Diet and Heart Disease: “Taking the Die out of Diet”

Kim Allan Williams, Sr., M.D., FACC, FAHA, FASNC
President, American College of Cardiology
James B. Herrick Professor and Chief
Division of Cardiology
Rush University Medical Center
Chicago, IL

No Disclosures
Over 47,000 Members Strong
Evidence-Based Science
The ACC is the PROFESSIONAL HOME for cardiovascular specialists and the care team.

ALIGN WITH THE TRIPLE AIM TO IMPROVE CARDIOVASCULAR HEALTH

LOWER COST BETTER CARE

BETTER OUTCOMES

Data, Information & Knowledge
Transformation of Care
Purposeful Education

Advocacy
Population Health
Member Value & Engagement
Population Health

• Develop partnerships with organizations and other stakeholder groups to pursue national and international population health objectives related to CV disease health.

• Support members in their expanded accountability to improve the health of populations.

• Encourage CV team-facilitated patient education.

• Partnering with government agencies:
  – White House FNV Initiative
  – FDA, Congress, USDA and CMS

• WHO 25 by 25
"Off hand, I'd say you're suffering from an arrow through your head, but just to play it safe, I'm ordering a bunch of tests."
Burden of Coronary Heart Disease

- CHD: 1 of every 6 deaths = 379,559 Americans annually
- 1st MI: ≈620,000 Americans
- Recurrent MI: ≈295,000
- Silent 1st MI: ≈150,000

“Every 34 seconds, 1 American has a coronary event, and approximately every 1 minute 23 seconds, an American will die of one.”

http://circ.ahajournals.org/content/129/3/e28.full.pdf+html
Major Causes of Death in the U.S.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart disease &amp; stroke</td>
<td>752,019</td>
</tr>
<tr>
<td>Cancer</td>
<td>562,875</td>
</tr>
<tr>
<td>Chronic Lower Respiratory Diseases</td>
<td>127,924</td>
</tr>
<tr>
<td>Accidents</td>
<td>123,706</td>
</tr>
<tr>
<td>Alzheimer's Disease</td>
<td>74,632</td>
</tr>
<tr>
<td>Diabetes</td>
<td>71,382</td>
</tr>
<tr>
<td>Influenza &amp; Pneumonia</td>
<td>52,717</td>
</tr>
</tbody>
</table>
Death Rates* for Cardiovascular Diseases, U.S., 1900–2008

Deaths/100,000 Population

- **CVD**
- Heart Disease
- CHD
- Stroke

* Not age-adjusted.

Source: Vital Statistics of the United States, NCHS.
Figure 1. Decline in Deaths from Cardiovascular Disease in Relation to Scientific Advances.
The timeline shows the steady decline in cardiovascular deaths over the late 20th and early 21st centuries, along with major advances in cardiovascular science and medicine. ALLHAT denotes Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial, CASS Coronary Artery Surgery Study, GISSI Italian Group for the Study of Streptokinase in Myocardial Infarction, HMG-CoA 1-hydroxy-3-methylglutharyl coenzyme A, ISIS-2 Second International Study of Infarct Survival, MI myocardial infarction, NCEP National Cholesterol Education Program, NHBPEP National High Blood Pressure Education Program, PCI percutaneous coronary intervention, SAVE Survival and Ventricular Enlargement, and TIMI 1 Thrombolysis in Myocardial Infarction 1.
Good News

- Reduction in heart disease deaths

  - **Medications**
    - Statins
    - Beta-blockers
    - Antiplatelet
    - Antithrombotic

  - **Revascularization**
    - PCI
    - CABG

  - **Diagnostic imaging**
    - Nuclear
    - Echo
    - CTA
Global CVD

• CVDs are the number 1 cause of death globally
• 17.5 million people died from CVDs in 2012, representing 31% of all global deaths
  – 7.4 million coronary heart disease
  – 6.7 million stroke
• Over three quarters of CVD deaths take place in low- and middle-income countries.
Global CVD

• Most cardiovascular diseases can be prevented by addressing behavioural risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol using population-wide strategies.

• People with cardiovascular disease or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidaemia or already established disease) need early detection and management using counselling and medicines, as appropriate.
Heart Disease in Russia

• 57% of all deaths are due to CVD, including stroke
• MI and stroke at younger ages, working people
• Mortality 2-3 times other developed countries when adjusted for age
• Spending is about one-third of the fraction of GDP that the U.S. spends (5% vs. 15%)

Fig. 1. Standardized death rates (SDR): diseases of the circulatory system, all ages per 100,000, European Region, 1980-2009.

