Overview of the cholesterol-lowering effect of soy protein and perspective on the FDA’s evaluation of the clinical data

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FDA WANTS SOY CLAIMS REMOVED

BY AP | October 31, 2017

Home › News › Agricultural News

U.S. moves to revoke claim that soy protein protects the heart

Toni Clarke

2 MIN READ

(Reuters) - The U.S. Food and Drug Administration on Monday proposed a rule revoking the right of companies to say soy protein protects the heart, while potentially allowing a more circumspect health claim.
### RIN Data

**HHS/FDA**  
**RIN:** 0910-AH43  
**Publication ID:** Spring 2018

**Title:** Food Labeling: Health Claims; Soy Protein and Coronary Heart Disease

**Abstract:**
This final rule would amend FDA’s regulation authorizing the use of health claims regarding the relationship between soy protein and coronary heart disease on the label or in the labeling of foods.

**Agency:** Department of Health and Human Services (HHS)  
**RIN Status:** Previously published in the Unified Agenda  
**Priority:** Other Significant  
**Major:** No  
**EO 13771 Designation:** Fully or Partially Exempt  
**Agenda Stage of Rulemaking:** Long-Term Actions  
**Unfunded Mandates:** No  
**CFR Citation:** 21 CFR 101.71 21 CFR 101.82  

**Legal Deadline:** None

**Timeline:**

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<th>Action</th>
<th>Date</th>
<th>FR Cite</th>
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<tr>
<td>NPRM</td>
<td>10/31/2017</td>
<td>82 FR 50324</td>
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<td>01/16/2018</td>
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<td>NPRM Comment Period Extended</td>
<td>01/17/2018</td>
<td>83 FR 2393</td>
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<td>09/00/2019</td>
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**Regulatory Flexibility Analysis Required:** Undetermined

**Federalism:** No

**Included in the Regulatory Plan:** No

**RIN Data Printed in the FR:** No

**Agency Contact:**
Crystal Rivers  
Nutritionist  
Department of Health and Human Services  
Food and Drug Administration  
5001 Campus Drive, HFS-830,  
College Park, MD 20740

**Government Levels Affected:** Undetermined
Direct effect of the protein
Fatty Acid Composition of Soybean Oil

<table>
<thead>
<tr>
<th>Fatty acid</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated</td>
<td>12</td>
</tr>
<tr>
<td>Monounsaturated</td>
<td>29</td>
</tr>
<tr>
<td>Omega-6 PUFA (LA)*</td>
<td>53</td>
</tr>
<tr>
<td>Omega-3 PUFA (ALA)*</td>
<td>6</td>
</tr>
</tbody>
</table>

*Essential fatty acids: LA, linoleic acid; ALA, α-linolenic acid

“Supportive but not conclusive scientific evidence suggests that eating about 1½ tablespoons (20.5 grams) daily of soybean oil, which contains unsaturated fat, may reduce the risk of coronary heart disease.”
Very limited and preliminary scientific evidence

Limited and not conclusive scientific evidence

Very limited and preliminary scientific evidence
Dietary Carbohydrates and Low Cholesterol Diets: Effects on Serum Lipids of Man¹,²

R. E. Hodges, M.D., W. A. Krehl, M.D., Ph.D., D. B. Stone, M.D., and A. Lopez, Ph.D., M.D.

As soon as vegetable protein replaced animal protein, serum cholesterol levels decreased markedly ...
Change in total cholesterol levels in response to soy protein in 6 hypercholesterolemic men

AJCN 20: 198, 1967
Pioneering Soy Protein Researcher

Cesare R. Sirtori, MD

Professor of Clinical Pharmacology; Director, Center of Hyperlipidemias, University of Milano and Niguarda Hospital, Milano, Italy
SOYBEAN-PROTEIN DIET IN THE TREATMENT OF TYPE-II HYPERLIPOPROTEINEMIA

C. R. Sertori E. Agabri Centre E. grassi, Padua, for the Study of Metabolic Diseases and Hyperlipidemia, University of Milan, Italy
F. Conti O. Mantero
Vergani Division and Department of Nutrition, Maggiore Hospital, Milan

