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INDUSTRY ADVISORY:

THE POLYSTYRENE DISPOSABLE DRINKING CUP DISSOLUTION DEMONSTRATION WITH OMEGA-3 ETHYL ESTER OILS

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Over the past 25 years, the visually surprising effect that ethyl ester oils of the omega-3 long-chain polyunsaturated fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), dissolve plastic has been repeatedly shown on television and the Internet. This physical effect involves commonly-used polystyrene plastics, such as atactic and expanded polystyrene used for disposable drinking cups, cutlery and food containers. Typically, a demonstration of this physico-chemical behavior is shown by pouring a few milliliters of an omega-3 ethyl ester oil into a disposable polystyrene cup, with the result that the bottom of the cup dissolves and disintegrates.

Disintegration of polystyrene is specific to the ethyl ester form of omega-3 fatty acids. It does not happen with the triglyceride form of omega-3 fatty acids. Although not formally investigated, it is plausible[1] that the dissolving behavior involves the disruption of the relatively weak interactions between the long and hydrophobic polystyrene polymers by the comparatively small and hydrophobic molecules such as the ethyl ester forms of fatty acids. Also dispersive forces between the phenyl groups of polystyrene and the linear EPA-ethyl ester and DHA-ethyl ester molecules may contribute to the disruption of materials made from polystyrene. Triglyceride forms of omega-3s do not dissolve polystyrene most probably because they are bigger molecules that do not intermingle into the plastic polymeric structure.

There is an obvious natural reaction by consumers that such an effect may be dangerous for health upon oral intake of omega-3 ethyl ester oils. However, the mouth, stomach and intestines are not made of polystyrene, and do not experience this particular effect. Omega-3 ethyl esters also do not disintegrate the gelatin capsules in which they are normally formulated. Omega-3s on the market are present as both triglycerides and ethyl ester oils, and both chemical presentations undergo similar digestive processes and have similar functional outcomes after oral ingestion. EPA and DHA in both ethyl ester and triglyceride form have been clinically proven to be readily absorbed after oral intake. For over 25 years, every known comprehensive safety evaluation on EPA/DHA, regardless of chemical form, has concluded that there is insufficient evidence to establish a tolerable upper intake level for EPA/DHA because of a lack of observed untoward outcomes.[2-5]

In summary, the polystyrene dissolving behavior is limited only to its interaction with materials made of polystyrene. There is no evidence that this physical behavior occurs in the body.

REFERENCES

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