• Mortality rate is lower recently - 900 per 100,000 per year to 800
• Large regional differences:
  – 1300 in Tver and Pskov,
  – 300 in Chechnya and
  – 160 in Ingushetia
• More heavy alcohol, more male smokers

Heart Disease in Russia

• Dietary fat from animal sources
  – More saturated and less monounsaturated
  – Less fruits and vegetables

• Finland cut CVD mortality by 50% with increased consumption of cereals, vegetables, fruits and berries, while reducing dairy and meat intake as well as smoking

The North Karelia Project

• 1960’s and 70’s:
  – *CVD risk factors:* serum cholesterol, blood pressure and smoking

• Finland suffered the highest coronary mortality in the world (Keys 1970), with its eastern province of North Karelia being the worst afflicted
Figure 3. Type of bread spread among 25–59-year-old men in North Karelia in 1972–2004.
6. THIRTY-FIVE-YEAR TRENDS IN CORONARY RISK FACTORS IN NORTH KARELIA AND OTHER AREAS OF FINLAND

Figure 1. Serum cholesterol in men aged 30-59 years
Japanese Dietary Advantage

Life Expectancy in Long-lived Populations and the US

Changes in Coronary Heart Disease Risk Among Japanese

Hiroyasu Iso, MD

Heart disease is the second most prominent cause of mortality in Japan, and coronary heart disease (CHD) accounts for approximately half of heart disease-related deaths.¹ The CHD mortality rate in Japan has been one-third to one-fifth that in the United States,¹-⁵ even when validated fatal CHD and sudden cardiac deaths were compared.³-⁵ However, there is growing concern about a possible increase in the incidence of and mortality from CHD because of the westernization of lifestyles such as high-fat diets and sedentary work patterns associated with socioeconomic development since the 1960s.⁶-¹¹

The present report reviews original articles on population-based surveys of the mortality, incidence, and risk factors of CHD. It focuses on their trends since the 1960s because Japan has experienced rapid changes in lifestyles and environment accompanying socioeconomic development and maturation. Diagnosis to ensure the validity of CHD surveillance. The age-adjusted incidence of CHD among male employees 40 to 59 years of age in Osaka increased from 0.4 per 1000 person-years in 1963 to 1970 to 1.5 per 1000 person-years in 1979 to 1986 and then plateaued until 1987 to 1994.¹⁰

More recently, Osaka male residents 40 to 69 years of age have shown a trend for CHD incidence to increase from 0.6 per 1000 person-years in 1980 to 1987 to 1.3 per 1000 person-years in 1996 to 2003.¹¹ Male residents in Takashima City had an increasing incidence of CHD for all ages from 0.7 per 1000 person-years in 1990 to 1992 to 1.0 per 1000 person-years in 1999 to 2001; the CHD increase was observed primarily for those 65 years of age, and information on risk factor trends was not available.¹²

However, the CHD incidence remained low and did not change materially among female residents in Osaka (≈0.4 per 1000 person-years)¹¹ and Takashima (≈0.3 per 1000 person-years),¹² nor did the incidence change over time among men and women 40 to 69 years of age in a rural community of Akita Prefecture (≈0.7 per 1000 person-years for men and 0.1 per 1000 person-years for women).⁷,¹¹ No significant trends in CHD incidence were observed among the
Eating To Break 100: Longevity Diet Tips From The Blue Zones

A distinct version of the Mediterranean diet is followed on the Blue Zone island of Ikaria, Greece. It emphasizes olive oil, vegetables, beans, fruit, moderate amounts of alcohol and low quantities of meat and dairy products.
Okinawan Lifestyle

Benefits

• Moving, working
• Low in meat, dairy, saturated fat, refined sugar
• High in soy, beans, vegetables and fruit
• Less obesity, hypertension, diabetes, CV mortality

Threats

• Western diet
• Increasing sedentary living
Blue Zones *(Dan Buettner)*

**Where?**

- Ikaria, Greece
- Okinawa, Japan
- Ogliastra Region, Sardinia
- Loma Linda, California, USA
- Nicoya Peninsula, Costa Rica.

**Threats**

- Western diet
- Increasing sedentary living
Blue Zones (*Dan Buettner*)

**What?**

- Stop eating when your stomach is 80 percent full to avoid weight gain.
- Eat the smallest meal of the day in the late afternoon or evening.
- Eat mostly plants, especially beans.
- Eat meat rarely, in small portions of 3 to 4 ounces (about once per week)
Daily Calorie Intake around the World

*Daily caloric intake per capita, kcal

<table>
<thead>
<tr>
<th>Country</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>3770</td>
</tr>
<tr>
<td>Austria</td>
<td>3760</td>
</tr>
<tr>
<td>Italy</td>
<td>3660</td>
</tr>
<tr>
<td>Israel</td>
<td>3540</td>
</tr>
<tr>
<td>Ireland</td>
<td>3530</td>
</tr>
<tr>
<td>U.K</td>
<td>3440</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>3320</td>
</tr>
<tr>
<td>New Zealand</td>
<td>3150</td>
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<tr>
<td>Argentina</td>
<td>3000</td>
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<tr>
<td>Nigeria</td>
<td>2710</td>
</tr>
<tr>
<td>India</td>
<td>2300</td>
</tr>
<tr>
<td>Democratic Republic of Congo</td>
<td>1590</td>
</tr>
</tbody>
</table>
Daily Calorie Intake vs. Obesity

- Canada
- USA
- Australia
- China
- Sweden
- France
- India
- UK
- Mexico

The graph compares daily calorie intake and obesity rates across different countries. It shows a notable correlation between high calorie intake and obesity rates, with countries like the USA and Mexico having significantly higher obesity rates compared to others.
200 Calories Compared
All the below food types equal 200

