The MOSH and MOAH urban myth

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If we look at the MOSH (mineral oil saturated hydrocarbons) and MOAH (mineral oil aromatic hydrocarbons) panic in food it is clear to see where this initially comes from. In the run up to Christmas 2013 a German consumer organisation published a report that the presence of MOSH and MOAH were found in chocolate.

Consumer organisations have a large following in the general public, not necessarily because of their scientific work, but because these are seen as defending the consumers interest against big industry producers that supposedly do not take their customers' health too seriously. Foodwatch Germany published their big test 10-2015 with the heading "mineral oil in food" and it was presented in a way that is at best misleading. Food packages on top of oil drums, a dirty oiler can, and in the opening text immediately the note of the cancer forming potential of mineral oils. The test was also televised on various channels broadcasting consumer programmes, and published in a wide number of regional papers. Due to the international presence of Foodwatch it also drew similar attention in a number of other European countries.

The effect on the food producing industries was a serious one. The chocolate sales over Christmas dropped severely, in some cases by 25% and producers of food were forced by their customers to deliver MOSH and MOAH free product under pressure of public sentiment. In various reports brands were also mentioned. In all, a significant loss of sales must have been significant beyond the clear reputation damage to the brand.

The fact that MOSH and MOAH was found in food is not disputed. If you find MOAH you also will find MOSH. These two are connected. The quantity and proportions of MOSH versus MOAH may tell you something of the origin but when it is taken out of context (disassociated from the matrix where it was isolated from) it can be very confusing to find the origin and interpret the data as you will only have analytical information with no point of reference. It could come from packaging material, from a process oil, from nature, from air or water pollution or from a fully regulatory compliant and safe lubricant, to name a few.

We are solving a problem that is not a problem!
In 2009, EFSA published their scientific opinion on Mineral Oil Hydrocarbons in food. This report is often referred to by f.e. Foodwatch if they want to show the risks of mineral oils. An updated scientific opinion was published by EFSA (European Food Safety Authority) on 28 August 2013. Many European governments have done activities around MOSH and MOAH and broadly MOH (mineral oil Hydrocarbon) in food.
When dealing with mineral oil, they use the terms MOSH and MOAH when referring to a food analysis. The analysis is based on the detection of these two fractions (MOSH and MOAH), which then trigger an interpretation of what they mean.

The German body BFR, (Bundesinstitut für Risikobewertung), has been one of the leading authorities. In their recent publication of February 2018 they came to the revised conclusion that the MOSH and MOAH found in medicinal grade mineral oils is considered not to cause a health risk. This is because MOSH and MOAH coming from refined products have a "refining history" and the results can be put into context. We know where they come from, so the context is given. The refinement history can be exemplified by looking at MOAH: there are two types of MOAH, carcinogenic and non-carcinogenic. The first ones are those aromatics that are removed by refinement. The other aromatics which are left in the oil after refinement are an essential part of the oil (to aid good solvency) and don't make the oil carcinogenic but are still referred to as MOAH, because the basic analytical method currently used can't distinguish between good or bad MOAH.

Thus, we should not only look at the "fractions" but at the whole product (which of course contains these). It is the oil that is of interest and the fractions are rather a description of the oil, not the other way around. These highly refined mineral oils are used in pharmaceuticals and in cosmetics (e.g creams and lotions) but are also legally used for food contact materials (packaging). We do not have regulations around lubricants in the EU, but since "food grade" lubricants have a known history of the purification process as e.g. the pharmaceutical grade oils, their aromatic content can be interpreted and concluded that it is at trace levels and is non-carcinogenic.

I believe we can extend this conclusion to the H1 lubricants used in food production plants: they are safe even if trace levels of aromatics (MOAH) are present.

Lubricants

Lubricants consist of a wide range of base oils and additives. Mineral Oils are the well known example (better referred to as highly refined mineral base oils, technical white oils and pharmaceutical white oils); but there are also Poly Alpha Olefins (PAO), Polyalkaline Glycols; Polyol Esters; Alkyl Naphthalene; silicones and so on. These are blended with a range of additives dedicated to enhance certain properties of the oil to make it suitable for the intended application.

Mineral oil based lubricants represent a large part of the H1 food grade lubricant market as these are technical good products for a reasonable price capable of doing what they are supposed to do, lubricate. These oils will contain "MOSH and MOAH", as this is logical, but that is not a problem.

I mentioned H1 and this is a category introduced by the USDA (United States Department of Agriculture) and lubricant products were registered by them based on a submitted formulation. That formulation needed to meet the criteria outlined in the 21CFR178.3570 and the registration is still done today by NSF (and formerly INS) and 2Probity. This is a US based system and is widely adopted in the industry because it is the only system available. It is not accepted in the EU but it is a good marker in any HACCP and GMP

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programme that all foodstuff producers will have. H1 means incidental food contact and as such it underlines that lubricants should not be present in food. However if an incident occurs it presents a safety feature for the consumer that, when not discovered early enough and contaminated food is consumed, the risks are minimal. Any operator will need to check oil levels on a daily basis and record top-up and consumption. This is the only practical way to establish if a lubricant is entering the food stuff. Measuring the final food tells you little. If you remove the manufacturing context from the final food, you may find the MOSH and MOAH fractions, but you cannot tell where the traces came from. A molecule found in bread can come from a dust depressant, a mould release, packaging material, agro equipment or the oil from a conveyer belt in your plant. Looking at an extensive analysis of the individual carbon numbers and types of hydrocarbons might help you further but this all is time-consuming and expensive and unnecessary.

H1 Lubricants are safe products

The highly refined mineral oil you use is proven not to be a potential source of cancer as is often wrongly reported. Over a period of 40 years the oil industry has collected evidence and proven the safety of the base oils leaving a refinery. No lubricant base oil is allowed to leave a refinery to enter the market when not tested by the IP346 a test that is conclusive of the elimination of the cancer potential molecules. This also means that motor oils, hydraulic oils and oils used in printing ink are considered safe. The base oils used in lubricants are technical white oils or pharmaceutical white oils. These have been treated even further to a point where aromatics are only at trace levels. We can conclude that if MOAH is found in food and the molecules originate from the lubricant, the MOAH is safe, so don't panic.

Conclusion

It is disappointing to see that although the lubricant industry has been communicating factual information about the safety of highly refined base oils, this does not reach the general public. In part this might come because the message "lubricants cause cancer" is a punchier headline. Also, this message has been in the news so often, and parroted elsewhere, that any Google search will show a high level of confirmation rather than accuracy or correctness. Even today Foodwatch maintains its position on its German website with the opinion date of 27-10-2015 ignoring the later information by the BFR and other scientific conferences like ILSI and CONCAWE.

Clearer research and more accuracy and verification through investigative journalism, will go far to redress the often misinformed fake news that exists around MOAH and MOSH.

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