Nobel evaluation of the food risk caused by insecticide - metabolized compounds -

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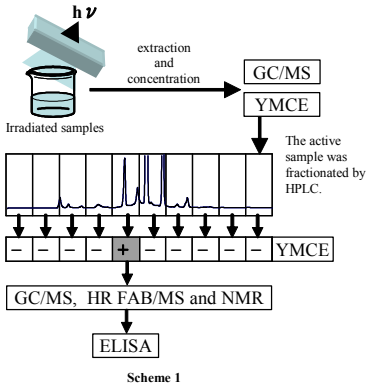
Fenthion, *O,O*-Dimethyl*O*-[3-methyl-4-(methylthio)phenyl] phosphorothioate, is one of the most commonly-used organophosphorus insecticides. It is widely used for pest control in agricultural and public health situations owing to its relatively rapid degradation in the environment and its low accumulation in the biological food chain. However, the food risk caused by fenthion relatives, especially its metabolized and/or transformed products, has not received much attention or been carefully investigated. In this study, we detected degradated and/or transformed products of fenthion in a photo-irradiated aqueous solution using an HPLC, and then identified their molecular structures using various NMR techniques, as shown in Scheme 1. Next, we evaluated the estrogenic potency of both the fenthion itself and its transformed products using yeast two-hybrid bioassay and ELISA.

Figure 1 shows the products identified in this study. For S-aryl fenthion, an isomer of fenthion, we used calculated electron shield-constants for ^{13}C-NMR spectra as supporting data to identify its molecular structure. In the results of two bioassays, estrogenic potency was not detected for fenthion itself. On the other hand, 3-methyl-4-methylthio-phenol, one of the major transformation products of fenthion, indicated a significant potency for the estrogen agonist. Furthermore, it should be noted that S-aryl fenthion also indicated such potency, although its molecular structure is very similar to that of fenthion.



Scheme 1

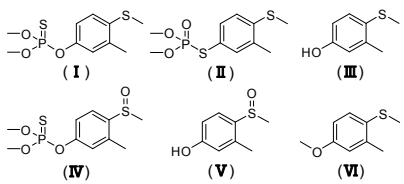


Figure 1. Molecular structure of fenthion and the transformed products. (Ⅰ) fenthion, (Ⅱ) S-aryl fenthion, (Ⅲ) MMP, (Ⅳ) fenthion sulfoxide, (Ⅴ) MMS, (Ⅵ) MMA.

Based on these results, we have not only identified new non-intentional products induced by the degradation and/or transformation of fenthion, but have also discovered a new food risk induced by them.