Summary
A soybean textured protein induced a 14% decrease of plasma-cholesterol levels after two weeks and 21% after three when substituted for animal proteins in a group of 20 patients with type-II hyperlipoproteinemia. Comparison of soybean diet with a standard low-lipid diet did not lead to the same patients, according to a cross-over protocol, indicated that this hypocholesterolemic effect was not due to differences in the lipid composition of the two diets. The hypothesis that a soy protein has a hypocholesterolemic response by the result in 8 type-II patients in who (300 g/day soy protein) lowered the cholesterol levels.

Introduction
Epidemiological and experimental studies suggest that vegetable proteins may prove useful for the treatment of human hyperlipidemia. People abstaining from animal proteins have significantly lower plasma-cholesterol levels than control populations and in rabbits, vegetable proteins, unlike animal proteins, exert a hypocholesterolemic effect. A dietary study in which a soybean textured protein totally replaced animal proteins has been conducted in patients with stable type-II hyperlipoproteinemia. According to a cross-over protocol, the soybeans-protein diet was compared in the same patients with a standard low-lipid, low-cholesterol diet. The results provide evidence that soy protein exerts a cholesterol-lowering effect independent of the lipid content of the diet.

Lancet 1, 275, 1977

1977

"...the soy protein diet exerted a remarkable hypocholesterolemic effect..."
... the soybean diet is an effective regimen for inducing significant cholesterol reduction ...
Depression of plasma cholesterol in men by consumption of baked products containing soy protein1-3


ABSTRACT The effects of soy-protein consumption with and without soy fiber on plasma lipids in 26 mildly hypercholesterolemic men were studied. Four 4-wk dietary treatments included 50 g protein and 20 g dietary fiber from soy flour (SF), isolated soy protein (soy conjugated fiber (ISP/SCF)), ISP/cholesterol (ISP/C), or nonfat dry milk control (NFDM/C) in conjunction with a low-fat, low-cholesterol diet. Plasma total cholesterol (TC) concentrations were lowest for both ISP dietary treatments compared with baseline (P < 0.05) and NFDM/C (P < 0.01). SF also led to lower TC compared with NFDM/C (P < 0.05). LDL-cholesterol values were lower for both ISP treatments compared with NFDM/C (P < 0.01), but lower compared with baseline only with ISP/SCF (P < 0.05). Apolipoprotein B was lowest when ISP/C was fed, compared with baseline, SF, and NFDM (P < 0.05). HDL-cholesterol and total triglycerides (TG) were not affected. Results indicate that 50 g ISP is effective in lowering TC, LDL-C, and apolipoprotein B while maintaining HDL concentrations in mildly hypercholesterolemic men. Am J Clin Nutr 1993;58: 501, 1993

KEY WORDS

Introduction

A dietary factor known to influence plasma lipids that has received little public attention is protein. There is a large body of research indicating that a total substitution of soy protein for animal protein lowers blood cholesterol concentrations in humans (1, 2). Sirtori et al (3, 4) reported that replacing saturated soy protein granules for animal protein in the diets of hypercholesterolemic men resulted in significant depression in total and low-density-lipoprotein (LDL)-cholesterol concentrations. Similar findings have been reported by others (1, 2, 5-7), primarily in those who are hypercholesterolemic, but in some instances, normocholesterolemic.

Fiber from soybeans has also been reported to decrease plasma lipids in humans (8, 9). Lo et al (9) showed that consumption of cookies containing 25 g soy conjugated fiber by hypercholesterolemic patients resulted in significant reductions in plasma total and LDL cholesterol compared with a standard low-fat, low-cholesterol diet. Whether or not there is an added benefit in lowering blood cholesterol concentrations from increased concurrent intake of soy protein and fiber in humans is not known.

The majority of investigations on soy protein-induced hypocholesterolemia used food items and dietary regimens such as liquid formulas, which are not common for most Americans (1, 2). Under these conditions the practicality of using soy protein as a treatment for hypercholesterolemia in the US population is questionable. Both soy protein and fiber can be incorporated into baked products at amounts that can provide up to one-half of the protein intake for an individual. Our goal was to evaluate the ability of a partial replacement of dietary protein with soy protein with and without soy conjugated fiber to decrease plasma lipid indexes when consumed in common baked products.

