


Healthy Eating Never Tasted So Delicious

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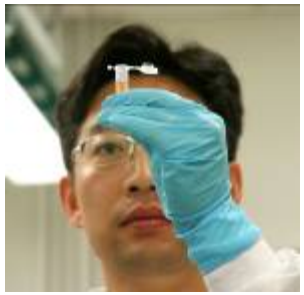
Guy H. Johnson
April, 2016

AMERICAN SPICE TRADE ASSOCIATION asta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The McCormick Science Institute advances scientific understanding of the potential health benefits of culinary spices and herbs

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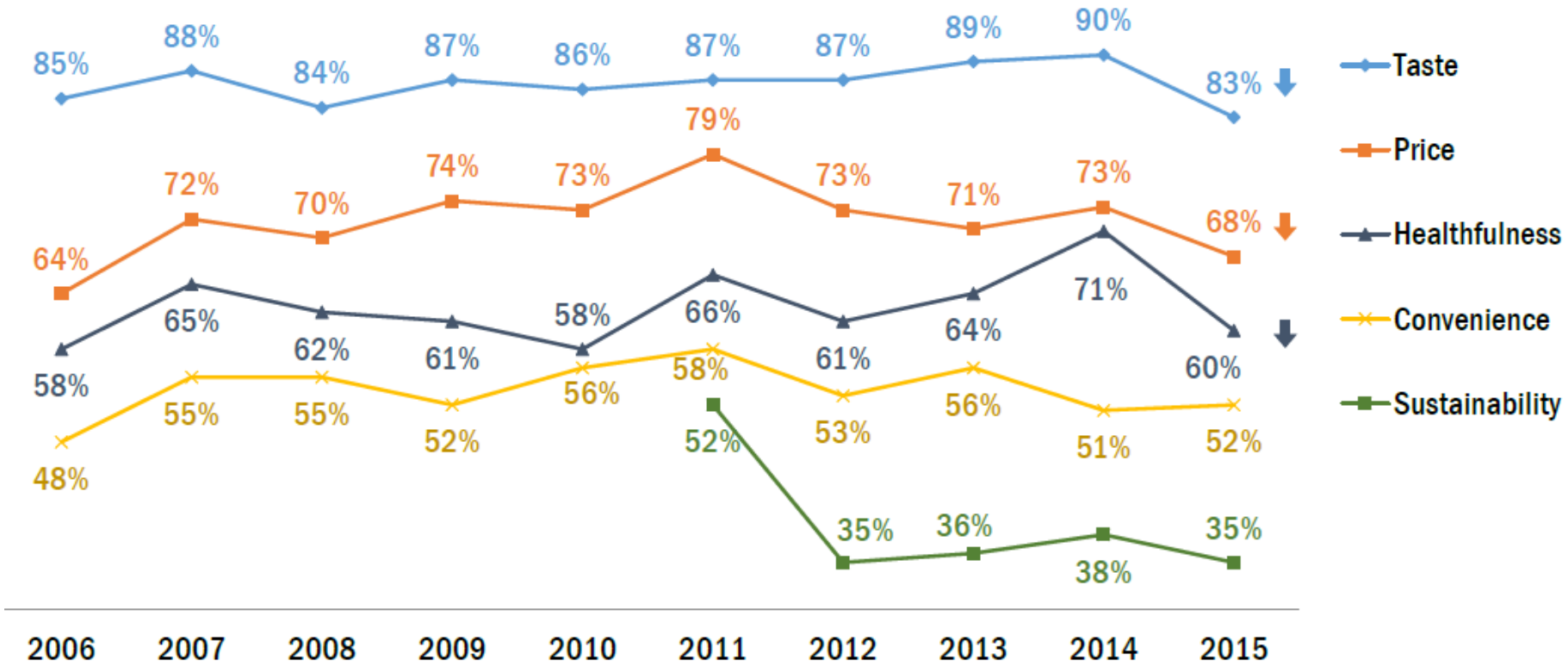
Taste (flavor) drives the decision to buy foods and beverages



Source: IFIC Food & Health Survey, 2015. N=1,007 consumers

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…and spices and herbs make foods taste great!

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Spices and herbs have a long history of use for health

"An herb is the friend of physicians and the praise of cooks"

Charlemagne - 9th Century

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Scientific evidence on the beneficial physiological effects of spices and herbs is accumulating

- Oxidative stress markers
- Inflammatory markers
- Blood glucose
- Insulin sensitivity
- Blood lipids
- Endothelial function
- Energy metabolism
- Hunger/satiety
- Pain associated with physical activity

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A spice blend inhibits formation of oxidative products in grilled burgers

Antioxidant-rich spice added to hamburger meat during cooking results in reduced meat, plasma, and urine malondialdehyde concentrations[1–4]

Zhaoping Li, Susanne M Henning, Yanjun Zhang, Alona Zerlin, Luyi Li, Kun Gao, Ru-Po Lee, Hannah Karp, Gail Thames, Susan Bowerman, and David Heber

ABSTRACT

Background: Emerging science has shown the effect of oxidation products and inflammation on atherogenesis and carcinogenesis. Cooking hamburger meat can promote the formation of malondialdehyde that can be absorbed after ingestion.

Objective: We studied the effect of an antioxidant spice mixture on malondialdehyde formation while cooking hamburger meat and its effects on plasma and urinary malondialdehyde concentrations.

Design: Eleven healthy volunteers consumed 2 kinds of burgers in a randomized order: one burger was seasoned with a spice blend, and one burger was not seasoned with the spice blend. The production of malondialdehyde in burgers and malondialdehyde concentrations in plasma and urine after ingestion were measured by HPLC.

Results: Rosmarinic acid from oregano was monitored to assess the effect of cooking on spice antioxidant content. Forty percent (19 mg) of the added rosmarinic acid remained in the spiced burger (SB) after cooking. There was a 71% reduction in the malondialde-

Fogelman et al (1) reported that malondialdehyde, an obligate product of the oxidation of arachidonic acid by lipoxygenase pathways, could cause Schiff's base formation with the ε amino groups of apolipoprotein B lysine residues in LDL. Altered lipoproteins bind to macrophage scavenger receptors, resulting in cholesteryl ester accumulation and the formation of foam cells. Oxidatively modified LDL is present in the artery walls of animals and humans with atherosclerosis and leads to destabilization of atherosclerotic plaques (2–4).

Malondialdehyde can also react with deoxyadenosine and deoxyguanosine in DNA and form DNA adducts that are mutagenic. Thus, the formation of malondialdehyde has implications for atherogenesis and carcinogenesis (5). Inhibition of the formation of malondialdehyde by antioxidants during the cooking of hamburger meat may result in reduced concentrations of malondialdehyde in plasma and urine as the result of inhibition of malondialdehyde formation ex vivo or the inhibition of its

Source: Li et al., *Am J Clin Nutr* 2010;91:1180

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Spice blend used


Spice	Grams/250 g patty	%
Cloves, ground	0,48825	4,34%
Cinnamon, ground	0,48825	4,34%
Oregano, mediterranean, ground	2,94413	26,17%
Rosemary, ground	0,48825	4,34%
Ginger, ground	1,22175	10,86%
Black pepper, ground	0,73238	6,51%
Paprika, ground	3,42450	30,44%
Turmeric, ground	1,46250	13,00%
Spice Mixture	11,25	100,0%

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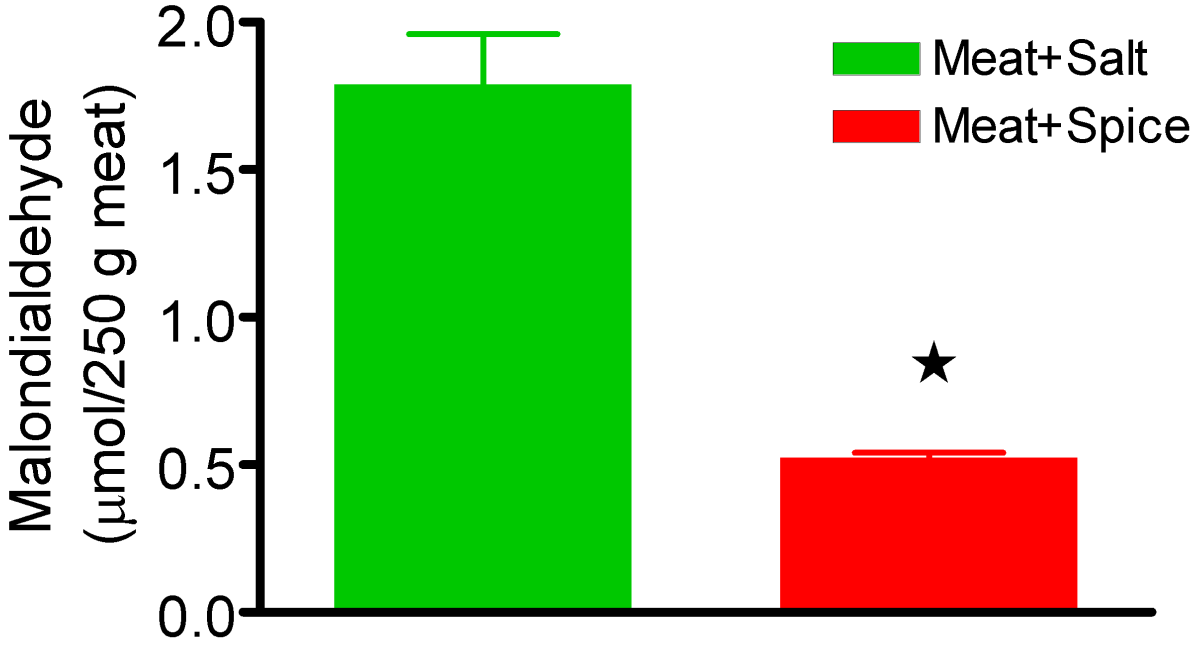
Lipid oxidation in the burger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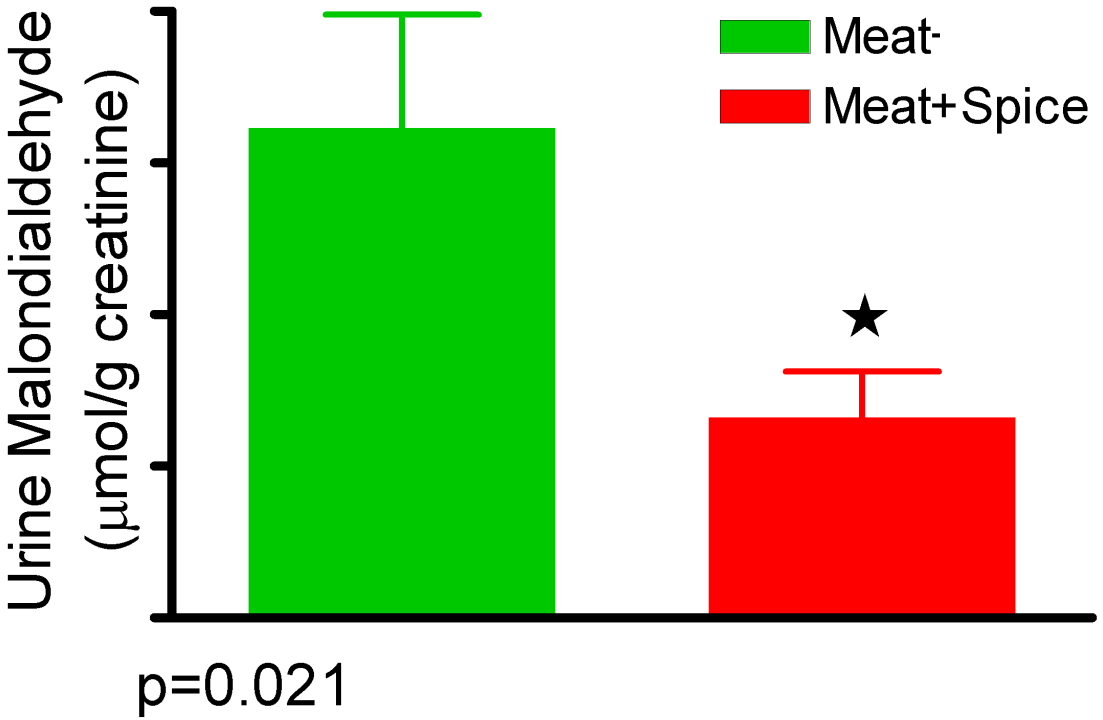
Urinary malondialdehyde concentration



