evidenze dirette
- Meccanismi protettivi
- Frutta e Verdure vs Integratori
- Frutta e Verdure vs Residui Fitofarmaci

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## The Mediterranean and Dietary Approaches to Stop Hypertension (DASH) diets and colorectal cancer.

**OBJECTIVE:** The objective was to **prospectively** assess the association between the Alternate Mediterranean Diet (aMed) and the DASH-style diet scores and risk of colorectal cancer in middle-aged men and women.

**DESIGN:** A total of **87,256 women and 45,490 men** (age 30-55 y for women and 40-75 y for men at baseline) without a history of cancer were **followed for  $\leq 26$  y.**

### CONCLUSION

Adherence to the DASH diet (which involves higher intakes of whole grains, **fruit and vegetables**; moderate amounts of low-fat dairy; and lower amounts of red or processed meats, desserts, and sweetened beverages) was associated with a lower risk of colorectal cancer.

# A protective effect of the Mediterranean diet for cutaneous melanoma.

**METHODS:** A hospital-based case-control study was conducted in the inpatient wards of IDI-San Carlo Rome, Italy including 304 incident cases of cutaneous melanoma and 305 controls, frequency matched to cases.

**RESULTS:** After careful control for several sun exposure and pigmentary characteristics, we found a protective effect for weekly consumption of fish (OR, 0.65, 95%CI = 0.43-0.97), shellfish (OR, 0.53, 95%CI = 0.31-0.89), fish rich in n-3 fatty acids (OR, 0.52, 95%CI = 0.34-0.78), daily tea drinking (OR, 0.42, 95%CI, 0.18-0.95; P(trend) = 0.025) and high consumption of vegetables (OR, 0.50, 95%CI = 0.31-0.80, P(trend) = 0.005) in particular carrots, cruciferous and leafy vegetables and fruits (OR, 0.54, 95%CI = 0.33-0.86, P(trend) = 0.013), in particular citrus fruits. No association was found for alcohol consumption and any other food items.

**CONCLUSION:** Overall, our findings suggest that some dietary factors present in the Mediterranean diet might protect from cutaneous melanoma.



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## Critical review: vegetables and fruit in the prevention of chronic diseases

**Table 3** Summary of the strength of evidence on the association between the consumption of vegetables and fruit and the risk of chronic diseases

	Evidence judgement (strength of the evidence)			
	Convincing	Probable	Possible	Insufficient
Obesity		o <sup>a</sup>	↓ <sup>b</sup>	
Type 2 diabetes mellitus		o		
Hypertension	↓			
Coronary heart disease (CHD)	↓			
Stroke	↓			
Cancer		↓		
Chronic inflammatory bowel diseases				~
Rheumatoid arthritis (RA)			↓	
Chronic obstructive pulmonary disease (COPD)			↓	
Asthma			↓	
Osteoporosis			↓	
Eye diseases			↓	
Macular degeneration			↓	
Cataract			↓	
Glaucoma				~
Diabetic retinopathy				~
Dementia			↓	

↓ Risk reduction by increased vegetable and fruit consumption, o no association, ~ insufficient evidence

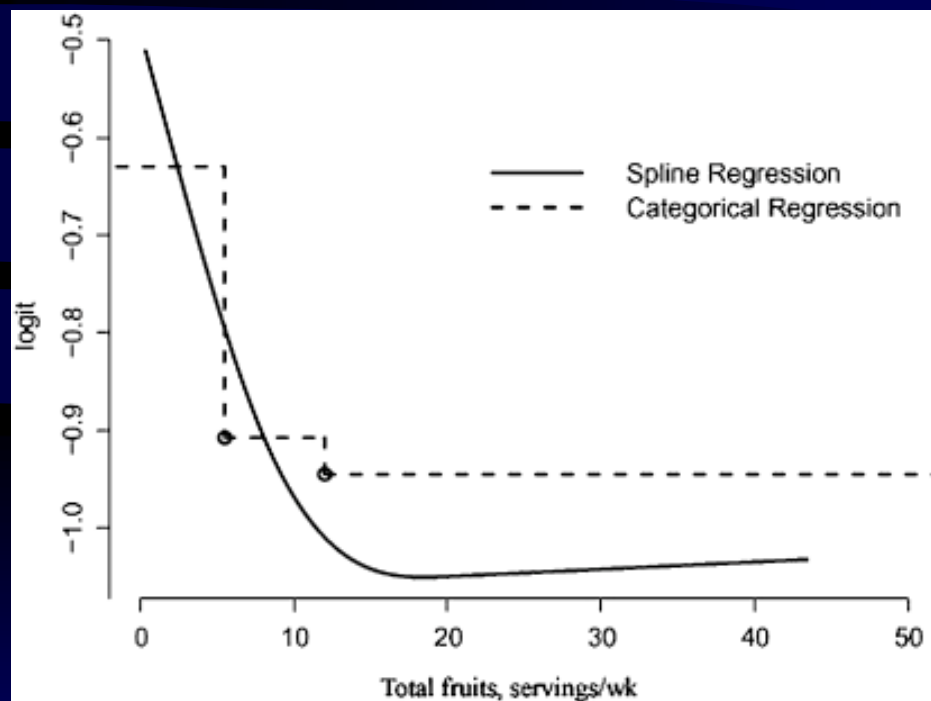
<sup>a</sup> Weight loss

<sup>b</sup> Weight increase



# Fruit and Vegetable Intakes Are Associated with Lower Risk of Colorectal Adenomas<sup>1-3</sup>

Huiyun Wu,<sup>4</sup> Qi Dai,<sup>5-8</sup> Martha J. Shrubsole,<sup>5-8</sup> Reid M. Ness,<sup>7-9</sup> David Schlundt,<sup>7-9</sup> Walter E. Smalley,<sup>5,7</sup> Heidi Chen,<sup>4</sup> Ming Li,<sup>4</sup> Yu Shyr,<sup>4</sup> and Wei Zheng<sup>5-8\*</sup>





