THE ALMOND CONFERENCE 2020

JOIN THE JOURNEY

ABC HEART HEALTH JOURNEY

Karen Lapsley, *Almond Board of California*

Kathy Musa-Veloso, *Intertek*

Claire Berryman, *Florida State University*

Wendy Hall, *Kings College London*

Becky Jeffers, *Almond Board of California*

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2020
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ABC HEART HEALTH JOURNEY

Karen Lapsley, *Almond Board of California*

Almond Heart Health Journey (1995 – 2020)

Moderator:

Dr. Karen Lapsley

(retired) Chief Scientific Officer

Almond Board of California

Speakers:

Dr. Kathy Musa-Velosa, INTERTEK, Toronto

Dr. Claire Berryman, Florida State University

Dr. Wendy Hall, King's College London, UK

Becky Jeffers, Almond Board of California

THE ALMOND CONFERENCE 2020 JOIN THE JOURNEY

CPE Credit for Registered Dietitian Nutritionists (RDNs)

For RDNs who attended this session, you will receive your Certificate acknowledging 1 CPE for your participation no later than Friday, December 11. Your certificate will be sent to the email address that you used to register for this session.

Questions? Email almondboardnutrition@porternovelli.com

1995 – 2020 Key milestones on heart health research and outreach journey

1995 ABC launches Nutrition Research Program

Systematic Review & Meta-Analysis on Almonds & Heart Health

Almonds & Cholesterol
(the good, bad, & total)
+
Waist, Belly Fat & Abdominal mass

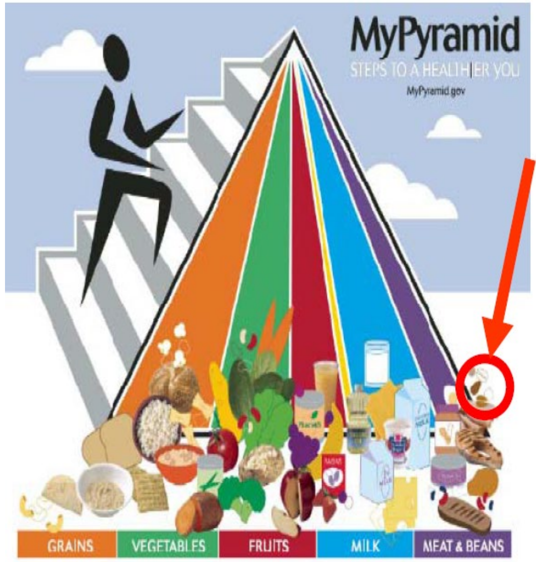
Almonds & Vascular Flow
+
Mental Stress

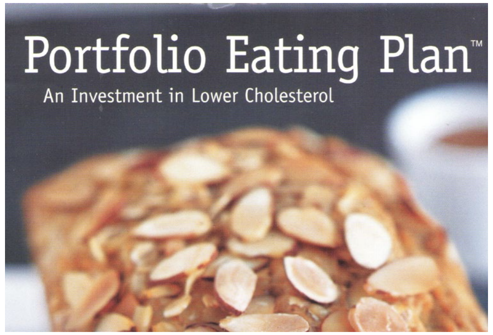
By 2020 ABC had funded 22 heart health projects with 40 published papers

2003: FDA Nut Health Claim

↓ *Total Cholesterol & LDL*

2005: Almonds Added to USDA MyPyramid





2003 – 2007 Univ. of Toronto eating plan with up to 30% cholesterol lowering

American Heart Association
CERTIFIED
Meets Criteria For Heart-Healthy Food

2011 – ABC joins AHA heart check program

2017

ACCORDING TO THE FDA, NOW
ALMONDS
ARE HEALTHY!

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ABC HEART HEALTH JOURNEY

Kathy Musa-Veloso, *Intertek*

california almonds
Almond Board of California

intertek
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A REVIEW OF THE POOLED LIPID-LOWERING EFFECTS OF ALMONDS

ABC Conference 2020

Kathy Musa-Veloso, PhD
Health Claims and Clinical Trials Group
Food and Nutrition
Intertek Health Sciences Inc.

intertek

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1. Meta-analyses and Nutrition Studies

2. Present Results of Systematic Review and Meta-analyses by Musa-Veloso *et al.* (2016)

3. Summary

Source: https://www.brunet.ca/en/health/health-tips/15-myths-about-nutrition/

META-ANALYSES AND NUTRITION STUDIES

Clinical nutrition studies are challenged in that:

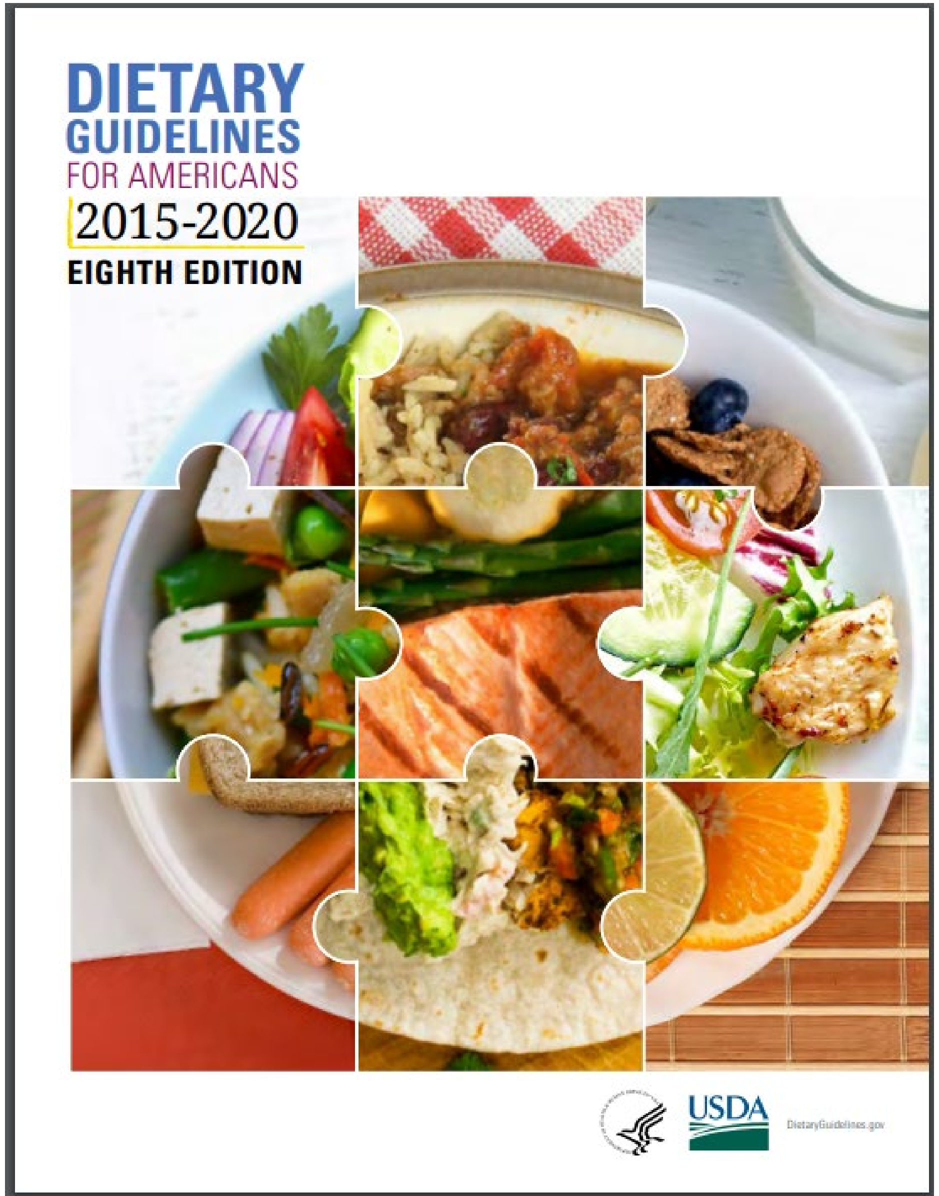
- Effects are generally small and highly variable
  - Compliance is often difficult
- Number of subjects needed to have robust statistical power is large and often not feasible

❖ **A meta-analysis is a way to increase statistical power.**

❖ **Meta-analyses are relied upon by the Agency for Healthcare Research and Quality (AHRQ), World Health Organization (WHO), and the Dietary Guidelines Advisory Committee (DGAC) for establishing policies and guidelines.**

THE USE OF META-ANALYSES IN POLICY AND GUIDELINES: DIETARY GUIDELINES FOR AMERICANS (DGA)

- The DGAC considered meta-analyses as part of the Stage 1 process ("Review of Current Evidence") in preparing the 2015-2020 Dietary Guidelines for Americans (DHHS/USDA, 2015)
- In the "Scientific Report of the 2020 Dietary Guidelines Advisory Committee", the DGAC recommended that meta-analyses be considered for appropriate questions on a continuous basis (DGAC, 2020)



THE USE OF META-ANALYSES IN POLICY AND GUIDELINES: AGENCY FOR HEALTHCARE RESEARCH AND QUALITY (AHRQ)

Application of Systematic Review Methodology in Nutrition (AHRQ, 2009)

- *"The ability to combine small studies with meta-analysis increases the statistical power available to address specific questions. This is particularly useful for systematic reviews of* ***nutrition topics*** *where the availability of large trials is relatively limited or lacking."*

Technical Review 17

Nutritional Research Series

Volume 1: Application of Systematic Review Methodology to the Field of Nutrition

Prepared for:
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U.S. Department of Health and Human Services
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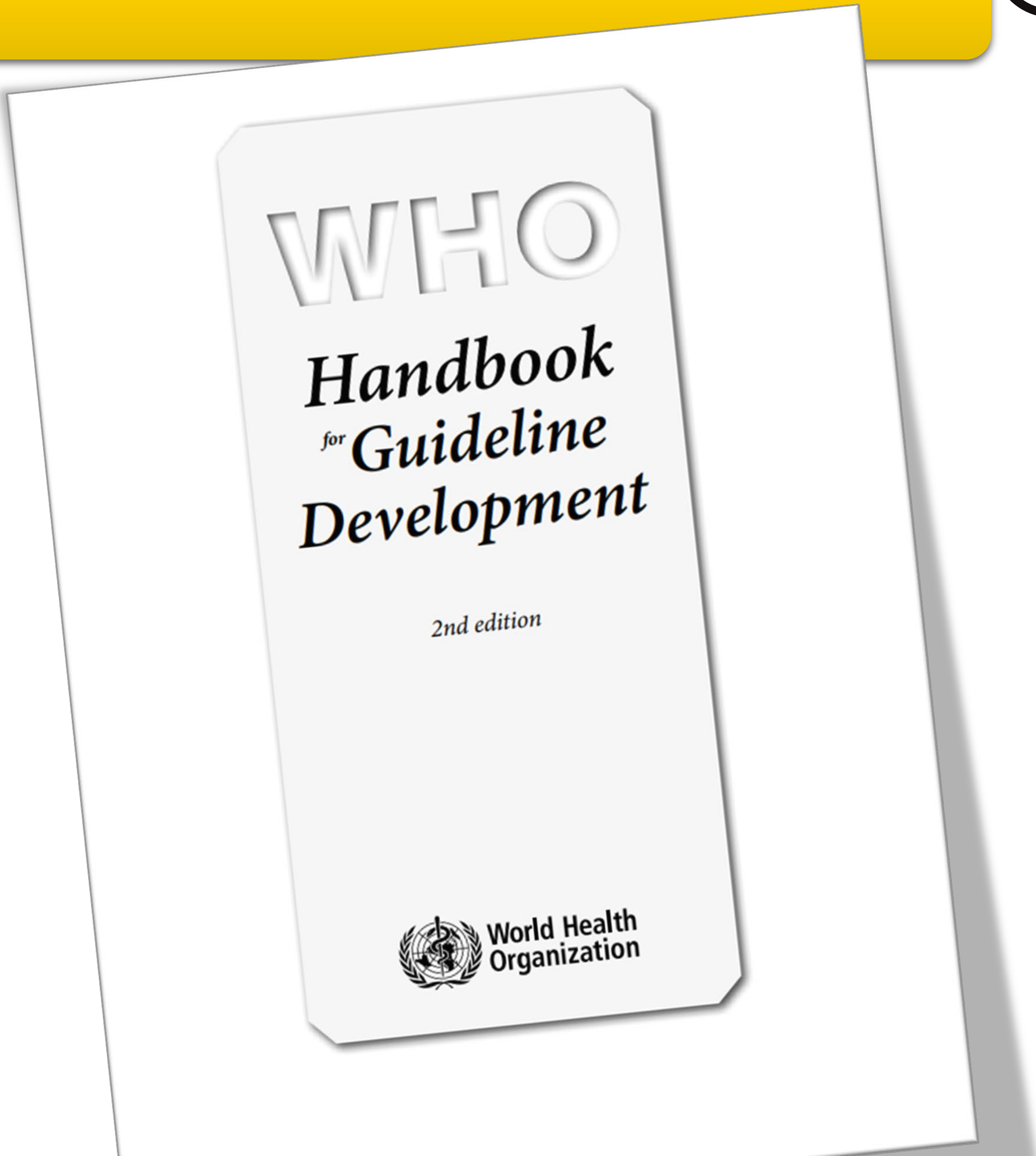
Joseph Lau, M.D.

