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1,2-Dichlorobenzene – Addendum for re-evaluation of the BAT values

Assessment Values in Biological Material – Translation of the German version from 2009

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BAT value (2008)	**140 µg 1,2-dichlorobenzene/l blood** Sampling time: immediately after exposure
	150 mg 3,4- and 4,5-dichlorocatechol (after hydrolysis)/g creatinine Sampling time: end of exposure or end of shift; for long-term exposures: at the end of the shift after several previous shifts
MAK value (2001)	**10 ml/m³ ≙ 61 mg/m³**
Absorption through the skin (1988)	H
Carcinogenicity	–

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Re-evaluation

The evaluation of the BAT values (biological tolerance values) for 1,2-dichlorobenzene [95-50-1] in 2002 was based on the 95th percentile of the 1,2-dichlorobenzene concentration in the blood and the 3,4- and 4,5-dichlorocatechol excretion in the urine of 17 volunteers who had been exposed to 1,2-dichlorobenzene at concentrations of 5 and 47.5 ml/m³ under standardised conditions for 8 hours (translated in Lewalter and Knecht 2010). The new definition of the BAT value as correlate for the average value of several individual examinations in one person makes a re-evaluation necessary.

Exposure and effects

As no further studies relevant for the biological monitoring of 1,2-dichlorobenzene have been published, the volunteer study by Knecht (1995) is used. Table 1 shows the concentrations in blood and urine obtained in this study as mean values.

Tab. 1 Correlation of the 1,2-dichlorobenzene (DCB) concentration in the air with the 1,2-dichlorobenzene concentration in blood and with the urinary concentrations of 2,3- and 3,4-dichlorophenol (DCP) as well as 3,4- and 4,5-dichlorocatechol (DCK) (Knecht 2007)

Air	Blood	Urine			
1,2-DCB	1,2-DCB	2,3-DCP	3,4-DCP	3,4-DCK	4,5-DCK
[ml/m³]	[µg/l]	[mg/g creatinine]			
up to 3	30	9.3	6.0	13.7	7.9
3–6	95	16.1	12.0	26.8	45.8
6–10	120	22.5	22.5	45.3	83.4

From these data, related to an 8-hour exposure to 10 ml 1,2-dichlorobenzene/m³, an average 1,2-dichlorobenzene concentration in blood of 120 µg/l and an average urinary excretion of 128.7 mg total 3,4- and 4,5-dichlorocatechol/g creatinine are obtained.

Re-evaluation of the BAT values

Related to an 1,2-dichlorobenzene concentration of 10 ml/m³ in the air, average BAT values of 120 µg/l for 1,2-dichlorobenzene in blood and of 130 mg/g creatinine for total 3,4- and 4,5-dichlorocatechol in urine would be obtained. The BAT values valid to date were, related to the 95th percentile, 140 µg 1,2-dichlorobenzene/l blood and 150 mg 3,4- and 4,5-dichlorocatechol/g creatinine. The resulting change in the BAT values would therefore be only about 14%. Because of the limited data available (only one study with 17 test persons) which led to the fact that the BAT values established in 2002 were regarded as only provisional, such a small change cannot be justified.

The existing

BAT values of 140 µg 1,2-dichlorobenzene/l blood and

150 mg 3,4- and 4,5-dichlorocatechol (after hydrolysis)/g creatinine

are therefore retained.

Urine sampling should take place after the end of exposure or end of shift; for long-term exposures: at the end of the shift after several shifts.

Blood samples should be taken immediately after the end of exposure. If an excursion is determined, the urinary concentrations of the dicholorocatechols should be re-analysed after 3 days at the earliest because of their expected long half-life of more than 8 hours. There is no fixed sampling time required for the re-determination of 1,2-dichlorobenzene in blood in case of exceeding of the limit value.

Interpretation of results

In the light of the new definition of the BAT value as an average value from several biomonitoring examinations in one person, single excursions above the BAT value are not necessarily indicating that the limit value has been exceeded. However, it must be observed that these excursions do not reach concentrations at which acute toxicity is to be expected. The main effects of 1,2-dichlorobenzene of that kind are acute irritation to the eyes and upper airways as well as on the CNS (headaches, dizziness, nausea) (Hollingsworth et al. 1958); the systemic (central nervous) effects are relevant for biological monitoring. After accidental exposure (estimated exposure concentration not higher than 100 ml/m³; 8 hours a day, for 4 days) effects on the CNS such as headaches, dizziness and nausea were reported in addition to irritant effects (Zapata-Gayon et al. 1982).

Such effects, however, are not to be expected if the at least ten times lower MAK value and the corresponding BAT value are observed.

Notes

Competing interests

The established rules and measures of the Commission to avoid conflicts of interest (https://www.dfg.de/en/dfg_profile/statutory_bodies/senate/health_hazards/conflicts_interest/index.html) ensure that the content and conclusions of the publication are strictly science-based.

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