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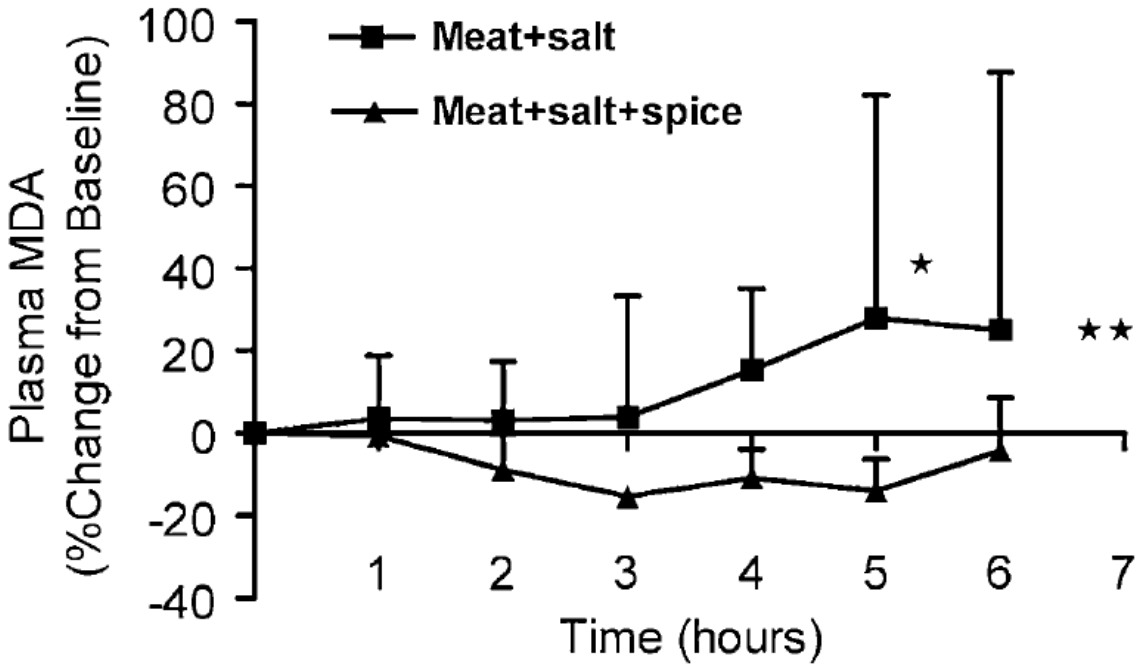
Plasma malondialdehyde concentrations



Turmeric plus black pepper are the most effective

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 DOI: 10.3109/09637486.2014.1000837

informa healthcare

FOOD COMPOSITION AND ANALYSIS

Turmeric and black pepper spices decrease lipid peroxidation in meat patties during cooking

Yanjun Zhang, Susanne M. Henning, Ru-Po Lee, Jianjun Huang, Alona Zerlin, Zhaoping Li, and David Heber

Center for Human Nutrition, University of California, Los Angeles, CA, USA

Abstract

Spices are rich in natural antioxidants and have been shown to be potent inhibitors of lipid peroxidation during cooking of meat. Turmeric contains unique conjugated curcuminoids with strong antioxidant activity. Piperine, one of the main constituents of black pepper, is known to increase the bioavailability of curcuminoids in mouse and human studies when consumed with turmeric. We investigated whether adding black pepper to turmeric powder may further inhibit lipid peroxidation when added to meat patties prior to cooking. The addition of black pepper to turmeric significantly decreased the lipid peroxidation in hamburger meat. When investigating the antioxidant activity of the main chemical markers, we determined that piperine did not exhibit any antioxidant activity. Therefore, we conclude that other black pepper ingredients are responsible for the increased antioxidant activity of combining black pepper with turmeric powder.

Keywords

Black pepper, hamburger, lipid peroxidation, malondialdehyde (MDA), turmeric

History

Received 21 November 2013
Revised 9 September 2014
Accepted 6 December 2014
Published online 13 January 2015

Source: Zhang et al., *Int J Food Sci Nutr* 2015;66:260

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Effect of individual spices on MDA formation

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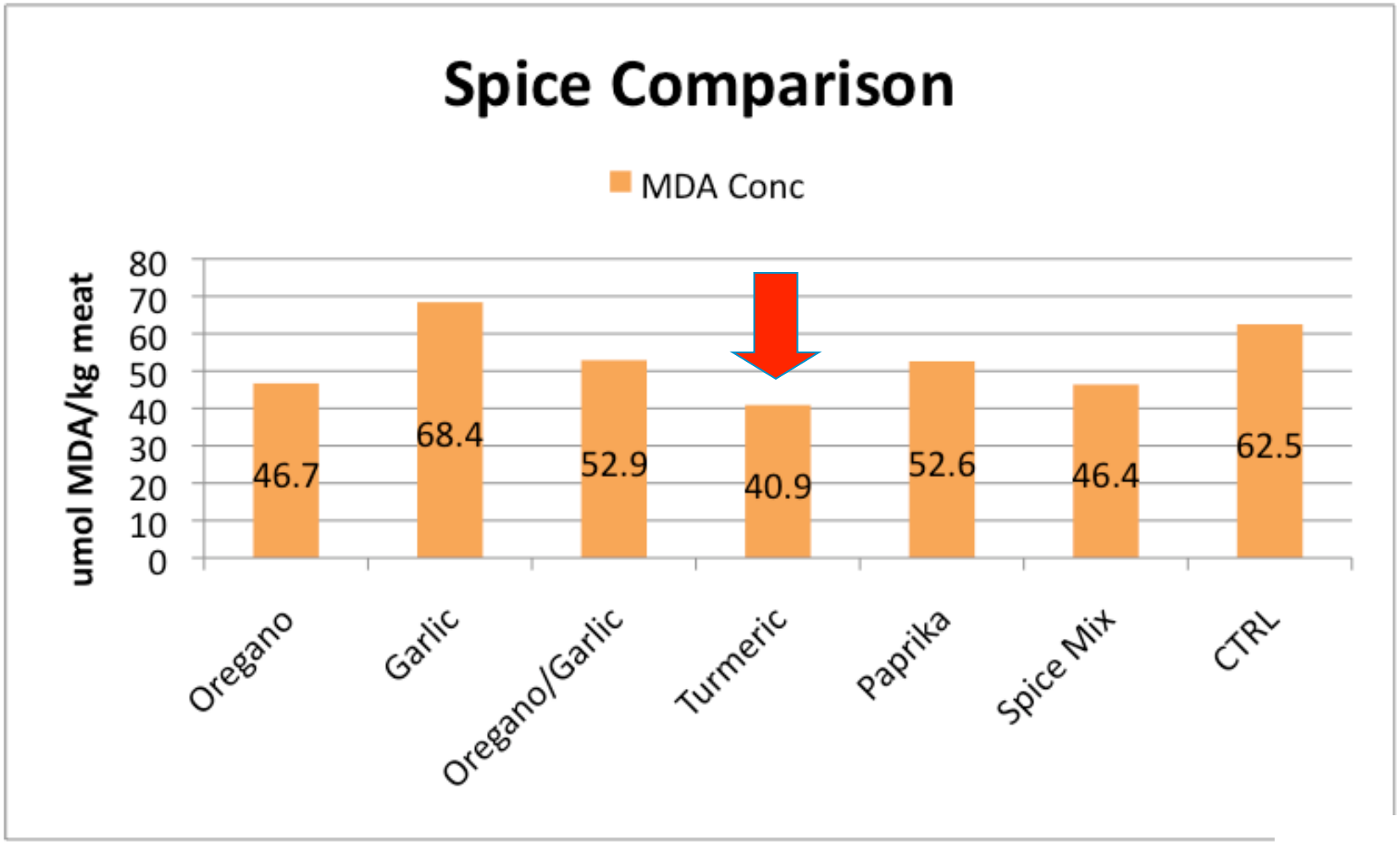
Turmeric was the most potent spice



