Co-Mutagenic Activity of Phenoxyherbicides MCPA- and MCPB-Ethylester in the Ames Assay

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Ames Assay.* Tohoku J. Exp. Med., 1990, **160** (2), 167-168 — Mutagenicity and
co-mutagenicity of MCPA- and MCPB-ethylester were examined in the Ames
assay. It was found that they enhance the mutagenic action of 2-aminoanthracene
in the Ames assay, although they were not mutagenic. ——— phenoxyher-
bicides; MCPA- and MCPB-ethylester; Ames assay

In spite of the extensive use of the phenoxyherbicides, 4-chloro-2-methylphenoxyacetic acid ethylester (MCPA-E) and 4-chloro-2-methylphenoxybutyric acid ethylester (MCPB-E), in the paddy field in Japan, little has been known about the long-term effects of these compounds from the point of view of mutagenicity and carcinogenicity in humans. In order to know the genetic effects of these compounds, we have already tested the action of MCPA-E in the rec assay and found that it is co-mutagenic, i.e., it amplified the growth inhibition originally induced by mitomycin C in the rec assay (Yamamoto et al. 1988). In the present study, we further investigated its co-mutagenicity using Ames assay. In addition we investigated the co-mutagenicity of structurally similar chemical, MCPB-E, in the same test system.

MCPA-E and MCPB-E were extracted with dichloromethane from the commercial products, purchased from Nissan Chemical Industry, Ltd.(Tokyo). Purities of MCPA-E and MCPB-E were about 96% and 98%, respectively, based on electron capture detector gas chromatography. These chemicals were dissolved in dimethyl sulfoxide.

The Ames assay was done according to a preincubation method described by Yahagi et al. (1977) using *Salmonella typhimurium* strain TA100 and TA98 with or without S9 mix. The testing was made with duplicate plates, and MCPA-E and MCPB-E were tested in seven doses without toxic effect. The dose ranges of MCPA-E and MCPB-E were 2.89-185 and 4.06-260 in $\mu\text{g}/\text{plate}$ in the system with S9 mix, 0.0452-2.89 and 0.0317-2.03 $\mu\text{g}/\text{plate}$ in the system without S9 mix, respectively. Mutagenicity of 2 $\mu\text{g}/2$ -aminoanthracene (2-AA) per plate was determined in the presence of MCPA-E or MCPB-E at the varrious doses with S9

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Fig. 1. Effects of MCPA-E and MCPB-E on mutagenicity of 2-aminoanthracene (2-AA) by Ames assay with S9. Every plate except negative control was dosed with 2 μ g of 2-AA as promutagen. Spontaneous revertants, 88-122 for TA100 (—○—) and 24-35 for TA98 (—●—), were subtracted.

mix to estimate effects of the testing materials on the mutagenic expression of the promutagen 2-AA.

No mutagenicity of the test materials was observed in the test system. The mutagenicity of 2-AA clearly increased with an elevation of dosage of MCPB-E and slightly increased with MCPA-E (Fig. 1). It can be inferred that these chemicals or contaminants may exhibit a DNA-modifying activity under the influence of mutagen 2-AA, or may react with 2-AA in the presence of S9 mix to give more active ultimate mutagen than in the case of 2-AA alone, or may elevate the activity of S9 mix to transform into an ultimate mutagen. Further study should be directed to the investigation of the present inference.

References

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