AHRQ Publication No. 09-0025
January 2009

THE USE OF META-ANALYSES IN POLICY AND GUIDELINES: WORLD HEALTH ORGANIZATION (WHO)

Handbook for Guideline Development (WHO, 2014)

- *"By combining information from all relevant studies, meta-analyses can provide more precise estimates of the effects of an intervention than estimates derived from the individual studies included within a review."*

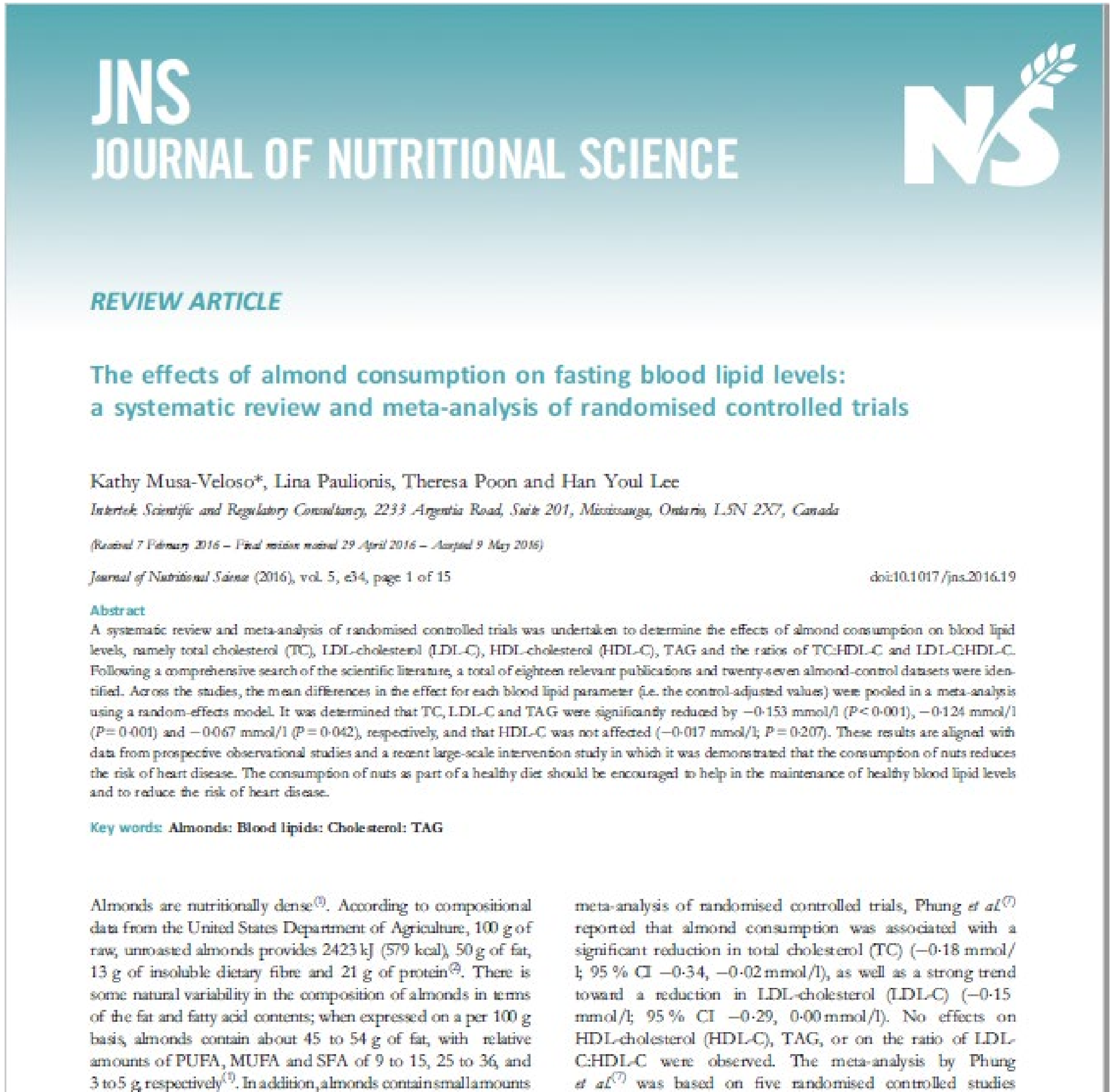


A REVIEW OF THE STUDY CONDUCTED BY MUSA-VELOSO *ET AL.* (2016)

Objective:

A systematic review and meta-analysis of randomised controlled trials was undertaken to determine the effects of almond consumption on blood lipid levels:

- Total cholesterol (TC);
- LDL-cholesterol (LDL-C);
- HDL-cholesterol (HDL-C);
- Triglycerides (TGs); and
- The ratios of TC:HDL-C and LDL-C:HDL-C.



JNS
JOURNAL OF NUTRITIONAL SCIENCE

REVIEW ARTICLE

The effects of almond consumption on fasting blood lipid levels: a systematic review and meta-analysis of randomised controlled trials

Kathy Musa-Veloso*, Lina Paulionis, Theresa Poon and Han Youl Lee

Intertek Scientific and Regulatory Consultancy, 2233 Argentia Road, Suite 201, Mississauga, Ontario, L5N 2X7, Canada

(Received 7 February 2016 – Final revision received 29 April 2016 – Accepted 9 May 2016)

Journal of Nutritional Science (2016), vol. 5, e34, page 1 of 15 doi:10.1017/jns.2016.19

Abstract

A systematic review and meta-analysis of randomised controlled trials was undertaken to determine the effects of almond consumption on blood lipid levels, namely total cholesterol (TC), LDL-cholesterol (LDL-C), HDL-cholesterol (HDL-C), TAG and the ratios of TC:HDL-C and LDL-C:HDL-C. Following a comprehensive search of the scientific literature, a total of eighteen relevant publications and twenty-seven almond-control datasets were identified. Across the studies, the mean differences in the effect for each blood lipid parameter (i.e. the control-adjusted values) were pooled in a meta-analysis using a random-effects model. It was determined that TC, LDL-C and TAG were significantly reduced by −0·153 mmol/l ($P<0·001$), −0·124 mmol/l ($P=0·001$) and −0·067 mmol/l ($P=0·042$), respectively, and that HDL-C was not affected (−0·017 mmol/l; $P=0·207$). These results are aligned with data from prospective observational studies and a recent large-scale intervention study in which it was demonstrated that the consumption of nuts reduces the risk of heart disease. The consumption of nuts as part of a healthy diet should be encouraged to help in the maintenance of healthy blood lipid levels and to reduce the risk of heart disease.

Key words: Almonds: Blood lipids: Cholesterol: TAG

Almonds are nutritionally dense[1]. According to compositional data from the United States Department of Agriculture, 100 g of raw, unroasted almonds provides 2423 kJ (579 kcal), 50 g of fat, 13 g of insoluble dietary fibre and 21 g of protein[2]. There is some natural variability in the composition of almonds in terms of the fat and fatty acid contents; when expressed on a per 100 g basis, almonds contain about 45 to 54 g of fat, with relative amounts of PUFA, MUFA and SFA of 9 to 15, 25 to 36, and 3 to 5 g, respectively[1]. In addition, almonds contain small amounts

meta-analysis of randomised controlled trials, Phung *et al.*[7] reported that almond consumption was associated with a significant reduction in total cholesterol (TC) (−0·18 mmol/l; 95 % CI −0·34, −0·02 mmol/l), as well as a strong trend toward a reduction in LDL-cholesterol (LDL-C) (−0·15 mmol/l; 95 % CI −0·29, 0·00 mmol/l). No effects on HDL-cholesterol (HDL-C), TAG, or on the ratio of LDL-C:HDL-C were observed. The meta-analysis by Phung *et al.*[7] was based on five randomised controlled studies

LITERATURE SEARCH

Search Date: May 2013, updated literature searches in May 2014 and February 2015

Literature Databases: 8 databases were searched using ProQuest Dialog™

Study Appraisal: Studies were appraised using Health Canada's standardised quality appraisal tool

Results:

- The effects of almonds on blood lipid levels were assessed in 18 publications (27 comparisons)

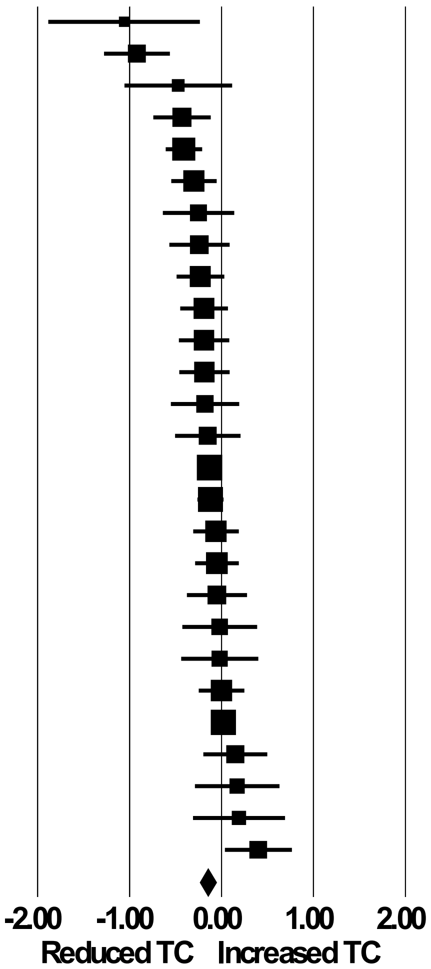
Inclusion Criteria

- Human intervention study that was randomised and controlled
- The study was a full-length article that was published in a peer-reviewed journal
- The objective of the study was to assess the effects of almond consumption on blood lipid levels
- The amount of almonds consumed was reported
- The subjects were healthy adults (aged ≥18 y)
- The study duration was ≥4 weeks
- Fasting blood lipids (*i.e.* TC, LDL-C, HDL-C and/or TAG) were assessed; and
- Fasting blood lipids were measured using validated methods.

ALMOND CONSUMPTION AND FASTING TC – META-ANALYSIS RESULTS

Study name	Baseline TC	Almond Intake	Statistics for each study: Difference in means	Lower limit	Upper limit	p-Value
Spiller et al. stratum 2(24)	Not optimal	100 g	-1.060	-1.883	-0.237	0.012
Abazarfard et al.(9)	Not optimal	50 g	-0.920	-1.277	-0.563	0.000
Spiller et al. stratum 1(24)	Not optimal	100 g	-0.470	-1.055	0.115	0.115
Wien et al.(28)	Not optimal	60 g	-0.430	-0.742	-0.118	0.007
Tamizifar et al.(25)	Not optimal	25 g	-0.410	-0.607	-0.213	0.000
Li et al.(20)	Not optimal	56 g	-0.300	-0.547	-0.053	0.017
Jia et al. stratum 1(18)	Optimal	84 g	-0.250	-0.638	0.138	0.206
Sabate et al. stratum 2(23)	Not optimal	68 g	-0.240	-0.567	0.087	0.150
Jenkins et al. stratum 2(17)	Not optimal	73 g	-0.230	-0.488	0.028	0.081
Jenkins et al. stratum 1(17)	Not optimal	37 g	-0.190	-0.448	0.068	0.150
Ruisinger et al.(22)	Optimal	100 g	-0.190	-0.463	0.083	0.173
Damasceno et al.(15)	Not optimal	50 to 75 g	-0.185	-0.458	0.087	0.182
Jia et al. stratum 2(18)	Optimal	168 g	-0.180	-0.551	0.191	0.342
Wien et al.(27)	Not optimal	84 g	-0.150	-0.505	0.205	0.408
Berryman et al.(11)	Not optimal	43 g	-0.130	-0.252	-0.008	0.036
Kurlandsky & Stote stratum 2(19)	Optimal	60 g	-0.120	-0.262	0.022	0.097
Lovejoy et al. stratum 2(21)	Optimal	57 to 113 g	-0.060	-0.306	0.186	0.633
Foster et al.(16)	Optimal	56 g	-0.050	-0.287	0.187	0.680
Sabate et al. stratum 1(23)	Not optimal	34 g	-0.050	-0.377	0.277	0.764
Tan & Mattes stratum 3(26)	Optimal	43 g	-0.020	-0.426	0.386	0.923
Tan & Mattes stratum 4(26)	Optimal	43 g	-0.020	-0.439	0.399	0.925
Lovejoy et al. stratum 1(21)	Optimal	57 to 113 g	0.000	-0.246	0.246	1.000
Kurlandsky & Stote stratum 1(19)	Not optimal	60 g	0.020	-0.112	0.152	0.766
Tan & Mattes stratum 1(26)	Optimal	43 g	0.150	-0.197	0.497	0.396
Tan & Mattes stratum 2(26)	Optimal	43 g	0.170	-0.289	0.629	0.468
Sweazea et al.(10)	Optimal	30.7 to 43 g	0.190	-0.310	0.690	0.456
Cohen & Johnston(14)	Optimal	20 g	0.400	0.037	0.763	0.031
			-0.153	-0.235	-0.070	0.000

Difference in means and 95% CI



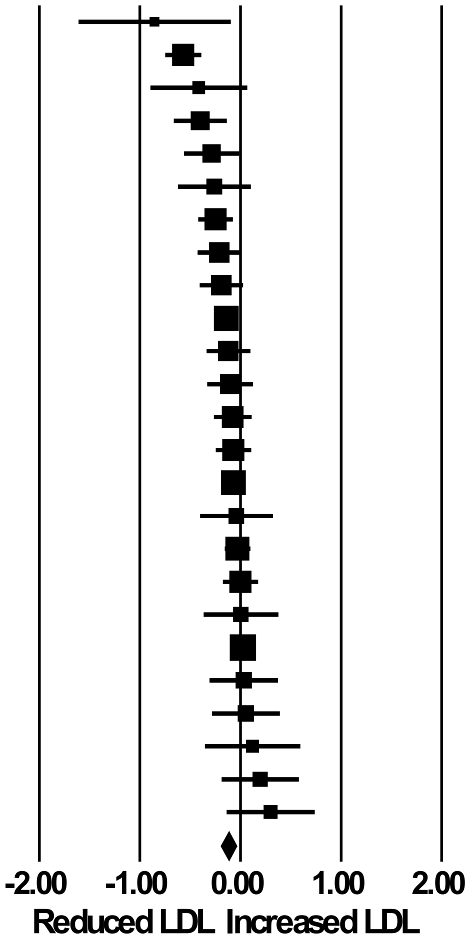
- **27 comparisons**
- **Pooled Effect: −0·153 mmol/l**
- **95% CI: −0·235, −0·070 mmol/l**
- **P<0·001**