- **Broccoli** VS **Gummy Bears**
  - 588 Grams
  - 51 Grams

- **Celery** VS **Coca Cola**
  - 1425 Grams
  - 496 ML

- **Apple** VS **Peanut Butter**
  - 385 Grams
  - 34 Grams

- **Honeydew Melon** VS **Salted Mixed Nuts**
  - 553 Grams
  - 33 Grams

- **Mini Peppers** VS **Cheeseburger**
  - 740 Grams
  - 75 Grams

“Don’t Hold Your Heart Hostage to Your Culture”
High Protein Diet
Low-carbohydrate–high-protein diet and long-term survival in a general population cohort

A Trichopoulou¹, T Psaltopoulou¹, P Orfanos¹, C-C Hsieh²,³ and D Trichopoulos¹,³

¹Department of Hygiene and Epidemiology, School of Medicine, University of Athens, Athens, Greece; ²University of Massachusetts Cancer Centre, Worcester, MA, USA and ³Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA

Objective: We have evaluated the effects on mortality of habitual low carbohydrate–high-protein diets that are thought to
Results: During 113,230 persons years of follow-up, there were 455 deaths. In models with energy adjustment, higher intake of carbohydrates was associated with significant reduction of total mortality, whereas higher intake of protein was associated with nonsignificant increase of total mortality (per decile, mortality ratios 0.94 with 95% CI 0.89 –0.99, and 1.02 with 95% CI 0.98 –1.07 respectively). Even more predictive of higher mortality were high values of the additive low carbohydrate–high protein score (per 5 units, mortality ratio 1.22 with 95% CI 1.09 –to 1.36). Positive associations of this score were noted with respect to both cardiovascular and cancer mortality.

Conclusion: Prolonged consumption of diets low in carbohydrates and high in protein is associated with an increase in total mortality.

“An increase in adherence to an animal-based LCD prospectively assessed from the pre- to post-MI period was associated with higher all-cause mortality and cardiovascular mortality (hazard ratios of 1.30 [95% CI: 1.03 to 1.65] for all-cause mortality and 1.53 [95% CI: 1.10 to 2.13] for cardiovascular mortality comparing extreme quintiles). An increase in adherence to a plant-based LCD was not associated with lower all-cause or cardiovascular mortality.”
Figure. Multivariate adjusted hazard ratios (HRs) for all-cause and cardiovascular mortality comparing new adherents versus nonadherents (n=1059 for women, with 294 new adherents and 765 nonadherents; n=804 for men, with 216 new adherents and 588 nonadherents). LCDS indicates low-carbohydrate diet score.
### Table 1. Comparison of Vegetarian With Nonvegetarian Dietary Patterns With Respect to All-Cause and Cause-Specific Mortality From a Cox Proportional Hazards Regression Model Among Participants in the Adventist Health Study 2, 2002-2009

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All-Cause</th>
<th>Ischemic Heart Disease</th>
<th>Cardiovascular Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>All (N = 73,308), No. of deaths&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>2560</td>
<td>372</td>
<td>987</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.88 (0.80-0.97)</td>
<td>0.81 (0.64-1.02)</td>
<td>0.87 (0.75-1.01)</td>
</tr>
<tr>
<td>Nonvegetarian</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
<tr>
<td>Men (n = 25,105), No. of deaths&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1031</td>
<td>169</td>
<td>390</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>0.82 (0.72-0.94)</td>
<td>0.71 (0.51-1.00)</td>
<td>0.71 (0.57-0.90)</td>
</tr>
<tr>
<td>Nonvegetarian</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
<td>1 [Reference]</td>
</tr>
</tbody>
</table>

**Figure Legend:**
Fruits and Veggies May Lower Stroke Risk

Aim for at least four to five a day, experts advise

THURSDAY, May 8, 2014 (HealthDay News) -- Regularly eating fruits and vegetables may reduce your stroke risk, according to a new review of worldwide research.

Stroke risk declined by 32 percent for every 200 grams of fruit consumed each day, and by 11 percent for every 200 grams of daily vegetables, according to the findings published in the journal Stroke.

"Improving diet and lifestyle is critical for heart and stroke risk reduction in the general population," senior study author Dr. Yan Qu, director of the intensive care unit at Qingdao Municipal Hospital in China, said in a news release provided by the American Heart Association.
Conclusions: Red meat consumption is associated with an increased risk of total, CVD, and cancer mortality. Substitution of other healthy protein sources for red meat is associated with a lower mortality risk.
Figure 1. Dose-response relationship between red meat intake and risk of all-cause mortality in the Health Professionals Follow-up Study (A) and the Nurses’ Health Study (B). The results were adjusted for age (continuous); body mass index (calculated as weight in kilograms divided by height in meters squared) category (23.0, 23.0-24.9, 25.0-29.9, 30.0-34.9, or 35); alcohol consumption (0, 0.1-4.9, 5.0-29.9, 30.0 g/d in men; 0, 0.1-4.9, 5.0-14.9, or 15.0 g/d in women); physical activity level (3.0, 3.0-8.9, 9.0-17.9, 18.0-26.9, or 27.0 hours of metabolic equivalent tasks per week); smoking status (never, past, or current [1-14, 15-24, or 25 cigarettes per day]); race (white or nonwhite); menopausal status and hormone use in women (premenopausal, postmenopausal never users, postmenopausal past users, or postmenopausal current users); family history of diabetes mellitus, myocardial infarction, or cancer; history of diabetes mellitus, hypertension, or hypercholesterolemia; and intakes of total energy, whole grains, fruits, and vegetables, all in quintiles. Broken lines represent 95% CI.
Nut consumption and risk of mortality in the Physicians' Health Study.