# Studio Epic-Interact

Range (g/day)	Quartiles of intake				P for trend
	Q1	Q2	Q3	Q4	
<i>Total fruit and vegetables</i>					
Range (g/day)	<235.7	≥ 235.7–<369.1	≥ 369.1–<544.8	≥ 544.8	
Total no. of cases	3031	2632	2545	2613	
Model A <sup>a</sup>	1.00	0.89 (0.81–0.97)	0.87 (0.80–0.95)	0.84 (0.73–0.96)	0.05
Model B <sup>b</sup>	1.00	0.92 (0.83–1.03)	0.93 (0.84–1.03)	0.90 (0.80–1.01)	0.42
<i>Total fruit<sup>c</sup></i>					
Range (g/day)	<103.7	≥ 103.7–<193.4	≥ 193.4–<315.9	≥ 315.9	
Total no. of cases	2989	2695	2521	2616	
Model A <sup>a</sup>	1.00	0.91 (0.85–0.98)	0.88 (0.78–0.99)	0.87 (0.80–0.96)	0.01
Model B <sup>b</sup>	1.00	0.92 (0.83–1.03)	0.94 (0.83–1.05)	0.89 (0.76–1.04)	0.30

\* Significativo

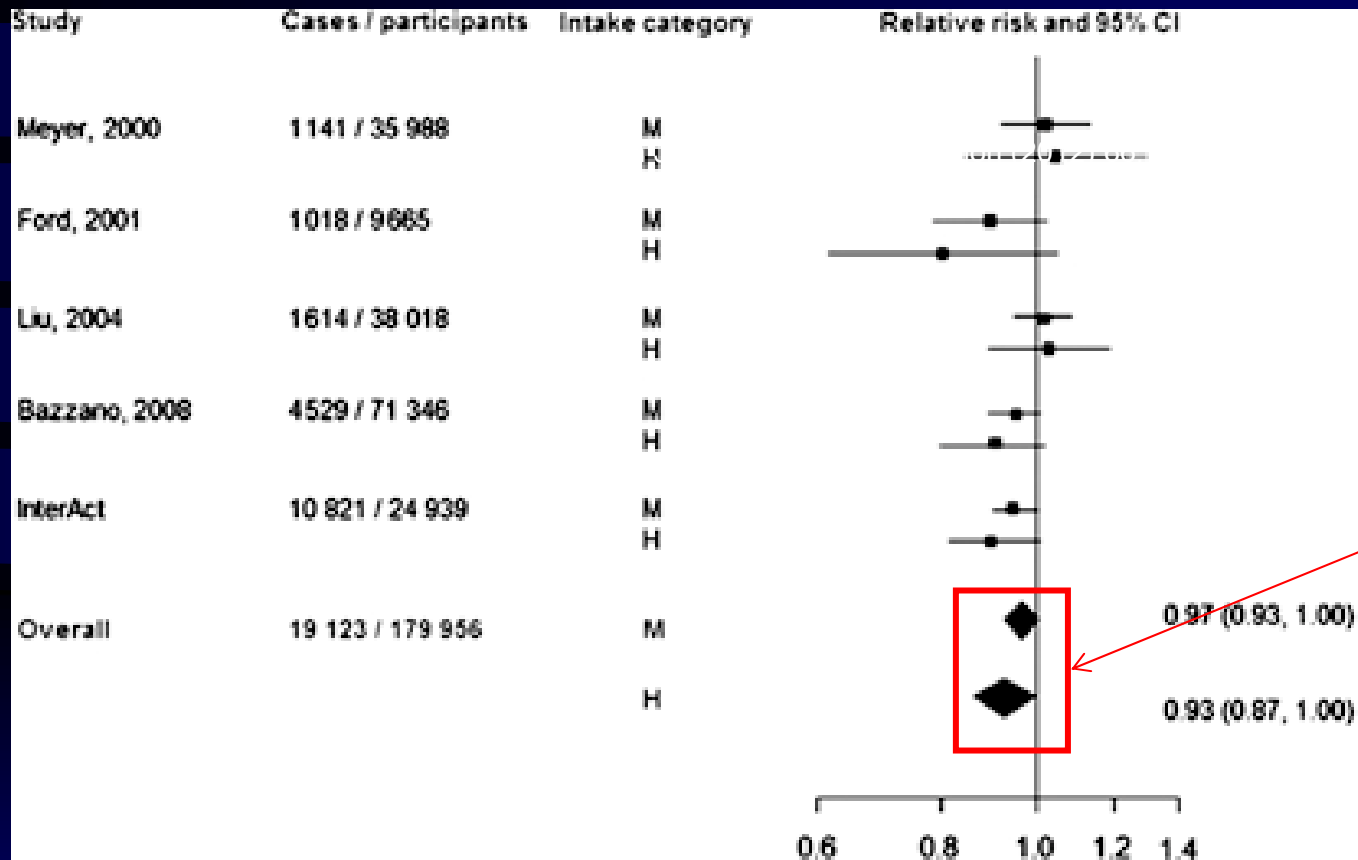
Non significativo dopo correzione per BMI, Alcol, Attività fisica, etc.

## Analisi sottogruppi

<b>Green leafy vegetables<sup>d</sup></b>					
Range (g/day)	<3.2	≥ 3.2–<14.1	≥ 14.1–<37.7	≥ 37.7	
Total no. of cases	1274	2182	2241	2529	
Model A <sup>a</sup>	1.00	0.74 (0.65–0.84)	0.66 (0.58–0.75)	0.79 (0.68–0.92)	0.04
Model B <sup>b</sup>	1.00	0.74 (0.65–0.84)	0.75 (0.65–0.86)	0.84 (0.65–1.07)	0.03

\* Vegetali a foglia verde unico sottogruppo a mantenere la significatività

## Metanalisi Intake di FV e riduzione del rischio relativo di DMT2



Maggiore il consumo, minore il rischio

Relative risk of type 2 diabetes for the middle and highest estimated intake categories of fruit and vegetables vs the reference intake category: meta-analysis results. M, medium category relative to the reference category, H, high category relative to the reference category.

