

2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute
of Food and Drug Safety Evaluation

Risk Assessment of Methidathion

Methidathion, an organophosphorous pesticide, is used to control insects such as peach twig borers, coccids, leaf miners, red spiders, whiteflies, aphids, thrips, and flea beetles. It is mainly applied to crops including almond, apple, apricot, cherry, mango, mandarin, olive, orange, peach, pear, plum, sunflower, and walnut. In Korea, it was first registered as a water-dispersible powder, and its MRL is set at 0.02–5 mg/kg for 29 foodstuffs such as potato, mango, and eggplant (MRLs for Pesticides in Foods, May 31, 2016).

The ADI of methidathion at 0.001 mg/kg bw/day was established by applying the safety factor 100 (differences between species and individual entities) to the NOAEL of 0.14 mg/kg bw/day drawn from repeated dose studies on dogs conducted for 90 days, one year, and two years. In the studies on dogs, effect on the liver appeared at a concentration level lower than the level where the inhibition of activation cholinesterase occurred and the possibility of effect on human liver was not confirmed. The NOAEL was set at 0.1 mg/kg bw/day, a concentration level where toxicity effects (effect on liver and inhibited activation of cholinesterase) did not appear.

The intake amount of methidathion 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 result of the monitoring showed that methidathion was detected in six samples. However, the pesticide level was below the LOQ, and thus, it was not detected in the rest 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 LOQ (upper exposure limit), according to the “evaluation of low level contamination of foods”

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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 of 2016) being applied for establishment and revision of pesticide residue standards, was used. Concerning the average weights of different age groups, the data from KNHANES was used in applying 12.3 kg, 19.2 kg, 37.4 kg, 59.5 kg, 65 kg, and 58.3 kg to the 1–2 year group, 3–6 year group, 7–12 year group, 13–19 year group, 20–64 year group, and the group aged 65 years or above, respectively. Risk characterization was made by calculating the 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, adverse effect of toxicity is expected from the exposure, and when HI is lower than 1, adverse effect is not expected. The results of the risk assessment of methidathion in different age groups revealed HI between 0.002 (non-detection data 0 applied) and 0.232 (non-detection data LOQ applied), as shown in the table below, and that its concentration is within the safe level of human exposure.

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Table 1. ADI and HI of methidathion

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	0.1×10^{-3}	5.7×10^{-3}	60	0.2×10^{-5}	0.1×10^{-3}	0.001	0.002	0.094
1-2	0.1×10^{-3}	2.8×10^{-3}	12.3	0.1×10^{-4}	0.2×10^{-3}		0.010	0.232
3-6	0.1×10^{-3}	3.7×10^{-3}	19.2	0.1×10^{-4}	0.2×10^{-3}		0.007	0.193
7-12	0.1×10^{-3}	4.5×10^{-3}	37.4	0.4×10^{-5}	0.1×10^{-3}		0.004	0.119
13-19	0.1×10^{-3}	4.9×10^{-3}	59.5	0.2×10^{-5}	0.1×10^{-3}		0.002	0.083
20-64	0.1×10^{-3}	6.1×10^{-3}	65.0	0.2×10^{-5}	0.1×10^{-3}		0.002	0.094
≥ 65	0.1×10^{-3}	5.5×10^{-3}	58.3	0.2×10^{-5}	0.1×10^{-3}		0.002	0.095

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