

# 2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute  
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## Risk Assessment of Parathion-methyl

Parathion-methyl, an organophosphorous pesticide, is used to control various harmful insects such as mites, mulberry thrips, rice weevils, aphids, and leafhoppers. In foreign countries, it is applied to crops including almond, barley, cabbage, corn, cottonseed, pecan, rice, beans, sugar beet, sweet potato, and walnut. Its MRL in Korea is set at 0.01–1 mg/kg for 61 foodstuffs such as plum and potato (MRLs for Pesticides in Foods, May 31, 2016).

The ADI of parathion-methyl at 0.003 mg/kg bw/day was established by applying the safety factor 100 (differences between species and individual entities) to the NOAEL of 0.3 mg/kg bw/day obtained from chronic toxicity and carcinogenicity studies on rats conducted for two years. The NOAEL was set at 0.3 mg/kg bw/day, the concentration level where toxicity effect (inhibition of activation of acetylcholinesterase in red blood cells) did not appear. Parathion-methyl causes bacterial mutation, but no genetic toxicity has appeared in the limited extent in mammalian studies. In addition, the NOAEL related to the inhibition of activation of cholinesterase in the brain obtained from a 13-week repeated dose study on dogs and that related to maternal and developmental toxicity drawn from the reproductive and developmental toxicity studies on fertilized female rats were identical at 0.3 mg/kg bw/day. The NOAEL on the inhibition of cholinesterase in red blood cells and blood plasma was also the same at 0.3 mg/kg bw/day.

The intake amount of parathion-methyl 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 the pesticide level was below the LOQ, and thus, parathion-methyl was not detected in any of the samples. Concerning data lower than the LOQ, in case

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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” 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. Risk characterization was made by calculating the HI according to the formula below 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, 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 of parathion-methyl in all age groups revealed HI between 0 (non-detection data 0 applied) and 0.013 (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 parathion-methyl

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	$2.4 \times 10^{-3}$	60	0	$0.4 \times 10^{-4}$	0.003	0	0.013

**Key words:** Parathion-methyl, Risk Assessment, Organophosphorus insecticide, ADI, Monitoring, Pesticide