Subjects and methods

Thirty-nine men were studied as inpatients during two phases of the Medical Research Council criteria for mixed hyperlipidemia, men secondary to renal disease, medication use known to alter lipid metabolism, β-HL, use for hypertension, and documented abnormality of thyroid function. All subjects were recruited from the outpatient population of the VAMC system and gave informed consent. The project was approved by the Institutional Review Board at the University of Illinois at Urbana-Champaign and the Research and Development Committee and Human Subjects Sub-Committee at the VAMC. Initial characteristics are given in Table 1.

Subject dropouts included six during the first 4 wk, six who complied at least one experimental period but did not complete

“... individuals with mildly elevated blood cholesterol concentrations benefit by incorporating soy protein into their diets.”
META-ANALYSIS OF THE EFFECTS OF SOY PROTEIN INTAKE ON SERUM LIPIDS

JAMES W. ANDERSON, M.D., BRYAN M. JOHNSTONE, PH.D., AND MARGARET E. COOK-NEWELL, M.S., R.D.

Abstract. Background. In laboratory animals, the consumption of soy protein, rather than animal protein, decreases serum cholesterol concentrations, but studies in humans have been inconclusive. In this meta-analysis of 38 controlled clinical trials, we examined the relation between soy protein consumption and serum lipid concentrations in humans.

Methods. We used a random-effects model to quantify the average effects of soy protein intake on serum lipids in the studies we examined and used hierarchical mixed-effects regression models to predict variation as a function of the characteristics of the studies.

Results. In most of the studies, the intake of energy, fat, saturated fat, and cholesterol was similar when the subjects ingested control and soy-containing diets; soy protein intake averaged 47 g per day. Ingestion of soy protein was associated with the following net changes in serum lipid concentrations from the concentrations reached with the control diet: total cholesterol, a decrease of 23.2 mg per deciliter (0.60 mmol per liter); 95 percent confidence interval, 13.5 to 32.9 mg per deciliter (0.35 to 0.85 mmol per liter); 0.3 percent; low-density lipoprotein (LDL) cholesterol, a decrease of 21.7 mg per deciliter (0.56 mmol per liter); 95 percent confidence interval, 11.2 to 31.7 mg per deciliter (0.30 to 0.82 mmol per liter); 12.8 percent; and triglycerides, a decrease of 13.3 mg per deciliter (0.15 mmol per liter); 95 percent confidence interval, 0.3 to 25.7 mg per deciliter (0.003 to 0.29 mmol per liter); 10.5 percent. The changes in serum cholesterol and LDL cholesterol concentrations were directly related to the initial serum cholesterol concentration (P = 0.001). The ingestion of soy protein was associated with a nonsignificant 0.4 percent increase in serum concentrations of high-density lipoprotein (HDL) cholesterol.

Conclusions. We found that the consumption of soy protein rather than animal protein significantly decreased serum concentrations of total cholesterol, LDL cholesterol, and triglycerides. (N Engl J Med 1995;333: 276-82.)

1995
Meta-analysis

“... the consumption of soy protein ... significantly decreased serum concentrations of total cholesterol, LDL cholesterol, and triglycerides.”
Decreases in serum cholesterol concentrations were reported in 34 of 38 studies.

