

# The Detoxifying Effect of Fish Oils

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Whether your client is a smoker, a truck driver or a general suburban inhabitant, polycyclic aromatic hydrocarbons are probably around. We look back to 2011 for an answer on how you may assist your patients in mitigating some of the damage these chemicals can cause.

The New Year is often a time when your patients become aware of their health. Many patients might be looking to recover from their Christmas extravagance; others might be seeking advice on how to clean out their bodies for the year ahead; while others may be after advice on how they can manage their health in this increasingly toxic world. Each request of course necessitates a slightly different approach. Given our focus on beating the Christmas diet last Nutritional News, we will focus this issue on the latter request – with environmental toxins so rampant, what measures can be taken to mitigate the ensuing biological damage? We look back to a great study published in October 2011 for an answer.

Polycyclic aromatic hydrocarbons (PAHs) are a family of molecules occurring when organic matter is burned – with sources including cigarette smoke and petrol exhaust. They can be quite ubiquitous molecules circulating in the air, soil and water, and gaining entry into your patient's bodies through their lungs, gut and skin. Once inside the body, PAHs are metabolised to reactive molecules termed 'diol-epoxides.' These diol-epoxides can then enter your patients' cells and bond to nucleotides (components of DNA), forming 'DNA adducts.' DNA adducts are dangerous phenomena, with numerous studies finding DNA adducts to play a role in the pathogenesis of cancers through the initiation of mutations in genes which encode tumour-regulating proteins – 'proto-oncogenes' and 'tumour suppressor genes'.<sup>(1-2)</sup>

Though fish oil perhaps isn't the first nutrient you might turn to when looking to detoxify your patients, the authors of this study, published in the journal PLoS One, hypothesised that, given fish oil's track record as a chemopreventive, it just might help reduce the toxicity of PAHs and thereby reduce the formation of DNA adducts.

The authors divided a sample of rats into two groups: one group consumed a high corn oil diet, while the other received a high fish oil diet. After 30 days on this diet, the mice received either a high or a low dose of a mixture of polycyclic aromatic hydrocarbons, with a few mice reserved as controls, not receiving any injections. The mice continued their diets following the injection of PAHs, and were then killed either 1, 3 or 7 days after the injection, and analysed.



The authors found that the high fish oil diet significantly inhibited the production of DNA adducts in nearly all of the mice – with the exception of those mice given the low PAH dose at 3 days. Turning their attention to a specific DNA adduct, BPDE-dG, the authors found that fish oil took 7 days to exert a meaningful effect.

The authors then sought to determine the mechanism through which the fish oil diet might have caused a reduction in DNA adduct formation. In order to do so, they directed their attention to the expression of detoxification enzyme genes. They found that the fish oil diet significantly increased the expression of the Cyp1a1 gene in both the high and low dose PAH groups; worth noting is that Cyp1a1 has been previously found to be an important detoxification enzyme for the metabolism of PAHs.

Corresponding with both of these findings, the authors also observed significantly less liver damage in the high fish oil diet group compared to the corn oil group.

So, fish oil seemed to reduce DNA adduct formation, possibly through increasing the expression of a detoxification enzyme known to metabolise PAHs, and in so doing, was found to reduce the hepatic toxicity of such PAHs. Much research has been previously conducted into the effects of fish oil, and the authors acknowledge that other, uninvestigated, effects may have contributed to these observations, such as a reduction in oxidative damage, or the induction of apoptosis in unhealthy cells. Irrespective, this study provides a great rationale for daily fish oil supplementation alongside other detoxifying nutrients. Indeed the ubiquity of PAHs in today's modern world may mean that no detoxification protocol is quite complete without a daily intake of clean fish oil.

### Based on the Article

Zhou GD, Zhu H, Phillips TD, Wang J, Wang SZ, Wang F, Amendt BA, Couroucli XI, Donnelly KC, Moorthy B. Effects of dietary fish oil on the depletion of carcinogenic PAH-DNA adduct levels in the liver of B6C3F1 mouse. PLoS One. 2011;6(10):e26589.

### References

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2. Roshandel G, Semnani S, Malekzadeh R, Dawsey SM. Polycyclic aromatic hydrocarbons and esophageal squamous cell carcinoma. Arch Iran Med. 2012 Nov;15(11):713-22.

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