Alimentazione e Salute



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Life expectancy around the world has steadily increased for nearly 200 years



Food components can influence physiological processes at all stages of life

It's not just a matter of Genetics!





Genes and environment





There is a strong connection between diet and chronic disease



Nei prossimi 20 anni, infarto e ictus aumenteranno e saranno superati solo dal cancro



Nature 493:S2, 2013

Global burden of chronic diseases

Chronic conditions, including cardiovascular diseases (CVD), diabetes, obesity, cancers and respiratory diseases, account for 59% of the 57 million deaths annually

> Of those with chronic conditions 60% are between the ages of 18 and 64

90% of seniors have at least one chronic disease

and 77% have two or more chronic diseases.

Food can be a risk factor, but also a preventive factor







Type of Exposition	Cancer risk distribution %
Food	35
Tobacco	30
Infections	10
Reproductive factors	7
Working activity	4
Geophysical factors	3
Environmental pollution	2
Drugs	1
Unknown factors	?
	From Doll and Peto 1981

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Dietary fruits and vegetables may decrease incidence of CVD

There is compelling epidemiological support that dietary fruits and vegetables reduce heart disease



Although the mechanisms remain uncertain, the evidence is compelling that *plant-rich diets are desirable*





Obesity is reaching epidemic proportions



The past thirty years have seen development of an enormous body of evidence on the importance of plant-based foods in preventing or reducing the risk of chronic diseases

Intake of fat, fatty acids and vitamins during human evolution



Figure 2. Hypothetical Scheme of Fat, Fatty Acid (ω 6, ω 3, *trans*, and Total) Intake (as Percentage of Calories from Fat) and Intake of Vitamins E and C (mg/day).

How do nutrients influence human health?



Oxidative stress occurs when production of RONS exceeds cellular antioxidant defenses





Our diet plays an important role in the balance between pro-inflammation and anti-inflammation



Pro-inflammatory 15:1 Anti-inflammatory eicosanoids eicosanoids



Oxidative stress and chronic inflammation promote cardiovascular diseases



Atherosclerosis Coronary heart disease Cerebrovascular disease Heart failure Cardiomiopathy



An early observation of this effect was called the French Paradox



Reprinted from Renaud S., de Lorgeril M. (1992). Wine, alcohol, platelets, and the French paradox for coronary heart disease. Lancet 339: <u>1523–1526</u>. with permission from Elsevier

Nutrienti presenti negli alimenti di origine vegetale





- Macronutrienti
 - Proteine
 - •Lipidi
 - Carboidrati
 - •Fibre
- Micronutrienti •Vitamine •Minerali
- Fitonutrienti
 - •Alcaloidi
 - Polifenoli
 - •Carotenoidi
 - •Composti azotati
 - Composti solforati





Molti fitonutrienti hanno effetto protettivo e vengono definiti composti bioattivi

Examples of bioactive components

Component	Source	Potential benefit	
1. Polyphenols			
Phenolic acids Caffeic acid, Ferulic acid	Apples, pears, citrus, some vegetables, coffee	Antioxidant defense; heart health; healthy vision	
Flavonoids Anthocyanins	Berries, cherries, red grapes	Antioxidant defense; heart health; brain function	
Flavanols	Tea, cocoa, chocolate, apples grapes	Heart health	
Flavanones	citrus	Antioxidant defense	
Flavonols	Onions, apples, tea, broccoli	Antioxidant defense	
Pro-anthocyanidins	Cranberries, cocoa,apples, strawberries, grapes, wine, peanuts, cinnamom	Heart health; urinary tract health,	
Isoflavones Daidzein, Genistein	Soybeans and soy-food	Prevention of coronary heart disease, osteoporosis, breast and prostate cancer, menopausal symptoms	

Examples of bioactive components

Component	Source	Potential benefit	
2. Carotenoids			
Beta-carotene	Carrots, sweet potato, pumpkin, cantaloupe	Antioxidant defense; precursor of vitamin A	
Lutein, zeaxanthin	Spinach, corn, eggs, citrus	Healthy vision	
Lycopene	Tomato and tomato sauce, watermelon, pink grape	Prostate health	
3. Fatty acids			
Monounsaturated fatty acids (MUFA)	Tree nuts, olive oil, canola oil	Reduce coronary heart disease	
Polyunsaturated fatty acids (PUFA)-plant Omega-3	Walnuts, flax	Heart health; Brain and visual function	
Polyunsaturated fatty acids (PUFA)-fish Omega-3	Salmon, tuna, marine and other fish oils	Reduce coronary heart disease; brain and visual function	
Conjugated linoleic acid (CLA)	Beef, lamb, some cheese	Healthy immune function	

Nutraceutici e alimenti funzionali



Fitonutrienti (=composti bioattivi) che hanno funzione benefica sulla salute umana e prevengono le patologie. *Essi possono essere assunti sotto forma di...*



Nutraceutici (nutrizione+farmaceutica)



Alimenti funzionali

The French paradox is attributed to moderate consumption of red wine



How many glasses of red wine per day?