<table>
<thead>
<tr>
<th>Measure</th>
<th>No. of studies</th>
<th>No. of subjects</th>
<th>Decrease (mg/dl)</th>
<th>Percent decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>38</td>
<td>730</td>
<td>23.2</td>
<td>9.3</td>
</tr>
<tr>
<td>LDL-C</td>
<td>31</td>
<td>564</td>
<td>21.7</td>
<td>12.9</td>
</tr>
<tr>
<td>TG</td>
<td>30</td>
<td>628</td>
<td>13.3</td>
<td>10.5</td>
</tr>
</tbody>
</table>
Twenty-five grams of soy protein per day, as part of a diet low in saturated fat and cholesterol, may reduce risk of heart disease.
Soy Protein and Cardiovascular Disease
A Statement for Healthcare Professionals From the Nutrition Committee of the AHA

2000

Circulation 102: 2555, 2000

“... it is prudent to recommend including soy protein foods in a diet low in saturated fat and cholesterol to promote heart health.”
“Since authorizing this health claim, numerous studies have evaluated the relationship between soy protein and coronary heart disease, and the findings of these studies are inconsistent.”
... A meta-analysis of 52 studies ... yielded a statistically significant net decrease of 5 mg/dL (about -3 percent).”

Included isoflavone-only interventions
“In the majority of 22 randomized trials, isolated soy protein with isoflavones, as compared with milk or other proteins, decreased LDL cholesterol concentrations; the average effect was 3%.”

Didn’t meta-analyze the data
"...earlier research indicating that soy protein has clinically important favorable effects as compared with other proteins has not been confirmed."

Didn’t meta-analyze the data
The meta-analysis of the AHA Soy Advisory data gave a mean LDL-C reduction of 0.17 mmol/L (n = 22; P < 0.0001) or 4.3% for soy...
Decrease in LDL-C (%) in response to soy protein: Results of published meta-analyses

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. of studies</th>
<th>(N)</th>
<th>LDL-C</th>
</tr>
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<tr>
<td>Jenkins</td>
<td>22</td>
<td>757</td>
<td>4.3</td>
</tr>
<tr>
<td>Anderson</td>
<td>20</td>
<td>1946</td>
<td>5.5</td>
</tr>
<tr>
<td>Weggemans</td>
<td>21</td>
<td>959</td>
<td>4.0</td>
</tr>
<tr>
<td>Reynolds</td>
<td>36</td>
<td>1387</td>
<td>4.0</td>
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<tr>
<td>Harland</td>
<td>10</td>
<td>2913</td>
<td>6.0</td>
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<tr>
<td>Zhan</td>
<td>33</td>
<td>1749</td>
<td>5.0</td>
</tr>
<tr>
<td>Benkhedda</td>
<td>52</td>
<td>3731</td>
<td>4.0</td>
</tr>
</tbody>
</table>

“... the evidence does not support our previous determination that there is SSA* to support an authorized health claim for the relationship between soy protein and reduced risk of CHD.”
“Since authorizing this health claim numerous studies have evaluated the relationship between soy protein and CHD, and the findings of these studies are inconsistent.”
Consumption of vegetarian diets was associated with a reduction in LDL-C of 12.2 mg/dl (p < 0.001) in clinical trials
Pooled plasma LDL-cholesterol responses to vegetarian diets in clinical trials

