NANOTOXICITY OF DIFFERENT TiO_2 NANOPARTICLES TO HUMAN KERATINOCYTES

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Introduction

The increased use of nano-sized materials in the past several years has triggered the scientific community to study the potential hazards of these unique materials. Titanium dioxide (TiO_2) occurs primarily in the form of rutile, anatase, and brookite. Here we have studied 4 different TiO_2 nanoparticles (NM 102, 103, 104, and 105) provided by JRC (Ispra, Italy) and widely used in daily life.

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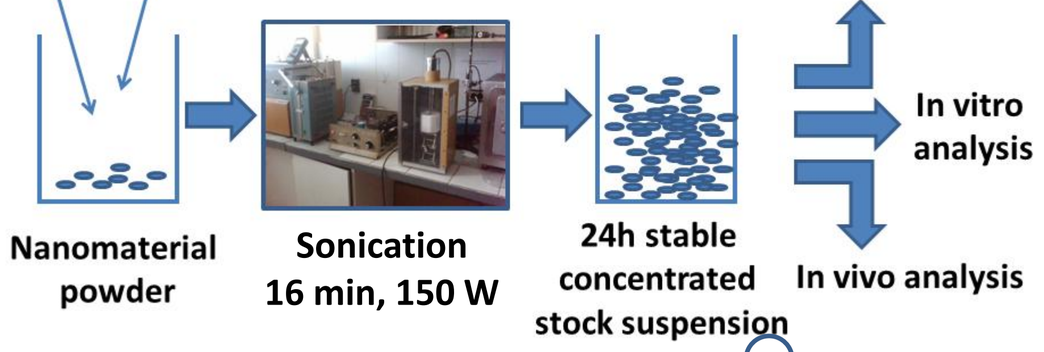
WP1 Coordination | **WP2** Dissemination | **WP3** Evaluation | **WP4** Characterization | **WP5** In vitro analysis | **WP6** In vivo analysis | **WP7** Toxicokinetics

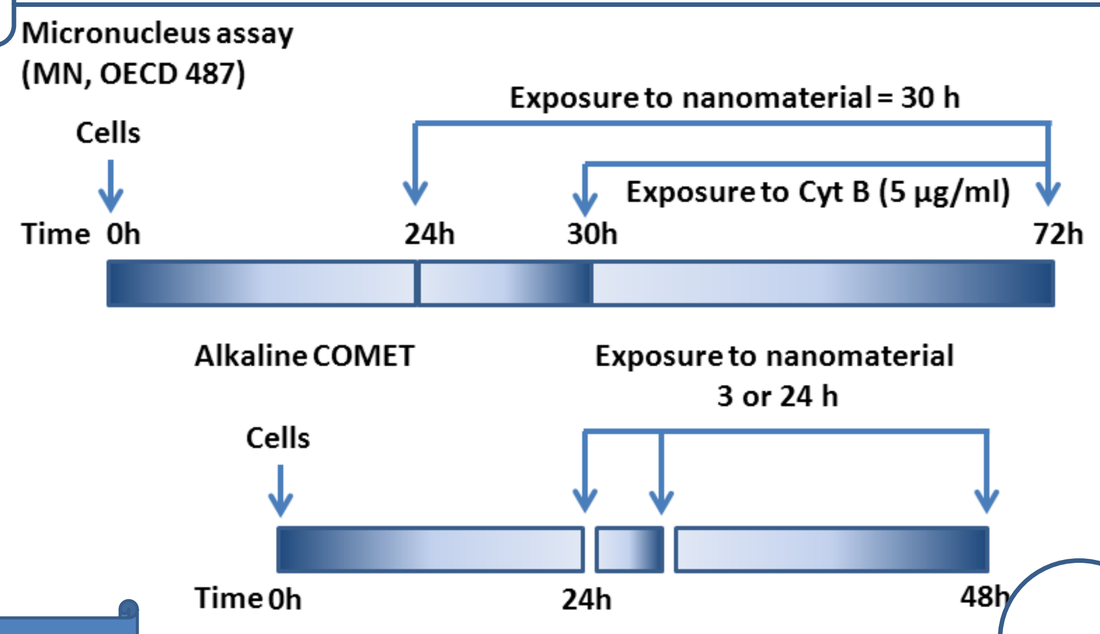
WP4



Size, shape, polydispersity, specific surface area, impurities, surface modification, suspension stability – studied by XDR, Raman, TEM, SEM, AFM, BET, SAXS, ICP-MS/ AAS, MALDITOF, Dustiness, DLS, etc.

