

2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute
of Food and Drug Safety Evaluation

Risk Assessment of Dichlorvos

Dichlorvos is an organophosphorus pesticide used to control insects such as flies, lice, mosquitoes, chiggers, mites, cockroaches, armyworms, chinch bugs, crickets, cutworms, and grasshoppers. In Korea, it was first registered in emulsion form in 1999, and its MRL is set at 0.05–2 mg/kg for 12 foodstuffs, such as tangerines, chestnuts, and soybeans (MRLs for Pesticides in Foods, May 31, 2016).

Dichlorvos' ADI is 0.004 mg/kg bw/day, and was established by applying the safety factor of 10 (differences between individual entities) to the NOAEL of 0.04 mg/kg bw/day obtained from a repeated dose test on male volunteers conducted for three weeks. In the chronic toxicity test, men were observed to have a lower survival rate than rodents at the concentration level where activation of cholinesterase in red blood cells and blood plasma was inhibited; men also appeared to have a slower recovery of cholinesterase levels than test animals (rats: about 2 h, men: 15 days). Therefore, the result in men was used as a representative value of the NOAEL regarding inhibited activation of acetylcholinesterase, the most important toxicity endpoint of dichlorvos.

The intake amount of dichlorvos was estimated based on an 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 showed that the pesticide level was below the LOQ, and thus, dichlorvos 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” recommended by the WHO. Food consumption was calculated through SAS 9.4 using the

2016 SCIENTIFIC REPORT



MINISTRY OF FOOD AND DRUG SAFETY

National Institute
of Food and Drug Safety Evaluation

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 effect of toxicity is expected, and when HI is lower than 1, adverse effect is not expected. The results of the risk assessment of dichlorvos in all age groups revealed HI between 0 (non-detection data, 0 applied) and 0.005 (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 dichlorvos

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	1.3×10^{-3}	60	0	0.2×10^{-4}	0.004	0	0.005

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