

# Exploring the Resurgence of Cocoa Antioxidants

*Does antioxidant capacity  
explain  
health benefits?*

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# Outline

- Cocoa and health benefits
- Are cocoa flavanols rivaling the success of superfruits as health powerhouses?
- Cocoa health claims under Reg. (EC) 1924/2006
- Understanding consumer's growing association between cocoa and health benefits

# Are cocoa flavanols rivaling the success of superfruits as health powerhouses?

# Superfruits

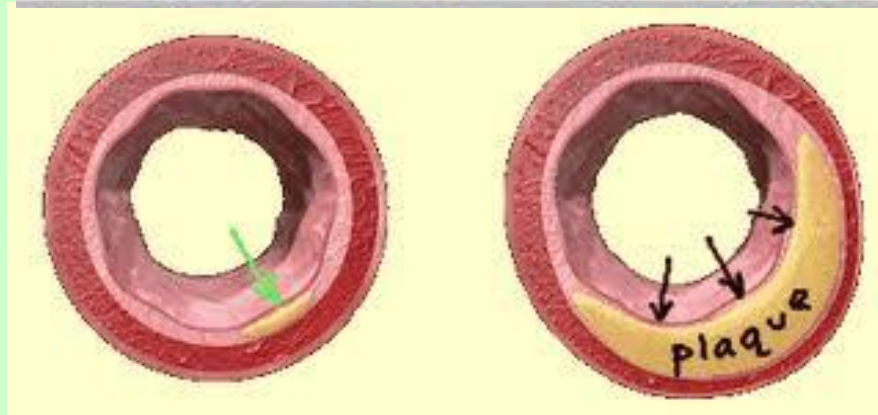
- marketing term first used in the food and beverage industry in 2005
- refers to a fruit which combines exceptional nutrient richness and antioxidant quality (and its purported health benefits)
- and has appealing taste that can stimulate and retain loyalty for consumer products

# Superfruits

- superfruits have not been defined by scientific criteria
- consumers cannot objectively assess nutrient value and potential for health benefits
- Term not endorsed by e.g. USDA
- USDA Database for the Flavonoids/Proanthocyanidin Content of Selected Foods

# Antioxidant potential Superfruits

- ‘Antioxidants’ associated with health



# Fruit and Health

- Many studies show correlation of high F&V intake with lower incidence of cancer and heart disease
- Past - presumed link between F&V- antioxidant vitamins and carotenoids and prevention of disease
- Current - presumed link between F&V antioxidant compounds and prevention of disease/health benefits.

# Fruit and Health

Several studies high F&V intake:

- Increase in plasma ORAC values (e.g. Cao et al., 1998; Root et al., 2012)
- Do increased plasma ORAC-values lead to health benefits???



# Fruit & Health

Several observational studies high F&V intake:

- Lower plasma CRP concentrations (Holt et al., 2009; Kobayashi et al., 2012)
- Lower CRP concentrations - improvement metabolic syndrome
- No evidence from RCTs!!

# Superfruits/antioxidants? how to advance the concept!

Fruits rich in anthocyanidins

- Very high *in vitro* antioxidant potential (ORAC)
- Low bioavailability - low plasma concentrations
- No/transient effects on plasma antioxidant status - physiological relevance?

*However!*

- may be adequate to affect signal transduction and/or gene expression - physiological effects!

# Superfruits/antioxidants? how to advance the concept!

Fruits rich in anthocyanidins

- important to distinguish between the *in vitro* and *in vivo* antioxidant activities of dietary anthocyanidins in relation to human health.
- *In vivo* antioxidant effects (as per EFSA) - statistical vs. physiological significance!
- ***Real health benefits!***

# Superfruits/antioxidants?

## how to advance the concept!

Fruit	ORAC	Health benefits	Human studies
Acai (fruit pulp/skin powder)	102,700	↓FG/FI; ↓PP glucose	Uncontrolled pilot (Udani, 2011)
Apple	2,500	↓ cholesterol	Pectin, RCT (Brouns, 2012)
Baobab	24,000	-	-
Breadfruit	8,100	-	-
Berries	5,000 - 10,000	↑ platelet function, HDL; ↓BP	Single-blind, PC-RCT (Erlund, 2008)
Cranberry juice/raw	1,500/9,100	URTI; Vascular reactivity	RCTs; Pilot
Pomegranate juice/raw	2,700/4,500	Vascular reactivity	Pilot

# Cocoa - Superfruit?



# Cocoa - Superfruit?



# Cocoa - Superfruit



# Cocoa and Consumers

- Cocoa use as food/drink date back to 1400 BC
- Cocoa introduction in Europe by late 15<sup>th</sup> century
- 18<sup>th</sup> century - Industrial production chocolate - chocolate bars (Van Houten, Nestlé, Cadbury)
- ≈ 2000 - first scientific reports on health benefits cocoa



# Search for genetic determinants high blood pressure

Kuna Indians:

- Home on offshore islands on the Caribbean Coast of Panama
- Have low BP even into old age (Kean, 1944)
- Confirmed by Hollenberg (1997)

# Search for genetic determinants high blood pressure

Kuna Indians:

- Indigenous diet - very high salt intake - no ↑ BP!!
- Kuna who moved to cities on Panama's mainland developed high BP
- Hence, protective environmental factor
  - Stress? - No!
  - Pollution? - No!
  - Diet? - Yes! > 5 cups of cocoa beverage/d (McCullough, J Cardiovasc Pharmacol, 2006)

# Resurgence in research cocoa and health

Early 2000 first trials cocoa:

- Inhibition platelet aggregation
- Oxidant stress
- Insulin sensitivity

# Resurgence in research cocoa and health

From 2005 onwards cocoa trials:

- Blood pressure
- Endothelium-dependent vasodilation (EDV)

# Resurgence of Cocoa

- Link cocoa consumption and BP (Kean, 1944)
- Link between cocoa consumption, BP and death from CVD (Buijsse, 2006)
- Link between chocolate consumption, lower BP and CVD risk (esp. stroke and MI)(Buijsse, 2010).

