A Spoonful of Olive Oil Makes the Vegetables Go Down: The Health Benefits of Cooking with EVOO

October 18, 2022
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• Nutrition nonprofit founded in 1990

• **Mission**: To inspire people to embrace the healthy and sustainable joys of the old ways of cooking and eating

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Webinar

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With a panel of plant-based experts

October 26 • 2:00 PM E.T.

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Webinar

**Whole Grains and Ancient Grains**
A Fit for Positive Nutrition and Today’s Consumer Trends

November 2
2:00 PM E.T.

OLDWAYS
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- Attendees will receive an email within ONE WEEK with **CPEU certificate**, **slides**, and **recording**

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- Please submit any questions using the CHAT function in Zoom

- THANK YOU to NAOOA for sponsoring this session!
Olive Oil 101:
Three Basic Issues

Joseph R. Profaci
Executive Director
North American Olive Oil Association

A Spoonful of Olive Oil Helps the Vegetables Go Down

Oldways Preservation & Exchange Trust

Webinar, October 18, 2022
Our Purpose
The North American Olive Oil Association (NAOOA) is a trade association of producers, marketers, packagers and importers of olive oil in the United States and Canada and their respective suppliers abroad.

What We Do:
Strengthen demand for olive oil across North America

How We Do It:
Promote the category, defend it from attack, ensure product quality and engage with the government on behalf of the industry

Why We Do It:
Share the health, taste and joy of olive oil with as many people as possible

Overarching Goals
The NAOOA focuses on the following core objectives:
- Increase consumption of all olive oil grades across the entire category — retail, foodservice and bulk
- Serve as a uniting force for the industry, including outside our membership
- Be viewed as an authoritative and trusted voice for olive oil
- Tell the unique story of olive oil
- Create a more inclusive association that reflects the breadth of the industry

Operational Functions
The association operates in five key functions, and specific tactics fall under each. These functions form the core of NAOOA’s work. They are:
- Promotion - Educating a variety of audiences about olive oil
- Defense - Protecting the category from attack
- Quality Assurance - Ensuring quality products are available in the marketplace
- Government Affairs - Engaging with lawmakers and policymakers on key subjects
- Association Leadership - Expanding membership and building external relationships
OLIVE OIL 101:
Three Basic Issues

1. Cultivation of Olives for Olive Oils
2. The Production of Olive Oils
3. Olive Oil Standards
1. Cultivation of Olives for Olive Oil

A. Basic Facts

• Grown primarily in Mediterranean countries, but also North and South America, China, South Africa, Japan
• Requires climate that has cool or cold winters (but not sustained freezing)
• Drought resistant, though fruit production depends on water
• Approximately 1,000 varieties
• World’s largest permanent crop
1. Cultivation of Olives for Olive Oil

B. Three Cultivation Methods

- Traditional (50-100 trees/acre)
- High Density (150-300 trees/acre)
- Super High-Density (500-900 trees/acre)
https://www.youtube.com/watch?v=Orwi0ZwUAvo&t=13s

OLIVE OIL 101

How Olive Oil is Made
2. Production of Olive Oils

A. Modern Techniques Vastly Improve Quality

- Enclosed steel crushers and malaxers replace mill stones
- Hemp mats are eliminated altogether
- Screw presses replaced by “centrifugal presses”
2. Production of Olive Oils

B. “First Cold Pressed”: Statement of Three White Lies

#1. With EVOO, there is never a second pressing, so “first” is redundant.

#2. All olive oil production is done without chemicals or high heat. Temperature is controlled at below 80°F—not hot, but also not “cold.”

#3. Not “pressed” in traditional sense anymore: screw presses replaced by “centrifugal presses.”
3. Standards for Olive Oils

A. International Olive Council, Codex, USDA, States

- The International Olive Council (IOC) is a U.N.-chartered organization whose members are countries.
- IOC chemistry experts set standards to define what can be labeled and sold as olive oil, and which oils can be called extra virgin.
- Countries around the world and the Codex Alimentarius base their olive oil standards on the IOC standards.
- USDA adopted voluntary standards based on the IOC standards.
- Four U.S. states have mandatory olive oil standards (California, New York, Connecticut, and Oregon).
- Olive oil industry recently petitioned FDA to create mandatory national standards.
3. Standards for Olive Oils

B. What Does “Extra Virgin” Really Mean

• To qualify as “extra virgin” an olive oil must:
  • Be unrefined (no processing other than filtration)
  • Meet strict chemical quality parameters
  • Be free of sensory defects as determined by expert taste panels.

