

Isopropyl benzene (cumene) – Addendum for re-evaluation of the BAT value

Assessment Values in Biological Material – Translation of the German version from 2014

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BAT value (2013)

10 mg 2-phenyl-2-propanol (after hydrolysis)/g creatinine

Sampling time: end of exposure or end of shift

MAK value (2012)

10 ml/m³ (ppm) $\hat{=}$ 50 mg/m³

Peak limitation (2002)

Category II, excursion factor 4

Absorption through the skin (1966)

H

Carcinogenicity (2012)

Category 3 B

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Re-evaluation

In the evaluation of 2000, the biological tolerance values (BAT values) were established as ceiling values for the concentration of isopropyl benzene in the blood and for the urinary excretion of 2-phenyl-2-propanol from a study in volunteers exposed under standardised conditions to isopropyl benzene [98-82-8] at the level of the then valid maximum workplace concentration (MAK value) of 50 ml/m³ for eight hours (translated in Knecht 2021). Owing to the redefinition of the BAT value as a correlate of the average value from several individual examinations in a worker and the lowering of the MAK value to 10 ml/m³, a re-evaluation of the BAT values for isopropyl benzene has become necessary.

Exposure and effects

Since the evaluation, neither new occupational-medical studies nor studies with volunteers have been published containing biomonitoring results of persons exposed to isopropyl benzene.

Analytical methods

Methods for the determination of isopropyl benzene in blood and 2-phenyl-2-propanol in urine tested by the MAK Commission's Working Group "Analyses in Biological Materials" are available (Goenechea and Machata 1983; Knecht et al. 2013).

Evaluation

In 2012, the MAK value was lowered to 10 ml isopropyl benzene/m³. The derivation of the BAT value was based on a study by Knecht and Ulshöfer (1996) in test persons (exposed in the range of 15 to 50 ml isopropyl benzene/m³). Because extrapolation into the concentration range of the current MAK value appeared to involve great uncertainty, the original data and further data from the lower concentration range tested (volunteers 18 and 19) were provided by the authors. These are shown in Table 1.

Tab. 1 Isopropyl benzene concentrations in the air and the 2-phenyl-2-propanol levels in urine determined at the end of exposure as well as the isopropyl benzene concentrations in blood determined at the end of exposure

Test person No.	Air isopropyl benzene [ml/m ³]	Urine 2-phenyl-2-propanol [mg/g creatinine]	Blood isopropyl benzene [mg/l]
1	37.5	26.3	0.4
2	48.6	30.6	1.0
3	48.7	35.4	1.3
4	40.3	23.1	1.1
5	39.0	33.3	1.0
6	44.6	24.5	2.1
7	47.1	28.2	1.8
8	46.1	29.3	1.6
9	47.5	22.9	1.7
10	49.0	37.8	1.6
11	26.7	12.1	1.9
12	34.6	21.2	0.7
13	29.9	22.4	0.5
14	15.3	9.4	0.5
15	16.1	16.0	0.7
16	43.7	29.3	1.2
17	25.4	24.5	0.8
18	10.0	9.6	0.3
19	6.0	4.5	0.3

Figure 1 shows the correlation between the excretion of 2-phenyl-2-propanol in urine and the corresponding concentrations of isopropyl benzene in the air.

