Engineered *Saccharomyces cerevisiae* Strain for the Detection of Metal Stress

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INTRODUCTION: The conventional analytical techniques for detection of heavy metals, such as atomic absorption spectrometry, are precise, but are expensive and demand proper training in order to use them. Microbial biosensors have many advantages compared to conventional analytical techniques like specificity, low cost and portability. Besides, they are cheaper than enzymes and antibodies, which are the most common type of biosensors used, and have higher tolerance to pH and temperature variations. **OBJECTIVE:** Toward this goal, we engineered a *Saccharomyces cerevisiae* strain to monitor cadmium stress. This metal is a serious environmental toxicant, being classified by the International Agency for Research on Cancer as a group I carcinogen for humans. Cd^{2+} concentration in Brazilian agricultural soils is around 30 µM, a level able to inhibit more than 60% human DNA-MMR repair system. **MATERIAL AND METHODS:** In this study, a sensor strain containing the l*acZ* gene reporter driven by the PvSR2 (Stress-Related gene number 2 of *Phaseolus vulgaris*) Cd^{2+}-inducible promoter was constructed. To evaluate the capacity of the recombinant yeast to respond to Cd^{2+}, the cells were exposed to increasing concentrations of the metal and beta-galactosidase activity was measured. **RESULTS AND DISCUSSION:** The *lacZ* expression was increased up to 50 µM of Cd^{2+}, in a dose dependent way, but sharply decreased at higher concentrations. Yeasts showed to be sensitive to Cd^{2+} concentrations higher than 50 µM, which could explain the decrease in beta-galactosidase activity at high concentrations. At this range of concentration, zinc and copper were not capable to induce *lacZ* expression. **CONCLUSIONS:** The approach of engineering *S. cerevisiae* with PvSR2-gene reporter seems to be very promising to monitor cadmium. In order to increase the specificity and robustness of the PvSR2 promoter, a series of 5' deletions was prepared and are under analysis.

Keywords: biosensor, cadmium, *Saccharomyces cerevisiae*, *lacZ*.
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