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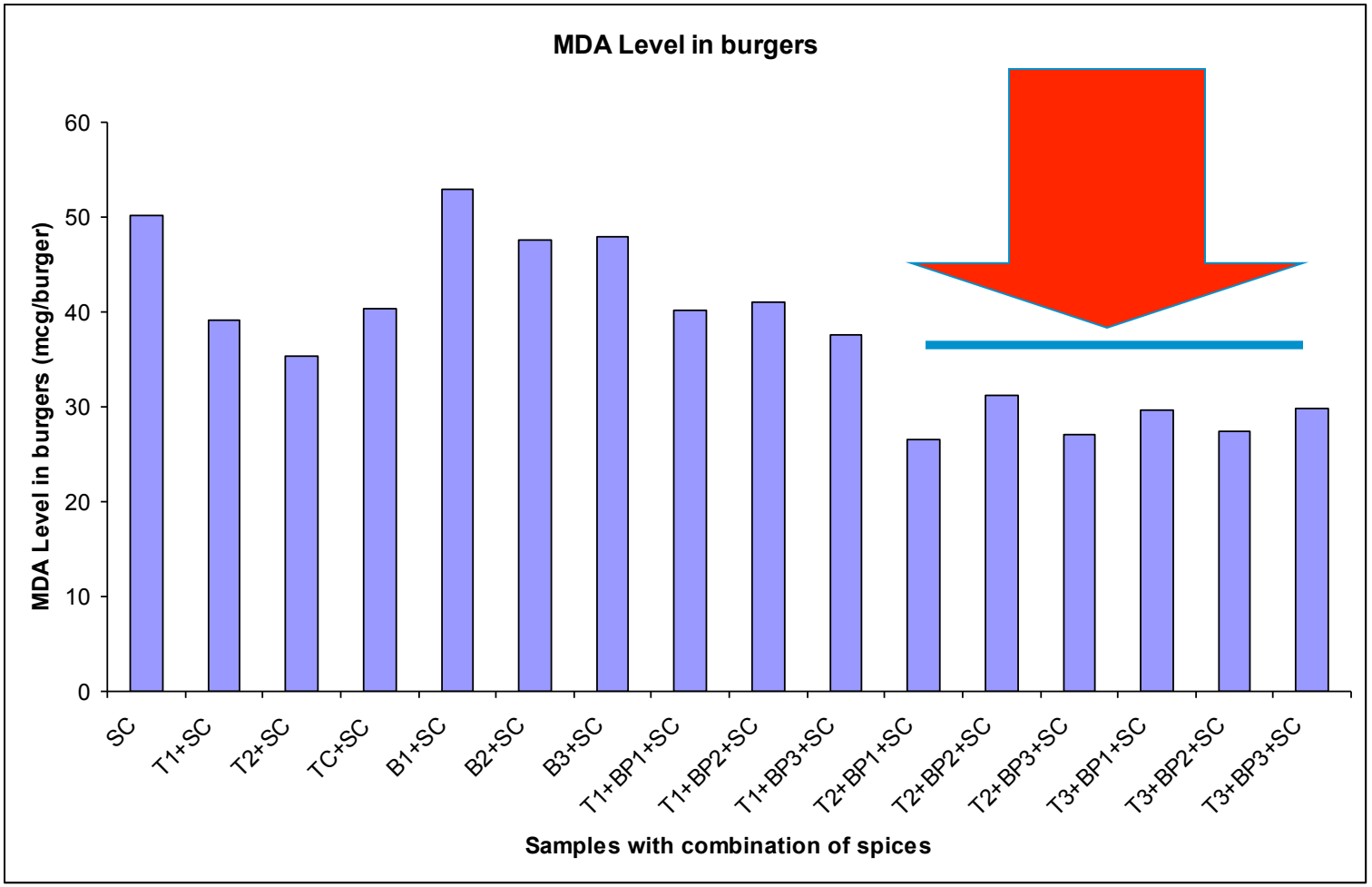
A combination of turmeric and black pepper works better than either spice alone for reduction in MDA formation



Turmeric: T1=1.5 g; T2= 3.0 g; T3= 6.0g
Black pepper: BP1= 0.12 g; BP2=0.36 g; BP3=1.08 g;
SC: Table salt 1.0 g

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The same spice blend also improves arterial function

DIABETICMedicine

DOI: 10.1111/dme.12120

Research: Treatment

Decrease of postprandial endothelial dysfunction by spice mix added to high-fat hamburger meat in men with Type 2 diabetes mellitus

Z. Li[1], S. M. Henning[1], Y. Zhang[1], N. Rahnama[1], A. Zerlin[1], G. Thames[1], C. H. Tseng[2] and D. Heber[1]

[1]Center for Human Nutrition and [2]Statistics Core, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, CA, USA

Accepted 9 January 2013

Abstract

Aims Consumption of a high-fat diet has been demonstrated to promote endothelial dysfunction, possibly through an increase in lipid peroxidation and decrease in serum nitric oxide. The present study was designed to investigate whether consumption of a hamburger cooked with a polyphenol-rich spice mixture will reduce postprandial lipid oxidation and endothelial dysfunction in men with Type 2 diabetes.

Source: Li et al., *Diabetic Med* 2013;30:590

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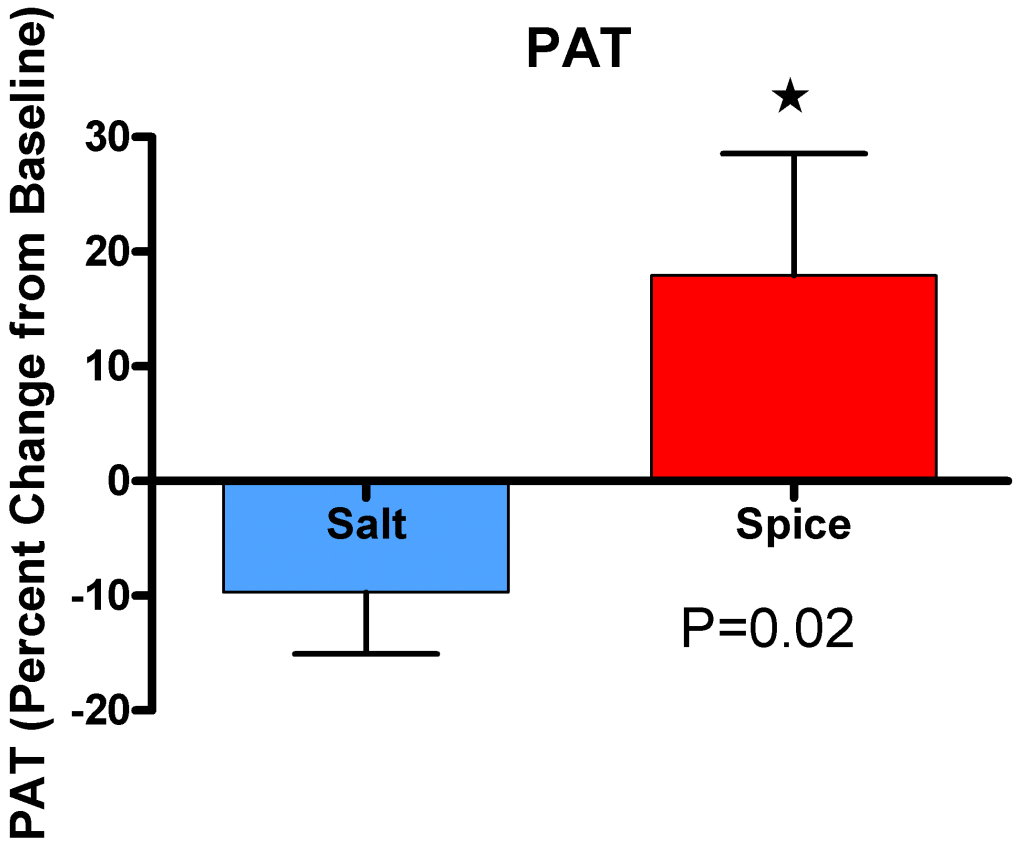
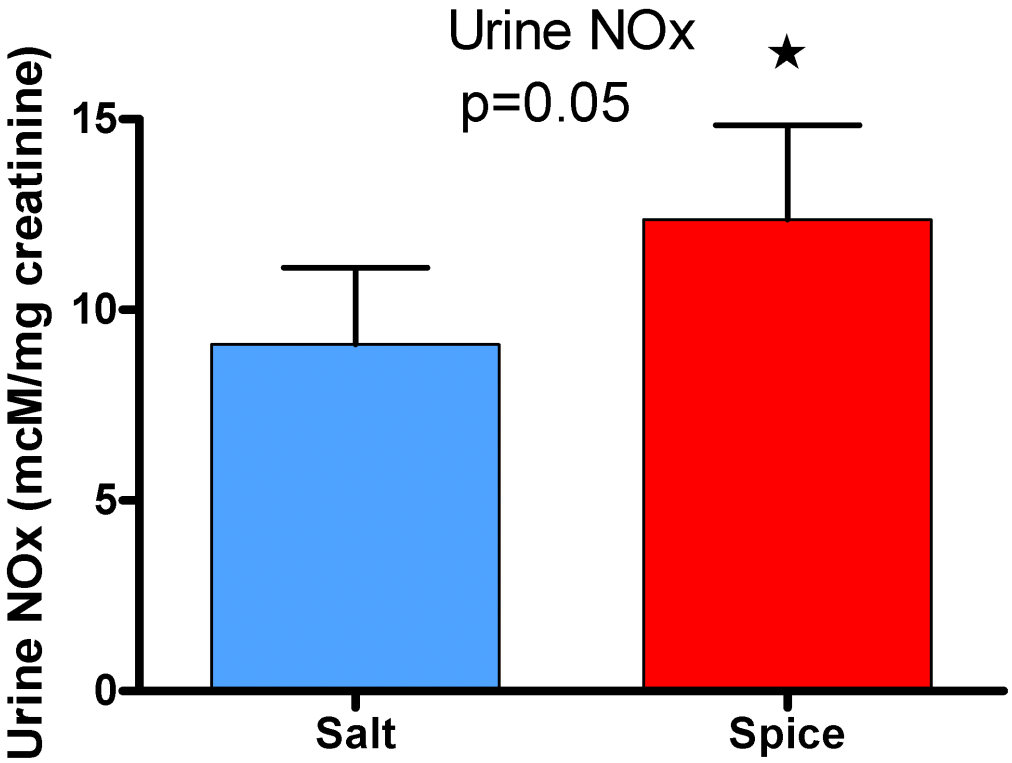
Spice improved endothelial function vs. baseline