Men 1-3 glasses Women 1-2 glasses



Anthocyanins in plants

Anthocyanins are a subclass of flavonoids They are the red, purple, violet and blue pigments of leaves, flowers and fruits



cyanidin

pelargonidin











cyanidin + delphinidin



Protective role of anthocyanins

- They protect against cardiovascular disesases
- They inhibit tumor formation and reduce cancer proliferation
- They protect against neurodegenerative diseases
- They have anti-obesity properties
- They enhance visual acuity



Anthocyanins protect against cardiovascular disease



Regulatory genes of anthocyanin biosynthesis were introgressed in nearly isogenic corn lines by classical breeding







6th Framework Program **STREP 007130**

1. Feeding trial with anthocyanin-rich blue corn on rats (12 mg/Kg/day)





2. Reduction of infarcted zone in ischemia-induced mice

Toufektsian et al., J Nutr 2008

3. Increased level of total omega-3 in blood

Toufektsian et al., J Nutr 2010





Tonelli-Petroni-Pilu UNIMI

Dietary anthocyanins have a fish-like effect enhancing Omega-3 levels in blood





ACN free diet



ACN rich diet

EPA, eicosapentanoic acid DHA, docosahexanoic acid



By contrast, Omega-6 levels are unaltered

Toufektsian et al., (2010) J Nutr doi:10.3945/jn.110.127225

In Western diet, low of fibers and rich in fats, the average intake of anthocyanins is estimated to be 12 mg/day

In proportion in our studies, rats received 13-fold more anthocyanins than most people following a standard Western-type diet

...and the amount of cardiac tissue that was damaged following ischemic conditions was reduced by approximately 30%

For humans,

this dosage would correspond to 156 mg/day of anthocyanins

Epidemic of overweight & obesity



Source: "Progetto Cuore" ISS – 1998-2002

Is it possible to prevent obesity by drinking blood orange juice ?





6th Framework Program STREP 007130







Titta et al., (2010) Int J Obesity, 34:578-88

Moro orange juice reduces weight gain

Standard diet

High fat diet





Titta et al., (2010) Int J Obesity, 34:578-88

Moro orange juice reduces abdominal and inguinal fat mass of mice under high fat diet



Moro orange juice was capable to rescue entirely the high fat-induced transcriptional reprogramming



Categories of genes up-/down-regulated in adipocytes under high fat diet



457 persons on Okinawa aged 100 or over, an average of 35 for each 100,000 inhabitants



In 2010, 1,4 mln people

The oldest woman reached 120 years

What do the Okinawan Elders Eat?



Bitter Melon with Tofu

Nigana Greens

Mozuku Seaweed



Tofu with Fish





Rice with Vegetables

Lean Meat Dishes

Curcuma longa











Curcumin

Delphinidin

Key Features of Traditional Okinawa Diet

- 1) Low Caloric Density (plant-based, low fat, moderate protein from soy, fish, lean meats)
- 2) High Nutrient Density (Vitamins A,C, E, potassium, magnesium, folate, and healthy oils)
- 3) Phyto-nutrient Rich (polyphenols, carotenoids mostly from green leafy, yellow root vegetables and seaweed)
- 4) Low in Glycemic Load (high quality carbohydrates from staple sweet potato)
- 5) Anti-inflammatory (CR, polyphenols, omega 3 fatty acids)

Willcox, Scapagnini, Willcox (2013) Mech Ageing Dev

Stile Mediterraneo

- 1 elevato rapporto grassi insaturi/grassi saturi
- 2 elevato consumo di legumi
- 3 elevato consumo di cereali
- 4 elevato consumo di frutta
- 5 elevato consumo di verdura
- 6 -moderato consumo di prodotti carnei
- 7 moderato consumo di latte e derivati





I modelli alimentari

Il modello alimentare giapponese e mediterraneo sono i più coerenti con le linee guida sull'alimentazione.



Thanks for your attention