• The term “extra” means “special.” It does NOT mean the oil is more virgin than other virgin olive oils.

• As with wines, in the extra virgin olive oil category you will find good, better and best qualities.
3. Standards for Olive Oils

C. What’s with the blue glass?

Among the many biases that can affect an olive oil taste panel is “color.” There is a natural bias towards thinking that dark green is good and yellow is bad, when in fact color has nothing to do with the flavor or aromas of the oil. The blue (or red) glass neutralizes the color of the oil to the taster.
3. Standards for Olive Oils

D. What Happens to Oils that Don’t Meet the Standards for Extra Virgin Olive Oil?

- “Virgin” olive oil (e.g., minor taste defects) is often sold in other countries labeled simply as “virgin,” and it is excellent for cooking. Not common in the U.S., however.

- If the defects are major, the oil is refined, an industrial process that removes flavor and color defects to create a neutral oil. Under olive oil standards, the process must preserve the natural healthy fatty acid profile of olive oils.

- All the most commonly used cooking oils in the U.S. are refined: canola, corn, soybean, grapeseed, sunflower, and the vast majority of avocado oil.
3. Standards for Olive Oils

E. Harvest Dates and Best-Before Dates

• No U.S. standards require “harvest dates” or “best-before” dates.

• Harvest dates can be confusing. Large companies may blend oils from multiple dates in the same harvest, or even a different harvest, including oils from northern and southern hemispheres. Just putting the year and not the month can mean a swing of more than several months.
3. Standards for Olive Oils

F. Harvest Dates and Best-Before Dates

- That said, “harvest date” is good information if it is provided in a clear fashion. For instance, if you are buying a “best quality” extra virgin olive oil for dipping or condiment use, the most recent harvest date is more important than if you are buying EVOO for everyday cooking.

- A best-before date is always important. IOC recommends olive oils include a “best-before” date of no more than 2 years from bottling and include a label statement to protect the oil from heat, light and oxygen. NAOOA members have voluntarily agreed to follow that guideline.
OLIVE OIL 101
Presented by the North American Olive Oil Association (NAOOA)

ABOUT EXTRA VIRGIN OLIVE OIL (EVOO)
- High in heart-healthy monounsaturated fat, has full complement of naturally occurring antioxidants and polyphenols
- Produced through natural crushing of olives without heat or chemicals
- 100% extra virgin olive oil
- Broad range of fruity flavors and aromas

USES
- Sautéing, grilling, roasting, baking, pan frying, deep frying
- Drizzling, dipping, dressings and marinades

TIP
Delicious used raw as a condiment or in cooking, versatile extra virgin olive oil makes food taste better. Pair different EVOOs with dishes to explore what you like best.

ABOUT OLIVE OIL
- High in heart-healthy monounsaturated fat, has some antioxidants and polyphenols
- A blend of refined olive oil and extra virgin/ virgin olive oil
- Mild, neutral flavors, more like vegetable oils; “light-tasting” is most neutral

USES
- Sautéing, grilling, roasting, baking, pan frying, deep frying
- Dressings and marinades

TIP
Perfect for meal preparation when more neutral flavors are preferred. Excellent substitute for butter, margarine and other more highly-processed neutral oils.

STORING OLIVE OIL? REMEMBER 
HOLA: Heat, Oxygen, Light, Age

HEAT
Store olive oil away from heat sources, like the stove or oven.

OXYGEN
Always store olive oil in a bottle with a cap or seal, as air exposure can affect taste.

LIGHT
Store olive oil away from windows and fluorescent lighting.

AGE
Shelf life for olive oil is no more than two years from bottling. Look for best-before dates on label.

Bottom Line: Pay attention to best-before dates when purchasing olive oil. Store in a dark, cool place and use within a few months of opening the bottle. Harvest date, if available, also provides useful information, especially for raw uses.
Thank You!