Spice increased urinary nitric oxide (n=8)



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As well as other physiological functions

A High Antioxidant Spice Blend Attenuates Postprandial Insulin and Triglyceride Responses and Increases Some Plasma Measures of Antioxidant Activity in Healthy, Overweight Men[1–3]

Ann C. Skulas-Ray,[4] Penny M. Kris-Etherton,[4] Danette L. Teeter,[5] C-Y. Oliver Chen,[7] John P. Vanden Heuvel,[6] and Sheila G. West[4,5]*

[4]Department of Nutritional Sciences, [5]Department of Biobehavioral Health, and [6]Department of Veterinary and Biomedical Sciences, The Pennsylvania State University, University Park, PA 16802; and [7]Jean Mayer USDA Human Nutrition Research Center on Aging, Friedman School of Nutrition Science and Policy, Tufts University, Boston, MA 02111

Abstract

There is much interest in the potential of dietary antioxidants to attenuate in vivo oxidative stress, but little characterization of the time course of plasma effects exists. Culinary spices have demonstrated potent in vitro antioxidant properties. The objective of this study was to examine whether adding 14 g of a high antioxidant spice blend to a 5060-kJ (1200 kcal) meal

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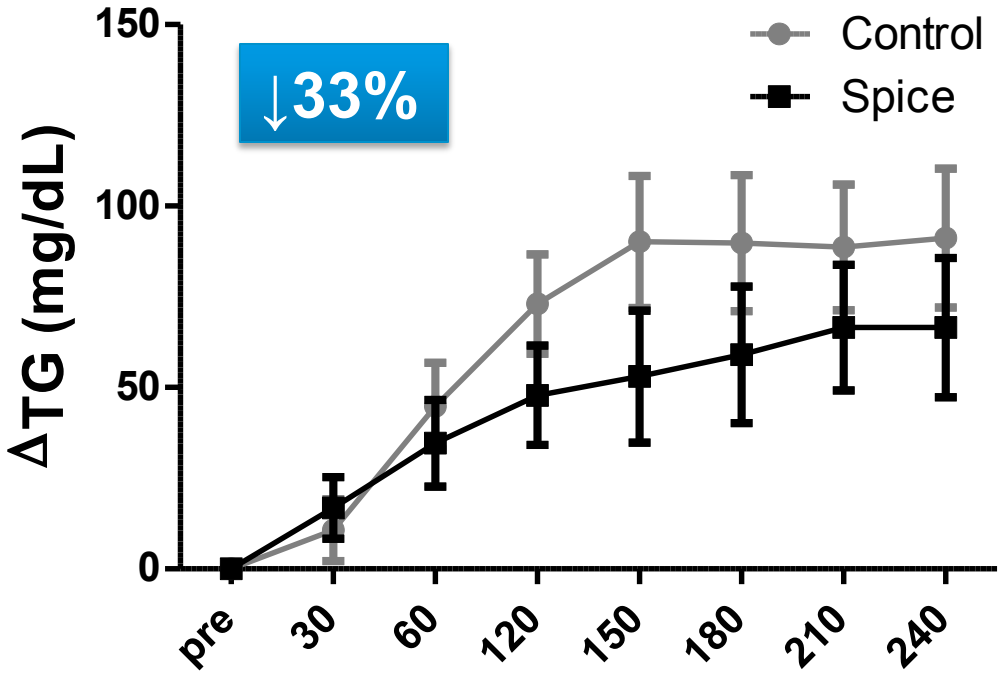
Significant reduction in postprandial triglycerides

~1200 kcal meal, with or without spice blend (~50 g total fat, 23 g SFA)

Treatment by time *P-interaction* < 0.05



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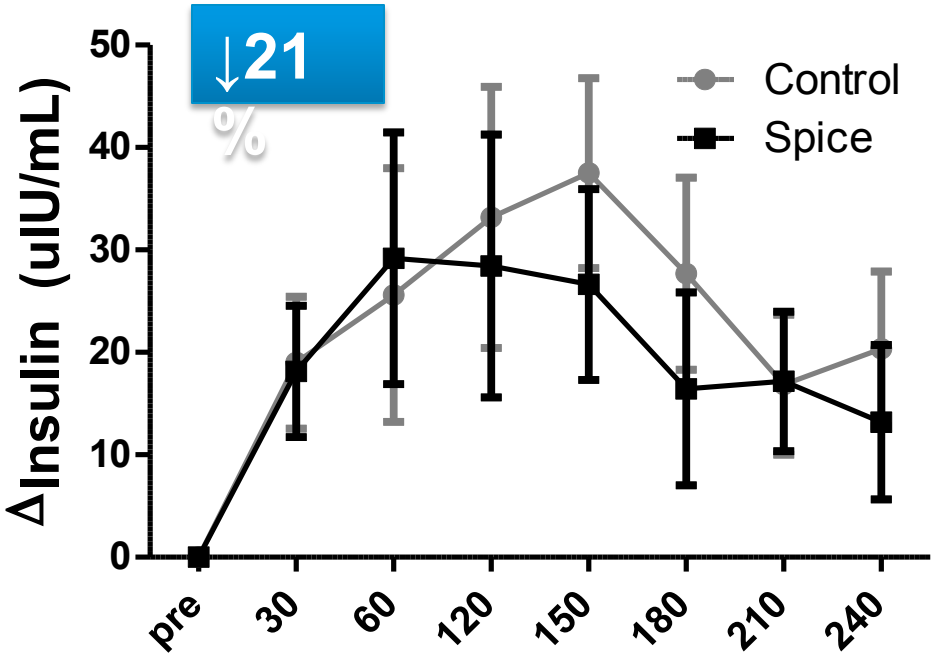
Significant reduction in postprandial insulin

Meal was well tolerated, no GI side effects, participants rated control and spice meals similarly.

Treatment by time *P-interaction* < 0.004



(No effect on glucose)

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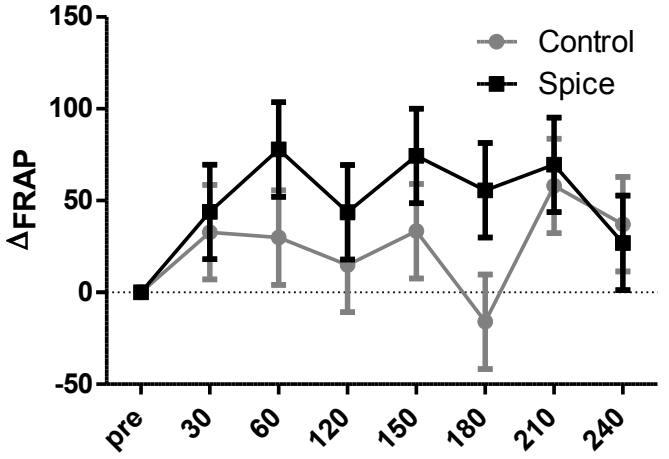
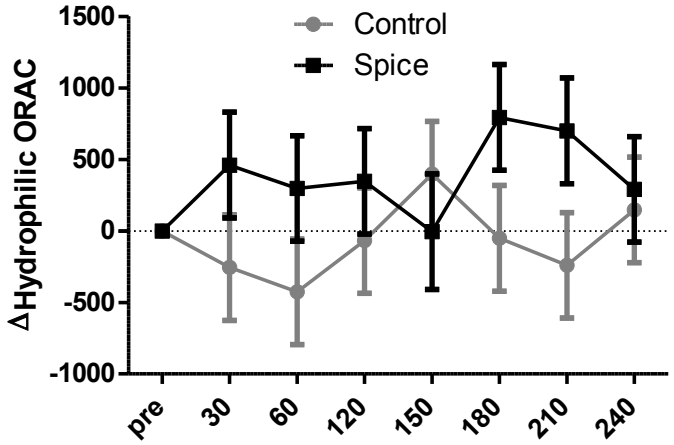
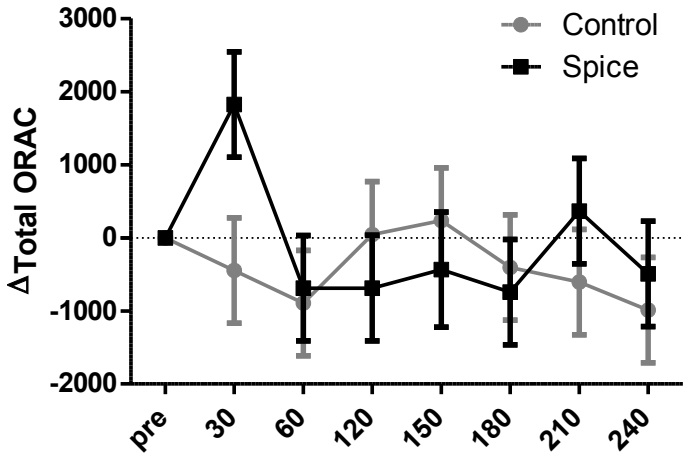
Significant increases in antioxidant capacity of serum

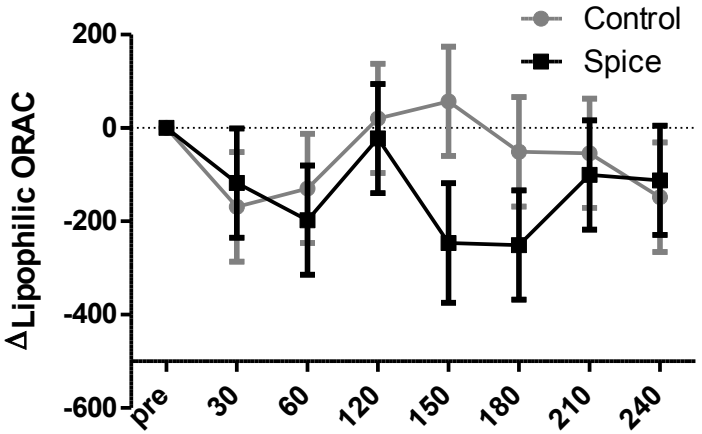
p = 0.009 for effect of treatment



p = 0.02 for effect of treatment







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Spicy Food May Boost Metabolism

New research suggests that a little spice may ramp up your metabolism. (Niels Busch/Getty Images)

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msn life & style

Spices could prevent heart disease

Adding some spice to your food can protect you from physical damage and reduce the stress that fatty foods place on your heart

You can still enjoy your favourite fatty meals without feeling too guilty if you add a bit of spice. Eating a diet rich in turmeric, cinnamon and paprika will protect your body from the effects of fatty foods.