Hsieh TT1, Petrone AB1, Gaziano JM1, Drouse L1.

Abstract

BACKGROUND: Previous studies have suggested that nut consumption is associated with beneficial cardiovascular outcomes. However, limited data are available on the association between nut intakes and all-cause mortality.

OBJECTIVE: Our aim was to test the hypothesis that nut consumption is inversely associated with the risk of all-cause mortality.

DESIGN: In this prospective cohort study in 20,742 male physicians, we assessed nut intake between 1999 and 2002 via a food-frequency questionnaire and ascertained deaths through an endpoint committee. We used Cox regression to estimate multivariable-adjusted HRs for death according to nut consumption. In secondary analyses, we evaluated associations of nut consumption with cause-specific mortality.

RESULTS: During a mean follow-up of 9.6 y, there were 2732 deaths. The mean (±SD) age at baseline was 66.6 ± 9.3 y. Median nut consumption was 1 serving/wk. Multivariable-adjusted HRs (95% CIs) were 1.0 (reference), 0.92 (0.83, 1.01), 0.85 (0.76, 0.96), 0.86 (0.75, 0.98), and 0.74 (0.63, 0.87) for nut consumption of never or <1 serving/mo, 1-3 servings/mo, 1 serving/wk, 2-4 servings/wk, and ≥5 servings/wk, respectively (P-linear trend < 0.0001), after adjustment for age, body mass index, alcohol use, smoking, exercise, prevalent diabetes and hypertension, and intakes of energy, saturated fat, fruit and vegetables, and red meat. In a secondary analysis, results were consistent for cardiovascular disease mortality but only suggestive and non-statistically significant for coronary artery disease and cancer mortality.

CONCLUSION: Our data are consistent with an inverse association between nut consumption and the risk of all-cause and cardiovascular disease mortality in US male physicians.

RESULTS:
During a mean follow-up of 9.6 y, there were 2732 deaths. The mean (±SD) age at baseline was 66.6 ± 9.3 y. Median nut consumption was 1 serving/wk. Multivariable-adjusted HRs (95% CIs) were 1.0 (reference), 0.92 (0.83, 1.01), 0.85 (0.76, 0.96), 0.86 (0.75, 0.98), and 0.74 (0.63, 0.87) for nut consumption of never or <1 serving/mo, 1-3 servings/mo, 1 serving/wk, 2-4 servings/wk, and ≥5 servings/wk, respectively (P-linear trend < 0.0001).
Nut consumption and risk of heart failure in the Physicians' Health Study I. [Am J Clin Nutr. 2008]

Nut consumption and 5-y all-cause mortality in a Mediterranean cohort: the SUN p [Nutrition. 2014]

Nut consumption and risk of stroke in US male physicians. [Clin Nutr. 2010]

Fruit and vegetable consumption and mortality from all causes, cardiovascular. [BMJ. 2014]

Nut consumption, vegetarian diets, ischemic heart disease risk [Am J Clin Nutr. 1999]

Related citations in PubMed

Heart failure in the
Am J Clin Nutr. 2008
-cause mortality in a
UN p [Nutrition. 2014]
stroke in US male
[Clin Nutr. 2010]
consumption and
[BMJ. 2014]
vegetarian diets,
Am J Clin Nutr. 1999]

See reviews...
Peanuts In Diet Linked To Lower Mortality

March 4, 2015 | by Lisa Winter
Results  With a median follow-up of 5.4 years in the SCCS, 6.5 years in the SMHS, and 12.2 years in the SWHS, 14,440 deaths were identified. More than half of the women in the SCCS were ever smokers compared with only 2.8% in the SWHS. The ever-smoking rate for men was 77.1% in the SCCS and 69.6% in the SMHS. Nut intake was inversely associated with risk of total mortality in all 3 cohorts (all $P < .001$ for trend), with adjusted HRs associated with the highest vs lowest quintiles of intake being 0.79 (95% CI, 0.73-0.86) and 0.83 (95% CI, 0.77-0.88), respectively, for the US and Shanghai cohorts. This inverse association was predominantly driven by cardiovascular disease mortality ($P < .05$ for trend in the US cohort; $P < .001$ for trend in the Shanghai cohorts). When specific types of cardiovascular disease were examined, a significant inverse association was consistently seen for ischemic heart disease in all ethnic groups (HR, 0.62; 95% CI, 0.45-0.85 in blacks; HR, 0.60; 95% CI, 0.39-0.92 in whites; and HR, 0.70; 95% CI, 0.54-0.89 in Asians for the highest vs lowest quintile of nut intake). The associations for ischemic stroke (HR, 0.77; 95% CI, 0.60-1.00 for the highest vs lowest quintile of nut intake) and hemorrhagic stroke (HR, 0.77; 95% CI, 0.60-0.99 for the highest vs lowest quintile of nut intake) were significant only in Asians. The nut-mortality association was similar for men and women and for blacks, whites, and Asians and was not modified by the presence of metabolic conditions at study enrollment.
C- Reactive Protein (CRP)

*That CReePy Molecule*
COMPARISON OF C-REACTIVE PROTEIN AND LOW-DENSITY LIPOPROTEIN CHOLESTEROL LEVELS IN THE PREDICTION OF FIRST CARDIOVASCULAR EVENTS

PAUL M. RIDKER, M.D., NADER RIFAI, PH.D., LYNDA ROSE, M.S., JULIE E. BURING, SC.D., AND NANCY R. COOK, SC.D.