Joseph R. Profaci
Executive Director
North American Olive Oil Assn.

jrprofaci@naooa.org
A Spoonful of Olive Oil Makes the Vegetables Go Down: The Health Benefits of Cooking with EVOO

Rosa M Lamuela-Raventós
October 18th 2022
Extra Virgin Olive Oil (EVOO)

Distinguished by its high content of nutritional and antioxidant compounds compared to other vegetable oils

Traditional food product with years of history

Mediterranean diet
EVOO composition

**Major fraction**
- Triglycerides: 95-98%
- Monounsaturated fatty acids: 55-83%
- Oleic acid

**Minor fraction**
- Phenolic compounds: 2-5%
- Triterpenic compounds
- Tocopherols
- Hydrocarbons
- Pigments (chlorophylls and carotenoids)
- Sterols

EVOO composition (Olive Oil Composition)
EVOO claims

According to MUFA’s levels

According to polyphenols levels
Health-promoting properties of EVOO

Oleocanthal (OLC)  Oleacein (OLEA)

Health-promoting properties

- Neuro-protective effects
- Anti-inflammatory effects
- Anticancer properties
- Antimicrobial properties
- Protection against CVD
Cooking with EVOO

- EVOO serves as heat transfer medium
- EVOO is transformed due to temperature and oxygen
- Both major and minor fraction change
- EVOO interacts with food
Methodology

120 ºC 170 ºC

30 min 15 min

60 min 30 min

liquid-liquid extraction

Results

Different letters mean significant differences between samples

<table>
<thead>
<tr>
<th>Condition</th>
<th>Sum of Phenols</th>
<th>Secoiridoids</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW</td>
<td>A</td>
<td>X</td>
</tr>
<tr>
<td>120 °C, 30 min</td>
<td>B</td>
<td>Y</td>
</tr>
<tr>
<td>120 °C, 60 min</td>
<td>B</td>
<td>Y</td>
</tr>
<tr>
<td>170 °C, 15 min</td>
<td>C</td>
<td>Z</td>
</tr>
<tr>
<td>170 °C, 30 min</td>
<td>C</td>
<td>Z</td>
</tr>
</tbody>
</table>

Sum of phenols

Secoiridoids
Olive oil polyphenols contribute to the protection of blood lipids from oxidative stress.

> 250 mg/kg of hydroxytyrosol and its derivatives (e.g. oleuropein complex and tyrosol)

120 °C
During the cooking process, the content of polyphenols decrease by 40% to 120ºC and by 75% at 170ºC, compared to the levels of antioxidants in raw oil (860 mg/Kg). Nevertheless, the levels of antioxidants keep fulfilling the parameters stated as healthy by the European Union.

