

The role of olive oil in lowering cancer risk: Is this real gold or simply pinchbeck?

For ancient Greeks, the olive tree was a symbol of success and peace, and the extracted oil was anointed on important members of the society. It was believed that prosperity and wealth depended on this ritual, and not only olive oil, but the olives themselves, constituted an indispensable food in ancient Greeks' diet. Today, our society is not as interested in these allegorical implications, but rather in pragmatic facts. Currently, olive oil is more widely used throughout the world than it ever has been, and it is increasingly being used as a substitute for other vegetable fats and for animal fats. As we move more and more towards globalisation and a more powerful influence of the mass media, and within the context of this practical perspective, citizens around the world may wonder how to get to the bottom line from different and sometimes conflicting messages received from different sources, including health professionals trying to promote healthy habits (including physicians trying to advise patients) and food companies or advertisers promoting their products and seeking to increase their profits. We believe that looking to independent researchers can help shed light on these mixed messages.

Triggered by a most interesting article published in this issue of the journal,¹ and given the high mortality and morbidity from cancer today and the consequent interest in attempts to lower these rates, it seems logical to ask ourselves: Is there enough evidence to state that olive oil intake is inversely related to cancer risk?

It is perhaps sensible to start by reviewing a well known fact arising from descriptive epidemiological studies. Countries in which there is a relatively high consumption of olive oil (average intake in the population) seem to have lower cancer incidence and mortality rates than other countries that, apart from this, are reasonably comparable with regards to socioeconomic development and quality of the aggregated data that allow for these comparisons.² But we should be aware of the complexity of these descriptive findings, and cannot directly attribute these differences to a single factor without more carefully analysing the question. This is important, as other elements of diet and other lifestyles vary when comparing groups of countries. Well designed ecological studies at a national level³ or existing international databases—such as the study presented in this issue for colorectal cancer¹—, are offering further support to the hypothesis of an inverse relation between olive oil intake and cancer risk when examining (by means of correlation and multiple regression analyses) consumption and rates after adjusting for the influence of exposures that could act as potential confounding factors (those factors possibly associated to olive oil intake and—at the same time—to risk of cancer).

In animal models, studying female Sprague-Dawley rats and after provoking the experimental initiation of the carcinogenic process, olive oil intake seemed to foster inhibitory consequences or just a weak or null mammary tumour promotion and progression.⁴ In male Sprague-Dawley rats with azoxymethane induced colon cancer, a recent study has shown that dietary olive oil tends to prevent the development of colon carcinoma perhaps due to modulation of arachidonic acid metabolism and local PGE(2) synthesis.⁵ Moreover, ICR mice fed with fatty intakes rich in oleic acid (even in the scenario of diets rich in total fat content) seem to have smaller incidence and tumour progression of certain induced cancers.⁶

With regard to human studies, but now moving to analytical, individually-based research designs, there is a growing body of knowledge, although it is restricted to observational studies. Different sites of cancer have been reviewed and the studies have been mostly based on retrospective and prospective case-control studies.

Centring our attention on these types of designs, the possibility of a moderate but significant reduction in the risk of colorectal cancer through olive oil intake has been pointed out in at least two studies.^{7, 8} In addition, the role of olive oil in the potential prevention of breast cancer has been given attention, and two studies from Spain,^{9, 10} one from Greece¹¹ and another from Italy¹² have shown a reduction of around 25% of risk when comparing women who were classified as relatively high consumers of olive oil with those who consumed other types of oil or fat, but not olive oil. In a multinational study carried out in five European centres that examined the relation of adipose tissue fatty acid content to breast cancer, a direct effect of oleic acid uptake was not found, pointing out some other protective components contained in the unsaponifiable fraction of the oil.¹³ Other epidemiological studies have reported that the consumption of olive oil is inversely associated with cancer of the ovary,¹⁴ endometrium,¹⁵ lung,¹⁶ pancreas,¹⁷ oral cavity and pharynx,¹⁸ and even with a better prognosis in male laryngeal cancer patients.¹⁹ However, the accumulated evidence in these cancer sites is relatively limited and more studies should be carried out in order to claim any solid link between the variables under study. We should also keep in mind that, before going for a causal interpretation of the inverse relation between olive oil intake and risk of malignant neoplasms, we should rule out residual confounding, as well as some of the limitations that may be present when the reported associations are modest and they arise from observational epidemiological studies (in this case, mainly case-control designs).²⁰

In summary, different studies have shown that olive oil may have a potential role in lowering the risk of malignant neoplasms. But there are still some remaining questions. Is the effect real or confounded? Which are the cancer sites potentially preventable? Is the effect derived from the monounsaturated fatty acid content or is it related to the antioxidant components of the unsaponifiable fraction? In other words, if there is a causal effect, is it restricted to virgin olive oil or is it the same in refined olive oil? Is it the same thing to use raw oil (for seasoning) as cooked oil (for frying)? Are there effect modifiers that could increase a possible positive effect or minimise such an effect? How long should we wait and what kind of extra evidence do we need to promote a reasonable message to the population and how careful or resolved should that message be?