ABSTRACT

Background  Both C-reactive protein and low-density lipoprotein (LDL) cholesterol levels are elevated in persons at risk for cardiovascular events. However, population-based data directly comparing these two biologic markers are not available.

Methods  C-reactive protein and LDL cholesterol were measured at baseline in 27,939 apparently healthy American women, who were then followed for a mean of eight years for the occurrence of myocardial infarction, ischemic stroke, coronary revascularization, or death from cardiovascular causes. We

BECAUSE of its critical importance in atherogenesis, low-density lipoprotein (LDL) cholesterol is the focus of current guidelines for the determination of the risk of cardiovascular disease. However, atherothrombosis often occurs in the absence of hyperlipidemia, and recent consensus panels assembled by the National Heart, Lung, and Blood Institute and the Centers for Disease Control and Prevention have concluded that population-based data on other risk factors are urgently needed.

Among the biologic markers considered by those panels as particularly important in Coronary...
Figure 3. Event-free Survival among Women with C-Reactive Protein (CRP) and LDL Cholesterol Levels above or below the Median for the Study Population.
Association of C-Reactive Protein With Cardiovascular Disease Mortality According to Diabetes Status
Pooled analyses of 25,979 participants from four U.K. prospective cohort studies

Andre Pascal Kengne, MD, PHD¹,²,³↓, G. David Batty, PHD⁴, Mark Hamer, PHD⁴, Emmanuel Stamatakis, PHD⁴ and Sébastien Czernichow, MD, PHD⁵,⁶

Author Affiliations

Corresponding author: Andre Pascal Kengne, andre.kengne@mrc.ac.za.

Abstract

OBJECTIVE C-reactive protein (CRP) is associated with the risk of cardiovascular disease (CVD); whether the effects are modified by diabetes status still is unclear. This study investigated these issues and assessed the added value of CRP to predictions.
Hazard ratios and 95% CIs for the association between CRP and all-cause (upper panels) and CVD (lower panels) mortality, overall (left column) and in men (middle column) and women (right column) with and without diabetes.
Rosuvastatin to Prevent Vascular Events in Men and Women with Elevated C-Reactive Protein


BACKGROUND
Increased levels of the inflammatory biomarker high-sensitivity C-reactive protein predict cardiovascular events. Since statins lower levels of high-sensitivity C-reactive protein as well as cholesterol, we hypothesized that people with elevated high-sensitivity C-reactive protein levels but without hyperlipidemia might benefit from statin treatment.
A Primary End Point

Cumulative Incidence

Years

Placebo
Rosuvastatin

P<0.00001

No. at Risk

Rosuvastatin  Placebo
8901 8631 8412 6540 3893 1958 1353 983 538 157
8901 8621 8353 6508 3872 1963 1333 955 531 174
Effects of a Dietary Portfolio of Cholesterol-Lowering Foods vs Lovastatin on Serum Lipids and C-Reactive Protein

David J. A. Jenkins, MD
Cyril W. C. Kendall, PhD
Augustine Marchie, BSc
Dorothea A. Faulkner, PhD
Julia M. W. Wong, RD
Russell de Souza, RD
Azadeh Emam, BSc
Tina L. Parker, RD
Edward Vidgen, BSc
Karen G. Lapsley, DSc
Elke A. Trautwein, PhD

**Context** To enhance the effectiveness of diet in lowering cholesterol, recommendations of the Adult Treatment Panel III of the National Cholesterol Education Program emphasize diets low in saturated fat together with plant sterols and viscous fibers, and the American Heart Association supports the use of soy protein and nuts.

**Objective** To determine whether a diet containing all of these recommended food components leads to cholesterol reduction comparable with that of 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors (statins).

**Design** Randomized controlled trial conducted between October and December 2002.

**Setting and Participants** Forty-six healthy, hyperlipidemic adults (25 men and 21 postmenopausal women) with a mean (SE) age of 59 (1) years and body mass index of 27.6 (0.5), recruited from a Canadian hospital-affiliated nutrition research center and the community.