Processing and matrix affect of polyphenols

- **40 healthy**
  - PROSPECTIVE
  - RANDOMIZED
  - CROSS-OVER
  - OPEN
  - CONTROLLED

**500 g TOMATO**

**250 g TOMATO SAUCE**

**250 g TOMATO SAUCE + OLIVE OIL**

**HPLC-Orbitrap-MS/MS**

PROCESSING AND OIL

- ↑ NARINGENIN
- ↑ NARINGENIN GLUCURONIDE
- ↑ QUERCETIN

10 POLYPHENOLS

93 POLYPHENOLS (Microbiota)
<table>
<thead>
<tr>
<th>Compound</th>
<th>RAW TOMATO ng/g FW</th>
<th>TOMATO SAUCE ng/g FW</th>
<th>TS+Oil ng/g FW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coumaric hexose 1</td>
<td>35.2 ± 0.6</td>
<td>29.7 ± 2.5</td>
<td>20.2 ± 2.1</td>
</tr>
<tr>
<td>Protocatechuic</td>
<td>23.9 ± 3.0</td>
<td>137.4 ± 9.3</td>
<td>77.4 ± 8.5</td>
</tr>
<tr>
<td><strong>Caffeic hexose 1</strong></td>
<td>1641.0 ± 108.8</td>
<td>1545.5 ± 175.5</td>
<td>1088.4 ± 55.0</td>
</tr>
<tr>
<td>Coumaric hexose 2</td>
<td>235.3 ± 4.8</td>
<td>51.7 ± 4.1</td>
<td>53.6 ± 6.7</td>
</tr>
<tr>
<td>3-Caffeoylquinic acid</td>
<td>135.7 ± 1.0</td>
<td>189.5 ± 12.2</td>
<td>298.2 ± 14.8</td>
</tr>
<tr>
<td><strong>Ferulic hexose</strong></td>
<td>1437.2 ± 54.2</td>
<td>822.3 ± 12.1</td>
<td>832.6 ± 8.0</td>
</tr>
<tr>
<td><strong>Caffeic hexose 2</strong></td>
<td>647.8 ± 20.9</td>
<td>722.5 ± 49.8</td>
<td>675.8 ± 19.8</td>
</tr>
<tr>
<td><strong>Homovanillic hexose 1</strong></td>
<td>4525.1 ± 361.6</td>
<td>6985.3 ± 445.0</td>
<td>8312.9 ± 524.1</td>
</tr>
<tr>
<td><strong>Homovanillic hexose 2</strong></td>
<td>636.6 ± 54.5</td>
<td>738.7 ± 43.0</td>
<td>923.6 ± 55.3</td>
</tr>
<tr>
<td>5-Caffeoylquinic acid</td>
<td>385.5 ± 10.6</td>
<td>899.1 ± 39.9</td>
<td>704.6 ± 78.9</td>
</tr>
<tr>
<td>Coumaric hexose 3</td>
<td>201.4 ± 1.8</td>
<td>374.2 ± 6.6</td>
<td>380.3 ± 8.6</td>
</tr>
<tr>
<td>Caffeic acid</td>
<td>379.5 ± 18.1</td>
<td>498.6 ± 18.7</td>
<td>527.7 ± 16.9</td>
</tr>
<tr>
<td>4-Caffeoylquinic acid</td>
<td>832.5 ± 7.1</td>
<td>533.8 ± 38.6</td>
<td>542.7 ± 12.4</td>
</tr>
<tr>
<td>3-Hydroxybenzoic acid</td>
<td>40.8 ± 3.6</td>
<td>13.3 ± 1.0</td>
<td>1.6 ± 0.2</td>
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<tr>
<td><strong>Rutin</strong></td>
<td>1889.4 ± 9.1</td>
<td>3849.9 ± 74.7</td>
<td>3628.5 ± 63.9</td>
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<tr>
<td>Naringenin chalcone</td>
<td>185.7 ± 2.6</td>
<td>207.5 ± 14.0</td>
<td>223.5 ± 1.1</td>
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<tr>
<td>Ferulic acid</td>
<td>48.2 ± 4.9</td>
<td>n.d.</td>
<td>n.d.</td>
</tr>
<tr>
<td>Dicaffeoylquinic acid</td>
<td>57.8 ± 0.3</td>
<td>48.0 ± 0.3</td>
<td>50.0 ± 0.5</td>
</tr>
<tr>
<td>Apigenin-7-glucoside</td>
<td>77.0 ± 2.4</td>
<td>97.9 ± 2.3</td>
<td>88.7 ± 11.0</td>
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<tr>
<td>Naringenin-O-hexoside</td>
<td>62.5 ± 4.1</td>
<td>60.0 ± 9.0</td>
<td>71.0 ± 6.6</td>
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<tr>
<td>Tricaffeoylquinic acid</td>
<td>116.3 ± 3.8</td>
<td>65.3 ± 5.7</td>
<td>63.1 ± 1.7</td>
</tr>
<tr>
<td>p-Coumaric acid</td>
<td>21.0 ± 1.8</td>
<td>26.8 ± 3.0</td>
<td>12.4 ± 1.6</td>
</tr>
<tr>
<td><strong>Naringenin</strong></td>
<td>3499.9 ± 379.2</td>
<td>3349.3 ± 38.7</td>
<td>3746.8 ± 102.2</td>
</tr>
</tbody>
</table>
Foods without phenolics
Bioavailability of tomato polyphenols is enhanced by processing and fat addition: Evidence from a randomized feeding trial

Miriam Martínez-Huélamo1,2, Anna Vallverdú-Queralt2,3, Giuseppe Di Lecce1, Palmira Valderas-Martínez2,4, Sara Tulipan5, Olga Jáuregui6, Elvira Escribano-Ferrer2,7, Ramón Estruch2,4, Montse Illán1 and Rosa M. Lamuela-Raventós1,2

Processing and matrix affect experiment
Gender and interindividual differences

Naringenin Glucuronide

Gender and interindividual differences on plasma polyphenols
Naringenin glucuronide results