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# Dieta mediterranea, sindrome metabolica ed obesità: quale meccanismo protettivo?

Journal of Nutritional Biochemistry 18 (2007) 149–160

REVIEWS: CURRENT TOPICS

Protective mechanisms of the Mediterranean diet in obesity and type 2 diabetes

Helmut Schröder\*

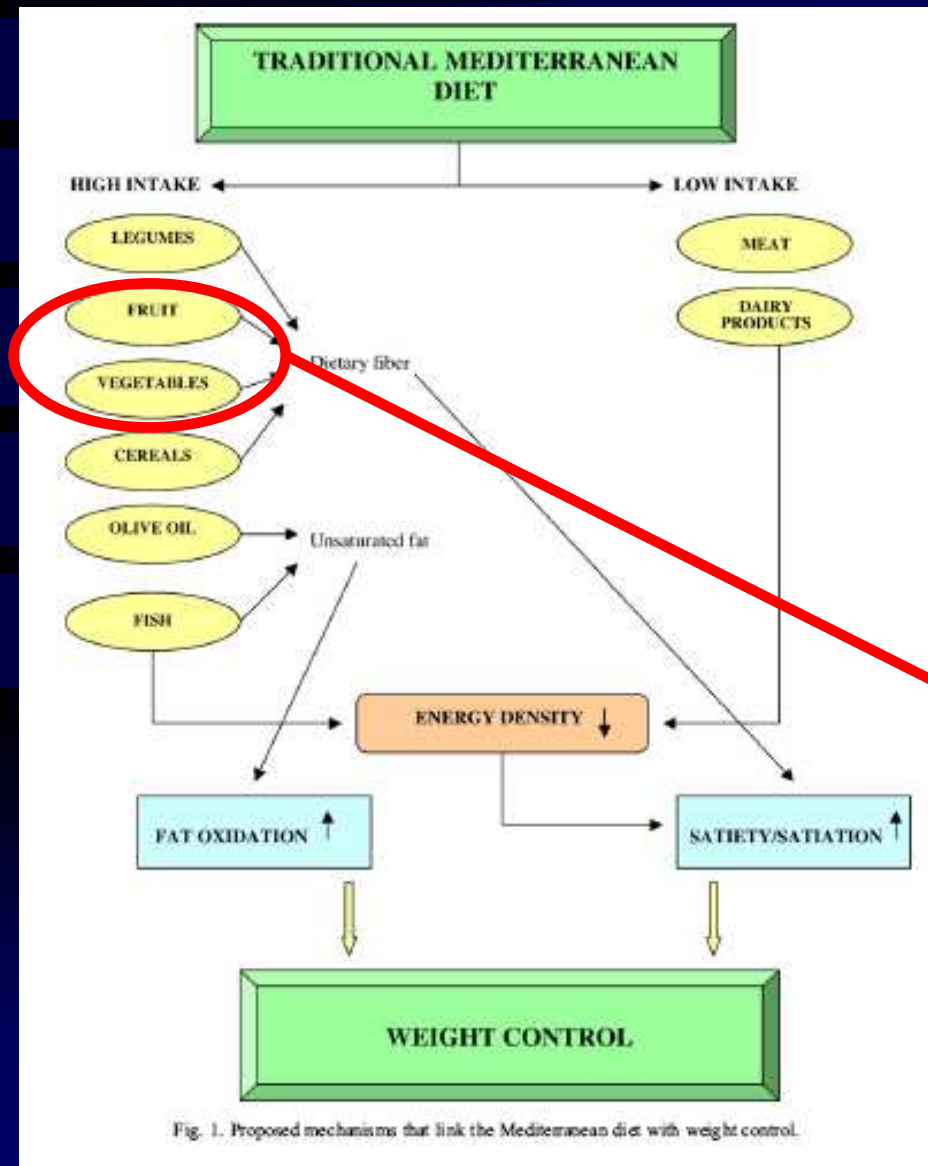


Fig. 1. Proposed mechanisms that link the Mediterranean diet with weight control.

↓ Densità calorica

↑ Fibre

# F&V: Protection Mechanism ?



European Heart Journal (2011) 32, 1235–1243  
doi:10.1093/eurheartj/ehq465

**CLINICAL RESEARCH**  
*Prevention and epidemiology*

**Fruit and vegetable intake and mortality from ischaemic heart disease: results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study**

## CONCLUSION

Results from this large observational study suggest that a higher intake of fruits and vegetables is associated with a reduced risk of IHD mortality

Whether this association is causal and, if so, the biological mechanism(s) by which fruits and vegetables operate to lower IHD risks remains unclear



Crowe F et al. EAJ 2011 32:1235-43

# F&V: Protection Mechanism ?

## Proprietà antiossidanti dei Polifenoli

### Problemi metodologici

- Esiste un test universale valido per il RedOx negli alimenti?
- .....e nel sangue e/o nei tessuti?

*British Journal of Nutrition* (2008), **99**, E-Suppl. 1, ES3–ES52  
© The Authors 2008