**Interventions** Participants were randomly assigned to undergo 1 of 3 interventions
Participants were randomly assigned to undergo 1 of 3 interventions on an outpatient basis for 1 month:

- a diet very low in saturated fat, based on milled whole-wheat cereals and low-fat dairy foods (n = 16; control);
- the same diet plus lovastatin, 20 mg/d (n = 14); or
- a diet high in plant sterols (1.0 g/1000 kcal), soy protein (21.4 g/1000 kcal), viscous fibers (9.8 g/1000 kcal), and almonds (14 g/1000 kcal) (n = 16; dietary portfolio).
Figure 2. Change From Baseline in LDL-C, LDL-C–HDL-C Ratio, and C-Reactive Protein

LDL-C indicates low-density lipoprotein cholesterol; HDL-C, high-density lipoprotein cholesterol. Values are expressed as mean (SE) because, with the number of participants involved, approximately twice the SE represents a significant difference.
Sugar

Not Too Sweet To You
Association of Insulin Resistance with Cardiovascular Risk Factors and Atherosclerosis

- Obesity
  - Insulin resistance
    - Glucose Intolerance + AGEs
      - Dyslipidemia
        - Low HDL
        - Small, dense LDL particles
        - Hypertriglyceridemia
    - Hypertension
    - Endothelial dysfunction
      - ↑ VCAM, E-selectin, ↓ NO
    - Inflammation
      - ↑ CRP
      - ↑ IL-6

- Atherosclerosis

Original Contribution

Risk Factors for Mortality in the Nurses’ Health Study: A Competing Risks Analysis

Heather J. Baer*, Robert J. Glynn, Frank B. Hu, Susan E. Hankinson, Walter C. Willett, Graham A. Colditz, Meir Stampfer, and Bernard Rosner

* Correspondence to Dr. Heather J. Baer, Division of General Medicine and Primary Care, Brigham and Women’s Hospital, 1620 Tremont Street, Boston, MA 02120 (e-mail: hbaer@partners.org).
Table 2. Associations of Risk Factors With All-Cause Mortality From a Cox Proportional Hazards Model Among 50,112 Participants in the Nurses’ Health Study, 1986–2004

<table>
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<tr>
<th>Risk Factor</th>
<th>HR(^{b})</th>
<th>95% CI</th>
</tr>
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<tbody>
<tr>
<td>Age (per 19 years)(^{c})</td>
<td>5.78</td>
<td>5.06, 6.61</td>
</tr>
<tr>
<td>Body mass index at age 18 years (per 7 kg/m(^{2}))(^{d})</td>
<td>1.23</td>
<td>1.15, 1.31</td>
</tr>
<tr>
<td>Weight change since age</td>
<td>1.07</td>
<td>1.00, 1.15</td>
</tr>
<tr>
<td>Glycemic load (per 41 units)(^{f})</td>
<td>1.22</td>
<td>1.12, 1.34</td>
</tr>
<tr>
<td>Dietary cholesterol (per 105 mg/1,000 kcal)(^{f})</td>
<td>1.17</td>
<td>1.08, 1.26</td>
</tr>
</tbody>
</table>

Nut consumption, servings/week\(^{c}\)

<table>
<thead>
<tr>
<th>Nut Consumption</th>
<th>HR(^{b})</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1.0</td>
<td>Referent</td>
</tr>
<tr>
<td>(\leq 1)</td>
<td>0.92</td>
<td>0.87, 0.98</td>
</tr>
<tr>
<td>(\geq 2)</td>
<td>0.86</td>
<td>0.77, 0.95</td>
</tr>
</tbody>
</table>

Polyunsaturated fat (per 3% energy)\(^{f}\)

<table>
<thead>
<tr>
<th>Polyunsaturated Fat</th>
<th>HR(^{b})</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.85</td>
<td>0.79, 0.91</td>
</tr>
</tbody>
</table>

Table continues

---

\(^{a}\) Units for continuous variables correspond to the difference between the 90th and 10th percentile values.

\(^{b}\) Adjusted for all other risk factors in table.

\(^{c}\) From 1986 questionnaire.

\(^{d}\) From 1980 questionnaire.

\(^{e}\) From 1976 questionnaire; 1 inch = 2.54 cm.

\(^{f}\) Average of values from 1980, 1984, and 1986 questionnaires.

\(^{g}\) From 1988 questionnaire.

\(^{h}\) From 1986 or previous questionnaires.
Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults

### Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults


<table>
<thead>
<tr>
<th>Subgroup</th>
<th>No. of Participants (Deaths)</th>
<th>Adjusted HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;60</td>
<td>8835 (144)</td>
<td>1.67 (0.78-3.58)</td>
</tr>
<tr>
<td>≥60</td>
<td>2898 (687)</td>
<td>1.83 (1.01-3.31)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5639 (434)</td>
<td>1.34 (0.60-3.00)</td>
</tr>
<tr>
<td>Female</td>
<td>6094 (397)</td>
<td>2.95 (1.48-5.91)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>4802 (494)</td>
<td>2.67 (1.48-4.80)</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>3233 (187)</td>
<td>0.71 (0.44-1.15)</td>
</tr>
<tr>
<td>Mexican American</td>
<td>3217 (134)</td>
<td>1.76 (0.49-6.39)</td>
</tr>
<tr>
<td>Education, y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12</td>
<td>4318 (455)</td>
<td>2.29 (1.49-3.50)</td>
</tr>
<tr>
<td>≥12</td>
<td>7415 (376)</td>
<td>1.67 (0.67-4.18)</td>
</tr>
<tr>
<td>Healthy Eating Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥Top 50%</td>
<td>5673 (457)</td>
<td>2.96 (1.15-7.63)</td>
</tr>
<tr>
<td>&lt;Top 50%</td>
<td>6060 (374)</td>
<td>1.80 (1.05-3.07)</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>4407 (287)</td>
<td>2.12 (0.63-7.18)</td>
</tr>
<tr>
<td>Low</td>
<td>7326 (544)</td>
<td>1.54 (0.93-2.53)</td>
</tr>
<tr>
<td>Body mass index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>4697 (320)</td>
<td>1.55 (0.56-4.34)</td>
</tr>
<tr>
<td>≥25</td>
<td>7036 (511)</td>
<td>2.23 (1.40-3.55)</td>
</tr>
</tbody>
</table>
Too much animal-based protein could lead to early death, study says
Low Protein Intake Is Associated with a Major Reduction in IGF-1, Cancer, and Overall Mortality in the 65 and Younger but Not Older Population