ALMOND CONSUMPTION AND FASTING LDL-C: META-ANALYSIS RESULTS

Study name	Baseline LDL-C	Almond Intake	Difference in means	Lower limit	Upper limit	p-Value
Spiller et al. stratum 2(24)	Not optimal	100 g	-0.854	-1.610	-0.098	0.027
Tamizifar et al.(25)	Not optimal	25 g	-0.569	-0.748	-0.390	0.000
Spiller et al. stratum 1(24)	Not optimal	100 g	-0.414	-0.895	0.067	0.092
Li et al.(20)	Not optimal	56 g	-0.400	-0.663	-0.137	0.003
Wien et al.(28)	Not optimal	60 g	-0.286	-0.560	-0.012	0.041
Sabate et al. stratum 2(23)	Not optimal	68 g	-0.260	-0.621	0.101	0.158
Damasceno et al.(15)	Not optimal	50-75 g	-0.247	-0.419	-0.076	0.005
Jenkins et al. stratum 2(17)	Not optimal	73 g	-0.210	-0.427	0.007	0.057
Ruisinger et al.(22)	Not optimal	100 g	-0.190	-0.405	0.025	0.084
Berryman et al.(11)	Not optimal	43 g	-0.140	-0.236	-0.044	0.004
Jenkins et al. stratum 1(17)	Not optimal	37 g	-0.120	-0.337	0.097	0.278
Wien et al.(27)	Not optimal	84 g	-0.104	-0.331	0.123	0.369
Foster et al.(16)	Not optimal	56 g	-0.077	-0.263	0.109	0.418
Lovejoy et al. stratum 2(21)	Not optimal	57 to 113 g	-0.070	-0.245	0.105	0.434
Kurlandsky & Stote stratum 1(19)	Not optimal	60 g	-0.070	-0.172	0.032	0.179
Sabate et al. stratum 1(23)	Not optimal	34 g	-0.040	-0.401	0.321	0.828
Kurlandsky & Stote stratum 2(19)	Not optimal	60 g	-0.030	-0.157	0.097	0.643
Lovejoy et al. stratum 1(21)	Not optimal	57 to 113 g	0.000	-0.175	0.175	1.000
Tan & Mattes stratum 4(26)	Optimal	43 g	0.005	-0.366	0.376	0.979
Abazarfard et al.(9)	Not optimal	50 g	0.025	0.009	0.041	0.002
Tan & Mattes stratum 3(26)	Optimal	43 g	0.033	-0.307	0.373	0.849
Tan & Mattes stratum 1(26)	Optimal	43 g	0.054	-0.283	0.391	0.753
Sweazea et al.(10)	Not optimal	30.7 to 43 g	0.120	-0.353	0.593	0.619
Tan & Mattes stratum 2(26)	Optimal	43 g	0.196	-0.188	0.580	0.317
Cohen & Johnston(14)	Optimal	20 g	0.300	-0.138	0.738	0.179
			-0.124	-0.196	-0.051	0.001

Statistics for each study

Difference in means and 95%CI



- 26 comparisons
- Pooled Effect: -0.124 mmol/L
- 95% CI: -0.196, -0.051 mmol/L
- P=0.001

ALMOND CONSUMPTION AND FASTING BLOOD LIPIDS – SENSITIVITY ANALYSES

	TC	LDL-C
Almond dose (g/d)	**↓SS with an ↑dose of almonds (≥45g)**	**↓SS with an ↑dose of almonds (≥45g)**
BL lipid level	**↓SS with ↑BL lipid level (not optimal)**	**↓SS with ↑BL lipid level (not optimal)**

BL = baseline; LDL-C = low-density lipoprotein cholesterol; SS = statistically significant; TC = total cholesterol.

SUMMARY

- ❖ Meta-analyses are used to increase statistical power in studies where effect sizes are small and highly variable.
- ❖ Meta-analyses are relied upon by the likes of AHRQ, WHO and DGAC for establishing policies and guidelines.
- ❖ In the meta-analysis by Musa-Veloso *et al.* (2016), consumption of almonds:
  - ❖ ↓TC and ↓LDL-C fasting levels;
  - ❖ Magnitude of reduction was greater with:
    - ❖ ↑dose of almonds and
    - ❖ ↑ BL lipid levels.
- ❖ **The consumption of almonds, as part of a healthy diet should be encouraged in order to support the management of blood lipid levels and to reduce the risk of heart disease.**

THANK YOU

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Claire Berryman, *Florida State University*

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Beyond cholesterol: emerging almond research in cardiovascular health

Claire Berryman, PhD, RD
Department of Nutrition, Food, and Exercise Sciences
Florida State University

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Almond Board of California

Disclosure of speaker's interests

(Potential) conflict of interest	See below
Potentially relevant company relationships in connection with event	Almond Board of California
Sponsorship or research funding	Funded past research (2009-2012) related to today's presentation Funded travel expenses to scientific conferences related to this research including Experimental Biology (2010, 2011, 2013, 2014), American Heart Association EPI/NPAM (2013), and IUNS 20th International Congress of Nutrition (2013) meetings Funded past graduate research project (2012-2015) Funding current research project (2020-2022)
Fee or other (financial) payment	None
Shareholder	None
Other relationship	None

Background

- Studies consistently show that almond consumption decreases total and LDL-cholesterol
- Despite being an energy dense food, almonds do not increase body weight, body mass index, or waist circumference
- Prior studies have incrementally decreased some or all foods in the control diet to accommodate the caloric addition of almonds
- The current study used a single, whole food substitution to investigate the independent effects of almonds beyond the contributions of a low-fat background diet

Berryman CE et al. Nutr Rev 2011; Flores-Mateo G et al. AJCN 2013

Study objectives

Determine the effects of 43 g (1.5 ounces) of almonds, substituted in a low-fat diet for a calorie-matched muffin, on cardiometabolic health:

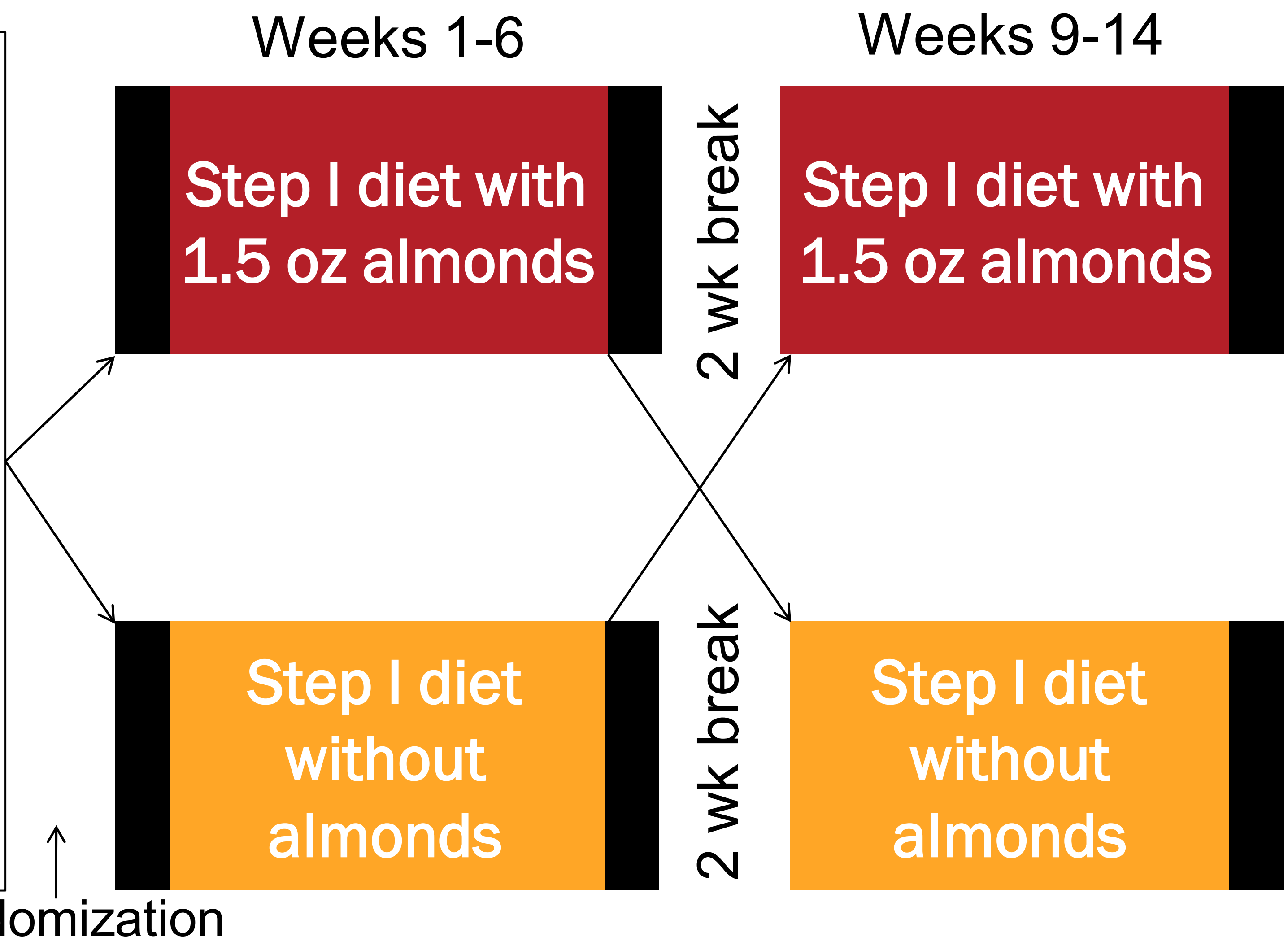
- Lipids and lipoproteins
- High density lipoprotein biology and function
- Body composition, including abdominal adiposity

Experimental design

Screening Visit

Measures:
- Height/weight
- Blood pressure
- Blood draw

Qualifications:
- Male or female
- Age: 30-65 years
- BMI: 20-35 kg/m^2
- Elevated LDL-C
- Non-smokers
- Not taking cholesterol-lowering medications/ supplements



█ Clinic Visit: Blood draw, blood pressure, body composition assessment

Diet design: sample menu

Breakfast:

- 2% milk
- Oatmeal
- Apple juice
- English muffin
- Blueberries
- Margarine

Snack:

43 g almonds

OR

106 g banana muffin

vs

Lunch:

- White bread
- Deli turkey
- Provolone cheese
- Mayonnaise
- Pretzels
- Yogurt
- Pear

Dinner:

- Chicken parmesan
- Broccoli
- Dinner roll
- Margarine

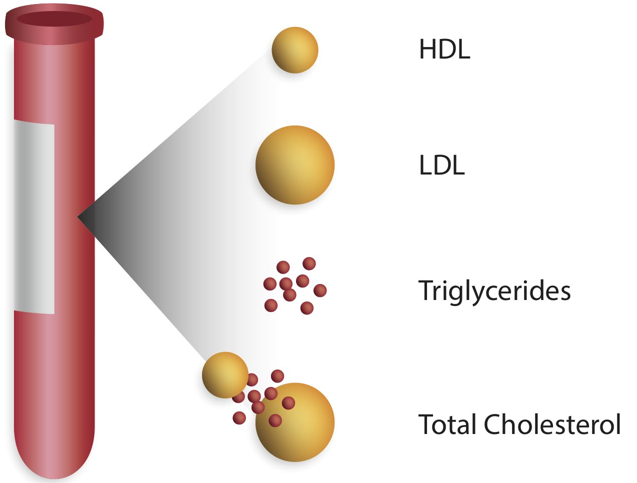
Diet design: nutrient composition

	Almond	Control
Protein, % of kcal (g)	16.4 (87)	15.2 (81)
Carbohydrate, % of kcal (g)	51.3 (270)	58.4 (310)
Fat, % of kcal (g)	32.3 (76)	26.4 (62)
SFA, % of kcal (g)	7.7 (18)	7.8 (18)
MUFA, % of kcal (g)	13.9 (33)	10.4 (24)
PUFA, % of kcal (g)	8.4 (20)	6.2 (15)
Cholesterol, mg	116	122
Fiber, g	26.1	23.1
Sodium, mg	3070	3220

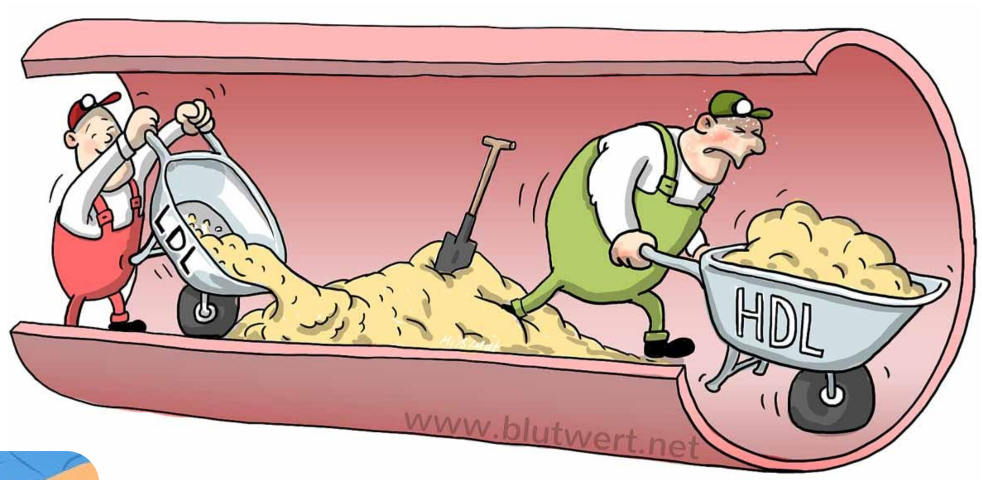
On the basis of 2100 kcal/d and averaged across a 6-d menu cycle. All values were determined using The Food Processor SQL (ESHA Research, Salem, OR). MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; SFA, saturated fatty acids.

