Toxic aldehydes detected in reheated oil

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At frying temperature, sunflower oil produces more harmful compounds than olive oil. Credit: SINC

Researchers from the University of the Basque Country (UPV/EHU, Spain) have been the first to discover the presence of certain aldehydes in food, which are believed to be related to some neurodegenerative diseases and some types of cancer. These toxic compounds can be found in some oils, such as sunflower oil, when heated at a suitable temperature for frying.

"It was known that at frying temperature, oil releases aldehydes that pollute the atmosphere and can be inhaled, so we decided to research into whether these remain in the oil after they are heated, and they do" María Dolores Guillén, a lecturer in the Pharmacy and Food Technology Department at the UPV, tells SINC.

The researcher is a co-author of a project that confirms the simultaneous presence of various toxic aldehydes from the 'oxygenated α, β-unsaturated group' such as 4-hydroxy-[E]-2nonenal. Furthermore, two have been traced in foods for the first time (4-oxo-[E]-2-decenal and 4-oxo-[E]-2-undecenal).

Until now these substances had only been seen in bio-medical studies, where their presence in organisms is linked to different types of cancer and neurodegenerative diseases such as Alzheimer's and Parkinson's.

The toxic aldehydes are a result of degradation of the fatty acids in oil, and although some are volatile, others remain after frying. That is why than be found in cooked food. As they are very reactive compounds they can react with proteins, hormones and enzymes in the organism and impede its correct functioning.

The research, which is published in the *Food Chemistry* journal, involved heating three types of oil (olive, sunflower and flaxseeds) in an industrial deep fryer at 190 ºC. This was carried out for 40 hours (8 hours a day) in the first two, and 20 hours for the linseed oil. The latter is not normally used for cooking in the west, but it has been chosen due to its high content in omega 3 groups.

More toxic aldehydes in sunflower oil

After applying gas chromatography/mass spectrometry techniques, the results show that sunflower and linseed oil (especially the first) are the ones that create the most toxic aldehydes in less time. These oils are high in polyunsaturated fats (linoleic and linolenic).

Adversely, olive oil, which has a higher concentration of monounsaturated fats (such as oleic), generate these harmful compounds in a smaller amount and later.

In previous studies, the same researchers found that in oils subjected to frying temperatures, other toxic substances, alkyl benzenes (aromatic hydrocarbons) were found. They concluded that of the oils studied, olive oil is the one that creates the least.

The dose makes the poison

"It is not intended to alarm the population, but this data is what it is, and it should be taken into account" Guillén highlights, who points out the need to continue researching to establish clear limits regarding the risk of these compounds. "On some occasions the dose makes the poison" the researcher reminds us.

Spanish regulations that control the quality of heated fats and oils establish a maximum value of 25% for polar components (degradation products coming from frying). Nonetheless, according to the new study, before some of the oils analysed reach this limit, they already have a "significant concentration" of toxic aldehyde.

The study counts all the aldehydes (not the just the harmful ones) that are generated during frying. Furthermore, the authors present a model that allows the prediction of how any hypothetical oil will evolve in the same conditions, if they know its initial fatty acid composition.

More information: Maria D. Guillén, Patricia S. Uriarte. "Aldehydes contained in edible oils of a very different nature after prolonged heating at frying temperature: Presence of toxic oxygenated α, β unsaturated aldehydes". *Food Chemistry* 131 (3): 915-926, April 2012 (available on line since September 2011). Doi: 10.1016/j.foodchem.2011.09.079

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