**Naringenin Glucuronide**

<table>
<thead>
<tr>
<th>Qnf (nmol)</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROOE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- a
- b
- a,b

- Tomato
- OF
- ROOE

- Red: Tomato
- Yellow: OF
- Orange: ROOE
Changes of Circulating Inflammatory Markers

Oil/water phase distribution

The sofrito is a typical technique of lightly frying onion and garlic in EVOO. Is an ingredient used to prepare many Mediterranean dishes and recipes. The tomato sofrito sauce has been reported to contain 40 different phenolic compounds and a high content of carotenoids.
Bioactive compounds in the Mediterranean sofrito

Influenced by ingredients such as:

- EVOO
- Sunflower oil
- Onion
Home cooking sofritos

Factorial design

- Full factorial design $2^4$
- Performed independently
- Triplicate
- Randomized
- 48 experiments
- Better reproducibility
- Estimate pure error and lack of fit

Table 1. Experimental level of the factors used in the Full Factorial Design (FDD).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Olive Oil</th>
<th>Onion</th>
<th>Garlic</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 %</td>
<td>20 %</td>
<td>2 %</td>
<td>30 min</td>
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<td>2</td>
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<td>20 %</td>
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<tr>
<td>16</td>
<td>10 %</td>
<td>40 %</td>
<td>4 %</td>
<td>60 min</td>
</tr>
</tbody>
</table>

Synergism effect

Isomerization

Lycopene

Synergism Effect

Tomato-based sofrito
8 weeks administration
Obese Zucker rats

### Sofrito and body weight

<table>
<thead>
<tr>
<th></th>
<th>LC</th>
<th>LS</th>
<th>OC</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight (g)</td>
<td>383.6 ± 28.7</td>
<td>378.4 ± 20.7</td>
<td>518.3 ± 49.6*</td>
<td>517.3 ± 46.1*</td>
</tr>
<tr>
<td>Food intake (g/day/rat)</td>
<td>20.00 ± 3</td>
<td>23.61 ± 4.43</td>
<td>28.64 ± 5.32*</td>
<td>34.44 ± 3.39*</td>
</tr>
<tr>
<td>Caloric intake (Kcal)</td>
<td>61.99 ± 11.50</td>
<td>73.71 ± 13.80</td>
<td>88.79 ± 16.50*</td>
<td>107.55 ± 10.57*#</td>
</tr>
</tbody>
</table>

Effect of sofrito on healthy volunteers

The tomato sofrito sauce made with EVOO has shown the ability to improve the vascular function and weight in animal models, and to decrease inflammatory status in healthy individuals.

The presence of EVOO enhances the bioavailability of bioactive compounds in foods (tomato sauce, tomato sofrito sauce).

The tomato sofrito sauce made with EVOO has shown the ability to improve the vascular function and weight in animal models, and to decrease inflammatory status in healthy individuals.
• Minor compounds are transferred to food enriching it and diminishing its oxidation.

• Phytochemicals migrate to EVOO, increasing its bioavailability and stability.

• Phenolic compounds prevent formation of undesired compounds as acrylamide.

Lozano-Castellón, 2022  Trends in Food Science & Technology
www.polyphenolresearch.com

Polyphenol Research Group

Thank you

lamuela@ub.edu
OLIVE OIL, BODY WEIGHT, AND LONGEVITY

Prof. Frank B Hu
Professor of Nutrition and Epidemiology
Chair, department of Nutrition
Harvard T.H. Chan School of Public Health
Mediterranean diet as a healthy dietary pattern

High intake of plant-based foods (fruits and vegetables, legumes, nuts, and OLIVE OIL)

Moderate intake of dairy, fish, poultry

Low in red meat, sweets and highly processed food

Mediterranean Diet Pyramid
A contemporary approach to delicious, healthy eating

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9-item

Adherence to a Mediterranean Diet and Survival in a Greek Population
Antonia Trichopoulou, M.D., Tina Costacou, Ph.D., Christina Barmis, Ph.D., and Dimitrios Trichopoulous, M.D.

• 1 point if >= sex-specific Median
  1. MUFA/SFA ratio
  2. Fruits & nuts
  3. Vegetables
  4. Cereals
  5. Legumes
  6. Fish

• 1 point if <= sex-specific Median
  7. Meat/meat products
  8. Dairy

9. Alcohol: 1 point if
  • Men: between 10-50 g/d
  • Women: between 5-25 g/d
Dietary patterns, Mediterranean diet, and cardiovascular disease


For every +2 points increment in the MEDdiet score, there was 13% reduction in CVD risk.