Outcome measures

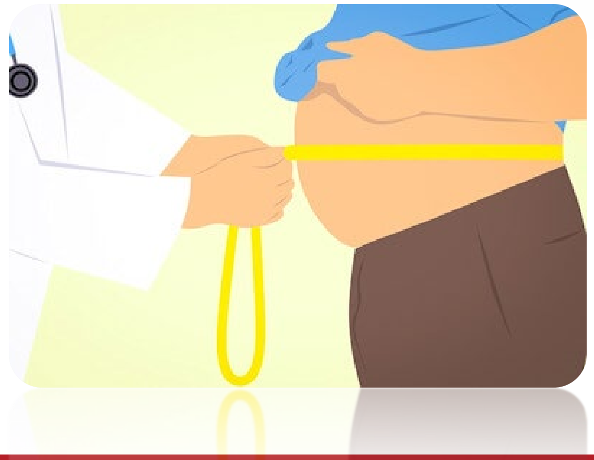
Traditional lipid and lipoprotein measures



High density lipoprotein biology and function



Body mass and composition



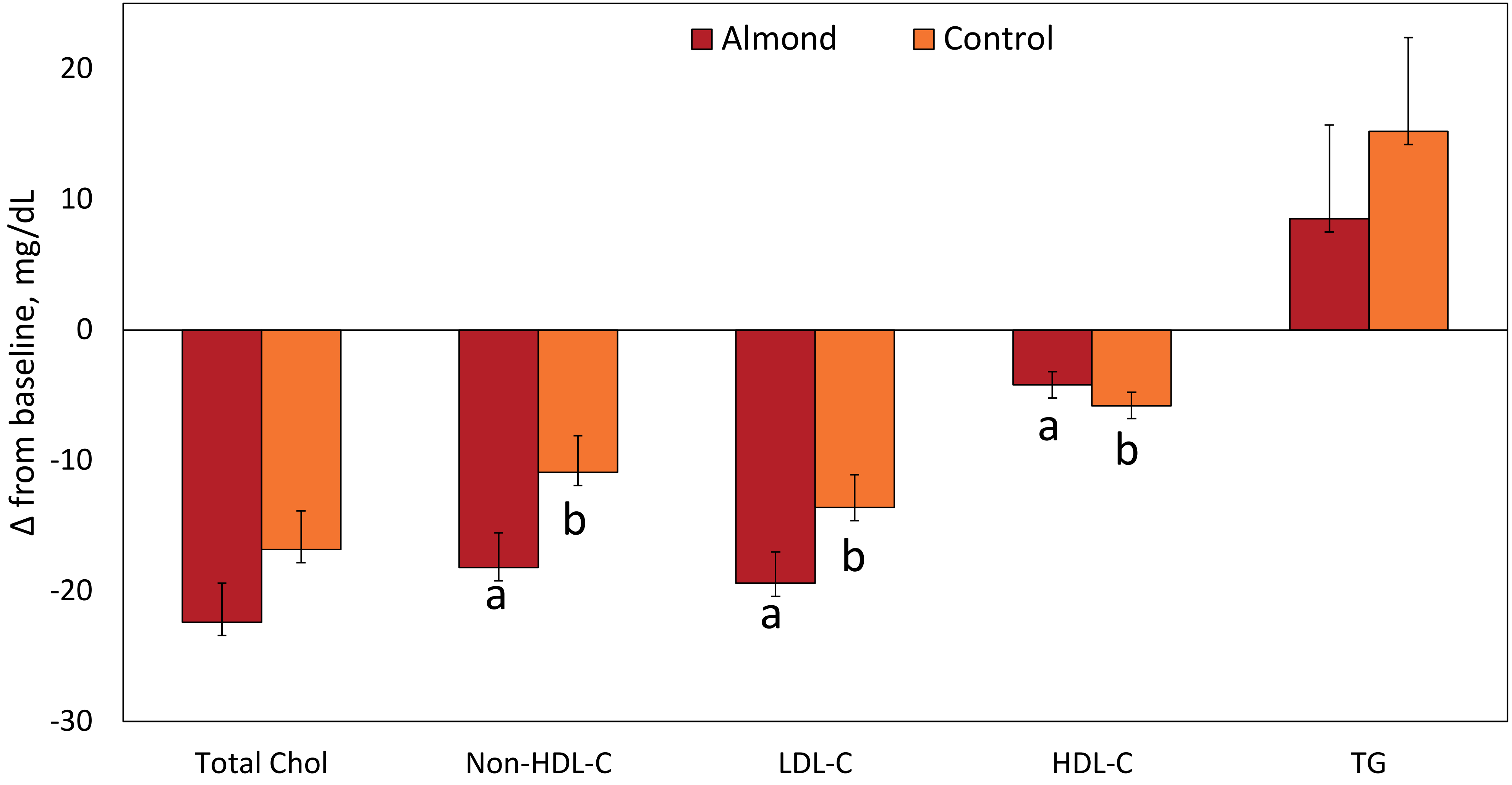
Baseline characteristics

Variable (n = 48)	
Age, y	49.9 ± 9.4
Race, n (%)	
White	45 (94)
Black	1 (2)
Asian	2 (4)
Hispanic	0 (0)
Body mass index, kg/m²	26.2 ± 2.8
Blood pressure, mm Hg	
Systolic	116 ± 11
Diastolic	78 ± 7
Lipids/lipoproteins, mg/dL	
Total cholesterol	228 ± 25
LDL-C	149 ± 20
HDL-C	55 ± 16
Triglycerides†	117 (90-143)
Glucose, mg/dL	89 ± 9
C-reactive protein, mg/L†	0.90 (0.50-1.40)

Values are mean ± standard deviation. † Median; interquartile range in parentheses.

 Claire E. Berryman, PhD, RD (cberryman@fsu.edu)

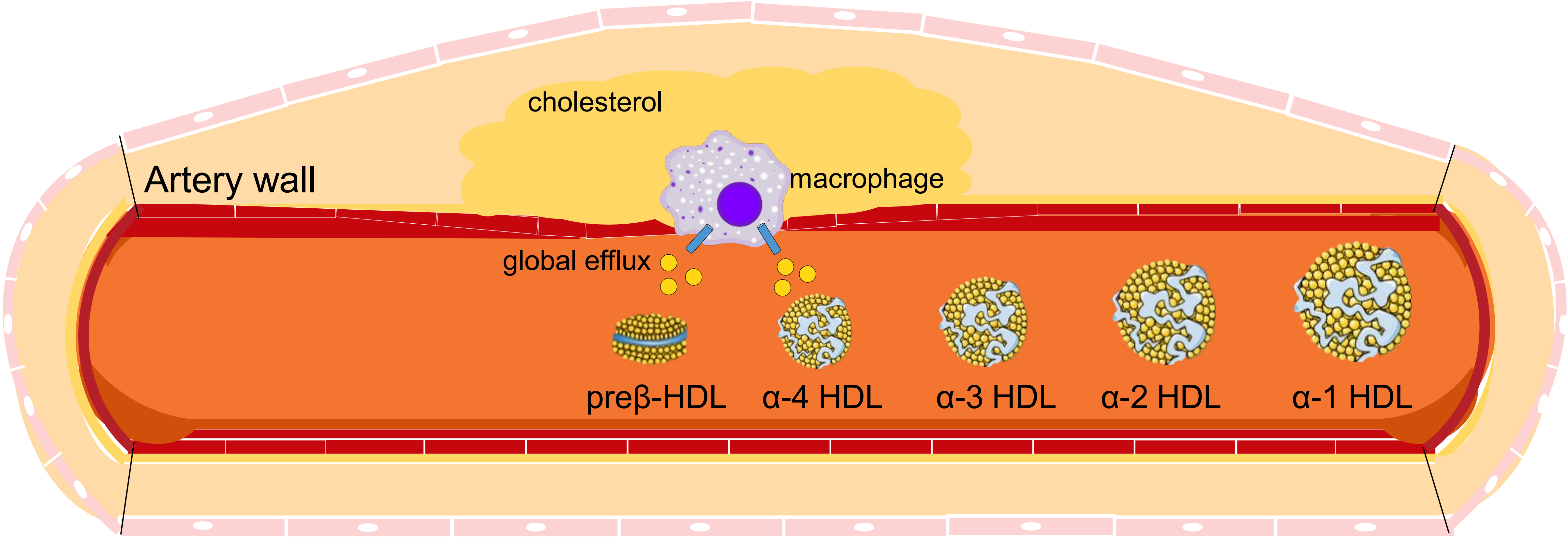
The diet with almonds improved traditional lipid and lipoprotein measures



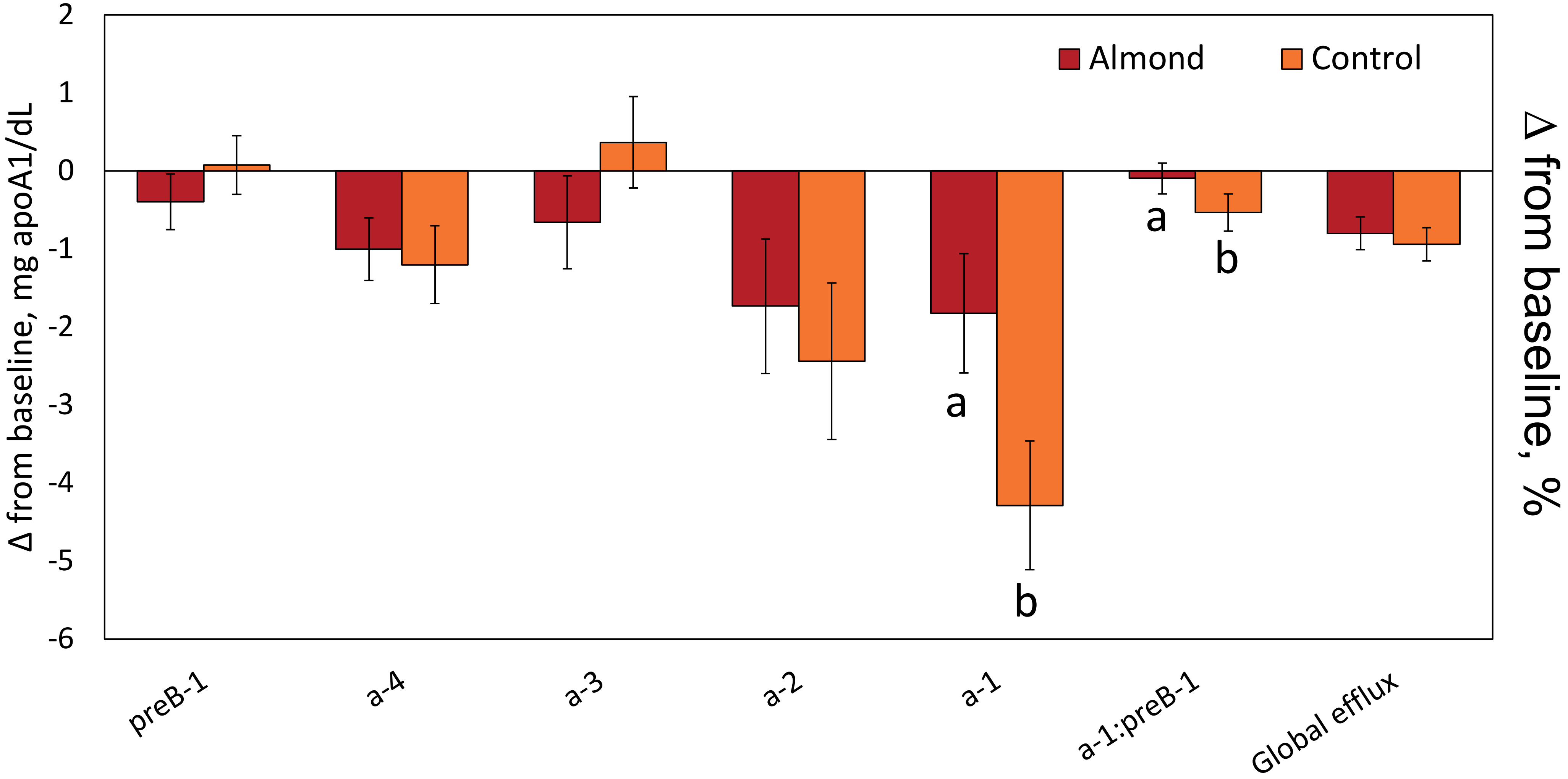
Mean ± standard error. Different letters within variables indicate treatment differences, P < 0.02.

 Claire E. Berryman, PhD, RD (cberryman@fsu.edu)

High density lipoprotein biology and function



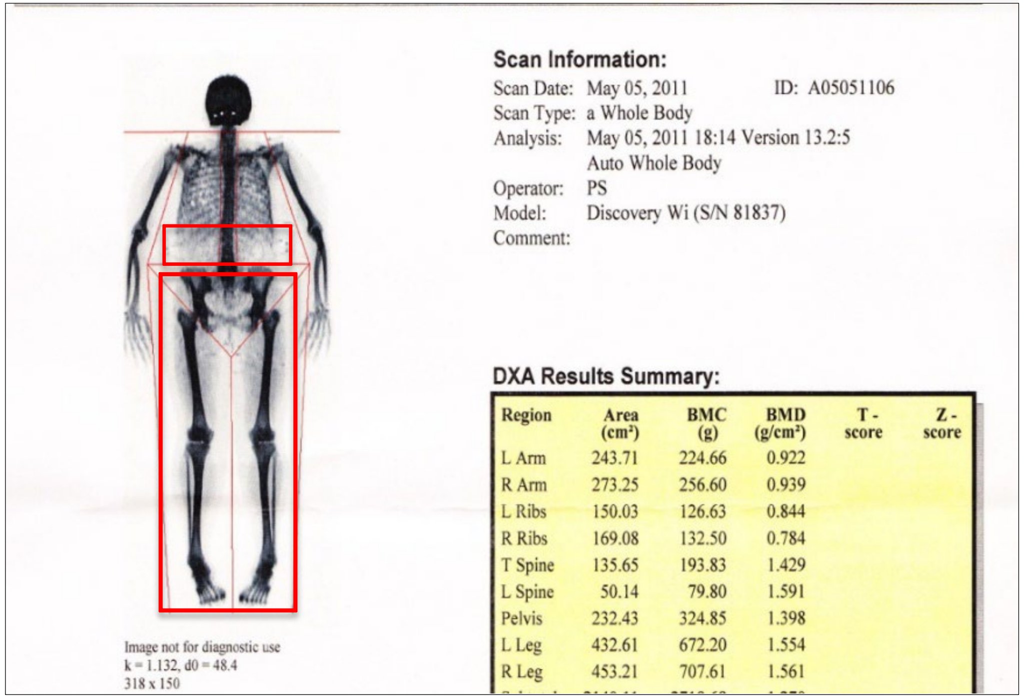
The diet with almonds preserved large, mature HDL particles



Mean ± standard error. Different letters within variables indicate treatment differences, P ≤ 0.02.

