

Occupational exposure to formaldehyde and oxidative stress in Italian workers

Giulia Squillacioti

G Squillacioti¹, V Bellisario¹, F Ghelli¹, R Bono¹

¹Department of Public Health and Pediatrics, University of Turin, Turin, Italy
Contact: giulia.squillacioti@unito.it

Background:

Formaldehyde (FA) is an environmental pollutant widely used in several occupational settings. Beyond its carcinogenic effect, FA can trigger inflammation by promoting reactive oxygen species formation in exposed subjects. The current study aims to investigate the association between air-FA exposure and systemic oxidative stress induction in specific working environments.

Methods:

We accounted for three different scenarios of air-FA exposure by including a sample of pathologists and nurses from operating theatres (n = 185), traffic police officers (n = 154) and wood-workers (n = 127), who participated as volunteers. Exposure to air-FA was assessed by passive air-samplers (Radiello®) and oxidative stress was quantified by 15-F2t-IsoP urinary biomarker (ELISA). A piecewise linear regression model was performed to analyse oxidative stress variation in response to air-FA exposure.

Results:

Overall, 466 subjects (45 ± 9 years) were included in the study, 53% were females. None significant changes of ln(15-F2t-IsoP) were observed before a specific exposure breakpoint of 4.729 (air-FA = 113 µg/m³). Beyond the breakpoint, ln(15-F2t-IsoP) showed a 1.5 increase (p < 0.0001), independently from age and sex. Interestingly, while age did not affect oxidative stress levels nor before neither beyond the breakpoint, sex determined an increase of ln(15-F2t-IsoP) only before the breakpoint (+0.62, p < 0.0001).

Conclusions:

Currently, the most precautionary regulatory limit of air-FA exposure in occupational settings is 0.1 ppm (TLW-TVA, i.e. 120 µg/m³). This limit is recommended to protect for eyes and upper respiratory tract irritation. However, our results highlighted that slightly lower exposures can induce a biological effect, which should deserve consideration from Primary Prevention perspective. Since oxidative stress may evolve in future diseases, it would be advisable considering to tailor the regulatory limits to such a pre-pathological condition rather symptoms onset.

Key messages:

- Occupational exposure to air-FA is able to induce systemic oxidative stress even below the regulatory limit, independently from age and sex.
- Future updates of the regulatory limits in force may consider pre-pathological conditions, such as oxidative stress, rather symptoms onset.