Study                              | RR (95% CI)
-----------------------------------|------------
Knoops, 2004                       | 0.87 (0.80, 0.94)  
Mitrou, 2007 (men)                 | 0.92 (0.88, 0.96)  
Mitrou, 2007 (women)               | 0.93 (0.88, 0.99)  
Fung, 2009 (CHD)                   | 0.86 (0.81, 0.92)  
Fung, 2009 (Stroke)                | 0.94 (0.87, 1.01)  
Buckland, 2009                     | 0.78 (0.69, 0.89)  
Martinez-Gonzalez, 2010            | 0.80 (0.62, 1.03)  
Gardener, 2011                     | 0.90 (0.80, 1.01)  
Dilis, 2012 (men)                  | 0.98 (0.87, 1.10)  
Dilis, 2012 (women)                | 0.85 (0.71, 1.02)  
Misirli, 2012                      | 0.85 (0.75, 0.97)  
Hoevenaar-Bloom, 2012              | 0.85 (0.80, 0.91)  
Tognon, 2012 (men)                 | 1.00 (0.98, 1.03)  
Tognon, 2012 (women)               | 0.95 (0.91, 0.99)  
Menotti, 2012                      | 0.16 (0.03, 0.90)  
Tognon, 2013                       | 0.86 (0.78, 0.95)  
Overall                            | 0.90 (0.86, 0.94)  

NOTE: Weights are from random effects analysis.
Olive oil as a good source of MUFA

A hallmark of traditional Mediterranean diets

Known as the liquid gold since the ancient times
The oldest olive tree still produces high-quality olives: A gift to humanity and the environment (preservation of natural resources and biodiversity)

https://greekreporter.com/2022/05/18/3000-year-old-olive-tree-in-crete/
Fig. 2: Olive oil production 2016-2017 metric tons (1,000)  
Source: IOC forecast reports November 2016
Time trends of olive oil consumption in the U.S.

United States Olive Oil Domestic Consumption by Year

Source: United States Department of Agriculture
Types of olive oil

• EXTRA VIRGIN OLIVE OIL
  Extracted directly from mechanically pressing ripe olives.

  • EXTRA-VIRGIN OO
    best quality, most intense flavour
    multiple bioactive and antioxidant components
    (polyphenols, phytosterols, vitamin E)

  • VIRGIN OO
    Not mixed and not refined

• REFINED OLIVE OIL
  Blend of virgin and refined olive oil.

  • Less flavour, colour, aroma
    Fewer amount of vitamins and antioxidants
    Very little vitamin E contain
Olive Oil and Health

VIRGIN OLIVE OIL

MUFA

Phenolic compounds (hydroxytyrosol, oleuropein, ...)

L lipid derivate molecules (squalene, tocopherols, ...)

Less susceptible to oxidation

Anti-inflammatory and anti-atherogenic

Oxidative stress

Endothelial function

Lipid profile

Insulin sensitivity and glycaemic control

Blood pressure
RCT: Effects of a Mediterranean-type diet on the Primary Prevention of Cardiovascular Disease (PREDIMED Study)
14-point score

1. Olive oil main culinary fat
2. Olive oil >=4 tablespoons/d
3. Veggies >=2 servings/d
4. Fruits >=3 servings/d
5. Red meats <1/d
6. Butter, marg, cream <1/d
7. Soda drinks <1/d
8. Wine >=7 glasses/wk
9. Legumes >=3/wk
10. Fish & seafood >=3/wk
11. Cakes, sweets <3/wk
12. Nuts >=3/wk
13. Poultry > red meats
14. Sofrito

Zazpe et al for the PREDIMED group,
J Am Diet Assoc 2008;108:1134-44

www.predimed.es
The incidence of major cardiovascular events was lower among those assigned to a Mediterranean diet supplemented with extra-virgin olive oil or nuts than among those assigned to a reduced-fat diet.
Nurses' Health Study (n=121,700, age 30-55)

Diet  Diet  Diet  Diet  Diet  Diet  Diet  Diet  Diet  Diet

Nurses' Health Study II (n=116,000, age 25-42)

