

Announcement by the German Federal Environmental Agency

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## Human-Biomonitoring of Formaldehyde

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Opinion of the Human Biomonitoring Commission of the German Federal Environmental Agency (Kommission "Human-Biomonitoring" (HBM) des Umweltbundesamtes)

Formaldehyde is produced worldwide in large quantities and mainly used in the production of resins and binders for wood products, pulp, paper, glass wool and rock wool. Common sources of non-occupational exposure include vehicle emissions, particle boards, building materials, tobacco smoke, and the use of formaldehyde as a disinfectant. Levels of formaldehyde in outdoor air are generally low, higher levels can be found in the indoor air of homes.

Formaldehyde is of great environmental health interest because of its

- sensitising properties,
- local irritation of skin and mucous membranes,
- classification as carcinogenic to humans (IARC 2004 [1–3]).

To monitor formaldehyde exposure of patients the determination of formaldehyde in blood and of formic acid (FA) in urine has been frequently used in practical environmental medicine [4,7]. The HBM Commission has evaluated the existing evidence for the rationale of this biomarker and concludes that formic acid is not recommended for biomonitoring of formaldehyde exposure.

Inhalation of 0.1 mg F/m<sup>3</sup> (the limit value for indoor air), means a total daily intake of 2 mg Formaldehyde via inhalation. This intake, which cannot result in more than a daily excretion of 2 mg of the metabolite FA in urine, is negligible and non-significant compared with the normal excretion of FA originating from metabolism of C1-compounds (e.g. methanol, acetone.) and some amino-acids. For these compounds a daily intake of 15 mg/day (mean) and 60 mg (95<sup>th</sup> percentile) was estimated [6,5]. Thus the contribution of inhaled "external" formaldehyde is rather small compared to the endogenously formed and metabolised "internal" formaldehyde.

Due to intra- and inter-individual differences in food composition and metabolic activity [5], the variation of FA in urine is large (3 – 30 mg/g creatinine), A positive correlation with age might indicate suboptimal folic acid supply in the elderly.

In conclusion the HBM Commission advises against biomonitoring of FA in urine. This marker is unspecific and does not reflect inhalative exposure to formaldehyde or vice versa the lack of exposure.

Instead, in cases where formaldehyde exposure is suspected, measurement of indoor air is recommended, upon which risk assessment and recommendations can be based. Indoor-air analyses should be performed according to VDI Guideline 4300 Blatt 3 [8]. Formaldehyde in indoor air above the health-based guideline value of 0.1 ppm requires identification and remediation of the sources [9,10].

### References

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