

2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute
of Food and Drug Safety Evaluation

Risk Assessment of Dimethoate

Dimethoate is an organophosphorus pesticide applicable on various crops including asparagus, broccoli, celery, cherry, napa cabbage, cottonseed, grapefruit, orange, pepper, mandarin, watermelon, barley, tomato, and kale, and is used to control insects such as aphids, citrus thrips, grasshoppers, leaf miners, mites, white flies, midges, weevils, leafhoppers, maggots, and moths. It was registered in emulsion form for the first time in Korea in 1981, and its MRL is set at 0.05–3 mg/kg for 36 foodstuffs, including potato and cottonseed (MRLs for Pesticides in Foods, May 31, 2016).

The ADI of dimethoate is 0.002 mg/kg bw/day, which was established by applying the safety factor of 500 (100 for differences between species and individual entities multiplied by 5, considering the possibility of reproductive toxicity on the NOAEL) to the NOAEL of 1.2 mg/kg bw/day obtained from reproductive and developmental toxicity studies in rats. The key endpoints of dimethoate are hindrance of reproduction and inhibition of cholinesterase activation; the NOAEL was set at 1.2 mg/kg bw/day based on the possibility of impaired reproduction and inhibited activation of acetylcholinesterase in the brain and red blood cells revealed from studies in rats.

The intake amount of dimethoate was estimated based on the results 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 showed that the pesticide level was below the LOQ, and thus, dimethoate 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 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) 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, adverse effects of toxicity may be expected, and when HI is lower than 1, adverse effects are not expected. The results of the risk assessment of dimethoate in all age groups revealed HI between 0 (non-detection data, 0 applied) and 0.062 (non-detection data LOQ applied), as shown in the table below, and that its concentration was within the safe level of human exposure .

Table 1. ADI and HI of dimethoate

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	7.5×10^{-3}	60	0	0.1×10^{-3}	0.002	0	0.062

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