

Genotoxic damage in workers exposed to pigment-grade titanium dioxide (TiO₂) during paint production

Sara Bonetta

Sa Bonetta¹, M Macri¹, M Acito², Si Bonetta¹, G Castrignano³, I Fenoglio³, E Bergamaschi¹, E Carraro¹

¹Department of Public Health and Pediatrics, University of Torino, Turin, Italy

²Department of Pharmaceutical Sciences, University of Perugia, Perugia, Italy

³Department of Chemistry, University of Torino, Turin, Italy
Contact: sara.bonetta@unito.it

TiO₂ is broadly used in a wide range of applications such as photocatalysis, pigments and additives. Despite the promising commercial opportunities, different studies have shown that TiO₂ can induce oxidative stress, inflammatory and genotoxic effects. The European Union has classified certain titanium dioxide powders and powder mixtures containing TiO₂ as a

suspected carcinogen (Category 2) via inhalation. Considering that the information about the potential adverse health effects of TiO₂ in occupational environment are still scarce and controversial, the purpose of the study was to investigate the genotoxic effects and oxidative stress in workers exposed to TiO₂ during paint production.

Biomarkers of early effect (DNA damage and micronuclei) were evaluated in the buccal cells and salivary leucocytes of 30 workers (15 production workers and 15 controls). To collect information about personal details, occupational history, medication, smoking, diet, physical activity, a questionnaire was administered to all workers. Personal and area monitoring have been carried out to determine airborne inhalable and respirable fraction of TiO₂; a NanoTracer was used to monitor the presence of ultrafine particles.

In spite of the low mass concentration and a mild percentage of nanoparticles, filter deposited TiO₂ was in sub-micron size, thus accounting for its respirability. Preliminary results on salivary leucocytes show a slight higher DNA damage in the exposed workers as compared to the controls.

Whereas biomarker assessment is still in progress, these preliminary findings show that workers are exposed to low but measurable levels of TiO₂ able to induce a mild genotoxic damage. A combined approach using both personal exposure assessment and biomonitoring can improve the risk assessment in occupational settings in which TiO₂ is handled. Moreover, this also suggest to take precautionary measure during specific activities and operational phases thus decreasing the risks for worker.

Key messages:

- The results of the present study may promote effective risk management practices in occupational environments that uses TiO₂.
- The results obtained suggest the introduction of activities and operational phases with lower risks for the worker.