doi:10.1017/S0007114508965752

### **Use of conventional and -omics based methods for health claims of dietary antioxidants: a critical overview**

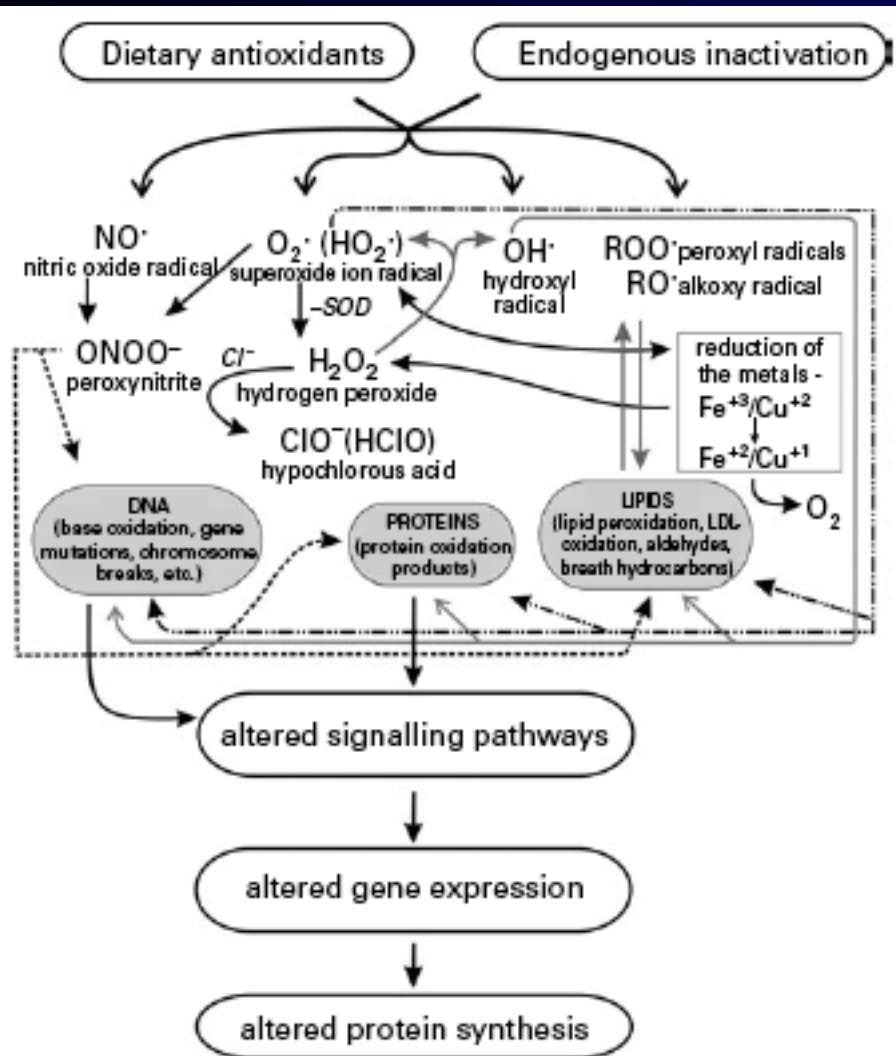
Siegfried Knasmüller<sup>1\*</sup>†, Armen Nersesyan<sup>1</sup>†, Miroslav Mišík<sup>1</sup>, Christopher Gerner<sup>1</sup>, Wolfgang Mikulits<sup>1</sup>, Veronika Ehrlich<sup>1</sup>, Christine Hoelzl<sup>1</sup>, Akos Szakmary<sup>1</sup> and Karl-Heinz Wagner<sup>2</sup>