A team from Penn State University has found that a blend of antioxidant spices can reduce the stress that high fat foods put on your heart by the build up of triglycerides that are stored in fat cells.

'If triglyceride levels are raised too much your risk of heart disease is increased,' says study leader Sheila West. 'We found that adding spices to a high-fat meal reduced triglyceride response by about 30 per cent, compared to a similar meal with no spices added.'

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Antioxidant-Rich Spices May Assist in Maintaining Ideal Weight

By Health News Team • Aug 10th, 2011 • Category: True Health News, Weight Loss

A study conducted by professors at Pennsylvania State University has revealed that spices rich in antioxidants, such as cinnamon, turmeric, oregano and rosemary, may be of assistance to individuals looking to maintain proper weight.

In the Penn State study, researchers cooked two meals on separate days for six men between 30 and 65 years of age, all of whom were relatively healthy in all aspects except their weight. The food was the same on both occasions – a dinner of chicken curry, Italian bread and a cinnamon biscuit – but the spices that the scientists were testing were only included once.

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Ginger has anti-inflammatory properties

Ginger (*Zingiber officinale*) Reduces Muscle Pain Caused by Eccentric Exercise

Christopher D. Black,* Matthew P. Herring,† David J. Hurley,‡ and Patrick J. O'Connor†

*Department of Kinesiology, Georgia College and State University, Milledgeville, Georgia.
†Department of Kinesiology, University of Georgia, Athens, Georgia.
‡Departments of Population Health and Large Animal Medicine, College of Veterinary Medicine, University of Georgia, Athens, Georgia.

Abstract: Ginger has been shown to exert anti-inflammatory effects in rodents, but its effect on human muscle pain is uncertain. Heat treatment of ginger has been suggested to enhance its hypoalgesic effects. The purpose of this study was to examine the effects of 11 days of raw (study 1) and heat-treated (study 2) ginger supplementation on muscle pain. Study 1 and 2 were identical double-blind, placebo controlled, randomized experiments with 34 and 40 volunteers, respectively. Participants consumed 2 grams of either raw (study 1) or heated (study 2) ginger or placebo for 11 consecutive days. Participants performed 18 eccentric actions of the elbow flexors to induce pain and inflammation. Pain intensity, perceived effort, plasma prostaglandin E_2, arm volume, range-of-motion and isometric strength were assessed prior to and for 3 days after exercise. Results Raw (25%, –.78 SD, P = .041) and heat-treated (23%, –.57 SD, P = .049) ginger resulted in similar pain reductions 24 hours after eccentric exercise compared to placebo. Smaller effects were noted between both types of ginger and placebo on other measures. Daily supplementation with ginger reduced muscle pain caused by eccentric exercise, and this effect was not enhanced by heat treating the ginger.

Source: Black et al., *Pain* 2010;113894

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Ginger reduced muscle soreness after eccentric exercise

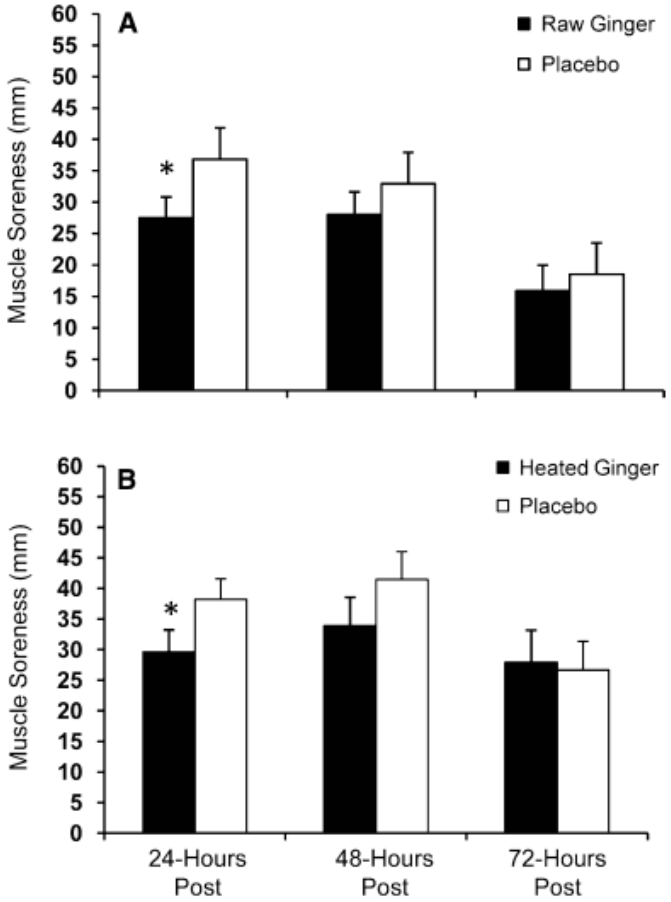

Figure 2. Ratings of arm muscle pain intensity 24, 48, and 72 hours after eccentric exercise. Preexercise muscle pain was "0" on a 0 to 100 VAS scale and is therefore not included. *Indicates a significant ($P < .05$) difference from placebo. Values are mean ± SE.

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Red pepper may be useful in weight management

Contents lists available at ScienceDirect

Physiology & Behavior

journal homepage: www.elsevier.com/locate/phb

The effects of hedonically acceptable red pepper doses on thermogenesis and appetite

Mary-Jon Ludy, Richard D. Mattes *

Purdue University, West Lafayette, IN 47907, USA

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Oral irritation
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Energy intake
Temperature
Palatability

ABSTRACT

Previous studies suggest consumption of red pepper (RP) promotes negative energy balance. However, the RP dose provided in these studies (up to 10 g/meal) usually exceeded the amount preferred by the general population in the United States (mean = ~1 g/meal). The objective of this study was to evaluate the effects of hedonically acceptable RP doses served at a single meal in healthy, lean individuals on thermogenesis and appetite. Twenty-five men and women (aged 23.0 ± 0.5 years, BMI 22.6 ± 0.3 kg/m^2, 13 spicy food users and 12 non-users) participated in a randomized crossover trial during which they consumed a standardized quantity (1 g); their preferred quantity (regular spicy food users 1.8 ± 0.3 g/meal, non-users 0.3 ± 0.1 g/meal); or no RP. Energy expenditure, core body and skin temperature, and appetite were measured. Postprandial energy expenditure and core body temperature were greater, and skin temperature was lower, after test loads with 1 g RP than no RP. Respiratory quotient was lower after the preferred RP dose was ingested orally, compared to in capsule form. These findings suggest that RP's effects on energy balance stem from a combination of metabolic and sensory inputs, and that oral exposure is necessary to achieve RP's maximum benefits. Energy intake was lower after test loads with 1 g RP than no RP in non-users, but

Source: Ludy et al., *Physiol & Behav* 2011;102:251

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Energy expenditure increased after pepper-containing soup

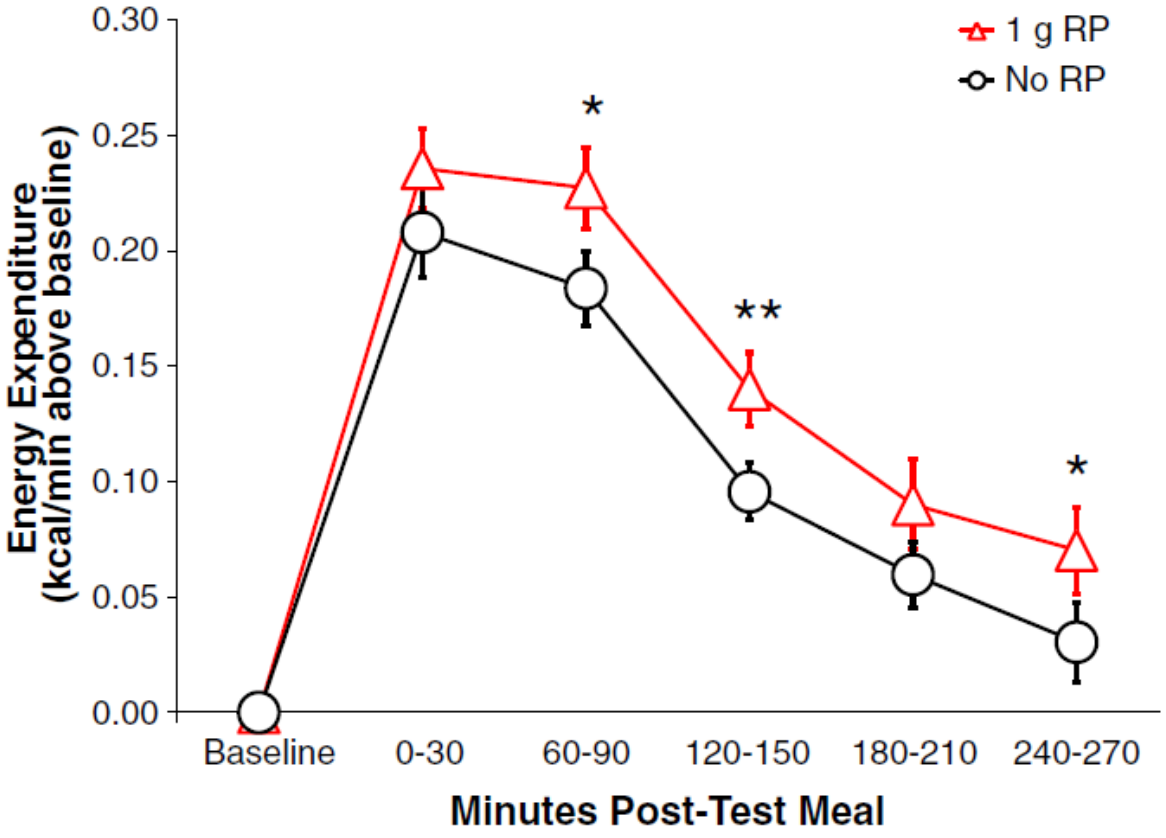

Fig. 2. Mean (±SEM) changes in energy expenditure measured over the 270 min after test loads ($n=25$) were greater with 1 g RP than no RP ($p<0.05$). *$p<0.05$, **$p<0.01$.

