The interplay between sulphur and selenium metabolism influences the intracellular redox balance in Saccharomyces cerevisiae

Selenium (Se) is an essential element for most eukaryotic organisms, including humans. The balance between Se toxicity and its beneficial effects is very delicate. It has been demonstrated that a diet enriched with Se has cancer prevention potential in humans. The most popular commercial Se supplementation is selenized yeast, which is produced in a fermentation process using an inorganic source of Se. Here, we show that the uptake of Se, Se toxic effects and intracellular Se-metabolite profile are largely influenced by the level of sulphur source supplied during the fermentation. A Yap1-dependent oxidative stress response is active when yeast actively metabolizes Se, and this response is linked to the generation of intracellular redox imbalance. The redox imbalance derives from a disproportionate ratio between the reduced and oxidized forms of glutathione and also from the influence of Se metabolism on the central carbon metabolism. The observed increase in glycerol production rate, concomitant with the inhibition of ethanol formation in the presence of Se, can be ascribed to the occurrence of redox imbalance that triggers glycerol biosynthesis to replenish the pool of NAD+.

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