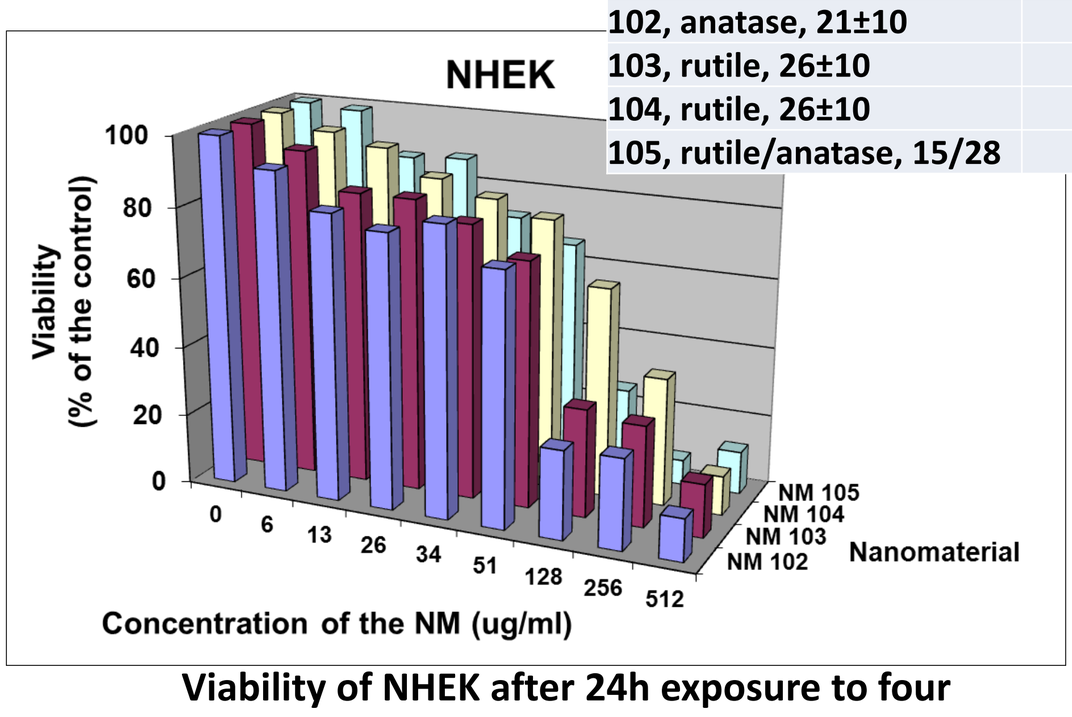
WP5

Aim (3): To test the cytotoxic and genotoxic effects of different manufactured TiO_2 NM on Normal Human Epidermal Keratinocytes (NHEK) and immortal one (HaCaT).