Body mass and composition

- Waist circumference
- Dual-energy x-ray absorptiometry (DXA)



Scan Information:

Scan Date: May 05, 2011 ID: A05051106
Scan Type: a Whole Body
Analysis: May 05, 2011 18:14 Version 13.2:5
Auto Whole Body
Operator: PS
Model: Discovery Wi (S/N 81837)
Comment:

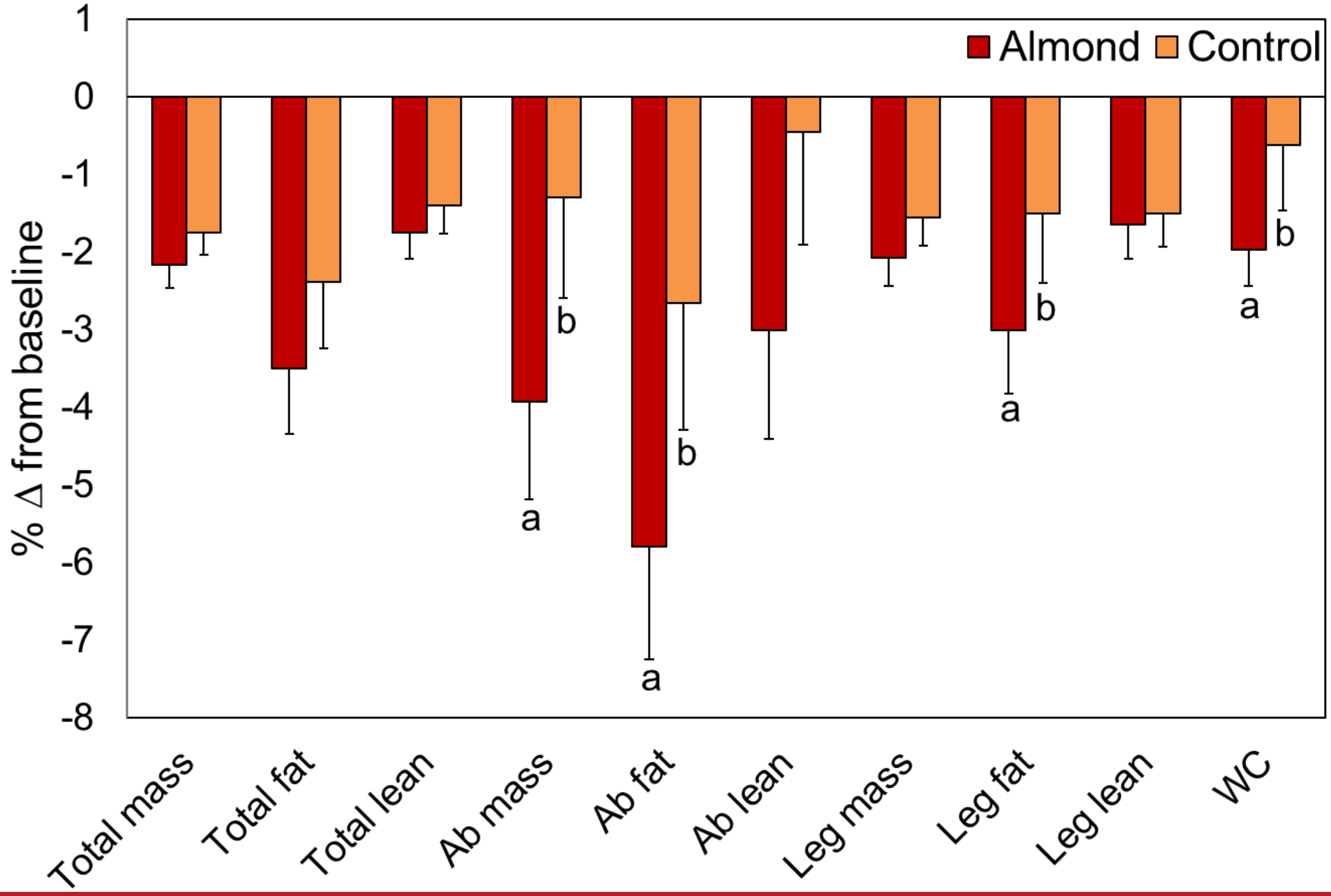
DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	Z - score
L Arm	243.71	224.66	0.922		
R Arm	273.25	256.60	0.939		
L Ribs	150.03	126.63	0.844		
R Ribs	169.08	132.50	0.784		
T Spine	135.65	193.83	1.429		
L Spine	50.14	79.80	1.591		
Pelvis	232.43	324.85	1.398		
L Leg	432.61	672.20	1.554		
R Leg	453.21	707.61	1.561		

Image not for diagnostic use
k = 1.132, d0 = 48.4
318 x 150

Almond Board of California

The diet with almonds decreased abdominal fat and leg fat



Percentage change in body composition from baseline. Mean percentage change ± standard error from baseline (n=48). Different lowercase letters within variables indicate treatment differences, $P \leq 0.023$. Ab, abdominal; WC, waist circumference.

Conclusions

- Almonds (43 g), substituted in a low-fat diet for a calorie-matched muffin, reduce LDL-cholesterol
- Almonds maintain favorable circulating HDL-cholesterol and α-1 HDL particle concentrations
- Almond consumption has a beneficial impact on regional body composition, decreasing both abdominal and leg fat

Take home message

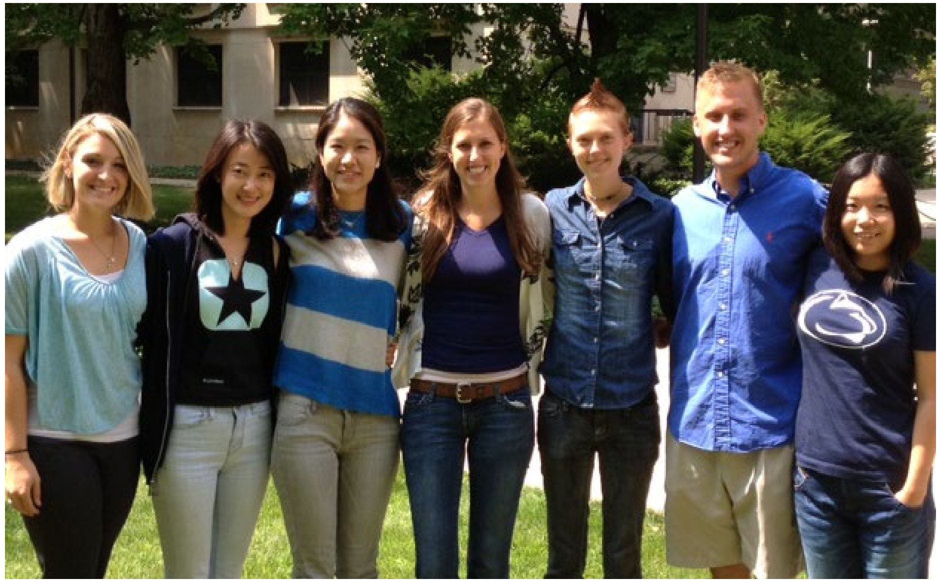
Almonds are a practical and healthy snack (~250 kcal/d) that reduce LDL-cholesterol levels and improve emerging cardiovascular risk factors, including abdominal adiposity, when substituted for carbohydrate-rich foods within a low fat diet.

Published work from today's presentation:

Berryman CE et al. J Am Heart Assoc. 2015 Jan; 4(1): e000993.
Berryman CE et al. J Nutr. 2017 Aug; 147(8): 1517–1523.

Acknowledgements

- Study Participants
- Cardiometabolic Research Lab (PSU)
- Nutritional Physiology Lab (FSU)
- Almond Board of California



Thank you

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ABC HEART HEALTH JOURNEY

Wendy Hall, *Kings College London*

KING'S College LONDON

Could snacking on almonds make a difference to heart health? Results of the ATTIS trial

Dr Wendy Hall, Reader in Nutritional Sciences

Principal Investigator on the ATTIS study: Almond Trial Targeting dietary Intervention with Snacks

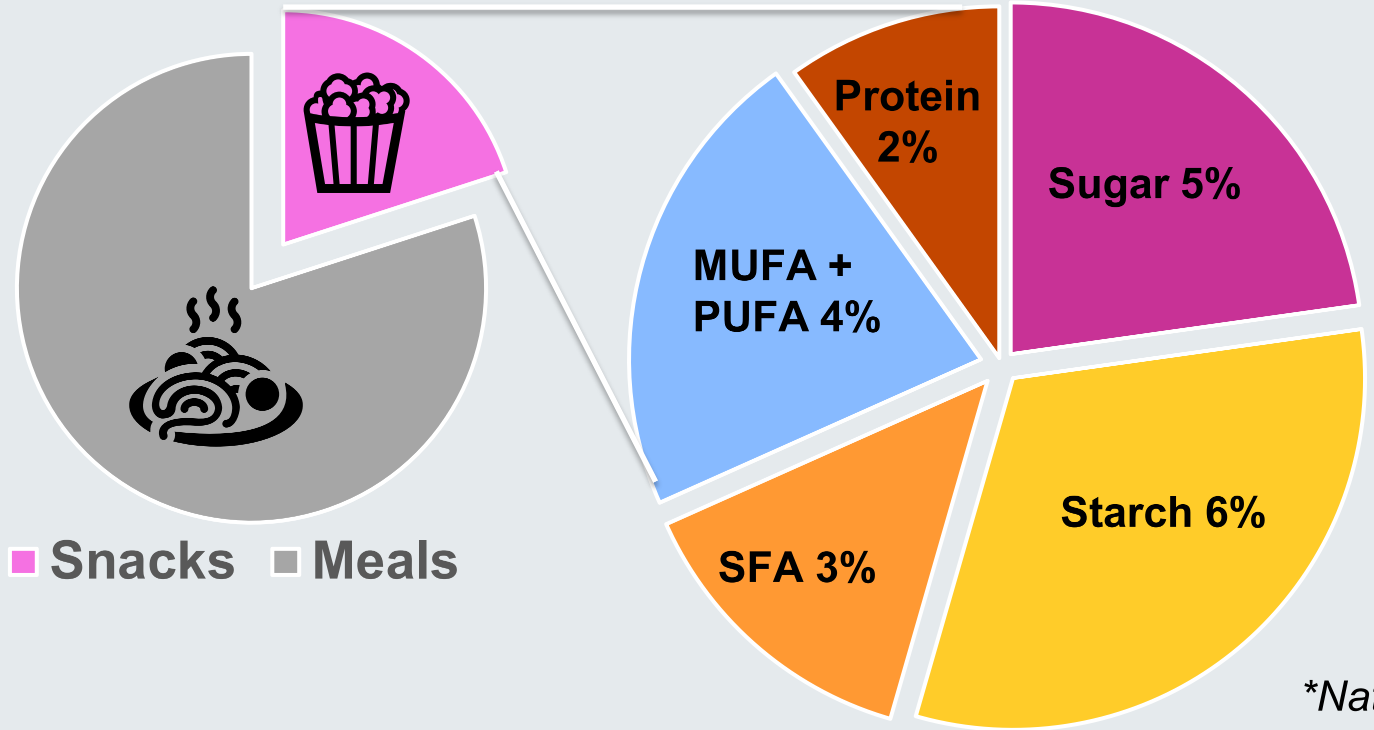
Disclosure of speaker's interests

(Potential) conflict of interest	See below
Potentially relevant company relationships in connection with event	Almond Board of California
Sponsorship or research funding	Funded the research presented here and scientific conference expenses to present the research at Nutrition 2018 (Boston, USA) and the 37th International Symposium on Diabetes & Nutrition (Kerkrade, Netherlands).
Fee or other (financial) payment	None
Shareholder	None
Other relationship	None

Snacking

- Snacking habits have been linked to risk of obesity
  - Diet quality
  - Sedentary behaviour

% energy intake in UK from snacks* | **% snack energy from macronutrients**

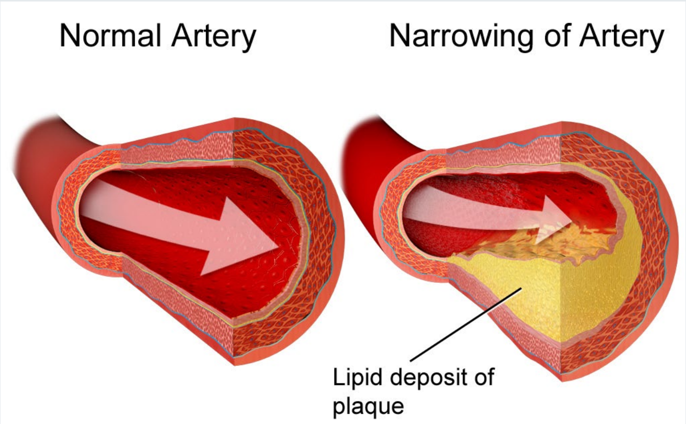


SFA
~12% energy

Free sugars
~12% energy intake

National Diet & Nutrition Survey rolling programme 19-64 y

Rationale for replacing typically consumed snacks with almonds



Improved cardiometabolic health

Insulin resistance
Raised LDL cholesterol and triglycerides

Swapping snacks

+ Micronutrients −
+ Phytochemicals −
− Refined carbohydrates +
− Saturated fat +
+ Fibre −

Research question: does snacking on almonds influence cardiometabolic health?