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Core body temperature was also greater

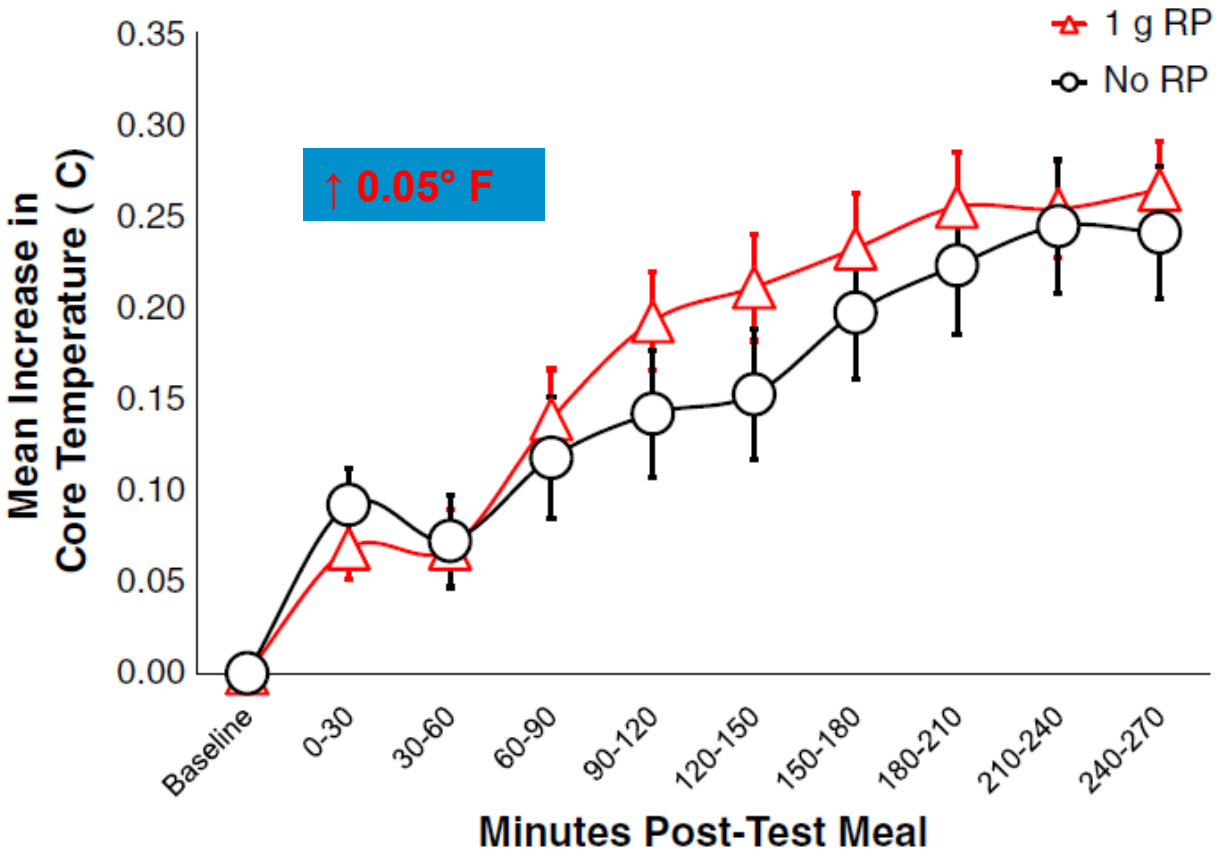

Fig. 4. Mean (± SEM) core body temperature measured over the 270 min after test loads ($n = 25$) was greater with 1 g RP than no RP ($p < 0.05$).

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Energy intake from an *ad lib* meal was decreased after 4.5 hours in subjects who did not frequently consume red pepper

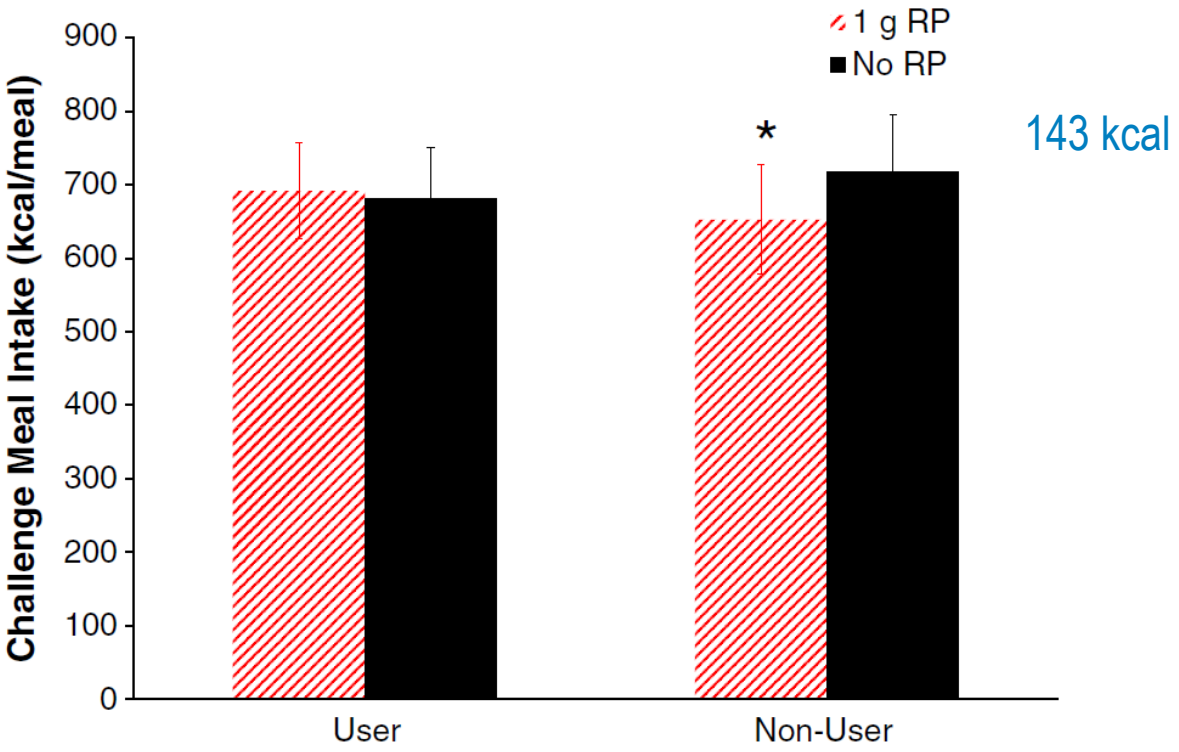

Fig. 6. Mean (±SEM) energy intake at a challenge meal served 270 min after test loads ($n = 25$) was lower in non-users after test loads with 1 g RP compared to no RP, but did not vary significantly in users ($p < 0.05$). $^{*}p < 0.05$.

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April 26, 2011 1:12 PM

Is weight-loss marvel hiding in your spice rack?

Posted by David W Freeman Leave Comment

(Credit: iStockphoto)

(CBS) - Can eating more of something help you weigh less? Maybe so, if the something in question is red chili peppers.

A new study shows that adding a bit of ground cayenne pepper to the diet can help people burn calories faster. What's more, the pepper seems to curb people's hunger - especially for fatty, salty, and sweet foods.

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Encouraging data on cinnamon continue to accumulate

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Cinnamon Use in Type 2 Diabetes: An Updated Systematic Review and Meta-Analysis

Robert W. Allen, PharmD[1]

Emmanuelle Schwartzman, PharmD[1,2]

William L. Baker, PharmD, BCPS (AQ CV)[3,4]

Craig I. Coleman, PharmD[3]

Olivia J. Phung, PharmD[1,2]

[1]College of Pharmacy, Western University of Health Sciences, Pomona, California

[2]Western Diabetes Institute, Pomona, California

ABSTRACT

PURPOSE Cinnamon has been studied in randomized controlled trials (RCTs) for its glycemic-lowering effects, but studies have been small and show conflicting results. A prior meta-analysis did not show significant results, but several RCTs have been published since then. We conducted an updated systematic review and meta-analysis of RCTs evaluating cinnamon's effect on glycemia and lipid levels.

METHODS MEDLINE, Embase, and Cochrane Central Register of Controlled Trials (CENTRAL) were searched through February 2012. Included RCTs evaluated cinnamon compared with control in patients with type 2 diabetes and reported at least one of the following: glycated hemoglobin (A_{1c}), fasting plasma glucose, total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), or triglycerides. Weighted mean differences (with 95% confidence intervals) for endpoints were calculated using random-effects models.

