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Parathion – Addendum: withdrawal of the BAT value for acetylcholinesterase inhibitors and continuation as BLW, withdrawal of the BAT value for p-nitrophenol in urine

Assessment Values in Biological Material – Translation of the German version from 2024

Keywords

parathion; biological tolerance value; BAT value; biological guidance value; BLW; p-nitrophenol; acetylcholinesterase; acetylcholinesterase inhibitor

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Abstract

The German Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (MAK Commission) decided to suspend the maximum concentration at the workplace (MAK value) and the other classifications of the insecticide and acaricide parathion [56-38-2], because it is no longer approved in the European Union and previous MAK value documentation and supplements do not reflect current data for the substance. As a new evaluation is not of high priority, the substance is listed in Section IIc of the List of MAK and BAT Values for substances no longer evaluated. The biological tolerance value (BAT value) for parathion, for the parameter p-nitrophenol in urine, was set in correlation to the former MAK value and was therefore withdrawn. The biological guidance value (BLW) (formerly BAT value) of "reduction of acetylcholinesterase activity to 70% of the reference value" still remains.

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BLW (2023)	**Reduction of acetylcholinesterase activity to 70% of the reference value** BLW derived as ceiling value because of acute toxic effects Sampling time: end of shift; for long-term exposures, after several previous shifts (after three consecutive working days); determination of individual pre-exposure values as reference values after an exposure-free period of at least one week
BAT value (2023)	**withdrawn**
MAK value	**see Section II c of the List of MAK and BAT Values**
Peak limitation	–
Absorption through the skin	–
Sensitisation	–
Carcinogenicity	–
Prenatal toxicity	–
Germ cell mutagenicity	–

Parathion is applied as a broad-spectrum insecticide and acaricide against sucking and biting insects and mites (AERU 2022). In the European Union, the use of parathion is not permitted per Regulation (EC) No. 1107/2009 concerning the placing of plant protection products on the market (European Commission 2022 b; European Parliament and European Council 2009). In the Federal Republic of Germany, the use of parathion was permitted from 1971 to 2002, and it was permitted in the former GDR until 1967 (BVL 2010). Parathion can be found in the list of chemicals in Appendix I, Parts 1 and 3 of the PIC Regulation (EC) No. 649/2012 (European Commission 2022 a). According to this regulation, it is necessary to issue an export notification when exporting this substance as well as to receive the explicit approval of the importing country. In 2022, the Permanent Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area realised that the currently available data are not reflected by the current evaluation but that a renewed evaluation is not a priority. For this reason, the MAK value, the peak limitation, the "H" designation for dermal absorption, and the classification for prenatal toxicity were all withdrawn and the substance was assigned to Section II c of the List of MAK and BAT Values (DFG 2022; Hartwig and MAK Commission 2024).

A biological tolerance value (BAT value) for the parameter p-nitrophenol in urine was derived in correlation to the former MAK value for parathion (translated in Lewalter 1995 b). Since the MAK value for parathion was withdrawn in 2022, the therefrom derived

BAT value for the parameter p-nitrophenol in urine is withdrawn.

Parathion is an organophosphate and acts as a strong cholinesterase inhibitor. The reduction of acetylcholinesterase activity in erythrocytes is the corresponding effect parameter in biological material. Since it is not known whether this is the most sensitive endpoint and therefore whether compliance with this assessment value reliably protects individuals from all health effects (Weistenhöfer et al. 2024), the BAT value for the acetylcholinesterase inhibition for parathion is withdrawn and the

reduction of acetylcholinesterase activity to 70% of the reference value is set as BLW for parathion,

whereby this value, like the former BAT value, is a ceiling value due to acute toxic effects (see also Lewalter 1995 a).

The individual reference value for acetylcholinesterase activity is to be determined at least once per year after an exposure-free period of at least one week.

For the reliable detection of representative acetylcholinesterase activity levels, it is recommended to take blood samples for the determination of acetylcholinesterase activity at the end of a shift after several previous shifts (after three consecutive working days) under contaminant-free conditions. For the evaluation of any collected data, it is important to note that women may exhibit lower acetylcholinesterase activity levels than men and that certain pharmaceuticals may alter acetylcholinesterase activity (see also Lewalter 1995 a and Weistenhöfer et al. 2024).

Notes

Competing interests

The established rules and measures of the Commission to avoid conflicts of interest (www.dfg.de/mak/conflicts_interest) ensure that the content and conclusions of the publication are strictly science-based.

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