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GMS PUBLISSO ZB MED-Publikationsportal Lebenswissenschaften

Pentachlorophenol – Addendum for re-evaluation of EKA

Assessment Values in Biological Material – Translation of the German version from 2019

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Keywords

pentachlorophenol, PCP, EKA, exposure equivalents for carcinogenic substances

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Abstract

In 2018, the German Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area has re-evaluated the correlation between inhalation exposure to pentachlorophenol [87-86-5] and urinary pentachlorophenol excretion (exposure equivalents for carcinogenic substances (EKA)). The re-evaluation of the available literature led to the conclusion that the present data are limited and all available studies show limitations regarding to air exposure assessment and characterisation of possible dermal exposure of the workers. Thus, the EKA were withdrawn.

Citation Note:
Walter D, Drexler H, Hartwig A, MAK Commission. Pentachlorophenol – Addendum for re-evaluation of EKA. Assessment Values in Biological Material – Translation of the German version from 2019. MAK Collect Occup Health Saf. 2020 Oct;5(3):Doc061.
DOI: 10.34865/bb8786e5_3ad

Manuscript completed:
05 Jul 2018

Publication date:
09 Oct 2020

EKA (2018)	–
MAK value (1990)	–
Absorption through the skin (1989)	H
Carcinogenicity (1990)	Category 2

Re-evaluation

Seven occupational studies investigated pentachlorophenol concentrations in urine and blood of exposed workers (ACGIH 2014; Table 1). Three studies (Begley et al. 1977; Klemmer et al. 1980; Lindroos et al. 1987), however, do not provide detailed information about air concentrations in the respective workplaces. In all studies, static sampling was performed to determine pentachlorophenol air concentrations instead of personal sampling; moreover, quantitative data on dermal exposure are missing. In a large number of cases, the pentachlorophenol concentrations determined by static sampling do not correlate with the internal exposure of the examined workers. The reason for this is the lack of data on the dermal exposure of the examined workers. Horstman et al. (1989) showed that 62% of pentachlorophenol dissolved in diesel oil penetrates human abdominal skin in vitro. The permeability coefficient for human skin in vivo is about 0.65 cm/h. This results in a significant increase in internal exposure (blood, serum/plasma) for pentachlorophenol in the case of dermal exposure (US EPA 1992).

Due to the limitations of the available studies described above and the overall very poor availability of data,

EKA for pentachlorophenol are withdrawn.

Tab. 1 Biomonitoring of pentachlorophenol – summary (ACGIH 2014)

Exposed workers (n)	Pentachlorophenol						References
	Air [µg/m³]		Urine		Blood		
6	9.8	0.005–15.3	164 ppb	41–760 ppb[f)]	1372 ppb[a), f)]	348–3963 ppb[a), f)]	Wyllie et al. 1975
7	19	3–63	2.83 mg/l	0.12–9.68 mg/l	–	–	ACGIH 2014
11	6	3–69	0.98 mg/l	0.13–2.58 mg/l	–	–	
7	14	4–1000	1.24 mg/l	0.17–5.57 mg/l	–	–	
18	–	–	1.31 ppm	0.09–3.3 ppm[e)]	5.14 ppm[e)]	0.43–14.0 ppm[e)]	Begley et al. 1977
18 urine/22 blood	–	–	0.95 ppm	< 0.01–7.80 ppm[e)]	3.78 ppm[a), e)]	0.15–17.4 ppm[a), e)]	Klemmer et al. 1980
23 urine/24 blood	–	–	0.27 ppm	< 0.01–2.40 ppm[e)]	1.72 ppm[a), e)]	0.02–7.70 ppm[a), e)]	
18	17.5	2–50	0.1 mg/g crea[d)]	0.01–2.11 mg/g crea	0.25 mg/l[a), d)]	0.02–1.5 mg/l[a)]	Zober et al. 1981
23	2.4	0.3–8.0	0.046 mg/g crea[d)]	0.006–0.41 mg/g crea	1.0 mg/l[a), d)]	0.2–2.4 mg/l[a)]	

Tab. 1 *(continued)*

Exposed workers (n)	Pentachlorophenol						References
	Air [µg/m³]		Urine		Blood		
34	< 500	–	0.9 µmol/l	0.1–13.3 µmol/l	–	–	Lindroos et al. 1987
3	5 ppb[g)]	8 ppb[c), g)]	45 ppb[f)]	15 ppb[c), f)]	–	–	Embree et al. 1984
5			–	–	241 ppb[b), f)]	232 ppb[b), c), f)]	

[a)] Plasma level
[b)] Serum level
[c)] Standard deviation
[d)] Median
[e)] 1 ppm ~ 1 mg/l
[f)] 1 ppb ~ 1 µg/l
[g)] 1 ppb ~ 1 µl/m³
crea: creatinine

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