Study design

- Randomised, controlled dietary intervention study
- Parallel groups: whole roasted almonds or muffin snacks
- Primary outcomes: vascular (endothelial) function and liver fat

Study population

- Men and women, 30-70 y
- Regularly consume ≥2 snack products per day,
- Moderate risk of developing CVD

Recruitment/ screening → Run-in (control snacks) → Intervention (randomised to control or almond snacks, 20% of energy requirements)

← 2 weeks → ← 6 weeks →

e.g. 400 kcal for an average woman

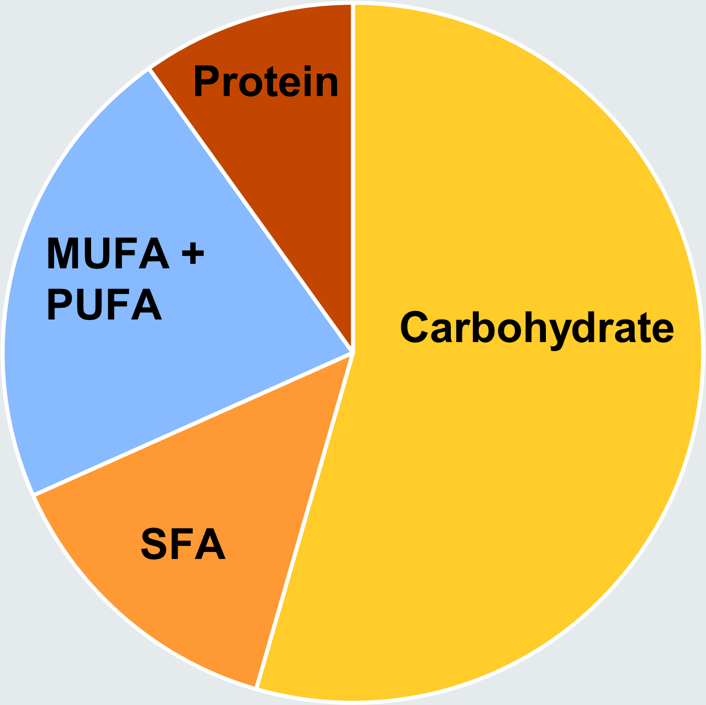
- ATTIS study duration: July 2016 to May 2019

Clinicaltrials.gov NCT02907684

Control snacks

The development of control muffin snacks (sweet and savoury)

Average macronutrient profile of UK snacks (% energy)

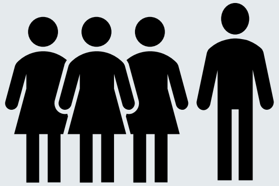


Irish Food Board. Snacking in Ireland and UK. Full Report March 2014.
National Diet and Nutrition Survey. (2008/2009 – 2011/12). May 2014. Public Health England.

Baseline characteristics of enrolled participants at screening

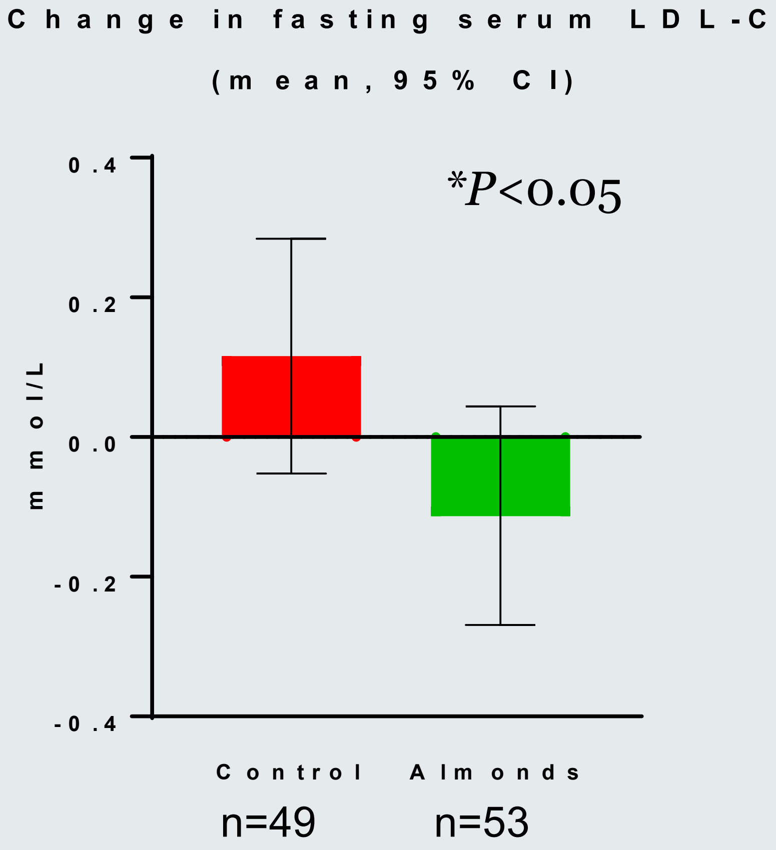
Randomised groups were matched for age, sex, ethnicity, BMI and other risk factors.

107 randomised
105 completed



Average age
57 years

LDL cholesterol lowered by almond snacking

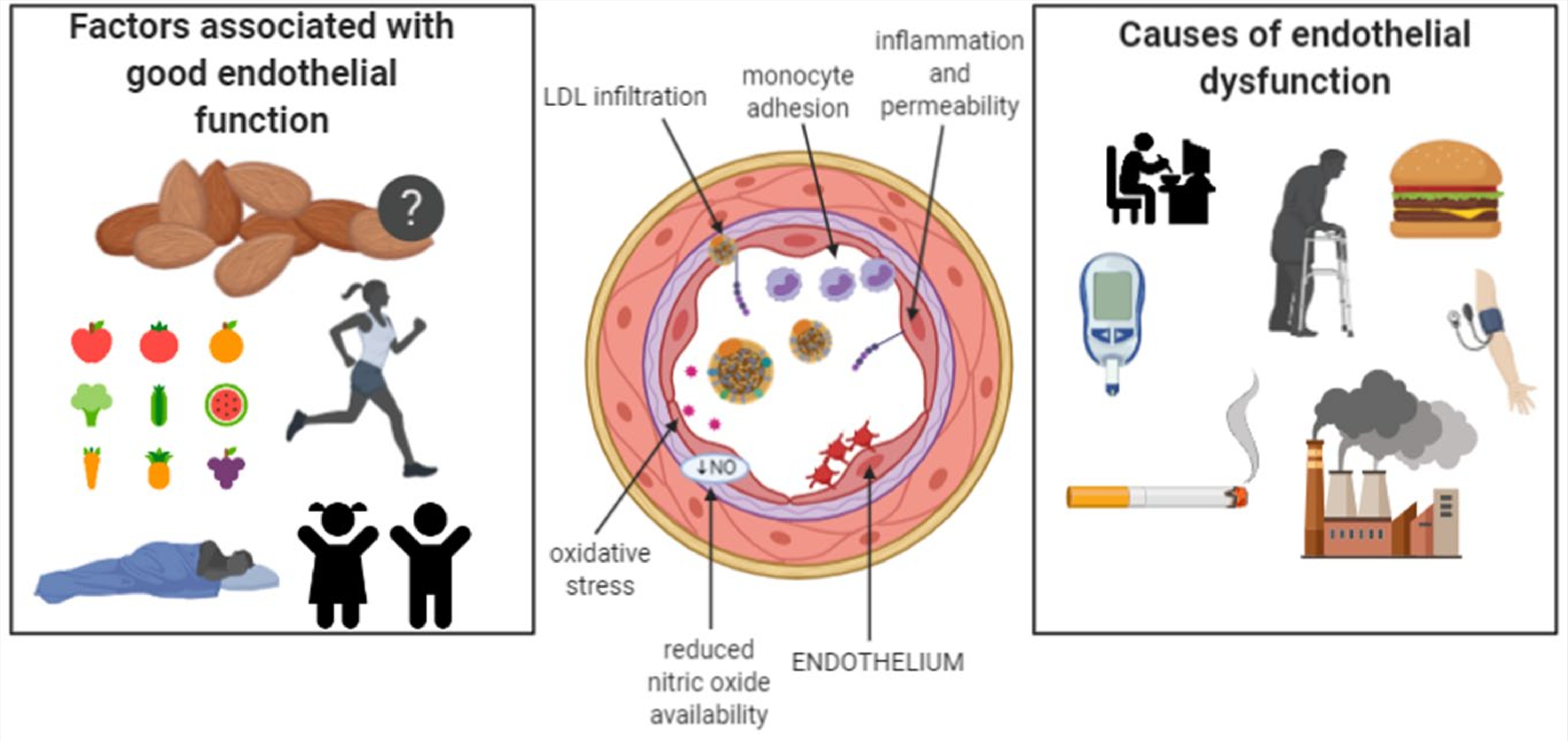


No effect on markers of body composition or glucose regulation:

- Liver fat
- Pancreatic fat
- Body composition
- Insulin
- Glucose
- Total cholesterol
- HDL-C
- Adipokines

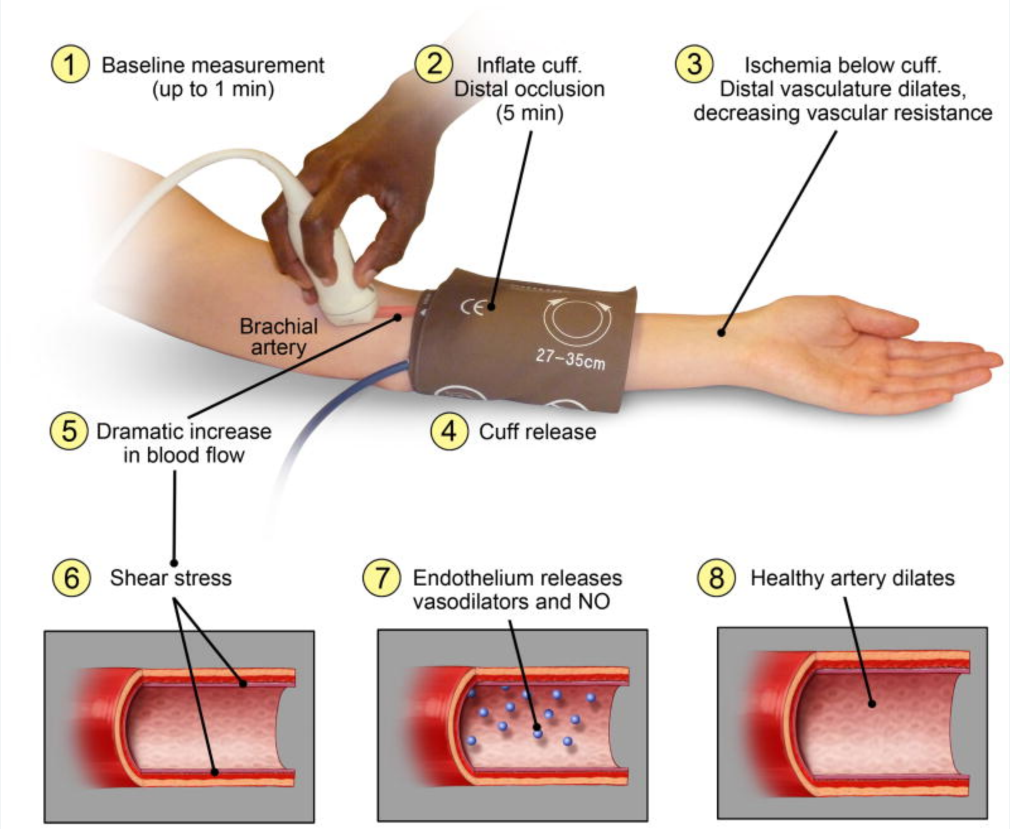
Dikariyanto et al 2020 American Journal of Clinical Nutrition, 111(6):1178-1189.

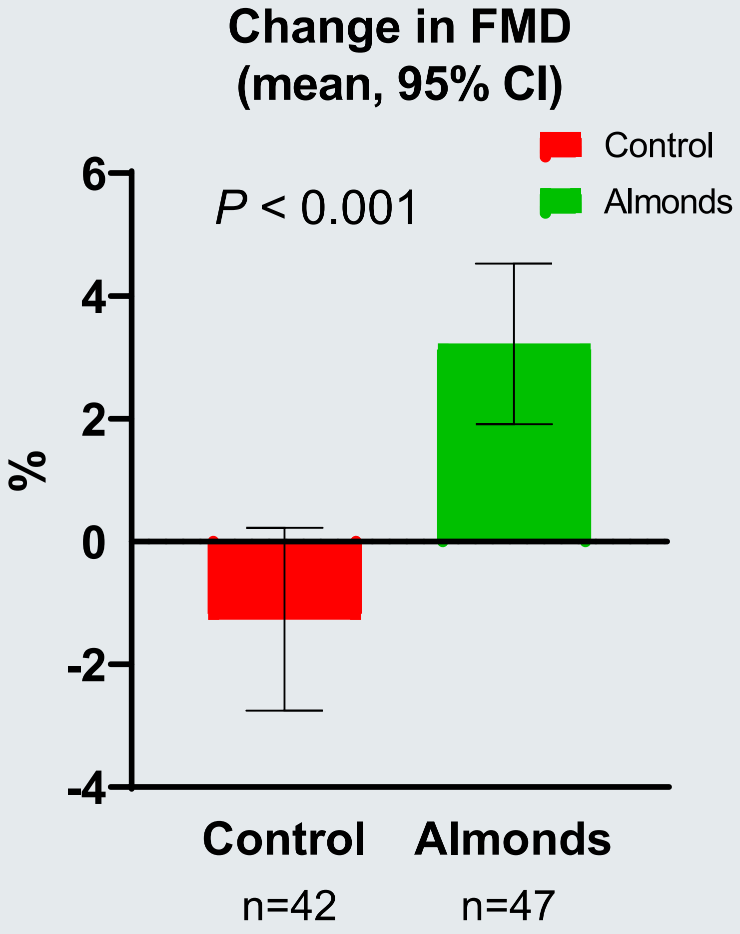
Primary Outcome: Endothelial Function



Endothelial function improved by almond snacking

Flow-mediated dilatation (FMD) measures are predictive of risk of cardiovascular disease



