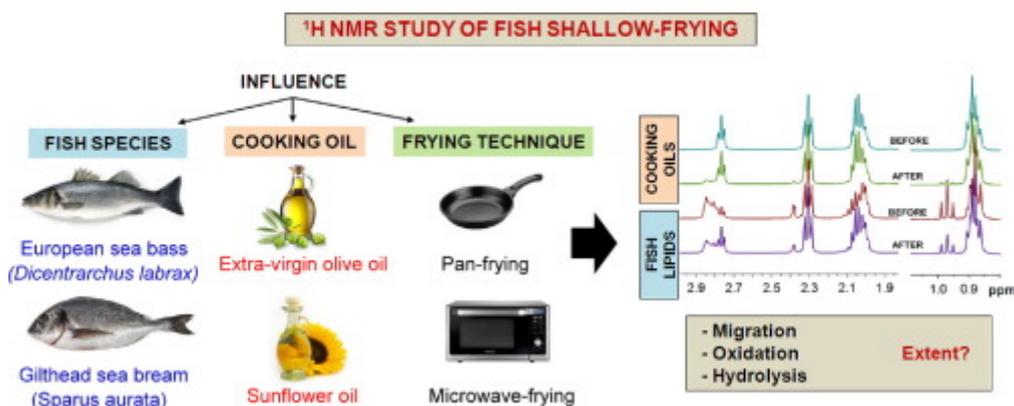


# Olive Oil Is Better For Frying Fish - Here Is The Chemistry Reason Why

By ACSH Staff — July 22, 2016

Some cooks swear by different oils when it comes to cooking fish, based on experience and advice passed down for generations. Deconstructing common wisdom and finding the science basis for it is a lot of the fun of chemistry and now you can learn about lipids, oils and fish for your weekend science experiments.

A [recent study](#) [1] examined the lipid profile in fish and what compounds are produced with oils in frying. To control the inputs, they used fillets of European seabass (*Dicentrarchus labrax*) and gilthead seabream (*Sparus aurata*). The samples were shallow-fried in a frying pan and in a microwave oven using extra virgin olive oil and refined sunflower oil. Then they examined the lipid composition of the fish and the oil using Proton Nuclear Magnetic Resonance Imaging (H-1 NMR).



## Migration of lipid components

As every cook knows, the fish changes the oil and the oil changes the fish. That is due to fish lipids. Oil is enriched by the acyl groups ('fatty acids') present in a higher concentration in the fish fat than in the original oil, while it is depleted in the acyl groups present in a higher concentration in the original oil than in the fish fat. After being used for frying, the extra virgin olive oil was richer in omega-3, omega-1 acyl groups, linoleic and saturated fats (from the fish) and poorer in oleic, which is the main acyl group in olive oil. Sunflower oil was richer in all the acyl group types (coming from the fish) except linoleic, which is the majority acyl group in sunflower oil.

Both types of oil were enriched by small amounts of cholesterol (from the fish.)

The fish fillets became enriched by the acyl groups present in a higher concentration in the frying oil than in the fillet (in other words, oleic if extra virgin olive oil was used, or linoleic if sunflower oil was used) and in plant sterols. They were depleted in the acyl groups and minority components

present in a greater concentration in the raw fillet than in the original oils, such as, for example, the omega-3 docosahexaenoic (DHA) and eicosapentaenoic (EPA) polyunsaturated groups.

### Thermal oxidation reaction - and aldehydes

One interesting effect they noted was that because the oils were subjected to high temperatures (170 °C) in the presence of oxygen, certain small-scale thermal oxidations took place.

With sunflower oil, secondary oxidation compounds (aldehydes) were formed - not enough to be toxic (1), though Center for Science in the Public Interest (CSPI) is probably mobilizing its army of lawyers based on reading that sentence - but if you are reading this site, you already know that formaldehyde concern is generally hyped, and you may know that one other aldehyde, glucose, is quite desirable. [Mix that one with two other aldehydes](#) [2], vanillin and cinnamaldehyde, Icanhasscience.com notes, and that CSPI jury will be eating a delicious dessert.

You needn't be more worried about harm from sunflower oil but olive oil is more degradation-resistant so the thermal oxidation reaction did not occur, which impacts the flavor profile. It also didn't occur in microwaves, and if you don't notice the flavor profile difference using that, you should just buy your fish in a box.

### Fat content of the fried fish

Different fish species contain different fat levels and that influenced the fat absorption-desorption process during frying. The fat content of the gilthead seabream was diminished after frying while the European seabass remained similar or increased.

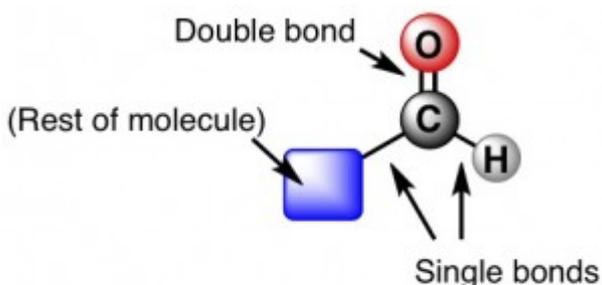
### Conclusion

It won't surprise you to learn that coastal cultures in the Mediterranean are on to something after a few thousand years of cooking fish, but now you know how the fish choice and the oil used can impact the final flavor profile.

**Citation:** Nieva-Echevarria, B., Goicoechea, E., Manzanos, MJ. & Guillen, MD. 'The influence of frying technique, cooking oil and fish species on the changes occurring in fish lipids and oil during shallow-frying, studied by H-1 NMR'. *Food Research International*. Volume 84, June 2016, Pages 150–159. [doi: 10.1016/j.foodres.2016.03.03](https://doi.org/10.1016/j.foodres.2016.03.03) [1]

NOTES:

(1) An aldehyde is an organic molecule that contains (somewhere) a set of three particular atoms – carbon (C), oxygen (O), and hydrogen (H) arranged just so:



### Definition of an Aldehyde

Formaldehyde is the simplest. Credit:

[Icanhasscience](#) [2]

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**Links**

[1] <http://www.sciencedirect.com/science/article/pii/S0963996916301090>

[2] <http://icanhasscience.com/chemistry/in-defense-of-aldehydes/>