# F&V: Protection Mechanism ?

## Proprietà biologiche dei Polifenoli

### Solo antiossidanti?



ROS/RNS



Substrati



Epigenetica



# F&V: Protection Mechanism ?

## Proprietà biologiche dei Polifenoli

### Solo antiossidanti?

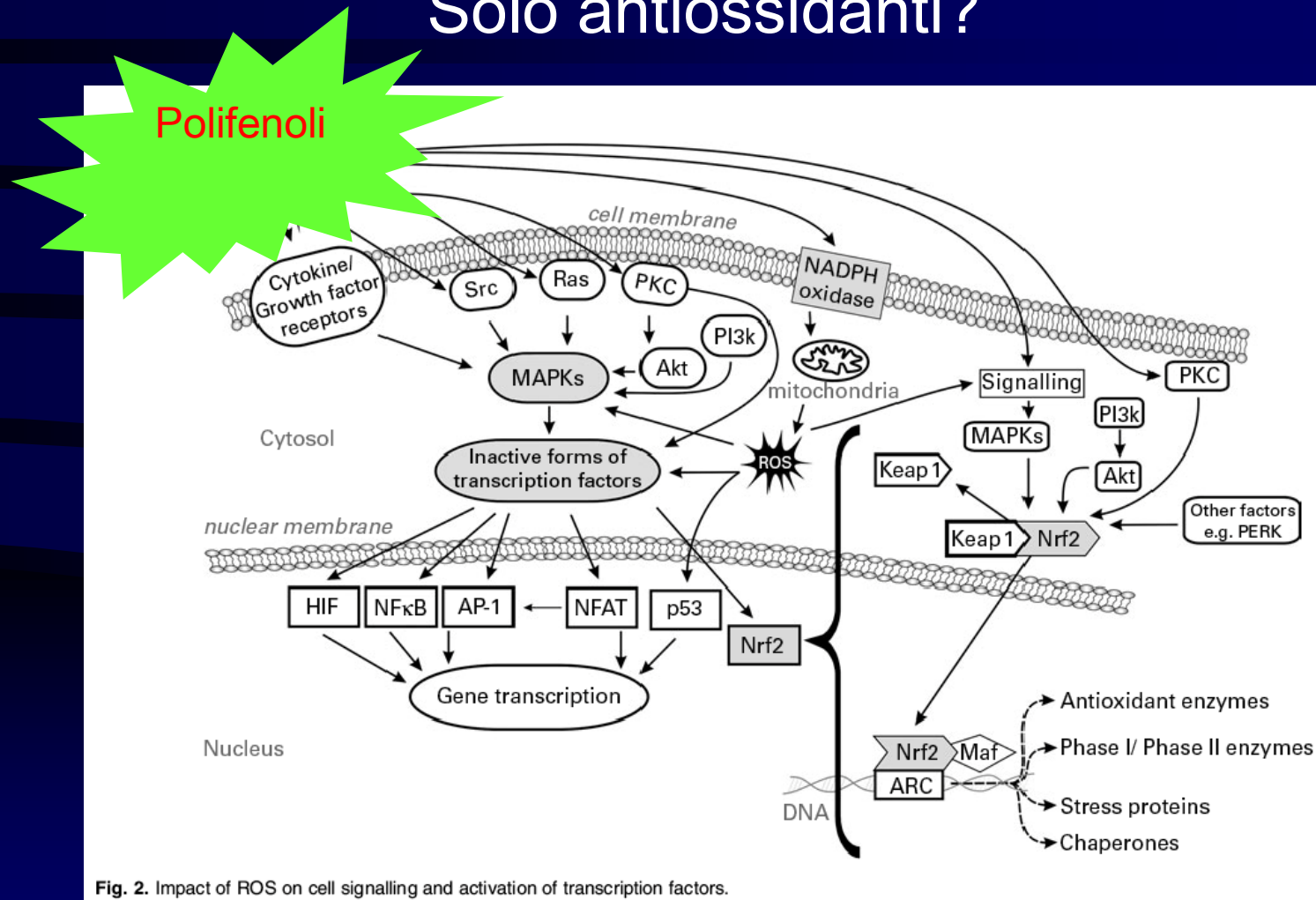


Fig. 2. Impact of ROS on cell signalling and activation of transcription factors.

Impact of ROS on cell signalling and activation of transcription factors.

# F&V: Protection Mechanism ?

*Nutrition and Cancer*, 62(3), 329–335  
Copyright © 2010, Taylor & Francis Group, LLC  
ISSN: 0163-5581 print / 1532-7914 online  
DOI: 10.1080/01635580903407106

## DNA Damage and Repair: Fruit and Vegetable Effects in a Feeding Trial

Epidemiologic studies have examined the association between fruit and vegetable (F&V) consumption and the risk of cancer. Several cancer-preventive mechanisms have been proposed, such as antioxidant properties and modulation of biotransformation enzyme activities; both may be associated with reducing DNA damage and hence the mutation rate. We investigated, in a randomized, controlled, crossover feeding trial, the effect of 10 servings/day of botanically defined F&V for 2 wk on endogenous DNA damage; resistance to  $\gamma$ -irradiation damage; and DNA repair capacity in lymphocytes, measured by the Comet assay. We also explored the association between the UGT1A1\*28 polymorphism and serum bilirubin concentrations and DNA damage and repair measures. Healthy men ( $n = 11$ ) and women ( $n = 17$ ), age 20 to 40 yr, provided blood samples at the end of each feeding period. Overall, F&V did not affect DNA damage and repair measures in lymphocytes. The number of UGT1A1\*28 alleles was inversely associated with sensitivity to  $\gamma$ -irradiation exposure and DNA repair capacity, but a biological mechanism to explain this association is unclear. A larger sample size is needed to investigate the association between bilirubin concentrations and endogenous DNA damage. With inconsistent findings in the literature, additional dietary intervention studies on the effect of F&V on DNA damage and repair are needed.



## The Mediterranean Diet Pattern and Its Main Components Are Associated with Lower Plasma Concentrations of Tumor Necrosis Factor Receptor 60 in Patients at High Risk for Cardiovascular Disease<sup>1-4</sup>

**TABLE 2** Concentrations of circulating inflammatory molecules at baseline and after 1 y in all participants by tertile of change in consumption of selected foods and nutrients<sup>1</sup>

	Δ Foods and Nutrients Tertiles			Repeated-measures ANOVA <sup>2</sup> Time x treatment	P value for differences <sup>3</sup>		
	1 (n = 131) (≤ -0.3)	2 (n = 125) (-0.3-24)	3 (n = 128) (≥24)		1 vs. 2	1 vs. 3	2 vs. 3
<b>Δ VOO consumption tertiles, g/d</b>							
TNFR60, μg/L							
Baseline	1.4 (1.2-1.5) <sup>b</sup>	1.4 (1.3-1.6) <sup>b</sup>	1.8 (1.6-2.0) <sup>a</sup>				
1 y	1.4 (1.3-1.6)	1.5 (1.3-1.7)	1.5 (1.4-1.7)*	0.002	1.00	0.008	0.005
Change	0 (-0.1-0.2)	0.1 (-0.03-0.2)	-0.3 (-0.5 to -0.1)				
<b>Δ Nut consumption tertiles, g/d</b>							
TNFR60, μg/L							
Baseline	1.6 (1.4-1.8)	1.5 (1.3-1.7)	1.5 (1.3-1.6)				
1 y	1.6 (1.5-1.8)	1.5 (1.4-1.7)	1.3 (1.2-1.5)	0.08	1.00	0.14	0.18
Change	0 (-0.1-0.2)	0 (-0.2-0.1)	-0.2 (-0.3 to -0.02)				
<b>Δ Vegetable consumption tertiles, g/d</b>							
TNFR60, μg/L							
Baseline	1.5 (1.3-1.7)	1.4 (1.3-1.6)	1.7 (1.5-1.9)				
1 y	1.6 (1.4-1.8)	1.4 (1.3-1.6)	1.5 (1.3-1.6)*	0.016	0.89	0.013	0.19
Change	0.1 (-0.1-0.2)	0 (-0.2-0.1)	-0.2 (-0.3 to -0.01)				
<b>Δ MUFA consumption tertiles, g/d</b>							
TNFR60, μg/L							
Baseline	1.4 (1.2-1.6)	1.4 (1.3-1.6)	1.8 (1.6-2.1)				
1 y	1.5 (1.3-1.7)	1.4 (1.3-1.6)	1.6 (1.4-1.8)	0.10	0.57	0.10	0.54
Change	0.1 (-0.1-0.3)	0 (-0.2-0.1)	-0.2 (-0.4 to -0.04)				
<b>Δ MD score tertiles</b>							
TNFR60, μg/L							
Baseline	6.6 (6.1-7.0)	6.1 (5.7-6.6)	6.5 (6.1-6.9)				
1 y	6.6 (6.2-7.0) <sup>a</sup>	6.4 (6.0-6.8) <sup>a,b</sup>	5.9 (5.5-6.3) <sup>a,b</sup>	0.006	1.00	0.07	0.006
Change	0 (-0.5-0.7)	0.3 (-0.4-0.7)	-0.6 (-1.2 to -0.3)				

