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Aerobic fermentation of *Saccharomyces cerevisiae* may be reversed by exposure to titanium dioxide nanoparticles under heat shock

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Saccharomyces cerevisiae preferentially uses its own fermentative metabolism when grown in glucose-rich media, even under fully aerobic conditions. This process involves the decarboxylation of pyruvate to acetaldehyde by means of pyruvate decarboxylase, followed by the reduction of acetaldehyde to ethanol, catalysed by alcohol dehydrogenase. Although nanoparticles may disturb biochemical processes, no studies were found which describe the modulation of energetic metabolism by nanoparticles under heat shock conditions. In this paper, it was observed that the addition of glucose to *S. cerevisiae* UE-ME$_3$ grown in a respiratory medium caused an increase in cell viability and in the fermentative enzyme activities. In addition, yeast cells grown in respiratory-fermentative conditions exposed to titanium dioxide nanoparticules <100 (5 μg/mL) and heat shock (28/40 °C), in the last 100 min of the culture, showed a negative modulation of the aerobic fermentation in this wild-type wine yeast from the Alentejo (Portugal).

Keywords yeast cell viability, pyruvate decarboxylase, alcohol dehydrogenase, nanomaterials, temperature

1. Introduction

Most yeast species are able to convert sugars in the form of glucose into ethanol and carbon dioxide by the fermentation pathway or into carbon dioxide and water by the respiratory route. [1,2,3]. Although the environmental O_2 level is a key regulator of glucose metabolism in yeasts, fermentation often predominates over