

The Effect of Polyphenols in Olive Oil on Heart Disease Risk Factors

A Randomized Trial

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5 September 2006 | Volume 145 Issue 5 | Pages 333-341

Background: Virgin olive oils are richer in phenolic content than refined olive oil. Small, randomized, crossover, controlled trials on the antioxidant effect of phenolic compounds from real-life daily doses of olive oil in humans have yielded conflicting results. Little information is available on the effect of the phenolic compounds of olive oil on plasma lipid levels. No international study with a large sample size has been done.

Objective: To evaluate whether the phenolic content of olive oil further benefits plasma lipid levels and lipid oxidative damage compared with monounsaturated acid content.

Design: Randomized, crossover, controlled trial.

Setting: 6 research centers from 5 European countries.

Participants: 200 healthy male volunteers.

Measurements: Glucose levels, plasma lipid levels, oxidative damage to lipid levels, and endogenous and exogenous antioxidants at baseline and before and after each intervention.

Intervention: In a crossover study, participants were randomly assigned to 3 sequences of daily administration of 25 mL of 3 olive oils. Olive oils had low (2.7 mg/kg of olive oil), medium (164 mg/kg), or high (366 mg/kg) phenolic content but were otherwise similar. Intervention periods were 3 weeks preceded by 2-week washout periods.

Results: A linear increase in high-density lipoprotein (HDL) cholesterol levels was observed for low-, medium-, and high-polyphenol olive oil: mean change, 0.025 mmol/L (95% CI, 0.003 to 0.05 mmol/L), 0.032 mmol/L (CI, 0.005 to 0.05 mmol/L), and 0.045 mmol/L (CI, 0.02 to 0.06 mmol/L), respectively. Total cholesterol–HDL cholesterol ratio decreased linearly with the phenolic content of the olive oil. Triglyceride levels decreased by an average of 0.05 mmol/L for all olive oils. Oxidative stress markers decreased linearly with increasing phenolic content. Mean changes for oxidized low-density lipoprotein levels were 1.21 U/L (CI, –0.8 to 3.6 U/L), –1.48 U/L (–3.6 to 0.6 U/L), and –3.21 U/L (–5.1 to –0.8 U/L) for the low-, medium-, and high-polyphenol olive oil, respectively.

Limitations: The olive oil may have interacted with other dietary components, participants' dietary intake was self-reported, and the intervention periods were short.

Conclusions: Olive oil is more than a monounsaturated fat. Its phenolic content can also provide benefits for plasma lipid levels and oxidative damage.

International Standard Randomised Controlled Trial number: ISRCTN09220811.

Editors' Notes

Context

- Olive oil, the main fat in the Mediterranean diet, contains polyphenols, which have antioxidant properties and may affect serum lipid levels.

Contribution

- The authors studied virgin olive oil (high in polyphenols), refined olive oil (low in polyphenols), and a mixture of the 2 oils in equal parts. Two hundred healthy young men consumed 25 mL of an olive oil daily for 3 weeks followed by the other olive oils in a randomly assigned sequence. Olive oils with greater polyphenol content increased high-density lipoprotein (HDL) cholesterol levels and decreased serum markers of oxidation.

Cautions

- The increase in HDL cholesterol level was small.

Implications

- Virgin olive oil might have greater health benefits than refined olive oil.

—The Editors

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Acknowledgments: The authors thank the EUROLIVE Investigators: R. Elosua, J.S. Vila, H. Schroder, and M. Farré-Albaladejo, Municipal Institute for Medical Research (IMIM), Barcelona, Spain, for methodologic and statistical assistance, performing diet record analyses, and management assistance; S. Voutilainen, T. Rissanen, T.P. Tuomainen, and V.P. Valkonen, Research Institute of Public Health, Kuopio University, Kuopio, Finland, for management and technical assistance; S. D'Addato, E. Grandi, S. Linarello, Z. Sangiorgio, and A. Fiorito, Policlinico S. Orsola-Malpighi, Bologna, Italy, for technical assistance and performing diet record analyses; T. Vilppo, Oy Jurilab, Kuopio, Finland, for performing oxidative and antioxidative biomarkers; and M.C. López-Sabater, K. De la Torre, and R.M. Lamuela-Raventós, Barcelona University, Barcelona, Spain, for the olive oil analyses.

Grant Support: By grant QLK1-CT-2001-00287 from the Commission of the European Communities Quality of Life and Management of Living Resources program.

Potential Financial Conflicts of Interest: None disclosed.

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Administrative, technical, or logistic support: J. Mursu, H. Bäumlér, J. Virtanen.

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5 September 2006 | Volume 145 Issue 5 | Page I-53

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The summary below is from the full report titled "The Effect of Polyphenols in Olive Oil on Heart Disease Risk Factors. A Randomized Trial." It is in the 5 September 2006 issue of *Annals of Internal Medicine* (volume 145, pages 333-341). The authors are M.-I. Covas, K. Nyssönen, H.E. Poulsen, J. Kaikkonen, H.-J.F. Zunft, H. Kiesewetter, A. Gaddi, R. de la Torre, J. Mursu, H. Bäumler, S. Nascetti, J.T. Salonen, M. Fitó, J. Virtanen, and J. Marrugat, for the EUROLIVE Study Group.

What is the problem and what is known about it so far?

A Mediterranean diet is an approach to eating that includes food choices common among people in countries around the Mediterranean Sea. The main fat in the Mediterranean diet is olive oil. The Mediterranean diet also includes fish, vegetables, fruits, whole grains, and nuts. Research has shown a strong connection between Mediterranean diets and lower rates of heart disease. Most researchers believe that the most important health-promoting substance in olive oil is oleic acid, which is a monounsaturated fatty acid. People want to know whether other substances in olive oil also promote health. Researchers think that polyphenol might be another health-promoting substance in olive oil. Virgin olive oil comes from the first pressing of olives. Refined olive oil comes from later pressings. Virgin olive oil has higher amounts of polyphenols than refined olive oil. If the amount of polyphenol in olive oil was important to health, people might prefer to use olive oil that was rich in polyphenols.

Why did the researchers do this particular study?

To determine whether olive oil containing different amounts of polyphenols affected risk factors for heart disease.

Who was studied?

200 healthy men 20 to 60 years of age who lived in 1 of 6 European cities.

How was the study done?

The researchers compared virgin olive oil (high level of polyphenols), refined olive oil (low level of polyphenols), and a mixture of equal amounts of the 2 olive oils (medium level of polyphenols). Each participant consumed about a tablespoon of one of the olive oils each day for 3 weeks. Over the course of the study, each participant consumed each of the 3 olive oils for a 3-week period. The researchers took blood samples to measure cholesterol levels and other chemicals before and after each 3-week period and compared the results after each type of olive oil.

What did the researchers find?

Virgin olive oil (high in polyphenols) increases the level of high-density lipoprotein cholesterol ("good cholesterol") the most. It also increases the body level of substances that prevent a chemical reaction (oxidation) that may damage low-density lipoprotein cholesterol ("bad cholesterol") and make it more likely to promote clots in blood vessels that can lead to heart disease.

What were the limitations of the study?

The study was too brief to determine whether consuming olive oil that contained different amounts of polyphenols changed people's risk for heart disease events.

What are the implications of the study?

Virgin olive oil seems to have a bigger effect on health-promoting substances in the body than refined olive oil. More research is needed to find out whether people who use virgin olive oil have a lower chance of developing heart disease than people who use refined olive oil.

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