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10.1016/j.cmet.2014.02.006

Authors
Morgan E. Levine, Jorge A. Suarez, Sebastian Brandhorst, Priya Balasubramanian, Chia-Wei Cheng, Federica Madia, Luigi Fontana, Mario G. Mirisola, Jaime Guevara-Aguirre, Junxiang Wan, Giuseppe Passarino, Brian K. Kennedy, Min Wei,
Insulin-like growth factor 1
(somatomedin C)
• High IGF-1 levels increased the relationship between mortality and high protein intake.

• High protein intake is linked to increased cancer, diabetes, and overall mortality.

• Higher protein consumption may be protective for older adults.

• *Plant-derived proteins are associated with lower mortality than animal-derived proteins.*
TMAO

Too Many Animals – Ouch!
Pathways Linking Dietary Phosphatidylcholine, Intestinal Microbiota, and Incident Adverse Cardiovascular Events.

Kaplan–Meier Estimates of Major Adverse Cardiovascular Events, According to the Quartile of TMAO Level.

Comparison of Fasting TMAO Levels Between Patients With Stable Heart Failure and Apparently Healthy Controls

(Left) Trimethylamine-N-oxide (TMAO) concentration was higher in patients with stable heart failure than healthy controls and (Right) portended poorer survival at higher levels regardless of B-type natriuretic peptide levels. Kaplan-Meier curves for 5-year all-cause mortality with TMAO with TMAO/B-type natriuretic peptide (BNP) stratified at median levels.
From: Prognostic Value of Elevated Levels of Intestinal Microbe-Generated Metabolite Trimethylamine-N-Oxide in Patients With Heart Failure: Refining the Gut Hypothesis


Kaplan-Meier Estimates of Risk of All-Cause Mortality According to Quartiles of Plasma Levels of TMAO

Kaplan-Meier curves for 5-year all-cause mortality with trimethylamine-N-oxide (TMAO) stratified as quartiles.

Figure Legend:
Phosphorus

*It’s Not for Us!*

The 13th element to be discovered, Phosphorus is used in making explosives and poison.

Hence, it is referred to as 'THE DEVIL’S ELEMENT'.
Excessive dietary phosphorus intake may be harmful even in the absence of high serum phosphorus concentrations. Serum phosphorus concentrations are tightly regulated by parathyroid hormone and fibroblast growth factor-23 (FGF-23), which is a hormone that increases urinary phosphorus excretion. Individuals with normal kidney function are largely able to maintain serum phosphorus in a physiologic range, even in the setting of high phosphorus consumption because increased phosphorus consumption leads to physiologic increases in parathyroid hormone and FGF-23 (8–10). Over the long term, high FGF-23 concentrations may stimulate left ventricular hypertrophy (11), and epidemiologic studies have linked high FGF-23 concentrations with heart failure (12), cardiovascular events, chronic kidney disease (CKD) progression, and mortality (7, 13).
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Quartile 1 ($n = 2424$)</th>
<th>Quartile 4 ($n = 2419$)</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute phosphorus intake (mg/d)</td>
<td>629 (503–737)$^2$</td>
<td>1992 (1769–2355)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Phosphorus density (mg/kcal)</td>
<td>0.48 (0.40–0.58)</td>
<td>0.67 (0.57–0.79)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total energy intake (kcal)</td>
<td>1309 ± 11$^3$</td>
<td>3253 ± 28</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HEI$^4$ score</td>
<td>58.9 ± 0.4</td>
<td>63.7 ± 0.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Consumed any soda (%)$^5$</td>
<td>56.9</td>
<td>61.2</td>
<td>0.07</td>
</tr>
<tr>
<td>Consumed any fast food (%)$^6$</td>
<td>14.9</td>
<td>17.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Nutrient and food group intakes standardized by total energy intake$^7$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium (mg/d)</td>
<td>3149 ± 40</td>
<td>3364 ± 31</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Potassium (mg/d)</td>
<td>2699 ± 46</td>
<td>2742 ± 33</td>
<td>0.5</td>
</tr>
<tr>
<td>Calcium (mg/d)</td>
<td>581 ± 9</td>
<td>944 ± 17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Protein (g/d)</td>
<td>67.4 ± 0.8</td>
<td>82.1 ± 0.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total fat (g/d)</td>
<td>70.0 ± 0.7</td>
<td>78.8 ± 0.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Saturated fat (g/d)</td>
<td>22.4 ± 0.4</td>
<td>27.5 ± 0.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fiber (g/d)</td>
<td>15.4 ± 0.3</td>
<td>15.6 ± 0.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Grains (servings/d)</td>
<td>6.69 ± 0.09</td>
<td>6.04 ± 0.10</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fruit (servings/d)</td>
<td>1.89 ± 0.09</td>
<td>1.23 ± 0.08</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Vegetables (servings/d)</td>
<td>3.49 ± 0.10</td>
<td>2.86 ± 0.07</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Dairy (servings/d)</td>
<td>1.14 ± 0.04</td>
<td>2.52 ± 0.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Meat (servings/d)</td>
<td>1.95 ± 0.04</td>
<td>2.12 ± 0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Legumes (servings/d)</td>
<td>0.07 ± 0.01</td>
<td>0.12 ± 0.01</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Heme Iron