# Cocoa-effects

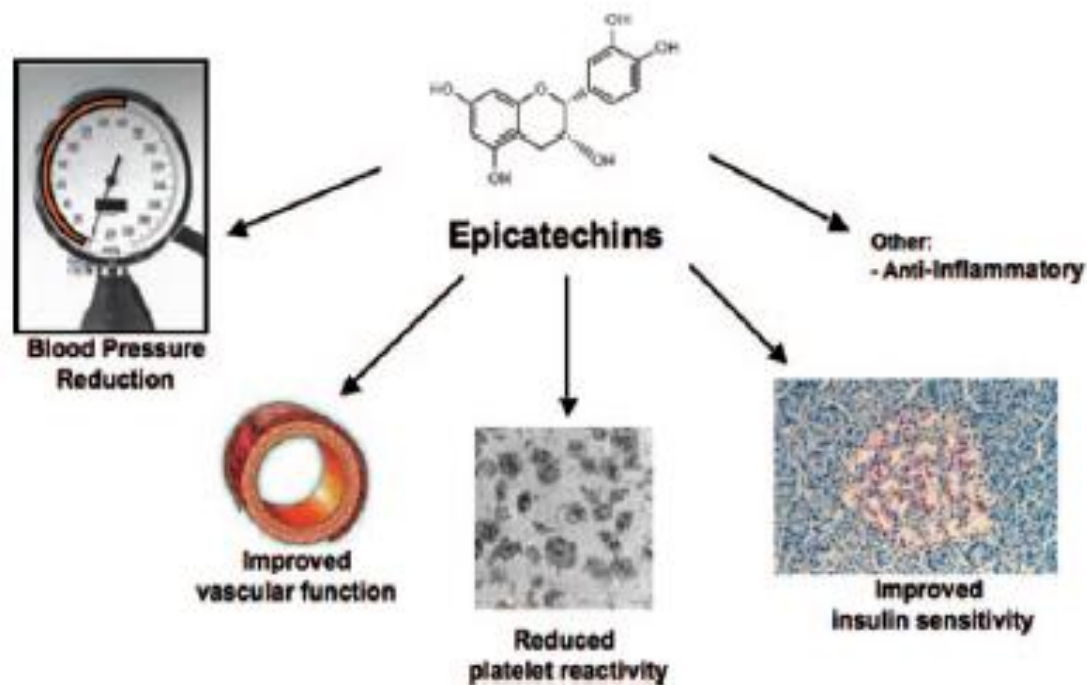


Figure 1. Health-relevant effect of epicatechins.

*RCTs!!*

# Superfruits/antioxidants?

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<b>Cocoa</b>	<b>55,653</b>	<b>BP, FMD, IS, Skin</b>	<b>RCTs</b>
Cranberry juice/raw	1,500/9,100	URTI; Vascular reactivity	RCTs; Pilot
Pomegranate juice/raw	2,700/4,500	Vascular reactivity	Pilot

# Art. 13.1 health claims Cocoa

- Blood pressure - insufficient evidence +/-
- Protection of lipids from oxidative damage - **X**



# Art. 13.5 health claim Cocoa & Endothelial Function

EFSA - 17 July 2012

- Endothelium-dependent vasodilation -
- 200 mg cocoa flavanols
- 2.5 g cocoa powder / 10 g dark chocolate
- Balanced diet!



# US Dietary Guidelines Advisory Committee

16<sup>th</sup> meeting - 12 May 2010

- ‘Modest consumption of dark chocolate or cocoa is associated with reduced CVD risk’
- ‘dark chocolate or cocoa can be part of a healthy balanced diet, provided...’
- ‘potential health benefits must be balanced with caloric intake’
- Level of scientific evidence - *Moderate* (fairly strong evidence)

# Dark chocolate acceptability

Affected by:

- Bitterness - generally considered a negative attribute in food
- Yet, many individuals enjoy some bitterness in products like coffee or chocolate
- Cocoa origin and processing conditions (Torres-Moreno, J Sci Food Agric., 2012)
- Preference for milk-chocolate (Harwood, Food Qual Prefer., 2012)

# Dark chocolate acceptability

## Label information:

- Premium brand chocolates generate high consumer expectations of chocolate acceptability
- fulfilled by the sensory characteristics of the products

*Torres-Moreno, Appetite, 2012*

# Dark chocolate acceptability

- Claims of a high percentage of cocoa - no higher expectations

Health Claims will!

*Torres-Moreno, Appetite, 2012*

A vibrant landscape featuring a large field of tulips in various colors (red, pink, purple, yellow, orange) stretching towards a traditional Dutch windmill. The sky is bright blue with scattered white clouds. The text "Thank you!" is overlaid in a large, orange, italicized font across the middle of the image.

*Thank you!*

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