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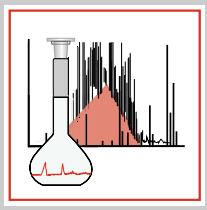

Highlights of Analytical Sciences in Switzerland

Division of Analytical Sciences

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Mineral Oil in Food – The Development of an Issue

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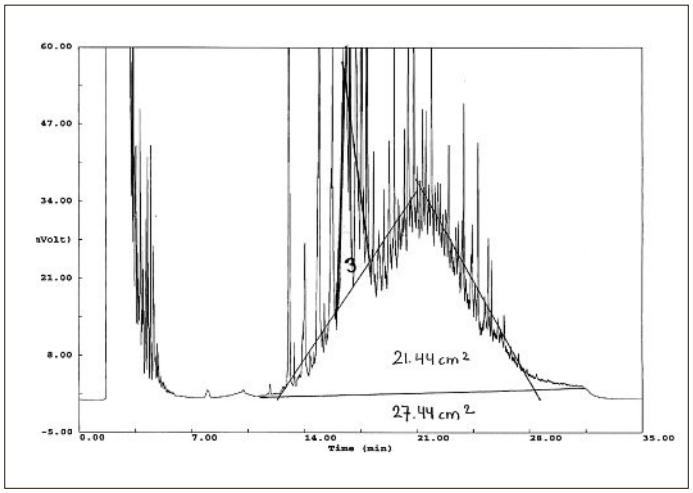
For many decades, 'clean' or 'food grade' mineral oil products were used rather carelessly, even though granuloma attributed to ingested mineral oil were widely observed in human tissues as far back as around 1950. This has changed dramatically: today mineral oil hydrocarbons are primarily considered as contaminants.

In 1989, it was detected that hazelnuts were contaminated from jute- and sisal bags made of fibers batched with rather crude mineral oils; chocolate sometimes contained several 100 mg/kg mineral oil. Typical batching oils included more than 30% mineral oil aromatic hydrocarbons (MOAH), among which genotoxic, largely alkylated polyaromatic hydrocarbons. Rice was sprayed with (white) mineral oil just to make it shiny (*ca.* 3000 mg/kg); industrial bakeries consumed truckloads of mineral oil products as release agents; used motor oils found their way into used frying oils added to animal feed and returned onto our plates with the meat or eggs. Milk powders for babies were contaminated from the recycled paperboard they were packed in. Over the years, all these contaminants were stopped or at least strongly reduced. There is, however, little that can be done against diesel oil and lubricating oil from diesel engines as well as debris from tires and bitumen contaminating our food.

For almost 20 years, the subject found little attention outside the Kantonales Labor Zurich (KLZ), mainly because of the demanding chemical analysis: on-line coupled HPLC-GC is the method of choice, a technique developed in the KLZ and until recently available only in few laboratories. Even the detection of mineral oil saturated hydrocarbons (MOSH) in human milk and human adipose tissue did not attract much attention. In 2008, mineral oil was added to Ukrainian sunflower oils, and all of sudden numerous laboratories had to analyze for mineral oils. This incidence was still not considered particularly serious, since only a further development of the on-line HPLC-GC method revealed the MOAH it contained but it triggered the EFSA opinion on mineral oils (completed in 2012).

Mineral oil contamination became an issue when the German BfR dealt with migration from recycled paperboard (at levels of 10–50 mg/kg food). The German ministry immediately drafted a regulation to get this migration under control, but did not succeed up to today. At this point, the issue heated up. Media reported



Mineral oil hydrocarbons in chocolate analyzed in 1993 by on-line HPLC-GC-FID and the graphical peak integration commonly used at that time. The narrow triangle (with inserted '3') primarily represents natural hydrocarbons in milk. Without these, the concentration corresponded to 42 mg/kg, which was typical by then, high values reaching hundreds of mg/kg.

and many laboratories bought HPLC-GC instrumentation to start analysis; ever-lower concentrations were considered critical.

The toxicity of MOSH was underestimated owing to strong accumulation in human tissues (determined in 2014): concentrations in livers and spleens are 100–1000 times higher than extrapolated from animal experiments. For the MOAH it was assumed that they include genotoxic constituents. This is confirmed for rather crude oils like those used for jute bags, but is questionable for better refined ones. This calls for a revision of the current reference values.

Mineral oil is the most common food contaminant, but still awaits adequate evaluation to conclude whether the strongly reduced present occurrence in foods can be tolerated.

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References

EFSA (European Food Safety Authority), CONTAM Panel, 2012. *EFSA J.* **2012**, *10*, 1 (2704). *http://www.efsa.europa.eu/en/efsajournal/pub/2704.htm*.

L. Barp C. Kornauth, T. Wuerger, M. Rudas, M. Biedermann, A. Reiner, N. Concin, K. Grob, *Food Chem. Toxicol.* **2014**, 72, 312.

L. Barp, M. Biedermann, K. Grob, F. Blas-Y-Estrada, U. C. Nygaard, J. Alexander, J. P. Cravedi, *Sci. Total Environ.* **2017**, 583, 319.

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