1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011
Diet  Diet  Diet  Diet  Diet  Diet  Diet

Health Professionals Follow-up Study (n=51,529, age 40-75)

Diet  Diet  Diet  Diet  Diet  Diet  Diet  Diet

Every two years: weight, physical activity, smoking, CVD risk factors, diseases
Every four years: detailed dietary habits.
Olive Oil Consumption and Cardiovascular Risk in U.S. Adults

Marta Guasch-Ferré, PhD, Gang Liu, PhD, Yanping Li, PhD, Laura Sampson, RD, JoAnn E. Manson, MD, DrPH,VALUE
Jordi Salas-Salvadó, MD, PhD, Miguel A. Martinez-González, MD, PhD, Meir J. Stampfer, MD, PhD, Walter C. Willett, MD, DrPH, Qi Sun, MD, PhD, Frank B. Hu, MD, DrPH
• Higher olive oil intake was associated with a lower risk of total CVD in our cohort studies (compared with non-consumers, those with higher olive oil intake (>1/2 tablespoon/d or >7g/d) had 14% lower risk of CVD)

• Higher olive oil intake was associated with lower levels of circulating inflammatory biomarkers and a better lipid profile.

• Replacing 5g/d of margarine, butter, mayonnaise, or dairy fat with the equivalent amount of olive oil was associated with 5-7% lower risk of CVD.
Olive oil consumption and risk of type 2 diabetes in US women\textsuperscript{1,2,3}

Marta Guasch-Ferré\textsuperscript{4,5}, Adela Hruby\textsuperscript{6}, Jordi Salas-Salvadó\textsuperscript{4}, Miguel A Martínez-González\textsuperscript{7}, Qi Sun\textsuperscript{5,6,8}, Walter C Willett\textsuperscript{5,6,8} and Frank B Hu\textsuperscript{5,6,8,*}
• The pooled HR (95% CI) of T2D in those who consumed >1/2 tablespoon (>8 g) of total olive oil per day compared with those who never consumed olive oil was 0.90 (0.82, 0.99).

• Substituting olive oil (8 g/d) for stick margarine, butter, or mayonnaise was associated with 5%, 8%, and 15% lower risk of T2D.
Original Investigation

Consumption of Olive Oil and Risk of Total and Cause-Specific Mortality Among U.S. Adults

Marta Guasch-Ferré PhD a, b, R, Yanping Li PhD a, Walter C. Willett MD, DrPH a, b, c, Qi Sun MD, ScD a, b, c, d, Laura Sampson RD a, Jordi Salas-Salvadó MD e, f, Miguel A. Martínez-González MD a, c, g, Meir J. Stampfer MD, DrPH a, b, c, Frank B. Hu MD, PhD a, b, c, g
• Compared with those who never or rarely consume olive oil, those in the highest category of olive oil consumption (>7 g/d) had 19% lower risk of total and CVD mortality, 17% lower risk of cancer mortality, 29% lower risk of neurodegenerative mortality, and 18% lower risk of respiratory mortality.

• Substituting 10 g/d of other fats, including margarine, butter, mayonnaise, and dairy fat, with olive oil was associated with reductions in the risk of total and cause-specific mortality.

• Olive oil consumption in the US population is very low compared to European populations and our study did not distinguish extra-virgin olive oil from refined olive oil,
Potential Mechanisms for Olive Oil Intake and Mortality

Monounsaturated fatty acids

Phenolic compounds (hydroxytyrosol, oleuropein, ...)

Lipid derive molecules (squalene, tocopherols, ...)

Less susceptible to oxidation

Anti-inflammatory and anti-atherogenic

Healthy gut microbiota

↑ Endothelial function

↑ Lipid profile

↑ Insulin sensitivity and glycemic control

↓ Blood pressure

Total mortality
Cardiovascular mortality
Cancer mortality
Neurodegenerative disease mortality
Respiratory disease mortality

Does Eating Fat Make You Fat?

Fat or no fat? More research needed, doctors say

Medicos call for more light and less heat in the diet debate. Samantha Page reports.

The Keto Diet Is Popular, but Is It Good for You?