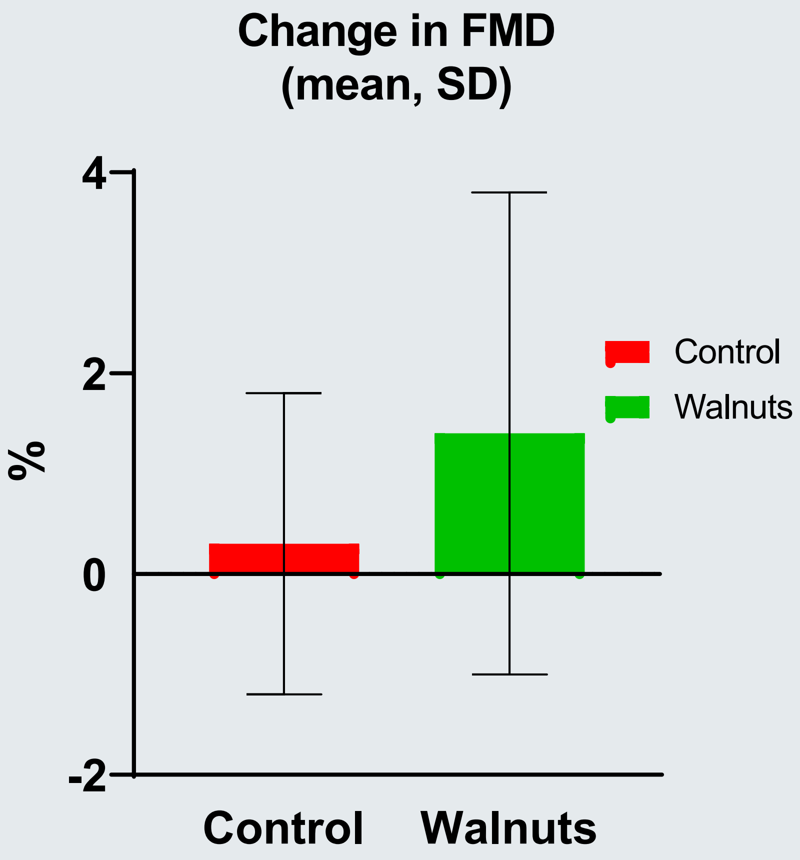


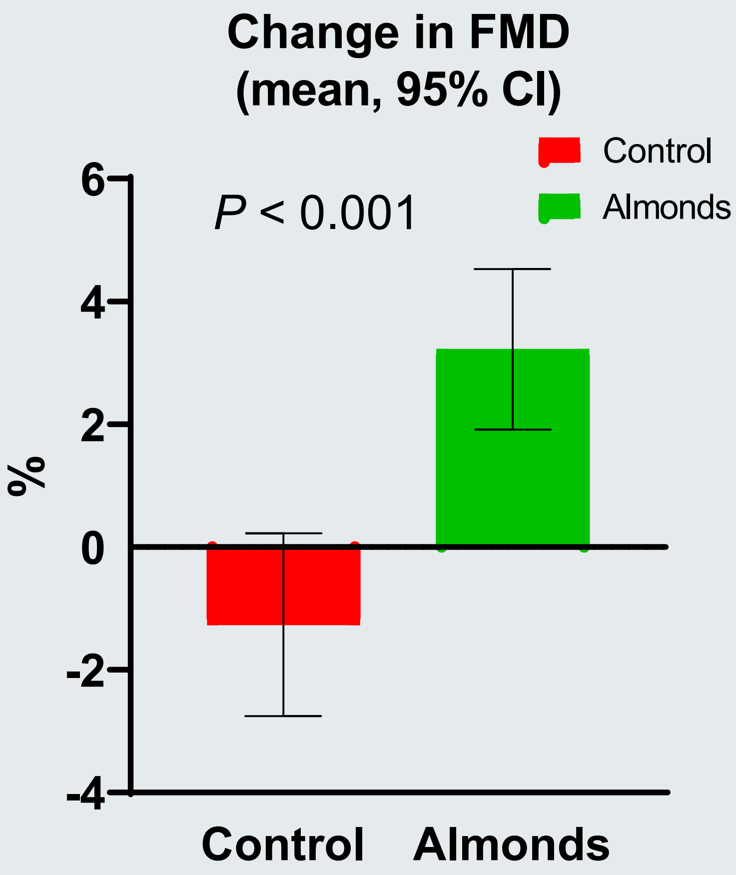
**Changes from baseline, adjusted for baseline value, sex, age, BMI*

Dikariyanto et al 2020 American Journal of Clinical Nutrition, 111(6):1178-1189.

Endothelial function improved by almond snacking

Katz et al (2012) J Am Coll Nutr, 31:6, 415-423





Mechanisms?

Polyphenols?

Arginine?

Fibre?

Displacement of less healthy snacks

- Results agree with previous studies on walnuts

Average intake of almonds is low in the UK

- **7% of UK adults consume whole almonds**
  UK National Diet and Nutrition Survey 2008-2017, n=6,802

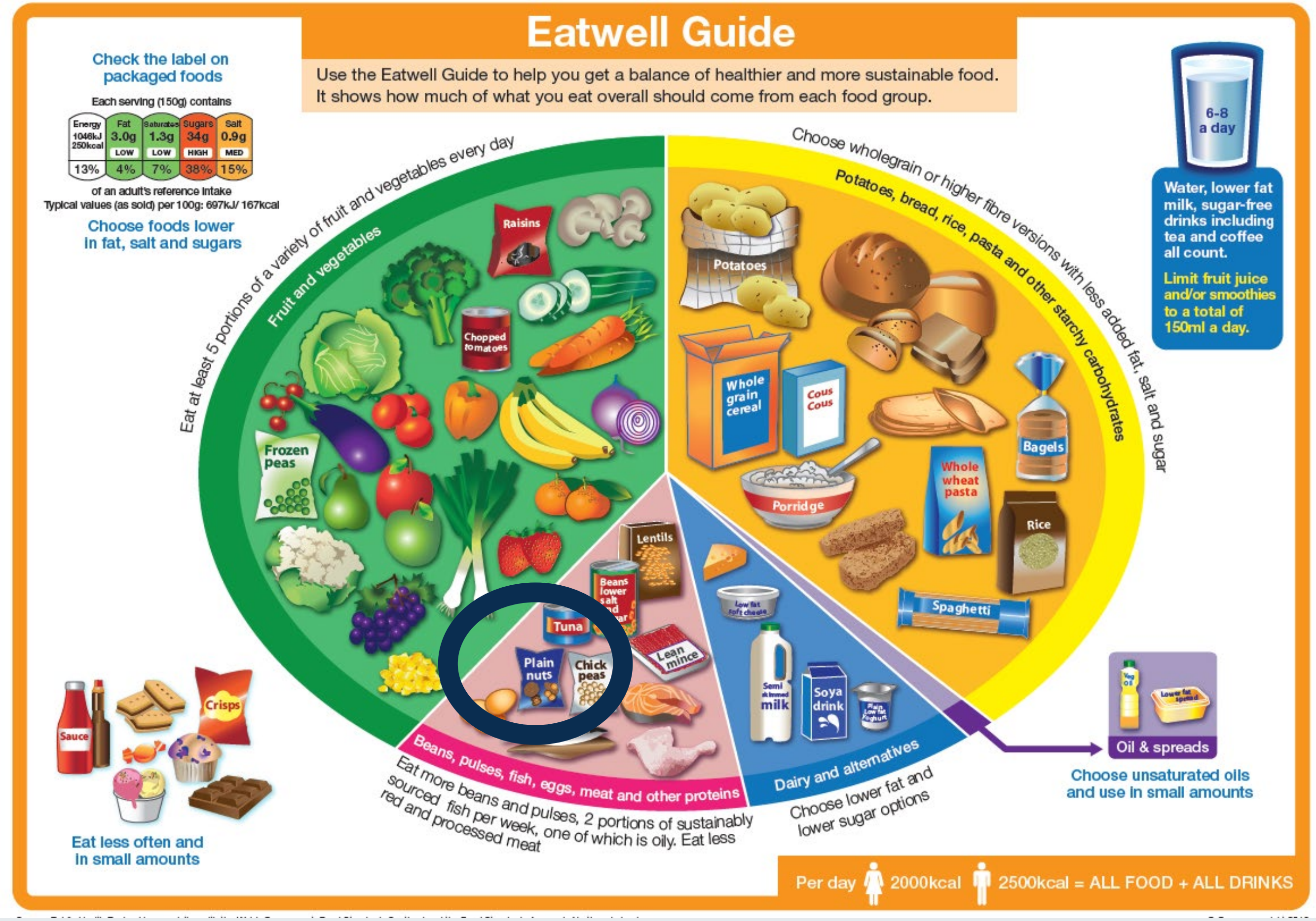
Median intake 5 g/d in almond consumers

** Reported during a 4-day period, not including nuts consumed as a composite part of meal*

Dikariyanto et al (2020) European Journal of Nutrition, May 16. doi: 10.1007/s00394-020-02270-9

Conclusions and implications

- Should we be encouraging more snacking on tree nuts – such as almonds – for better heart health?

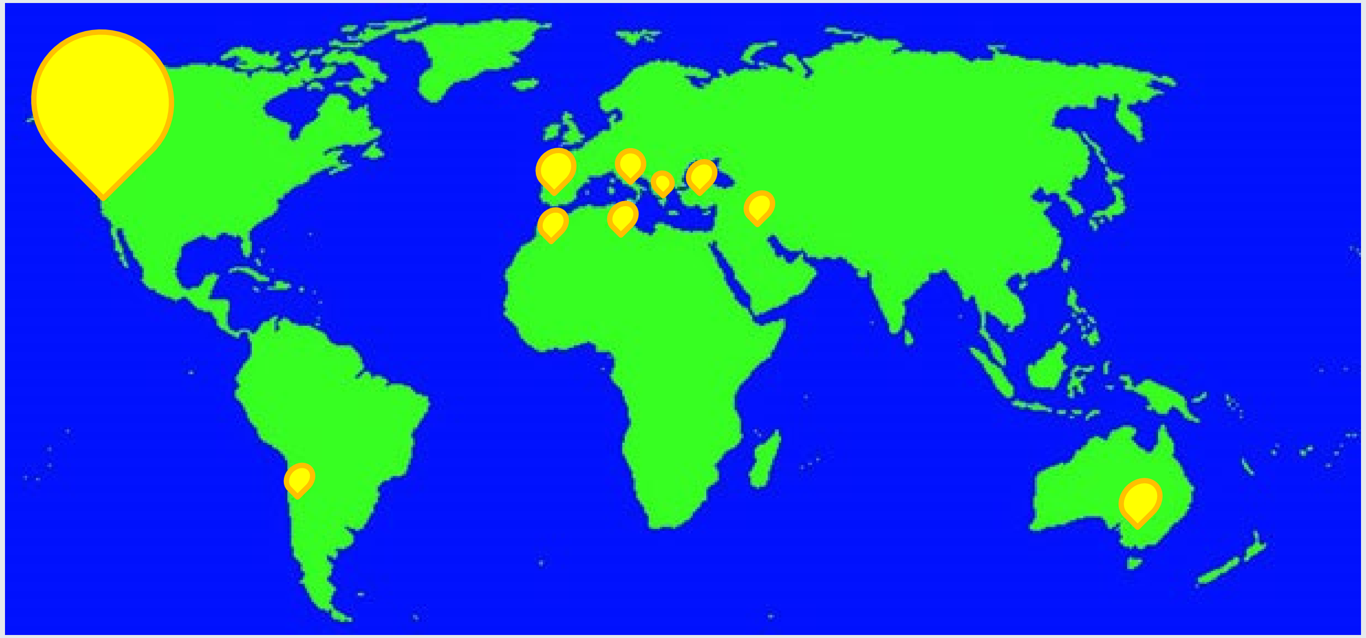


- “Nuts are high in fibre, and unsalted nuts make a good snack. But they do still contain high levels of fat, so eat them in moderation.” www.NHS.uk/live-well/eat-well - National Health Service website advice is out of date/misguided.

Conclusions and implications

EAT-Lancet planetary health diet: at least 50 g nuts/day as alternative to red meat

- Can we increase almond intakes?
  - Requirement for crop-land and water would be very large – effect on ecosystems?



Geographical areas of almond production

https://eatforum.org/eat-lancet-commission/

The ATTIS Trial Research Team

Dr Sarah Berry **Dr Wendy Hall**

Joint Principle Investigators

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Research Assistant and Study Dietitian

Vita Dikariyanto
PhD student

Co-Investigators

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Advisor on almond bioaccessibility

Prof Phil Chowienczyk

Vascular expert

Dr Geoff Charles-Edwards

Medical physicist (leading MRI/MRS)

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Eslem Kusaslan
~20 other BSc/MSc/international intern students

KING'S College LONDON

california almonds
Almond Board of California

Thank you

Dr Wendy Hall/Dr Sarah Berry for more information

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ABC HEART HEALTH JOURNEY

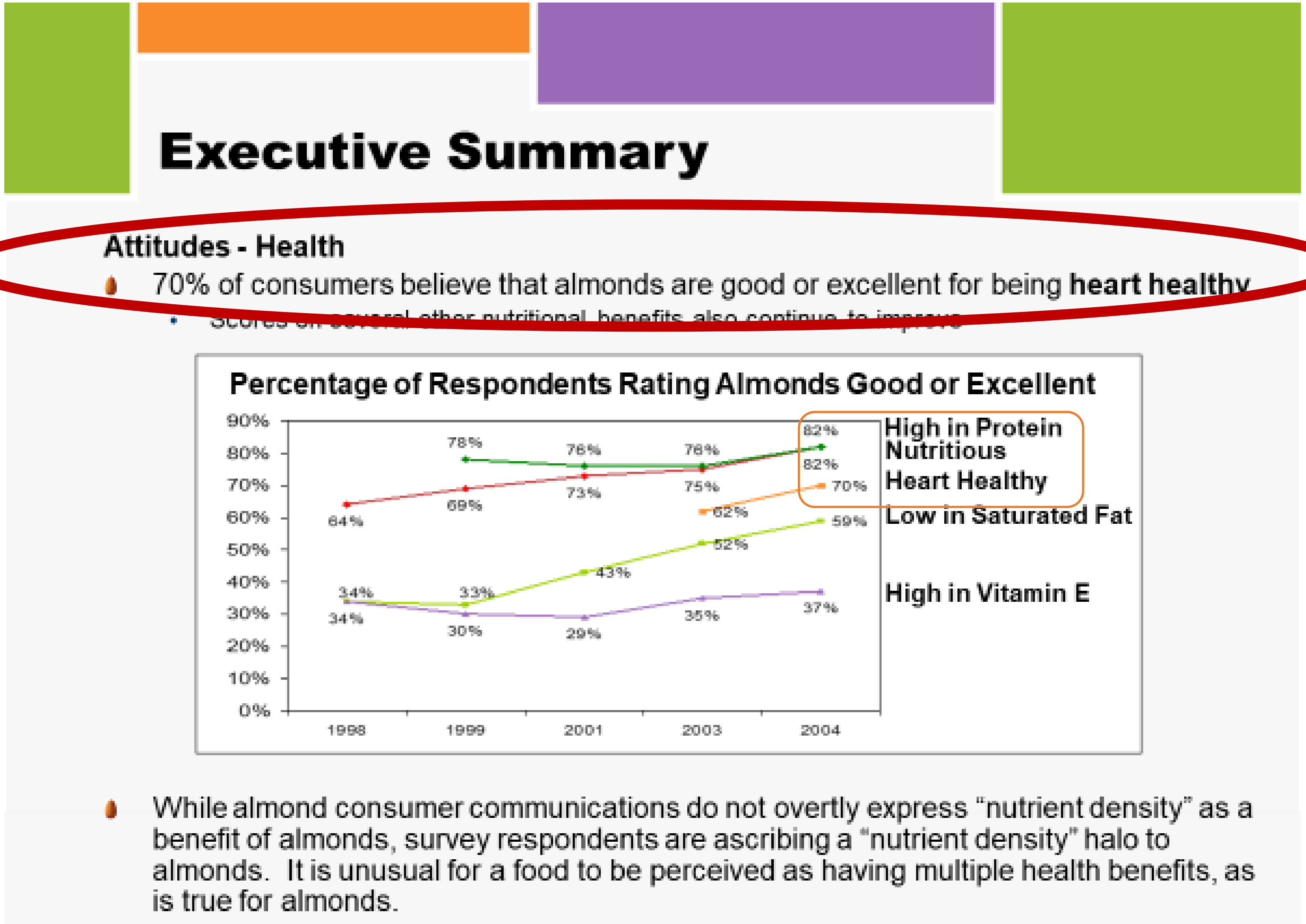
Becky Jeffers, *Almond Board of California*