Elevato Intake di vegetali (3° tertile di consumo) associato con riduzione di TNFR

# F&V: Protection Mechanism ?

## Proprietà biologiche dei polifenoli alimentari

### Problemi metodologici

- Modesta biodisponibilità sistemica dovuta a bassi livelli plasmatici
- Identificazione dei metaboliti attivi
  - Es. Antocianine vs Acido Protocatecuico

## **Protocatechuic Acid Is the Major Human Metabolite of Cyanidin-Glucosides<sup>1-3</sup>**

Paola Vitaglione,<sup>4\*</sup> Giovanna Donnarumma,<sup>4</sup> Aurora Napolitano,<sup>4</sup> Fabio Galvano,<sup>5</sup> Assunta Gallo,<sup>6</sup> Luca Scalfi,<sup>4</sup> and Vincenzo Fogliano<sup>4</sup>

J. Nutr. 137: 2043–2048, 2007.

# F&V: Protection Mechanism ?



Evidenze più robuste: Tumore del Colon-retto

## ➤ Effetti delle fibre

- Aumento velocità di transito
- Azione sequestrante di molecole cancerogene
- Funzione prebiotica

## ➤ Effetti dei folati

## ➤ Effetti dei polifenoli

- Biodisponibilità in situ elevata 
- Formazione in sito di metaboliti attivi
  - Es. Antocianine  Acido Protocatecuico



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ra" spetta alla Danimarca

è tra le migliori in Europa perché la dieta mediterranea ricca di fibre, verdura, frutta, olio d'oliva, pesce, poca carne, è protettiva, al contrario dell'Europa centrale, in particolare in Danimarca, dove si registra

proteggono, mentre cattiva dieta, sovrappeso e obesità sono responsabili di un tumore su tre. Il consumo eccessivo di cibi grassi, salati, alla griglia, di dolci, zuccheri e b i -

grate, il pesce azzurro ricco di acidi grassi

Castellanza (va)

© RIPRODUZIONE RISERVATA

## UN POSSIBILE MENU DELLA GIORNATA

Principali elementi

ti chemiopreventivi



la Repubblica

MARTEDÌ 27 APRILE 2010

28

## SALUTE IN PRIMO PIANO

**Una dieta appropriata può far calare di un terzo la mortalità per cancro**

*Lo dicono numerosi studi. Per questo abbiamo chiesto a uno specialista*

*di parlarci di "nutraceutica", la scienza che studia gli alimenti*

*benefici e protettivi, e dunque di aiutarci a capire cosa mangiare e cosa no*



Per saperne di più

# Cibo & tumori

ACIDO ELLAGICO

Nelle fragole, è antiossidante

nei processi di protezione delle cellule

Nell'uva rossa e nella mela, sono antiossidanti

Previene neoplasie intestinali

Slides realizzate da Andrea Ghiselli, INRAN!



# Antiossidanti e longevità

## Mortality in Randomized Trials of Antioxidant Supplements for Primary and Secondary Prevention. Systematic Review and Meta-analysis.

**Data Sources and Trial Selection** All randomized trials involving adults comparing *beta carotene, vitamin A, vitamin C, vitamin E, and selenium either singly or combined* vs placebo or vs no intervention were included in our analysis.

In low-bias risk trials, after exclusion of selenium trials, beta carotene (RR, 1.07;95% CI, 1.02-1.11), vitamin A (RR, 1.16; 95% CI, 1.10-1.24), and vitamin E (RR, 1.04;95% CI, 1.01-1.07), singly or combined, significantly increased mortality. Vitamin C and selenium had no significant effect on mortality.

### Conclusions

*Treatment with beta carotene, vitamin A, and vitamin E may increase mortality. The potential roles of vitamin C and selenium on mortality need further study.*