Source Allen et al., *Ann Fam Med* 2013;11:452

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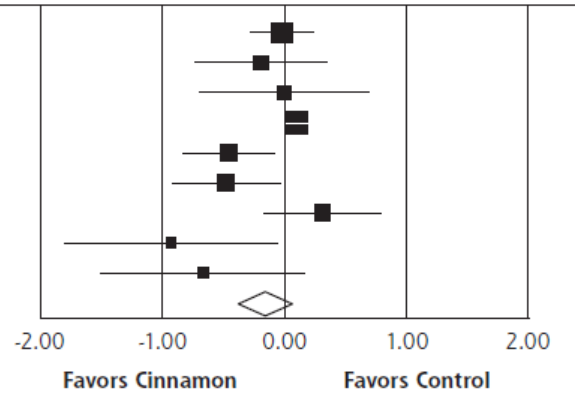
Fasting blood glucose is reduced (but not Hb A1c)

A. Hemoglobin A_{1c} (%)

Study name	Sample size: Cinnamon	Sample size: Control
Mang et al, 2006	33	32
Suppapitiporn et al, 2006	20	40
Vanschoonbeck et al, 2006	12	13
Blevins et al, 2007	29	28
Crawford, 2009	55	54
Akilen et al, 2010	30	28
Wainstein et al, 2011	29	30
Lu et al, 2012-1	23	10
Lu et al, 2012-2	23	10
Combined	**254**	**245**

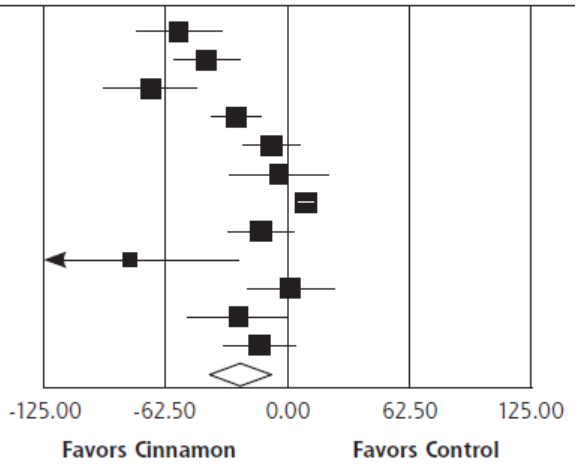
$I^2 = 66.5\%$; Egger's $P = .33$



B. Fasting Blood Glucose (mg/dL)

Study name	Sample size: Cinnamon	Sample size: Control
Khan et al, 2003-1	10	10
Khan et al, 2003-2	10	10
Khan et al, 2003-3	10	10
Mang et al, 2006	33	32
Suppapitiporn et al, 2006	20	40
Vanschoonbeck et al, 2006	12	13
Blevins et al, 2007	29	28
Akilen et al, 2010	30	28
Khan et al, 2010	7	7
Wainstein et al, 2011	29	30
Lu et al, 2012-1	23	10
Lu et al, 2012-2	23	10
Combined	236	228

$I^2 = 91.98\%$; Egger's $P = .004$



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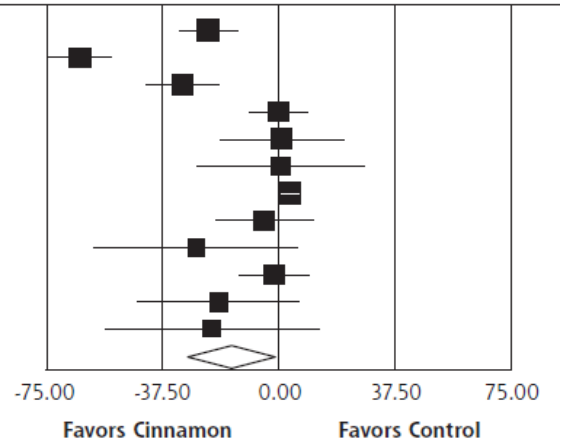
So are total cholesterol and LDL-C

A. Total Cholesterol (mg/dL)

Study name	Sample size: Cinnamon	Sample size: Control
Khan et al, 2003-1	10	10
Khan et al, 2003-2	10	10
Khan et al, 2003-3	10	10
Mang et al, 2006	33	32
Suppapitiporn et al, 2006	20	40
Vanschoonbeck et al, 2006	12	13
Blevins et al, 2007	29	28
Akilen et al, 2010	30	28
Khan et al, 2010	7	7
Wainstein et al, 2011	29	30
Lu et al, 2012-1	23	10
Lu et al, 2012-2	23	10
Combined	**236**	**228**

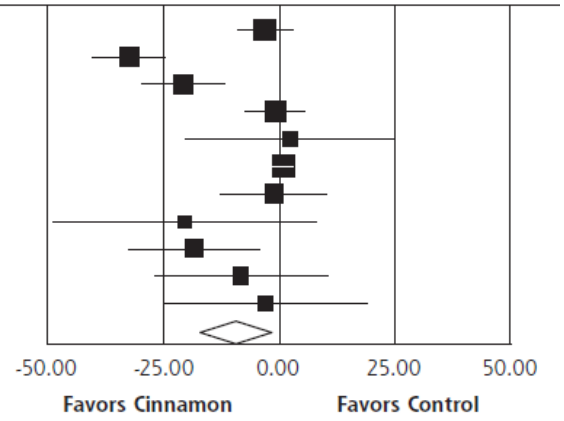
$I^2 = 94.72\%$; Egger's $P = .11$



B. LDL Cholesterol (mg/dL)

Study name	Sample size: Cinnamon	Sample size: Control
Khan et al, 2003-1	10	10
Khan et al, 2003-2	10	10
Khan et al, 2003-3	10	10
Mang et al, 2006	33	32
Vanschoonbeck et al, 2006	12	13
Blevins et al, 2007	29	28
Akilen et al, 2010	30	28
Khan et al, 2010	7	7
Wainstein et al, 2011	29	30
Lu et al, 2012-1	23	10
Lu et al, 2012-2	23	10
Combined	**216**	**188**

$I^2 = 88.6\%$; Egger's $P = .12$



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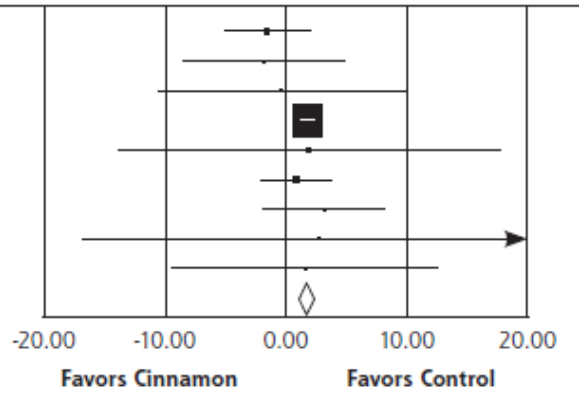
And good news for HDL-C and triglycerides

C. HDL Cholesterol (mg/dL)

Study name	Sample size: Cinnamon	Sample size: Control
Mang et al, 2006	33	32
Suppapitiporn et al, 2006	20	40
Vanschoonbeck et al, 2006	12	13
Blevins et al, 2007	29	28
Akilen et al, 2010	30	28
Khan et al, 2010	7	7
Wainstein et al, 2011	29	30
Lu et al, 2012-1	23	10
Lu et al, 2012-2	23	10
Combined	**206**	**198**

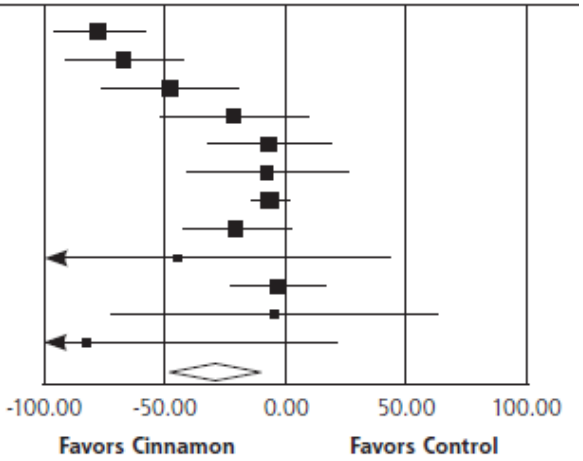
$I^2 = 0\%$; Egger's $P = .23$



D. Triglycerides (mg/dL)

Study name	Sample size: Cinnamon	Sample size: Control
Khan et al, 2003-1	10	10
Khan et al, 2003-2	10	10
Khan et al, 2003-3	10	10
Mang et al, 2006	33	32
Suppapitiporn et al, 2006	20	40
Vanschoonbeck et al, 2006	12	13
Blevins et al, 2007	29	28
Akilen et al, 2010	30	28
Khan et al, 2010	7	7
Wainstein et al, 2011	29	30
Lu et al, 2012-1	23	10
Lu et al, 2012-2	23	10
Combined	**236**	**228**

$I^2 = 84.27\%$; Egger's $P = .27$



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The garlic data are also becoming compelling

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Garlic Lowers Blood Pressure in Hypertensive Individuals, Regulates Serum Cholesterol, and Stimulates Immunity: An Updated Meta-analysis and Review[1,2]

Karin Ried*

National Institute of Integrative Medicine, Melbourne, Australia

Abstract

Background: Garlic has been shown to have cardiovascular protective and immunomodulatory properties.

Objectives: We updated a previous meta-analysis on the effect of garlic on blood pressure and reviewed the effect of garlic on cholesterol and immunity.

Methods: We searched the Medline database for randomized controlled trials (RCTs) published between 1955 and December 2013 on the effect of garlic preparations on blood pressure. In addition, we reviewed the effect of garlic on cholesterol and immunity.