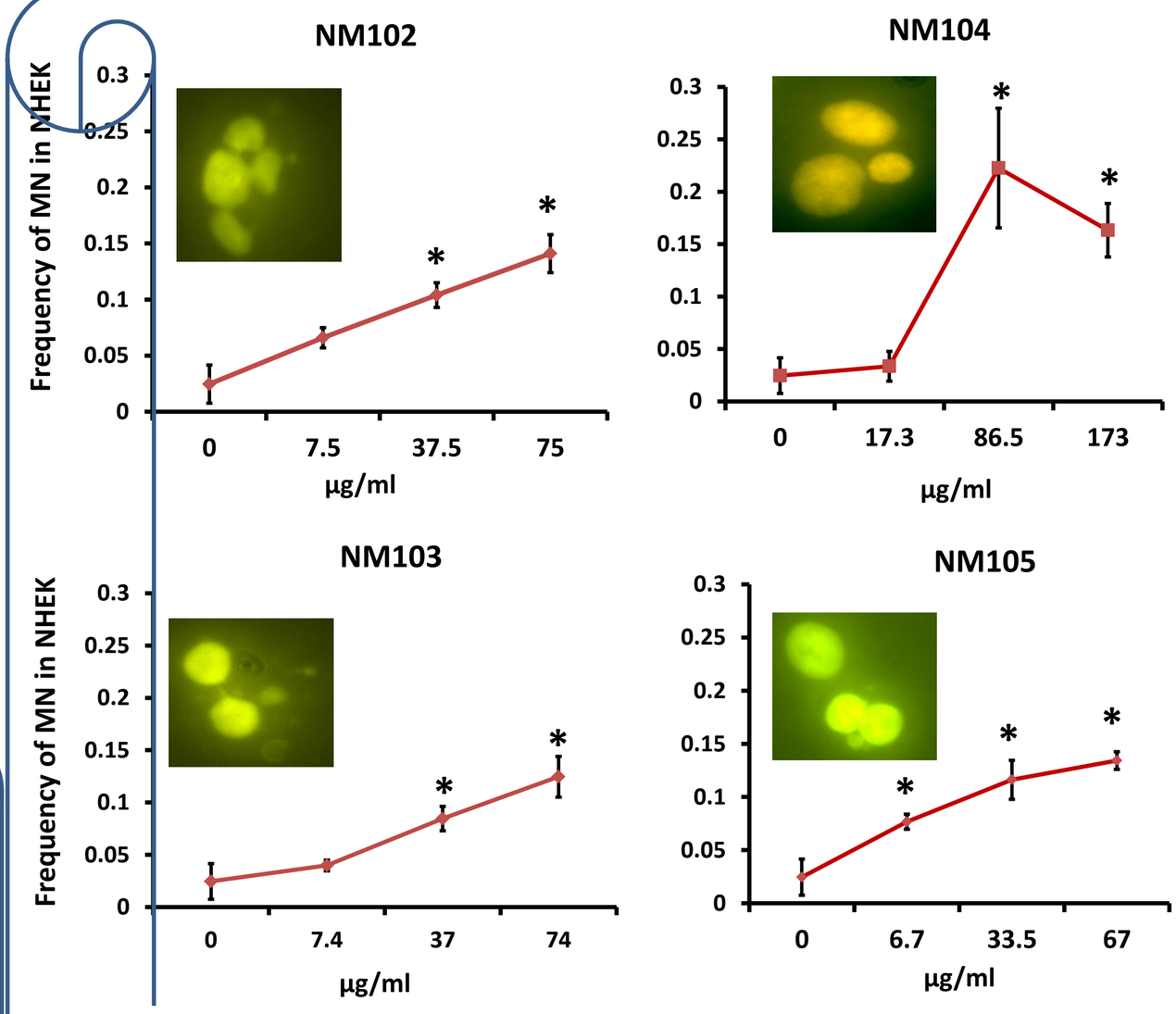


Results

Nanomaterial Form, Size (nm)	EC_{50} [µg/ml]
102, anatase, 21±10	75
103, rutile, 26±10	74
104, rutile, 26±10	173
105, rutile/anatase, 15/28	67