Nutr Rev 75: 683, 2017

☑ Not statistically significant in 9 of 17 trials

<table>
<thead>
<tr>
<th>Study name</th>
<th>Subgroup within study</th>
<th>Comparison</th>
<th>Outcome</th>
<th>Statistics for each study</th>
<th>Difference in means and 95% CI</th>
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<tbody>
<tr>
<td>Elkan et al., 2008 (41)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-81.207 (-105.548 - 66.866)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Omish et al., 1998 (42)</td>
<td>Lacto-ovo</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-54.970 (-87.107 - 22.833)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Agren et al., 2001 (46)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-28.616 (-37.403 - 19.829)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Ling et al., 1992 (54)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-28.616 (-63.682 6.450)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Kestin et al., 1989 (44)</td>
<td>Lacto-ovo</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-23.569 (-43.395 - 3.782)</td>
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<td>Barnard et al., 2000 (45)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-14.000 (-26.168 - 1.832)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<td>de Mello et al., 2006 (40)</td>
<td>Lacto-ovo</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-13.148 (-36.950 10.654)</td>
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<td>Bunner et al., 2014 (47)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-11.100 (-21.385 - 0.315)</td>
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<tr>
<td>Mishra et al., 2013 (52)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-7.200 (-13.382 - 3.018)</td>
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<tr>
<td>Gardiner et al., 2005 (43)</td>
<td>Lacto-ovo</td>
<td>Low fat</td>
<td>LDL</td>
<td>-7.000 (-11.949 - 2.051)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Miller et al., 2009 (56)</td>
<td>Lacto-ovo</td>
<td>Mediterranean</td>
<td>LDL</td>
<td>-4.800 (-16.996 7.396)</td>
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<td>Gardner et al., 2007 (57)</td>
<td>Lacto-ovo</td>
<td>National guideline</td>
<td>LDL</td>
<td>-4.400 (-10.071 1.271)</td>
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<td>Barnard et al., 2009 (49)</td>
<td>Vegan</td>
<td>ADA diet</td>
<td>LDL</td>
<td>-4.100 (-16.245 8.045)</td>
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<tr>
<td>Fertowsian et al., 2010 (51)</td>
<td>Vegan</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>-3.700 (-13.436 6.036)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Dansinger et al., 2005 (38)</td>
<td>Lacto-ovo</td>
<td>Carolei restricted</td>
<td>LDL</td>
<td>-3.300 (-13.531 6.931)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Kahleova et al., 2013 (48)</td>
<td>Lacto-ovo</td>
<td>EASD diet</td>
<td>LDL</td>
<td>-1.160 (-13.143 10.822)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td>Aldana et al., 2007 (55)</td>
<td>Lacto-ovo</td>
<td>Omnivorous</td>
<td>LDL</td>
<td>2.760 (-10.430 15.950)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12.188 (-17.710 - 6.665)</td>
<td>-100.00 -50.00 0.00 50.00 100.00</td>
</tr>
</tbody>
</table>
“Soluble fiber, 2–10 g/d, was associated with ... significant decreases in ... LDL cholesterol ...”
Oat products, average dose, 5 g

Net change (mmol·L⁻¹·g soluble fiber⁻¹)
AJCN 69: 30, 1999

Not statistically significant in 14 of 25 trials
The effect of oat β-glucan on LDL-cholesterol, non-HDL-cholesterol and apoB for CVD risk reduction: a systematic review and meta-analysis of randomised-controlled trials

Hoang V. T. Ho1,5, John L. Sievenpiper1,2,3,4,5, Andreea Zurbau1,5, Sonia Blanco Mejia1,4,5, Elena Jovanovski1,5, Fei Au-Yeung1,5, Alexandra L. Jenkins1 and Vladimir Vuksan1,2,3,5*

1 Clinical Nutrition and Risk Factor Modification Centre, St. Michael’s Hospital, 30 Bond Street, Toronto, ON, Canada, M5B 1W8
2 Li Ka Shing Knowledge Institute, St. Michael’s Hospital, 30 Bond Street, Toronto, ON, Canada, M5B 1W8
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4 Toronto 3D Knowledge Synthesis and Clinical Trials Unit, St. Michael’s Hospital, Toronto, ON, Canada, M5B 1W8
5 Department of Nutritional Sciences, Faculty of Medicine, University of Toronto, 27 King’s Circle, Toronto, ON, Canada, M5S 1A1

(Submitted 24 February 2016 – Final revision received 7 June 2016 – Accepted 22 July 2016 – First published online 11 October 2016)