Journey of Understanding Heart Health: Research to Recommendations

Becky Jeffers
Manager, North America Marketing

PRE-2000's almonds suffered from misperception

By the early 2000's, consumers were acknowledging heart benefits



Executive Summary

Attitudes - Health

- 70% of consumers believe that almonds are good or excellent for being **heart healthy**
  - Scores on several other nutritional benefits also continue to improve

- While almond consumer communications do not overtly express "nutrient density" as a benefit of almonds, survey respondents are ascribing a "nutrient density" halo to almonds. It is unusual for a food to be perceived as having multiple health benefits, as is true for almonds.

Source: Almond Board of California Consumer Attitudes and Usage Study 2004

From the foundation of heart health research, California Almonds' meaning evolved

Heart Healthy

Healthy Nut

Lifestyle Nut

2017 FDA allows "healthy" based on increased understanding of fats

This halo of almonds has allowed category growth

2006:

38% Snack almonds
62% Ingredient

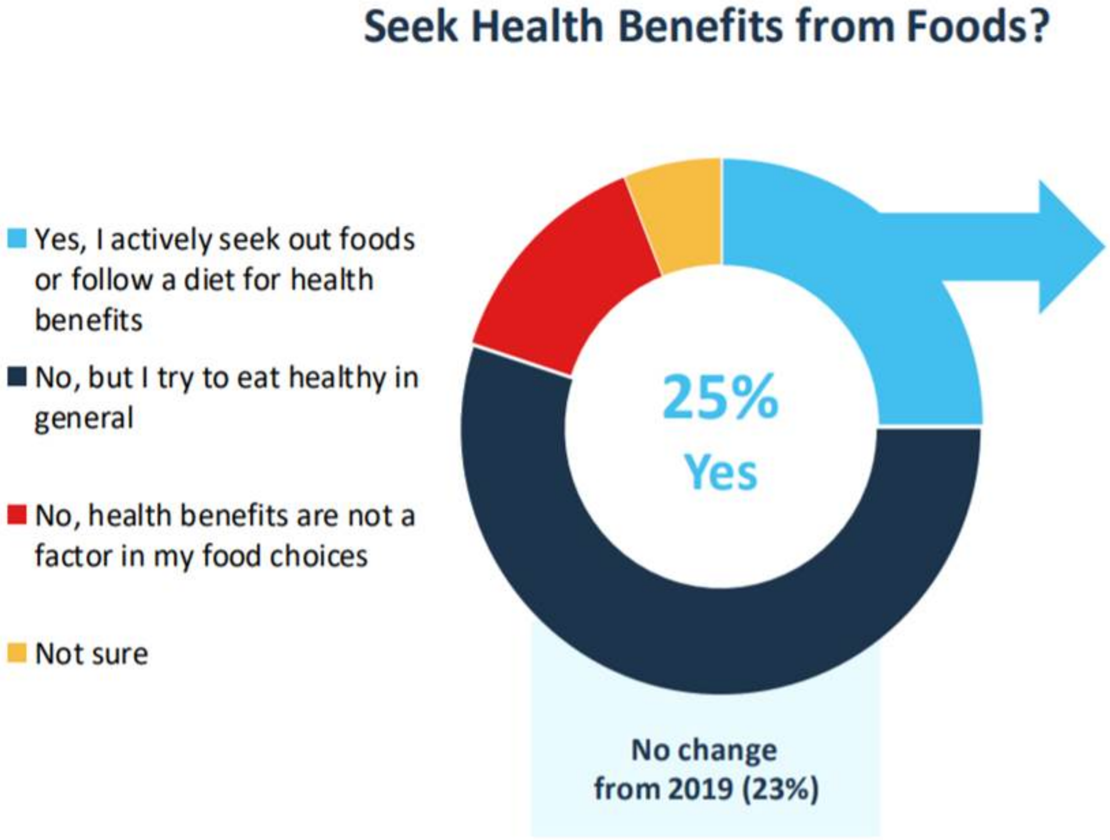
2019:

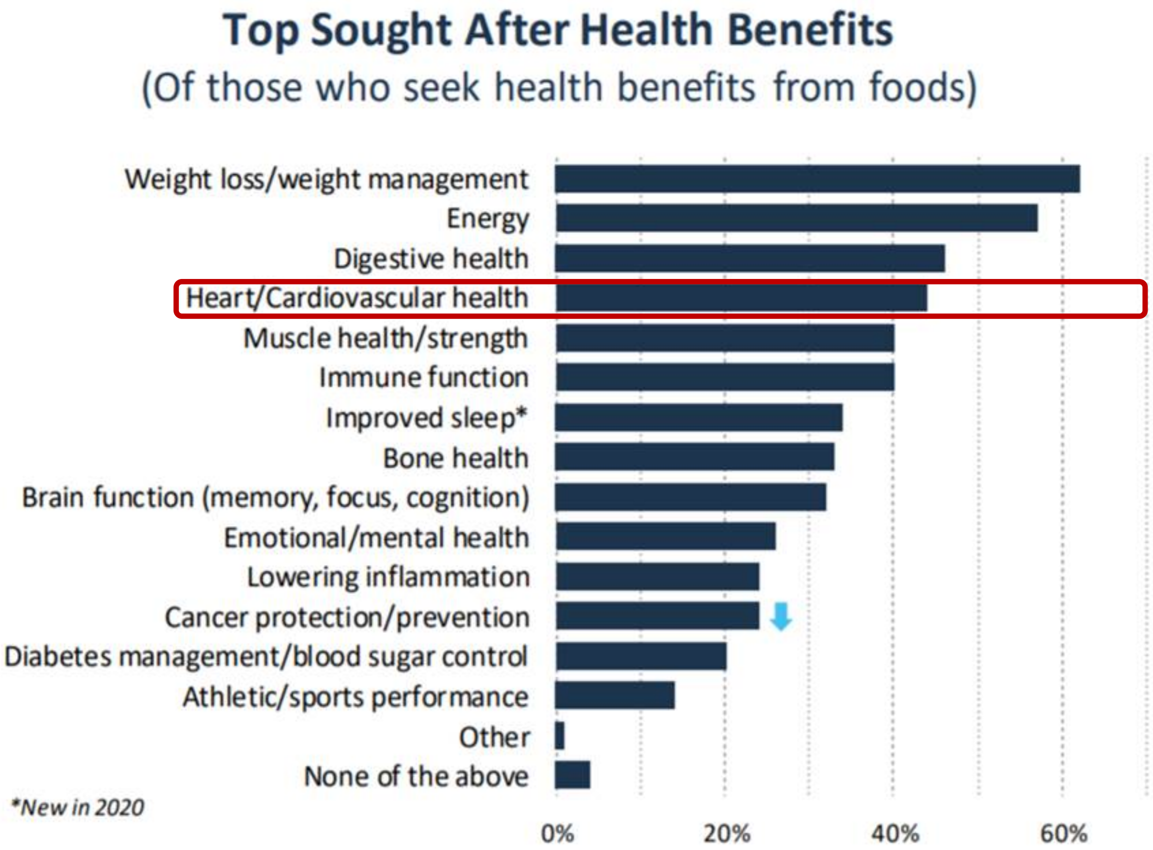
54% Snack almonds
19% Almond milk
6% Almond butter
21% Ingredient


Keto
Paleo
TODAY'S WORLD IS COMPLEX
sugar FREE
vegan

1 in 4 Consumers actively seek foods for health benefits; heart health ranks high

Those in very good health are more likely than their counterparts to actively seek out foods or follow a diet for the health benefits





Q32 (TREND): Do you seek out certain foods or follow a particular diet because of the health benefits that those foods/diet provide? (n=1,011)
Q35 (REVISED TREND): Which of the following health benefits are you seeking to get from foods or nutrients? Select all that apply. (Of those who seek health benefits from foods, n=232)

What health topics do almonds own in consumers minds?

U.S.

Exact Same Ranking Seen Internationally As Well:

Source: Almond Board of California, Global Perception Study 2019, “Best nut for…”


CONSUMER
ATTENTION IS SHORT

4 KEY ELEMENTS

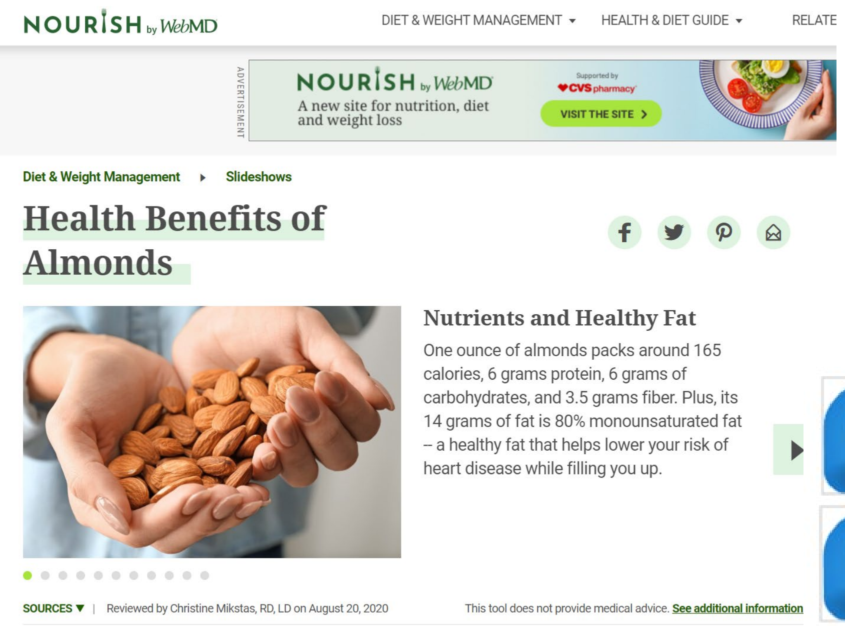
+ Transparent science

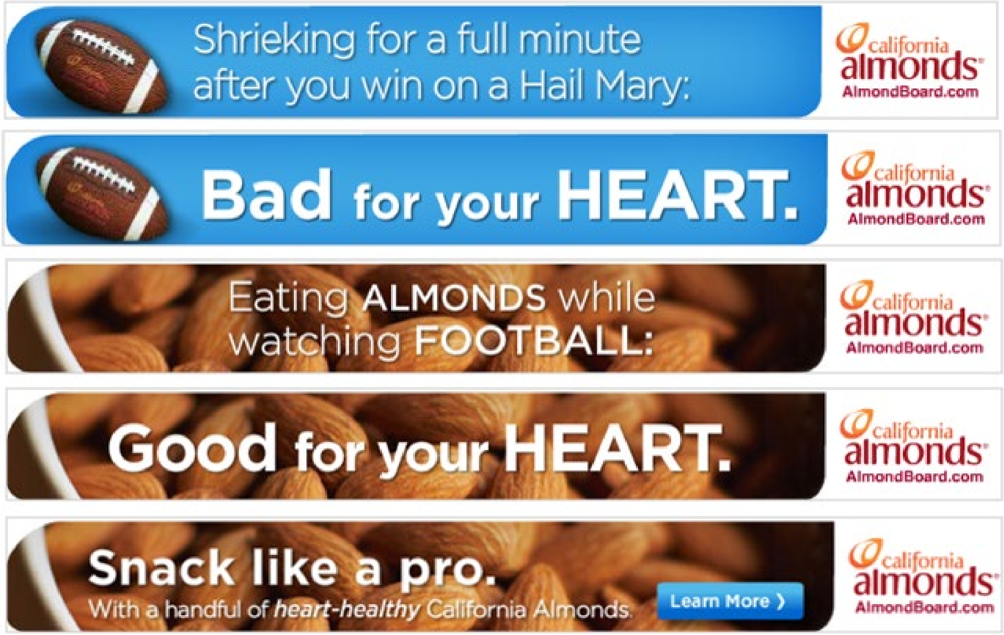
+ Understand how almonds fit in people's lives

+ Be relevant to how people eat

+ Support Healthcare Professionals as experts

Putting It Into Practice





Resources at Almonds.com

Digestible Handouts

Easy Messaging

Treat your heart right with almonds.

Heart Health

Almonds' heart-smart benefits are meaningful for just about everyone, especially since cardiovascular disease holds the spot as the leading cause of death among men and women in the U.S.

Almonds are cholesterol-free, and have only 1 gram of saturated fat and 13 grams of unsaturated fat per one-ounce serving. According to the U.S. Food and Drug Administration, "*Scientific evidence suggests, but does not prove, that eating 1.5 ounces per day of most nuts, such as almonds, as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease.*"

The American Heart Association® has certified whole almonds to display the sought-after Heart-Check mark. Now it's easy for everyone out there to identify almonds as a heart-smart option.[1]

THANK YOU

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Almond Board of California


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