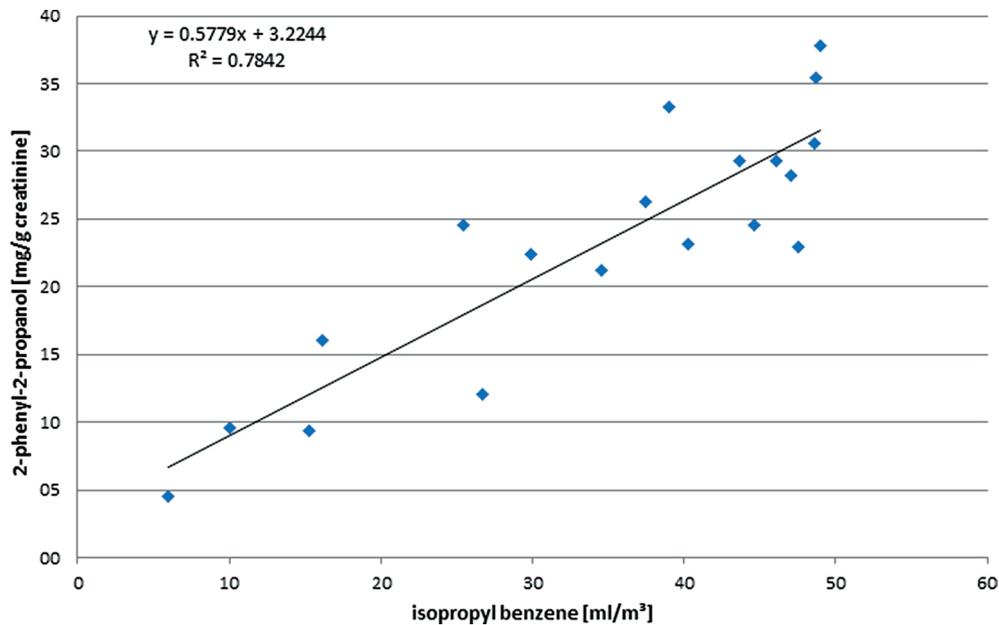


Fig. 1 Excretion of 2-phenyl-2-propanol [mg/g creatinine] in the urine of test persons at the end of a standardised 8-hour exposure to isopropyl benzene in the air (concentrations in the range of 6 ml/m³ to 50 ml/m³)

From the data of Table 1 and Figure 1, a regression line with the function

$$c(2\text{-phenyl-2-propanol [mg/g creatinine]}) = 0.5779 \times c(\text{isopropyl benzene [ml/m}^3\text{]}) + 3.2244$$

is obtained.

From this, for a concentration in the air at the level of the MAK value of 10 ml/m³, an average concentration of 9 mg 2-phenyl-2-propanol/g creatinine is derived.

Further studies are not available. In line with the principle of the “preferred value approach”,

a BAT value of 10 mg 2-phenyl-2-propanol (after hydrolysis)/g creatinine

for isopropyl benzene in urine is therefore established.

Sampling is to be carried out at the end of exposure or end of shift, however, at the latest two hours after end of shift.

Because of the low number of volunteers exposed to concentrations of less than 15 ml isopropyl benzene/m³, the BAT value must be considered as provisional, and has to be checked in further studies.

Figure 2 shows the correlation between the concentration of isopropyl benzene in the air and isopropyl benzene in blood immediately after the end of the exposure.

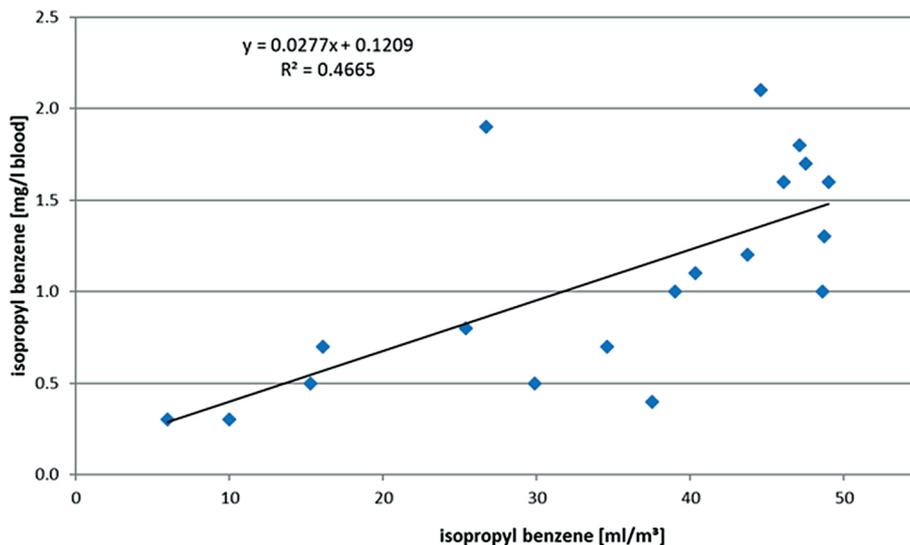


Fig. 2 Isopropyl benzene concentrations in the air and in blood samples from test persons at the end of a standardised 8-hour exposure to concentrations in the range of 6 ml/m³ to 50 ml/m³

Because of the short half-life and the resultant scatter of data (see Figure 2), the concentration of isopropyl benzene in blood is less suitable for the derivation of a BAT value.

The BAT value for isopropyl benzene in blood has therefore been withdrawn.

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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