

The MAK Collection for Occupational Health and Safety

Addendum to Dichloromethane

Assessment Values in Biological Material – Translation of the German version from 2016

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The commission established [rules](#) and [measures](#) to avoid conflicts of interest.

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Addendum to Dichloromethane

BAT Value Documentation

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Abstract

In 2015 the German Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area has re-evaluated dichloromethane [CAS No. 75-09-2], considering dichloromethane in blood to characterize the internal exposure.

In a chamber study, 14 non-smokers were exposed to different concentrations of dichloromethane. After exposure to the present MAK value of 50 ml dichloromethane/m³ without physical activity, a concentration of 0.3 mg dichloromethane/l blood was measured. Considering an increased intake due to elevated breathing volume during work, the exposure to 50 ml dichloromethane/m³ results in a blood concentration of 0.5 mg/l. Taking into account this study and the EKA correlation of 2001, a BAT value of 500 µg dichloromethane/l blood was evaluated. Sampling time is straight after exposure.

Keywords

dichloromethane; methylene chloride; occupational exposure; biological tolerance value; BAT value; EKA; toxicity

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BAT (2015)

500 µg dichloromethane/l whole blood

Sampling time: immediately after exposure

EKA (2001)

Air		Whole blood
Dichloromethane		Dichloromethane
[ml/m ³]	[mg/m ³]	[mg/l]
10	35	0.1
20	70	0.2
50	175	0.5
100	350	1.0

MAK value (2014)

50 ml/m³

Absorption through the skin (2014) H

Sensitization –

Carcinogenicity (2014)

Carcinogen Category 5

In 1982, a BAT value (biological tolerance value) for dichloromethane was set at 5% CO-Hb (see BAT Documentation 1982, translated). In 1989, a further BAT value was derived at 1 mg dichloromethane/l blood (see BAT Documentation 1989, translated). After classification of dichloromethane as a suspected carcinogen in carcinogen category 3A, both BAT values were withdrawn in 2001, and EKA (exposure equivalents for carcinogenic substances) derived (see BAT Documentation 2001, translated). In 2014, dichloromethane was reclassified in carcinogen category 5, and a MAK value derived at 50 ml/m³, so that the BAT value is now also re-evaluated.

12 Re-evaluation of the BAT value

In the MAK Documentation of 2015, studies are cited that contain data on exposure to dichloromethane and data on the internal exposure (Hartwig 2015, translated).

Eleven male and three female non-smokers aged 21 to 42 years were exposed once to 50, 100, 150 or 200 ml dichloromethane/m³ for 7.5 hours or to 100, 150 or 200 ml dichloromethane/m³ for 7.5 hours on five consecutive days. Exposure was interrupted for half an hour after four hours. Figure 1 shows the blood levels as a function of time (DiVincenzo and Kaplan 1981 a).

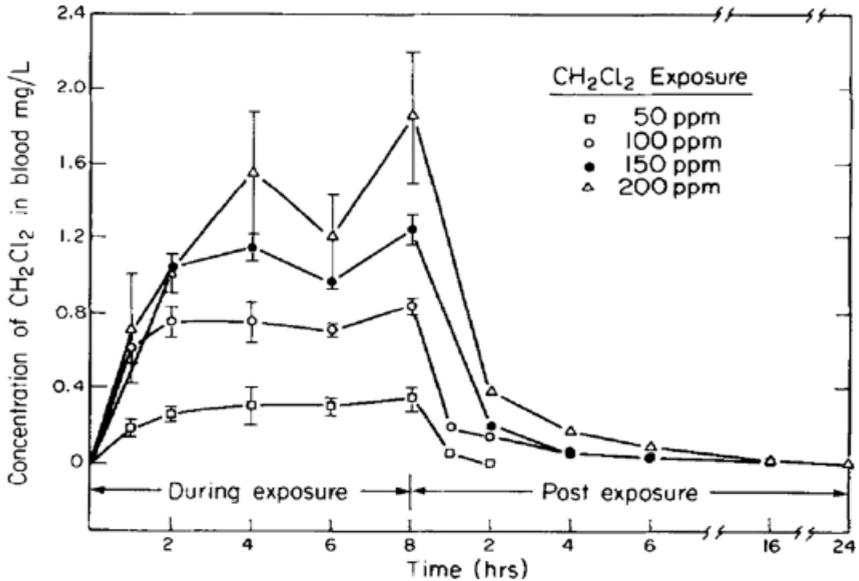


Figure 1 Dichloromethane levels in the blood of 14 persons (11 ♂, 3 ♀) during and after exposure to 50, 100, 150 and 200 ml dichloromethane/m³ for 7.5 h (from DiVincenzo and Kaplan 1981 a)

At 200 ml dichloromethane/m³, the level increased continuously up to eight hours (1.5 mg/l blood) whereas, at 100 ml dichloromethane/m³, the steady state was reached after two hours (at a concentration of 0.75–0.85 mg dichloromethane/l blood). After two hours, the concentration after exposure to 50 ml dichloromethane/m³ was about 0.3 mg/l blood; there was no increase up to the end of exposure after eight hours.

After exposure for 7.5 hours (half an hour interval after four hours of exposure) to 100 ml dichloromethane/m³ at rest and under physical exercise (50, 100 or 150 W; treadmill) the concentrations of dichloromethane were determined in the blood of three male non-smokers aged 23–27 years. The CO-Hb level in blood reached 5% to 6% under exercise. The respiratory activity under resting conditions was 4 ml O₂/min/kg body weight. At 50 W (lowest exercise condition), an approximately threefold increase in respiratory activity (14–16 ml O₂/min/kg body weight) was recorded. This corresponds to approximately the conditions of 10 m³ per eight hours, which were taken as basis for the derivation of the MAK value. The volunteers, however, exercised for only 5 minutes during a 15 minute period, i.e. the increased respiratory activity was only during 33% of the exposure time. The concentrations were 0.85 mg/l blood in the resting participants, and on average 0.2 mg/l blood higher in the exercising participants (DiVincenzo and Kaplan 1981 b). Extrapolation to an uninterruptedly increased respiratory activity yields an

increase of 0.6 mg/l (corresponding to 70%). Assuming a concentration in the air of 50 ml dichloromethane/m³, which corresponds to a concentration of 0.3 mg dichloromethane/l blood at rest (DiVincenzo and Kaplan 1981 a), a concentration of 0.3 mg/l blood • 1.7 = 0.51 mg/l blood is obtained for an increased uptake due to an increase in respiratory activity.

From the studies by DiVincenzo and Kaplan (1981 a, b) and the EKA derived in 2001, therefore, a **BAT value** of

500 µg dichloromethane/l whole blood

is established for an exposure at the level of the MAK value of 50 ml dichloromethane/m³.

Sampling should be carried out during or immediately after the exposure, at the earliest however two hours after it starts.

13 References

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