Abstract

Oats are a rich source of β-glucan, a viscous, soluble fibre recognised for its cholesterol-lowering properties, and are associated with reduced risk of CVD. Our objective was to conduct a systematic review and meta-analysis of randomised-controlled trials (RCT) investigating the cholesterol-lowering potential of oat β-glucan on LDL-cholesterol, non-HDL-cholesterol and apoB for the risk reduction of CVD. MEDLINE, Embase, CINAHL and Cochrane CENTRAL were searched. We included RCT of ≥3 weeks of follow-up, assessing the effect of diets enriched with oat β-glucan compared with controlled diets on LDL-cholesterol, non-HDL-cholesterol or apoB. Two independent reviewers extracted data and assessed study quality and risk of bias. Data were pooled using the generic inverse-variance method with random effects models and expressed as mean differences with 95% CI. Heterogeneity was assessed by the Cochran’s Q statistic and quantified by the R²-statistic. In total, fifty-eight trials (n 3974) were included. A median dose of 3·5 g/d of oat β-glucan significantly lowered LDL-cholesterol (−0·19; 95% CI −0·23, −0·14 mmol/l, P<0·00001), non-HDL-cholesterol (−0·20; 95% CI −0·26, −0·15 mmol/l, P<0·00001) and apoB (−0·03; 95% CI −0·05, −0·02 g/l, P<0·00001) compared with control interventions. There was evidence for considerable unexplained heterogeneity in the analysis of LDL-cholesterol (I²=79%) and non-HDL-cholesterol (I²=99%). Pooled analyses showed that oat β-glucan has a lowering effect on LDL-cholesterol, non-HDL-cholesterol and apoB. Inclusion of oat-containing foods may be a strategy for achieving targets in CVD reduction.

Key words: Oats; β-Glucan; Cholesterol-lowering properties; CVD: Systematic reviews and meta-analyses
22/38 (58%) of studies involving participants with elevated cholesterol reported significant decreases in LDL-Cholesterol.

9/19 (47%) of studies involving participants whose cholesterol was “unclassified” reported significant decreases in LDL-Cholesterol.
64% of the 59 studies that evaluated the LDL-C-lowering effect of phytosterols/stanols found a statistically significant reduction.
The proposed rule would revoke the regulation authorizing the use of a health claim regarding the relationship between soy protein and risk of coronary heart disease.
19/46 (41%) found statistically significant reductions in LDL-C

- Binary approach to data interpretation
- Didn’t meta-analyze the data
Trials were deemed supportive based entirely on statistical significance.

## DEPARTMENT OF HEALTH AND HUMAN SERVICES

**Food and Drug Administration**

21 CFR Part 101  
[Docket No. FDA–2017–N–0763]  
RIN 0910–AH43  

Food Labeling: Health Claims; Soy Protein and Coronary Heart Disease

**AGENCY:** Food and Drug Administration, HHS.  
**ACTION:** Proposed rule.

- **Binary approach to data interpretation**  
- **Didn’t meta-analyze the data**
Food Risk Analysis Communication

Issued By Health Canada’s Food Directorate

Health Canada’s Proposal to Accept a Health Claim about Soy Products and Cholesterol Lowering

Karima Benkhedda¹, Cynthia Boudrault¹, Susan E. Sinclair¹, Robin J. Marles¹, Chao Wu Xiao¹ and Lynne Underhill¹

¹ Bureau of Nutritional Sciences, Food Directorate, Health Products and Food Branch, Health Canada

Health Canada’s Food Directorate is making available this paper, following an internal peer review by Food Directorate scientific and regulatory experts, to seek comments from peer scientists, regulators and stakeholders prior to finalization.

This paper is open for comment commencing October 22, 2014, and closing on November 21, 2014 (30 calendar days). Comments of a scientific nature only will be considered in developing the final version of this document. Authors will strive to document how the various comments received, when deemed relevant, were considered in amending and shaping the final published document.

Comments may be submitted electronically at the address indicated below. Please use the phrase “Soy Health Claim Comments” in the subject box of your e-mail.

E-mail: healthclaims-allegationssante@hc-sc.gc.ca

DOI: 10.5772/59411

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Food Risk Analysis Communication
Issued By Health Canada’s Food Directorate

The direction of effect was highly consistent toward a reduction

**Total cholesterol:**
- 26% were statistically significant
- 75% of studies showed a reduction

**LDL-cholesterol:**
- 33% were statistically significant
- 81% of studies showed a reduction
A statistical approach to combining the results from multiple studies in order to increase power (over individual studies), improve estimates of the size of the effect and/or to resolve uncertainty when reports disagree.
Comprehensive dietary approach experimentally shown to dramatically lower cholesterol
"... the evidence does not change our previous conclusion that the use of soy protein at the levels necessary to justify a claim has been demonstrated, to our satisfaction, to be safe and lawful ...."
Thanks for listening

markjohnmessina@gmail.com