The ongoing and future well designed observational studies (and particularly cohort studies) will certainly help shed light on this relation and further analyses of the effects of olive oil are warranted. But to provide solid answers to the above questions, large enough and well conducted trials—particularly including countries with low olive oil consumption—will be necessary. The potential that is glimpsed thus far makes this effort worthwhile.

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- 1 Stoneham M, Goldacre M, Seagroatt V, *et al.* Olive oil, diet and colorectal cancer: an ecological study and a hypothesis. *J Epidemiol Community Health* 2000;**54**:756–60.
- 2 Parkin DM, Pisani P, Ferlay J. Global cancer statistics. *CA Cancer J Clin* 1999;**49**:33–64.
- 3 D'Amicis A, Farchi S. Olive oil consumption and cancer mortality in Italy. A correlation study. *Adv Exp Med Biol* 1999;**472**:67–71.
- 4 Weisburger JH. Mechanisms of macronutrient carcinogenesis. In: Micozzi MS, Moon TE, eds. *Macronutrients. Investigating their role in cancer*. New York: Marcel Dekker, 1992:3–31.
- 5 Bartoli R, Fernandez-Baneres F, Navarro E, *et al.* Effect of olive oil on early and late events of colon carcinogenesis in rats: modulation of arachidonic acid metabolism and local prostaglandin E(2) synthesis. *Gut* 2000;**46**:191–9.
- 6 Takeshita M, Ueda H, Shirabe K, *et al.* Lack of promotion of colon carcinogenesis by high-oleic safflower oil. *Cancer* 1997;**79**:1487–93.
- 7 Bautista D, Obrador A, Moreno V, *et al.* Ki-ras mutation modifies the protective effect of dietary monounsaturated fat and calcium on sporadic colorectal cancer. *Cancer Epidemiol Biomarkers Prev* 1997;**6**:57–61.
- 8 Braga C, La Vecchia C, Franceschi S, *et al.* Olive oil, other seasoning fats, and the risk of colorectal carcinoma. *Cancer* 1998;**82**:448–53.
- 9 Martin-Moreno JM, Willett P, Gorgojo L, *et al.* Dietary fat, olive oil intake and breast cancer risk. *Int J Cancer* 1994;**58**:774–80.
- 10 Landa MC, Frago N, Tres A. Diet and risk of breast cancer in Spain. *Eur J Cancer Prev* 1994;**3**:313–20.
- 11 Trichopoulos A, Katsouyanni K, Stuver S, *et al.* Consumption of olive oil and specific food groups in relation to breast cancer risk in Greece. *J Natl Cancer Inst* 1995;**87**:110–16.
- 12 La Vecchia C, Negri E, Franceschi S, *et al.* Olive oil, other dietary fats, and the risk of breast cancer. *Cancer Causes Control* 1995;**6**:545–50.
- 13 Simonsen NR, Fernandez-Crehuet NJ, Martin-Moreno JM, *et al.* Tissue stores of individual monounsaturated fatty acids and breast cancer: the EURAMIC study. European Community Multicenter Study on Antioxidants, Myocardial Infarction, and Breast Cancer. *Am J Clin Nutr* 1998;**68**:134–41.
- 14 Tzonou A, Hsieh C, Polychronopoulou A, *et al.* Diet and ovarian cancer: a case-control study in Greece. *Int J Cancer* 1993;**55**:411–14.
- 15 Tzonou A, Lipworth L, Kalandidi A, *et al.* Dietary factors and the risk of endometrial cancer: a case-control study in Greece. *Br J Cancer* 1996;**73**:1284–90.
- 16 Fortes C, Forastiere F, Anatra F, *et al.* Consumption of olive oil and specific food groups in relation to breast cancer risk in Greece [letter]. *J Natl Cancer Inst* 1995;**87**:1020–1.
- 17 Soler M, Chatenoud L, La Vecchia C, *et al.* Diet, alcohol, coffee and pancreatic cancer: final results from an Italian study. *Eur J Cancer Prev* 1998;**7**:455–60.
- 18 Franceschi S, Favero A, Conti E, *et al.* Food groups, oils and butter, and cancer of the oral cavity and pharynx. *Br J Cancer* 1999;**80**:614–20.
- 19 Crosignani P, Russo A, Tagliabue G, *et al.* Tobacco and diet as determinants of survival in male laryngeal cancer patients. *Int J Cancer* 1996;**65**:308–13.
- 20 Willett WC. *Nutritional epidemiology*. New York: Oxford University Press, 1998.