Low-carb, high-fat eating can lead to weight loss, but scientists debate the long-term effects on health.
MYTH: OLIVE OIL PROMOTES WEIGHT GAIN
Effect of a high-fat Mediterranean diet on bodyweight and waist circumference: a prespecified secondary outcomes analysis of the PREDIMED randomised controlled trial

Ramón Estruch*, Miguel Ángel Martínez-González, Dolores Corella, Jordi Salas-Salavador, Montserrat Fité, Gemma Chiva-Sánchez, Miquel Fiol, Enrique Gómez-Gracia, Fernando Arós, José Lepetit, Luís Serena-Majem, Xavier Pintó, Pilar Bulló-Cosiales, José V. Sola, Miguel A. Muñoz, Josep Basora-Galloway, Rosa María Lamuela-Raventós, Mercè Serena-Mir, Emilio Ros*, for the PREDIMED Study Investigators

![Graph showing bodyweight change over follow-up by intervention group](image-url)

Figure 2: Multivariable-adjusted average bodyweight of PREDIMED participants during follow-up, by intervention group.
Participants in all three groups reduced body weight.

Compared to the control group, adjusted differences in 5-year changes in **body weight (kg)**:

- MeDiet + EVOO: **-0.43** (95% CI, -0.86 to -0.01) kg
- MeDiet + nuts: **-0.08** (95% CI, -0.50 to +0.35) kg

Diff. in 5-y changes in **waist circumference (cm)**:

- MeDiet + EVOO: **-0.55** (95% CI, -1.16 to -0.06) cm
- MeDiet + nuts: **-0.94** (95% CI, -1.60 to -0.27) cm
Olive oil consumption and weight change: the SUN prospective cohort study

M Bas-Rastrollo, A Sánchez-Villegas, C de la Fuente, J de Irala, J A Martínez, M A Martínez-González

- A higher baseline consumption of olive oil was associated with a lower likelihood of weight gain.

Participants with higher olive oil intake had lower BMI levels than those who rarely or never consumed olive oil.
Increases in Consumption of Nuts per 0.5 serving/day are Associated with Less Weight Gain

- Total nuts
- Treenuts
- Walnuts
- Other tree nuts
- Peanuts
- Peanut butter

Weight change at 4 year interval (kg)

Liu et al. 2019; BMJNPB, 0:1-10
Changes in Types of Dietary Fats Influence Long-term Weight Change in US Women and Men

Xiaoran Liu, Yanping Li, Deirdre K Tobias, Dong D Wang, JoAnn E Manson, Walter C Willett, and Frank B Hu

Total fat (5%)
Animal source fat (5%)
Vegetable source fat (5%)
SFA (5%)
Trans-fat (1%)
MUFA (5%)
PUFA (5%)

Weight Change per 4-Year Period (kg)

Liu et al. 2018; Journal of Nutrition, 148(11) 1821-29
Changes in Types of Dietary Fats Influence Long-term Weight Change in US Women and Men

Xiaoran Liu, Yanping Li, Deirdre K Tobias, Dong D Wang, JoAnn E Manson, Walter C Willett, and Frank B Hu

<table>
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<tr>
<th>Type of Fat</th>
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<td>Total fat</td>
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<td>PUFA (5%)</td>
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</tbody>
</table>

Weight Change per 4-Year Period (kg)

Liu et al. 2018; Journal of Nutrition, 148(11) 1821-29
Association between weight changes and changes in MUFA

- Food sources contributing to MUFA shifted from animal sources to plant sources

Red meat contributes 28% of total MUFA

Olive oil and nuts contribute 18% of total MUFA

Overall association ▲ 1986-1994 ● 1994-last update
Conclusions

- Higher olive oil intake was associated with lower risk of type 2 diabetes, CVD, and mortality in large prospective cohorts of U.S. men and women, consistent with results from European populations.

- The substitution of margarine, butter, mayonnaise, and dairy fat with olive oil could lead to lower risk of CVD and mortality.

- There is no evidence that increasing olive oil consumption is associated with weight gain. On the contrary, higher consumption of plant-based MUFA such as olive oil and nuts may prevent weight gain and help weight control.
Dr. Marta Guash-Ferre
Dr. Yanping Li
Laura Sampson
Dr. JoAnn E. Manson
Dr. Jordi Salas-Salvado
Dr. Miguel A Martinez-Gonzalez
Dr. Meir J Stampfer
Dr. Walter C Willett
Dr. Qi Sun

NHS/NHS2/HPFS Study Investigators