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*The role of extra virgin olive oil  
in improving clinical risk factors*

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# Epidemiology

Lower rate of heart disease and cancers in countries consuming a traditional Mediterranean diet

- extra virgin olive oil
- plant-based (vegetables, fruits, grains)
- red wine

Seven Countries Study <sup>(1)</sup>

New definition:

Meddiet Score – using ratio MFA:SFA

[Flynn: not useful]

Extra virgin olive oil – **key component** of the Mediterranean diet

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# Clinical risk factors for chronic diseases that extra virgin olive oil can change

- excessive oxidation
  - lipids (cholesterol, triglycerides) and lipoproteins (HDL, LDL)
  - blood pressure
  - blood levels of glucose and insulin
  - inflammation
  - cancer – initiation, treatment
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## Extra virgin olive oil



Juice of the olive

Health benefits from **phenols**

**not** the monounsaturated fat

phenol content – mg/kg or ppm

Depends on: olive, growing/ harvesting conditions

In study methods: look for wording

Need to see “extra virgin olive oil”

**Not:** “olive oil” or “Meddiet score”

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# Oxidation

Polyunsaturated fats readily oxidize

Found in: vegetable seed oils (soybean, safflower, corn)

Also: fish oils are high in polyunsaturated fats

Oxidation of DNA → cancer initiation (2)

Oxidation of cell membranes → cancer promotion

Oxidation of LDL → atherosclerosis

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# Oxidation and extra virgin olive oil

Olive oil:

- primarily monounsaturated fat
  - highest content of alpha tocopherol (vitamin E) (3)
  - high phenolic content
    - (366 v 164 mg/kg) decrease LDL oxidation (4)
    - (592 v 147 mg/kg) decrease DNA oxidation (5)
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## Blood lipids/ lipoproteins

oxidized LDL is the issue, not level of LDL

Compared to vegetable oil:

extra virgin olive oil may or may not decrease LDL

*but* : it does decrease oxidation of LDL

Phenolic content: some evidence higher phenolic  
( $> 300/400$  mg/kg) may lower LDL

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# HDL

- Linear increase in HDL with phenolic content (4)
  - 3 tablespoons/day for 3 wks extra virgin olive oil v canola oil
  - No difference total HDL, but HDL<sub>2</sub> higher with extra virgin olive oil (6)
  - 2 tablespoons/day for 3 wks refined v 366 mg/kg
  - Higher phenol = higher HDL<sub>2</sub> ; enhanced HDL oxidative status, improvement HDL efflux (7)
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## Blood pressure

Compared to sunflower oil:

2 to 3 tablespoons/day olive oil for 6 months:  
significant decrease in systolic and diastolic (8)

(84 yrs): 4 tablespoons/ day 4 wks  
decrease in systolic BP (9)

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# Blood pressure

Phenolic content:

men (161 mg/kg v refined) at 3 tablespoons/day for 3 weeks:  
lowered systolic BP <sup>(10)</sup>

Women (564 mg/kg v refined) at 4 tablespoons/day for 8  
weeks  
lowered systolic and diastolic <sup>(11)</sup>

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## Blood levels of insulin and glucose

Higher (but within normal range) levels related to:  
increase risk of heart disease and cancers (breast, prostate, colon, leukemia)

2 tablespoons/day for 2 weeks extra virgin olive oil v sunflower oil:

significant decrease in fasting glucose and insulin (12)

Olive oil enriched diet v vegetable oils for 8 weeks:  
improved insulin sensitivity and vasodilation (13)

Pasta and eggplant fried in olive oil (2.5 tablespoons) lead to lower blood glucose and insulin v just adding olive oil (14)

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# Inflammation

Response to disease, level of disease

Oleocanthal – inhibits COX 2 <sup>(16)</sup>

COX2 leads to inflammatory pathway  
same action as ibuprofen (NSAID)

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# Olive oil and cancer protection

Oleocanthal: selectively induces cancer (breast and prostate) cell death (17)

Squalene – tumor inhibitor (18)  
decreases cancer risk (19, 20)

Most of squalene to the skin → UV protection (20)

Oleuropein (in test tube) inhibited cancer cell invasion and regressed tumors (21)

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## Body weight

- Inverse relationship Mediterranean diet adherence and body mass index (BMI) in Spain <sup>(22)</sup> and Greece <sup>(23)</sup>
  - SUN Study (Spain): higher baseline consumption of olive oil reported, lower likelihood of gaining weight (not significant, but a trend) <sup>(24)</sup>
  - Israel: women had better weight loss with Mediterranean diet v low-fat diet <sup>(25)</sup>
  - Better weight loss plant- based, olive oil v NCI diet <sup>(26)</sup>
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# Vegetables and olive oil

Carotenoids – give pigment to vegetables

powerful cancer fighting properties in the body

\*\* need dietary fat to absorb (27,28)

\*\* cooking in fat increases absorption (29)

Glucosinolates – cruciferous family

(cauliflower, cabbage, broccoli, Brussel sprouts, kale)

cancer protective, especially breast and prostate

\*\* water soluble (30)

*preserved with fat ?*

Makes vegetables taste better, increases intake

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## Cost of olive oil

Consider at price per tablespoon

Should be an “every day food”

Benefits start at 2 tablespoons (30 ml)/ day

Flynn: 1 tablespoon EVoo per cup of vegetables

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# Cooking with extra virgin olive oil

- Can use to cook, but some decrease in phenols due to:

Light, heat, oxygen

Oxygen seems to cause greatest loss <sup>(31)</sup>

cooking vegetables in extra virgin olive oil:

- conserves and increases the phenolic compounds of vegetables <sup>(32)</sup>
  - cooking in water decreases phenols
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## Conclusions:

Consistent use of 2 tablespoons per day of extra virgin olive oil will in about 3 weeks:

- improve health by lowering blood pressure, and blood glucose and insulin, oxidation, inflammation.
  - improve health and level of blood lipids (LDL, HDL)
  - lowering body weight and decrease risk of weight gain
  - lower food costs and improve diet (likely increase vegetable intake)
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