Influence of temperature on *Saccharomyces cerevisiae* UE-ME_3 response to titanium dioxide nanoparticles

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Titanium dioxide is a polymorphic material which can be found in nature in three mineral phases: rutile, anatase and brookite, the most unstable and of less interest. The form of NP-rutile TiO_2 (<100 nm) is described as one of the most toxic compound. While living organisms have been exposed with nanoparticles from millions of years ago and may be adapted to low levels of these materials, the increase of industrial capacity of synthesis, manipulation and massive use in electronic, energy and catalysis processes has increase the environmental levels of nanomaterials in several regions of the planet. The nanotoxicology is an emerging field for research, since fixed mass, density and surface reactivity are features of nanoparticles that contribute for the generation of ROS. The main intention of this work was to determine the influence of temperature and titanium dioxide nanoparticles on the growth of *S. cerevisiae* UE-ME_3, a wine wild-type strain of Alentejo, Portugal.

Cells growing at mid exponential phase in liquid YEPD medium with 2 % (w/v) glucose, at 28 or 40 ºC, were exposed during 200 min to 0.1 or 1.0 µg/mL of titanium dioxide nanoparticles (NP-TiO_2), prepared by sonication, at same temperature conditions. Samples of each treatment were used to obtain the post-12000 *g* supernatant for proteins, glutathione, ROS, MDA contents as well as GR, GPx, CAT A and LOX activities determinations [1, 2, 3, 4, 5, 6, 7, 8, 9].

The results show that the temperature influence differently the response of *S. cerevisiae* UE-ME_3 to titanium nanoparticles, since cells grown at 28 °C show dry weight, protein and glutathione contents higher than values determined in yeast cells grown at 40 ºC. In addition, it was observed a significant increase of glutathione content in cells exposed to nanoparticles at 28 ºC, response only observed in cells grown in the presence of 0.1 µg/mL of NP-TiO_2 at 40 ºC. However the GSH /GSSG ratio is greater in yeast cells grown at 40 °C, response which can be interpret by a sharp decrease of glutathione disulfide content, apparently justified by a significant decrease of GPx activity, more evident effect in cells exposed to NP-TiO_2. Furthermore, *S. cerevisiae* grown in presence of 1µg/mL NP-TiO_2 at 28 ºC reveal a lower value of GPx activity, as well as, higher values of ROS contents and LOX activity than control, which can explain the elevated MDA contents in these cells. In other hand the values of CAT A, LOX enzyme activities and ROS are significantly highest in cells grown at 28 °C. However, there was a significant decrease in CAT A and LOX activities, as well as, an increase of ROS in cells grown in the presence of 0.1µg/mL NP-TiO_2 at 28 °C. These results suggest that NP-TiO_2 at 28 °C induces oxidative stress and cell death. Although the biomass markers suggest a decrease of cell survival in cultures at 40 ºC, this response probably result from surface interaction of nanoparticles on cell membranes and denaturating effects induced by temperature.

Keywords: *yeast, titanium dioxide nanoparticles, oxidative stress*

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