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EFFECTS OF THE METALLOID OXYANION TELLURITE ON GROWTH OF THE YEAST *SACCHAROMYCES CEREVISIAE*

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The tolerance of microorganisms to potentially toxic metals has received considerable attention. Microbial resistance to the metalloid tellurium (Te) as potassium tellurite, a higly toxic compound, is poorly understood but is thought to be associated with tellurite reduction and precipitation of metallic tellurium . Growth in the presence of tellurite is often associated with reduction of the oxyanion to Te°, which leads to blackening of the cells due to either cytoplasmic or periplasmic Te° crystalline precipitates (Zannoni et al., 2008). The capacity to reduce Te is not restricted to prokaryotes, as eukaryotes, including fungi, yeasts and plants, as well as animal tissues may carry out various reactions leading to black Te° precipitates (Zannoni et al., 2008). To gain insight about the nature of such biological mechanisms, the objective of the present work was to analyze the effects of potassium tellurite on growth, survival and micro-morphology of the model yeast, *Saccharomyces cerevisiae*. The yeast strains Sc57 rho$^+$ and its rho° derivative Sc57-R3 (Del Giudice et al., 2005) were used. Both rho$^+$ and rho° strains grew on a fermentable carbon source with up to 1.2 mM K_2TeO_3, while rho$^+$ yeast cells grown on a non-fermentable carbon source were inhibited at tellurite levels as low as 50μM suggesting that this metalloid specifically inhibited mitochondrial functions. Growth of rho$^+$ yeast cells in the presence of increasing amount of tellurite resulted in dose-dependent blackening of the culture, a phenomenon not observed with rho° cultures. The percentages of Sc57 and Sc57-R3 colony forming survivors were determined for cells growing in media containing glucose and different potassium tellurite concentrations. The number of viable cells of both strains decreased by increasing the potassium tellurite concentration in the media, while the addition of Bacto peptone in the media increased the percentage of viable cells in presence of tellurite suggesting an antagonistic metabolic reaction between Bacto peptone into the media and potassium tellurite. To analyze the tellurium uptake by yeast cells, Sc57 cultures growing in YED (yeast extract and glucose) media containing potassium tellurite were observed microscopically. Transmission electron microscopy (TEM) of *S. cerevisiae* rho$^+$ cells grown in the presence of tellurite showed that blackening was likely due to elemental tellurium (Te°) that formed large deposits along the cell wall and small precipitates in both the cytoplasm and mitochondria. The exact location of Te° grains in this organelles (i.e., the internal membrane of mitochondrial crests or the interspace between the internal and external mitochondrial membranes) remains to be

established. Nevertheless, the TEM data support the above-mentioned hypothesis that mitochondria may be involved in both tellurite reduction to Te° and, very likely, tellurite toxicity in *S. cerevisiae* (Massardo et al., 2009).

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- Zannoni et al.. Adv Microb Physiol 53, 1-72 (2008)
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