# Integratori e Tumori

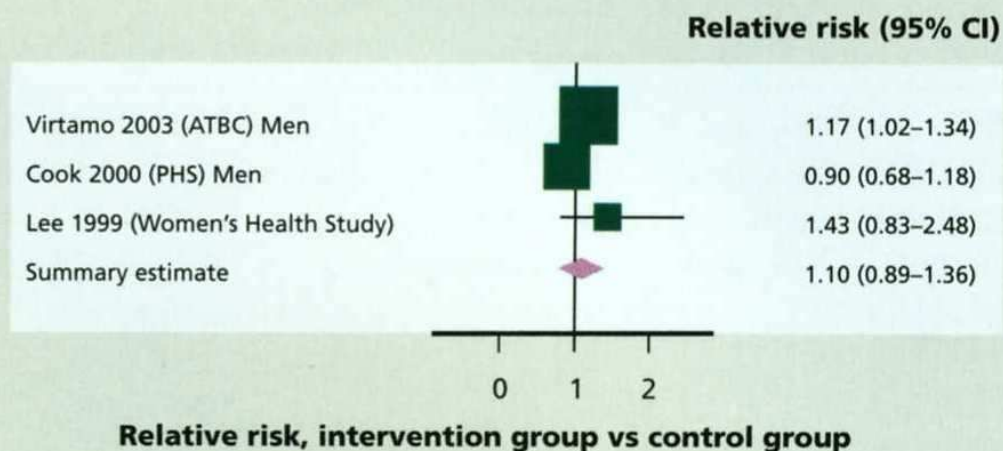


**Food, Nutrition,  
Physical Activity,  
and the Prevention  
of Cancer:**  
a Global Perspective

# Beta-carotene e tumore del polmone

**Figure 4.10.1**

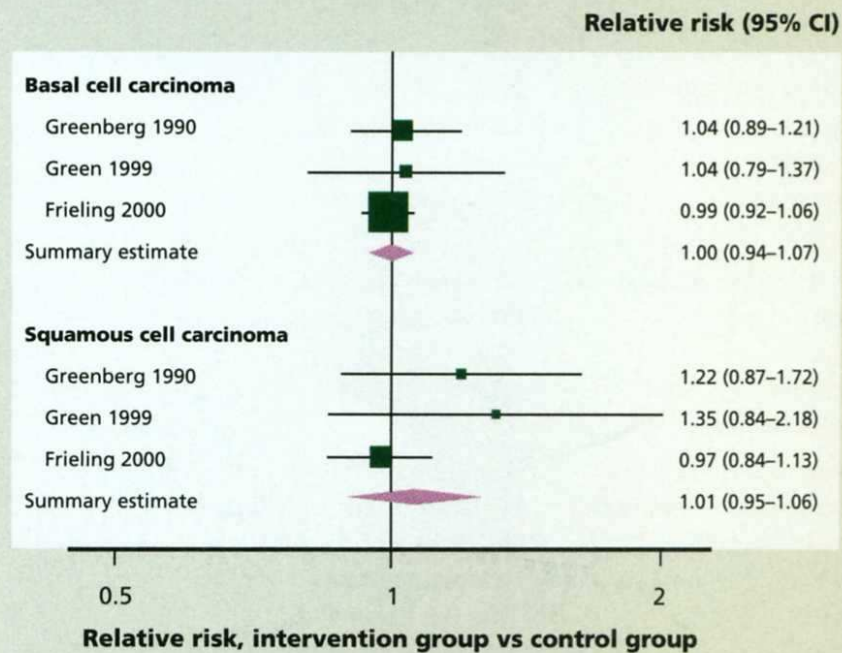
## Beta-carotene supplements and lung cancer; trials



# Integratori di Beta-carotene e tumori della pelle (non melanoma)

Figure 4.10.2

Beta-carotene supplements and non-melanoma skin cancer; trials





# Frutta e verdura

## Livello di evidenza: Probabile

Integratori?  
**No**

### VEGETABLES,<sup>1</sup> FRUITS,<sup>1</sup> PULSES (LEGUMES), NUTS, SEEDS, HERBS, SPICES, AND THE RISK OF CANCER

In the judgement of the Panel, the factors listed below modify the risk of cancer. Judgements are graded according to the strength of the evidence.

	DECREASES RISK		INCREASES RISK	
	Exposure	Cancer site	Exposure	Cancer site
<b>Convincing</b>				
<b>Probable</b>	<ul style="list-style-type: none"> <li>Non-starchy vegetables<sup>1</sup></li> <li>Allium vegetables<sup>1</sup></li> <li>Garlic<sup>1</sup></li> <li>Fruits<sup>1</sup></li> <li>Foods containing folate<sup>2</sup></li> <li>Foods containing carotenoids<sup>2</sup></li> <li>Foods containing beta-carotene<sup>2</sup></li> <li>Foods containing lycopene<sup>2,3</sup></li> <li>Foods containing vitamin C<sup>2,4</sup></li> <li>Foods containing selenium<sup>2,5</sup></li> </ul>	<ul style="list-style-type: none"> <li>Mouth, pharynx, larynx</li> <li>Oesophagus</li> <li>Stomach</li> <li>Stomach</li> <li>Colorectum</li> <li>Mouth, pharynx, larynx</li> <li>Oesophagus</li> <li>Lung</li> <li>Stomach</li> <li>Pancreas</li> <li>Mouth, pharynx, larynx</li> <li>Lung</li> <li>Oesophagus</li> <li>Prostate</li> <li>Oesophagus</li> <li>Prostate</li> </ul>		
<b>Limited — suggestive</b>	<ul style="list-style-type: none"> <li>Non-starchy vegetables<sup>1</sup></li> <li>Carrots<sup>1</sup></li> <li>Fruits<sup>1</sup></li> <li>Pulses (legumes)<sup>7</sup></li> <li>Foods containing folate<sup>2</sup></li> <li>Foods containing pyridoxine<sup>2,8</sup></li> <li>Foods containing vitamin E<sup>2,6</sup></li> <li>Foods containing selenium<sup>2,5</sup></li> <li>Foods containing quercetin<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Nasopharynx</li> <li>Lung</li> <li>Colorectum</li> <li>Ovary</li> <li>Endometrium</li> <li>Cervix</li> <li>Nasopharynx</li> <li>Pancreas</li> <li>Liver</li> <li>Colorectum</li> <li>Stomach</li> <li>Prostate</li> <li>Oesophagus</li> <li>Colorectum</li> <li>Oesophagus</li> <li>Oesophagus</li> <li>Prostate</li> <li>Lung</li> <li>Stomach</li> <li>Colorectum</li> <li>Lung</li> </ul>	Chilli <sup>1</sup>	Stomach
<b>Substantial effect on risk unlikely</b>		Foods containing beta-carotene <sup>9</sup> : prostate; skin (non-melanoma)		

### RECOMMENDATION 8

#### DIETARY SUPPLEMENTS

**Aim to meet nutritional needs through diet alone<sup>1</sup>**

#### PUBLIC HEALTH GOAL

Maximise the proportion of the population achieving nutritional adequacy without dietary supplements

#### PERSONAL RECOMMENDATION

Dietary supplements are not recommended for cancer prevention

<sup>1</sup> This may not always be feasible. In some situations of illness or dietary inadequacy, supplements may be valuable

# Alimento vs Integratore

## Folati e Neoplasie del Colon-retto

**Folate and cancer: how DNA damage, repair and methylation impact on colon carcinogenesis**

Susan J. Duthie

Diete ricche in folati riducono il rischio di tumore del colon-retto

L'integrazione con acido folico aumenta il rischio di tumore del colon-retto ma anche di mammella, polmone e prostata

La fortificazione delle farine (Cile, USA) ha aumentato l'incidenza del tumore del colon-retto

# Livello di evidenza





# Molecola vs Alimento vs Dieta

## Effetto matrice



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# Frutta e verdure vs residui pesticidi Risk/Benefits (Dati USA)