Producing Reactive Oxygen Species
EAT YOUR IRON
The Veggie Edition

Did You Know...

- **Spirulina**: 15mg Iron in ONE tablespoon!
- **Chia Seeds**: 6x More Iron than spinach!
- **Kale**: More iron than beef!
- **Morel Mushrooms**: 12mg Iron per 8 mushrooms!

Up to and including: dates, watermelon, parsley, hemp seeds, beans, spinach, potatoes, nuts, apricots and dried fruit!

Daily Iron Needs

- **Women**: 8-18mg
- **Men**: 8-11mg

IRON INHIBITORS
- Red Wine
- Isolated Soy
- Tea & Coffee

IRON ENHANCERS
- Broccoli
- Oranges
- Tomatoes
On the basis of a Cox proportional hazards model adjusting for age, examination year, cigarette pack-years, ischemic ECG in exercise test, maximal oxygen uptake, systolic blood pressure, blood glucose, serum copper, blood leukocyte count, and serum high density lipoprotein cholesterol, apolipoprotein B, and triglyceride concentrations, men with serum ferritin > 200 mcg/l had a 2.2-fold (95% CI, 1.2-4.0; p<0.01) risk factor-adjusted risk of acute myocardial infarction compared with men with a lower serum ferritin. An elevated serum ferritin was a strong risk factor for acute myocardial infarction in all multivariate models.
Heme Iron and Coronary Heart Disease in Women With Type 2 Diabetes

suPAR

soluble urokinase-type Plasminogen Activator Receptor
suPAR

- Independent CV risk factor, particularly in elderly
- Determinant of mortality in renal failure patients
- Results from the Malmö Diet and Cancer Study suggest dietary intervention may decrease suPAR

Vegetarians Have Lower Rates

- overweight and obesity
- cardiovascular disease (CVD)
- hypertension
- type 2 diabetes
- some cancers
- gallstones
- kidney stones
- constipation
- diverticular disease
- anti-inflammatory

Cardiovascular Disease

– Reduced risk of coronary heart disease (CHD) and coronary disease mortality

– 5 prospective studies reported a combined:
  • 24% lower risk of mortality from IHD in vegetarians
  • 34% reduced in lacto-ovo vegetarians
  • 26% reduced risk in vegans

– The benefit was apparent if diet followed for at least 5 years and was greater in younger age groups
Plaque Regression with Plant-Based Diet

Esselstyn
Figure 1.—Mean percentage diameter stenosis in treatment and control groups at baseline, 1 year, and 5 years. Error bars represent SEM; asterisk, $P = .02$ by between-group 2-tailed test; dagger, $P = .001$ by between-group 2-tailed test.

Figure 2.—Changes in percentage diameter stenosis by 5-year adherence tertiles for the experimental group.
Increased Longevity Among Vegetarians

– Reduced consumption of saturated fat, cholesterol, animal protein, red meat, heme iron, IGF-1, suPAR, phosphorus and phosphatidyl choline

– Increased consumption of beneficial dietary components, including fruit, vegetables, whole grains, legumes, and nuts, all rich in dietary fiber, antioxidants, and phytochemicals

– Other healthy lifestyle choices (*less sugar*)
Conclusions

• Well-planned vegetarian diets are not only nutritionally adequate but also provide many health benefits, particularly in the prevention and treatment of many chronic diseases, including heart disease.

• A vegetarian diet may present a significant advantage over meat-based diets, and a number of studies have shown increased longevity in vegetarians.
• Widespread acceptance of plant-based dieting for prevention or treatment of CV disease requires large, well-designed, long-term, randomized, prospective trials in free-living populations.

• In view of the “strength of signal” with smaller trials and weight of observational evidence, these may be difficult to accomplish.
Three Phases of Truth

"All truth passes through three stages. First, it is *ridiculed*. Second, it is *violently opposed*. Third, it is accepted as being *self-evident.*"

Arthur Schopenhauer
German Philosopher
(1788-1866)
• https://www.youtube.com/watch?v=jAbOss8T3hM
DISRUPT YOUR THINKING

Improve your patients’ lives by staying up-to-date with cutting-edge advances and practice-changing updates in cardiovascular care at ACC.16

accscientificsession.org/meeting

BE AT THE INTERSECTION OF SCIENCE & CHANGE