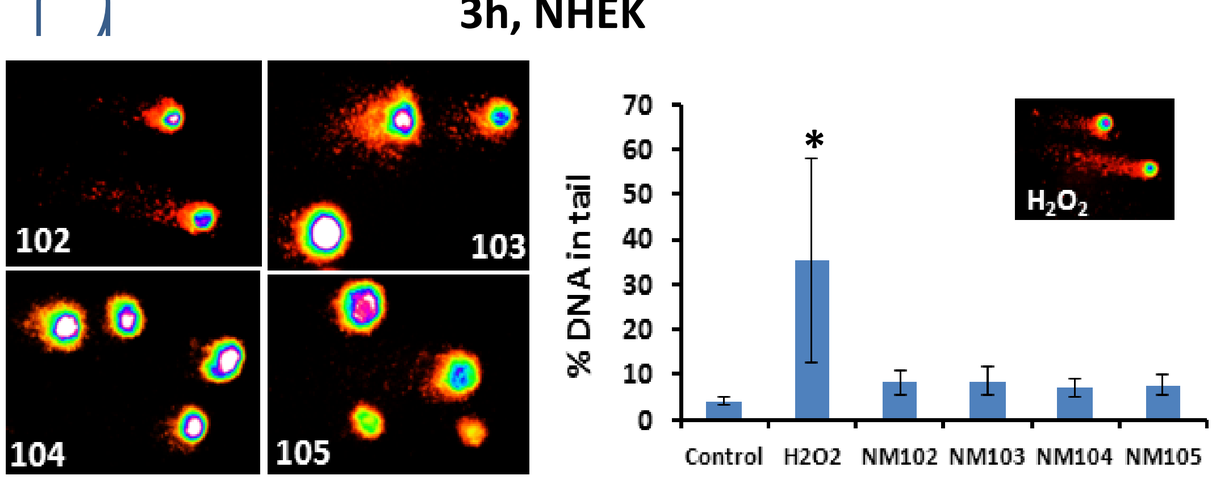


Viability of NHEK after 24h exposure to four TiO_2 nanomaterials tested by Trypan blue method (n=10).



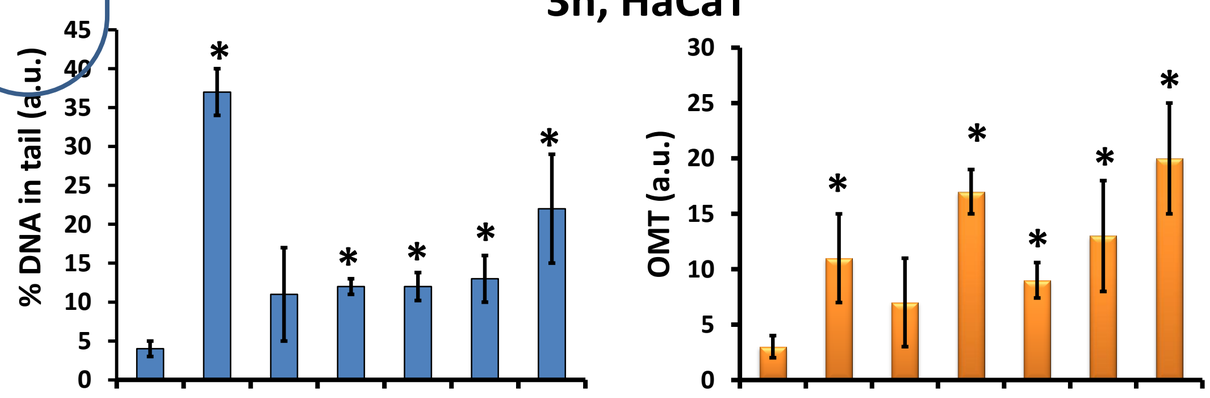
Micronucleus (MN) content analysis after 30-h exposure to TiO_2 nanomaterials. The mean frequencies of micronucleated binucleate cells among all binucleate cells (n=1000). Error bars show SD. *p< 0.05 compare to the control cells.

3h, NHEK



Alkaline Comets Assay. Mean DNA damage (% DNA in tail) after exposure to equitoxic EC_{50} TiO_2 nanomaterials in normal human epidermal keratinocytes (NHEK). n=1000. Error bars show SD. *p< 0.05 compare to the control cells.

3h, HaCaT



24h, HaCaT

Alkaline Comets Assay. Mean DNA damage (% DNA in tail) and Olive tail moment after exposure to equitoxic EC_{50} TiO_2 nanomaterials in HaCaT cells following 3 or 24h exposure. 110 – 5µM ZnO NM. n=1000. Error bars show SD. *p< 0.05 compare to the control .

Conclusions

Synthetic nanosized TiO_2 are able to induce cytotoxicity and to produce DNA damage in keratinocytes by clastogenic mechanisms.

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