Risk/Benefit=1/2000

## A B S T R A C T

The current paper provides an analysis of the potential number of cancer cases that might be prevented if half the U.S. population increased its fruit and vegetable consumption by one serving each per day. This number is contrasted with an upper-bound estimate of concomitant cancer cases that might be theoretically attributed to the intake of pesticide residues arising from the same additional fruit and vegetable consumption. The cancer prevention estimates were derived using a published meta-analysis of nutritional epidemiology studies. The cancer risks were estimated using U.S. Environmental Protection Agency (EPA) methods, cancer potency estimates from rodent bioassays, and pesticide residue sampling data from the U.S. Department of Agriculture (USDA). The resulting estimates are that approximately 20,000 cancer cases per year could be prevented by increasing fruit and vegetable consumption, while up to 10 cancer cases per year could be caused by the added pesticide consumption. These estimates have significant uncertainties (e.g., potential residual confounding in the fruit and vegetable epidemiologic studies and reliance on rodent bioassays for cancer risk). However, the overwhelming difference between benefit and risk estimates provides confidence that consumers should not be concerned about cancer risks from consuming conventionally-grown fruits and vegetables.

# Frutta e verdure vs residui pesticidi

## Risk/Benefits (Dati Francia)

*J Environ Sci Health B.* 2011;46(1):84-91.

### **Realistic approach of pesticide residues and French consumer exposure within fruit & vegetable intake.**

Drouillet-Pinard P, Boisset M, Periquet A, Lecerf JM, Casse F, Catteau M, Barnat S.

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#### **Abstract**

The increase of fruit and vegetable (F&V) intake contributes to the prevention of chronic diseases, but could also significantly increase pesticide exposure and may thus be of health concern. Following a previous pesticide exposure assessment study, the present study was carried out to determine actual levels of pesticides within 400 g of F&V intake and to evaluate consumer risk. Forty-three Active Substances (AS) exceeding 10 % of the Acceptable Daily Intake (ADI) in balanced menus established for our previous theoretical study were considered. Fifty-six pooled food samples were analyzed: 28 fruit samples and 28 vegetable samples. Pesticide values were compared to Maximum Residue Levels (MRL) and to the "toxicological credit" derived from ADI. It was observed that 23 out of the 43 retained AS were never detected, 5 were detected both in F&V samples, 12 only in fruits and 3 only in vegetables. The most frequently detected AS were carbendazim, iprodione and dithiocarbamates. When detected, AS were more frequently found in fruit samples (74 %) than in vegetable samples (26 %). A maximum of 3 AS were detected at once in a given sample. Overall, we observed 8 and 14 overruns of the MRL in 1204 measures in pooled vegetable and fruit samples, respectively (0.7 % and 1.2 % of cases, respectively). Chronic exposure for adults was the highest for dithiocarbamates but did not exceed 23.7 % of the ADI in F&V. It was concluded that raising both F&V consumption up to 400 g/day (~5 F&V/day) according to recommendations of the national health and nutrition plan, does not induce pesticide overexposure and should not represent a risk for the consumer.

5 F&V/day does not induce pesticide overexposure and should not represent a risk

# Frutta e verdure vs residui pesticidi

## Risk/Benefits

CURRENT  
OPINION  
www.current-opinion.com

### Paradoxical effects of chemicals in the diet on health

Anthony Trewavas\* and Derek Stewart†

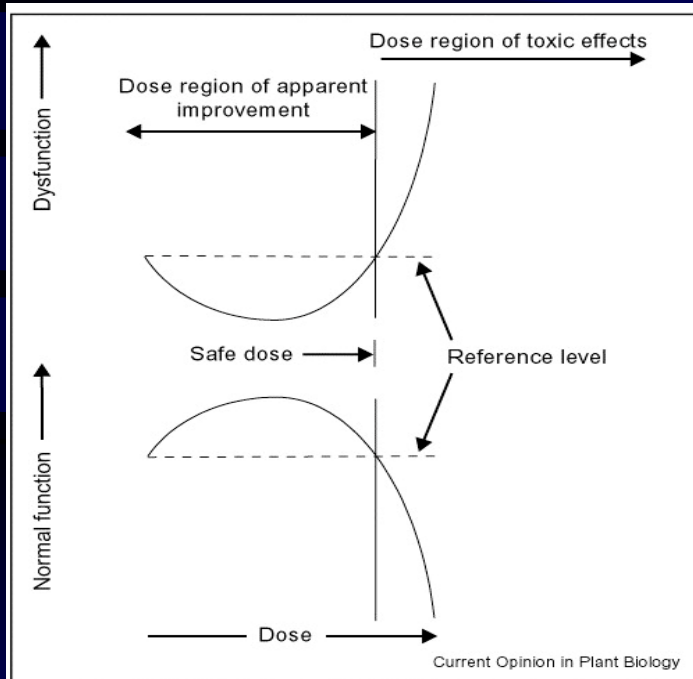


Figure 1. J-shaped dose response curves illustrating an apparent reduction in dysfunction (such as cancer rate) or an improvement in function (such as growth or reproduction) at low doses.

## Effetto Ormetico

Traces of synthetic pesticides (and perhaps mycotoxins) together with the natural pesticides (carcinogens) that are found in fruit and vegetables may potentiate the immune system, helping to protect against cancer.

# Take home messages

F&V costituiscono componenti fondamentali della dieta  
Mediterranea

Un adeguato intake di F&V è in grado di ridurre il rischio di  
patologie cardiovascolari e del tumore del colon-retto

Sono ancora da definire i meccanismi

I benefici dell'assunzione di F&V non sono estensibili agli  
integratori alimentari da essi derivati

Un adeguato intake di F&V non comporta rischi correlati  
all'aumentato intake di residui fitosanitari



# CONCLUSIONI

$\Delta \acute{\iota} \alpha \iota \tau \alpha = \textit{Diaeta} = \text{regola, stile di vita}$

- Nessun singolo alimento o singola molecola può essere la chiave della salute di una persona
- L'autentica dieta mediterranea ed uno stile di vita adeguato prevengono l'insorgenza di numerose malattie crónico-degenerative