Source Reid et al., *Nutr Rev* 2013;71:282

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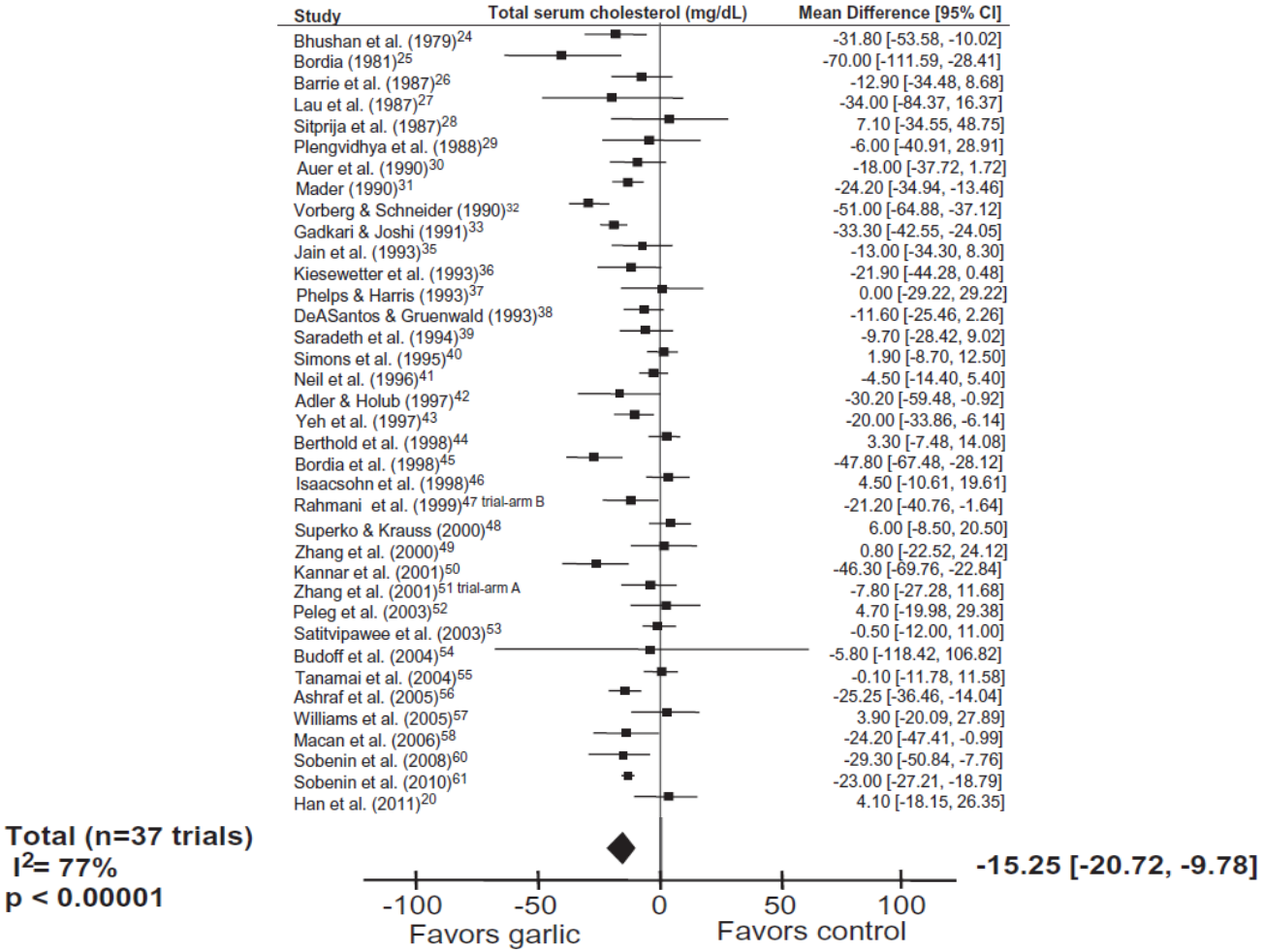
Garlic appears to have favorable effects on blood cholesterol



Source Reid et al., *Nutr Rev* 2013;71:282

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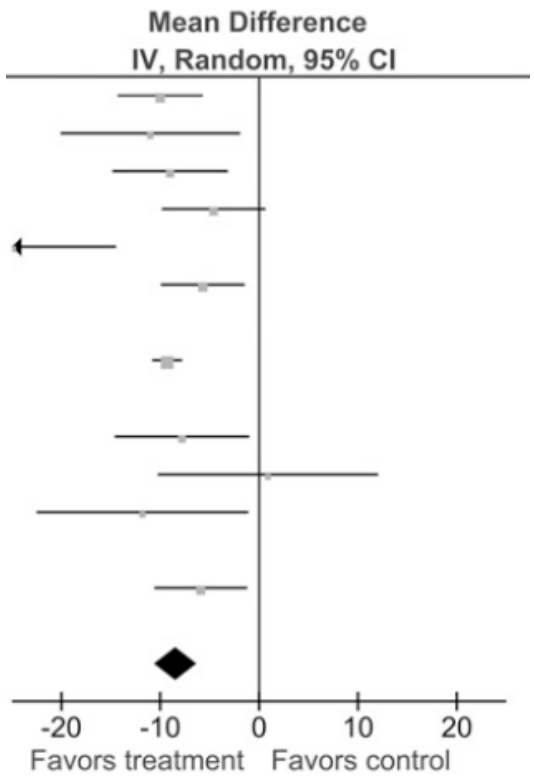
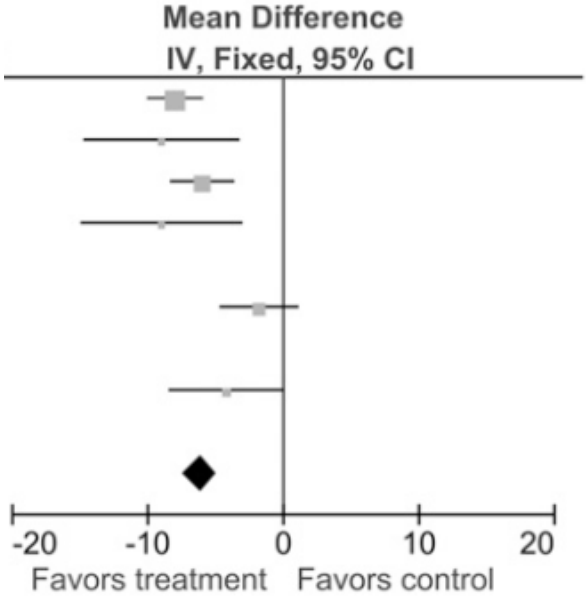
And blood pressure



Systolic



Diastolic

Source Ried et al., *J Nutr* 2016;146:389S

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Possible effect of spices and herbs on the microbiome


Hypothesis:
Spices and herbs can increase the growth of beneficial bacteria and/or inhibit the growth of harmful bacteria *in vitro*

- Cultures for 48 hours
  - *C difficile, Lactobacillus, Bifidobacterium*
  - Ginger, Mediterranean rosemary, red pepper, black pepper, turmeric and oregano
  - Aqueous extracts (2-fold serial dilutions
- Outcome measures
  - Minimum inhibitory concentrations
  - Concentrations resulting in change in appearance
    - Growth stimulation
    - Growth stimulation plateau

David Heber
Zhaoping Li

Potential benefits of long-term increased spice/herb intake


Hypothesis:
Increased consumption of spices and herbs (2-3 times current) will exert beneficial physiological effects with equal or better liking

- Controlled feeding study – seasoned vs. control
  - Three month-long interventions
  - Cross-over design
  - 80 overweight or obese healthy adults with at least one other metabolic syndrome risk factor

- Outcome measures
  - Diet satisfaction
  - Blood pressure/arterial function
  - Blood glucose and lipids
  - Inflammatory markers
  - Microbiome

PENNSTATE 1855

Penny Kris-Etherton
Sheila West
Barbara Rolls

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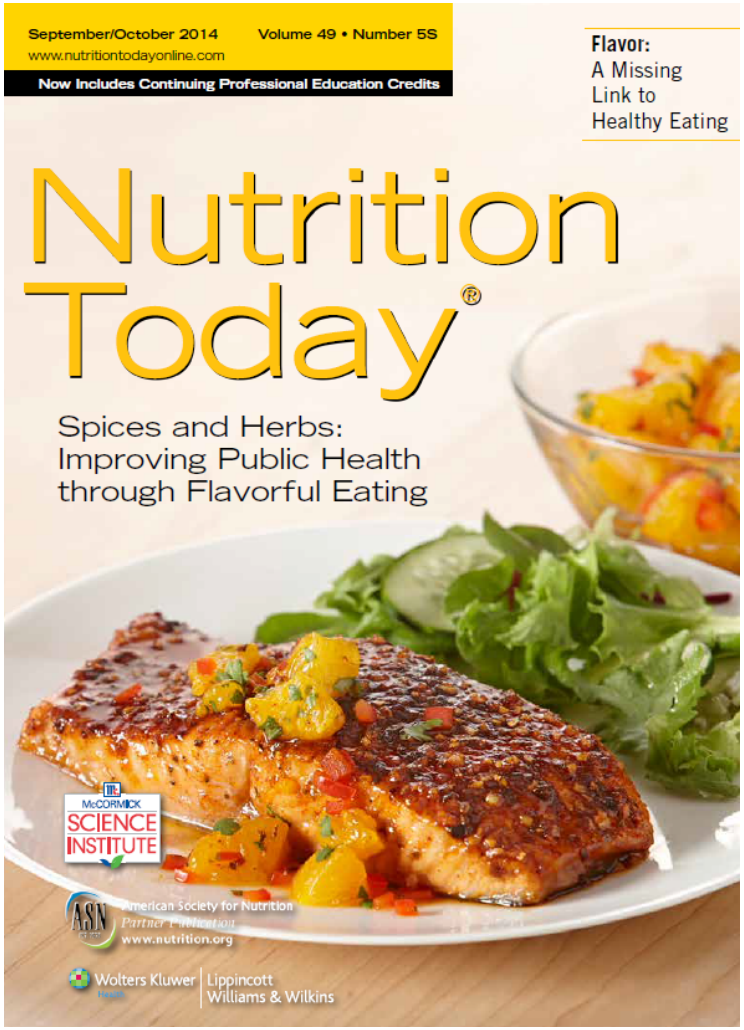

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RECENTLY PUBLISHED

August, 2015
Researchers at Johns Hopkins University studied the effects of a behavioral intervention, which emphasized spices and herbs, on the maintenance of sodium intake at the recommended intake of 1500 mg/d.

July, 2015
Researchers in Baltimore City, Maryland determined whether an experiential nutrition education intervention focusing on spices and herbs ("Spice MyPlate") was feasible.

ABOUT MSI

The McCormick Science Institute is a research-driven organization whose mission is to support scientific research and disseminate information on the health benefits of culinary herbs and spices.

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Thank you!