

2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute
of Food and Drug Safety Evaluation

Risk Assessment of Malathion

Malathion is an organophosphorous pesticide applied to a variety of farm produce including avocado, barley, beans, blueberry, broccoli, cottonseed, cucumber, grapes, grapefruit, mushroom, potato, tomato, and walnut. It is mainly used to control numerous harmful insects such as ants, aphids, cockroaches, armyworms, beetles, borers, flies, fleas, and lice. In Korea, it was first registered in 1991, and its MRL is set at 0.05–8 mg/kg for 69 foodstuffs including napa cabbage and rice (MRLs for Pesticides in Foods, May 31, 2016).

The ADI of malathion is 0.29 mg/kg bw/day, and it was established by applying the safety factor 100 (differences between species and individual entities) to the NOAEL of 29 mg/kg bw/day obtained from the chronic toxicity test and the carcinogenicity test conducted on rats for two years. The NOAEL was determined based on the pesticide's effects on the inhibition of activation of acetylcholinesterase in the brain, weight loss, and reduction in the survival rate.

The intake amount of malathion was estimated based on the results of the analysis of 2,082 samples of 52 foodstuffs including rice in the Monitoring of Agricultural Products in Korea (2011–2015) by the National Institute of Food and Drug Safety Evaluation. The results of the monitoring show that the pesticide level was below the LOQ, and thus, malathion was not detected in any of the samples. Concerning data lower than the LOQ, in case more than 60% of data were below the LOQ, estimation was made by applying 0 (non-detection) as the lower exposure limit or the LOQ (upper exposure limit), according to the “evaluation of low level contamination of foods” recommended by the WHO. Food consumption was calculated through SAS 9.4 using the tertiary food code data from the KNHANES conducted for five years (2010–2014). For the average weight of all age groups, 60 kg, the weight currently (as

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of 2016) being applied for establishment and revision of pesticide residue standards, was used. Risk characterization was made by calculating the HI in consideration of the EDI calculated in the exposure assessment and the ADI, the safe level of human exposure.

In general, when HI is 1 or higher, it is considered that the adverse effects of toxicity may be expected from the exposure, and when HI is lower than 1, adverse effect is not expected. The results of the risk assessment for malathion in all age groups revealed HI between 0 (non-detection data 0 applied) and 0.1×10^{-3} (non-detection data LOQ applied), as shown in the table below, and that its concentration is within the safe level of human exposure.

Table 1. ADI and HI of malathion

Age	EDI (mg/person/day)		Average weight (kg)	EDI (mg/kg bw/day)		ADI (mg/kg bw/day)	HI	
	0	LOQ (mg/kg)		0	LOQ (mg/kg)		0	LOQ (mg/kg)
All	0	1.6×10^{-3}	60	0	0.3×10^{-4}	0.29	0	0.1×10^{-3}

Key words: Malathion, Risk Assessment, Organophosphorus insecticide, ADI, Monitoring, Pesticide