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+.

General information
State: Published
Organisations: National Food Institute, Division of Food Chemistry, Chalmers University of Technology
Contributors: Mapelli, V., Hillestrøm, P. R., Patil, K., Larsen, E. H., Olsson, L.
Pages: 20-32
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: F E M S Yeast Research
Volume: 12
Issue number: 1
ISSN (Print): 1567-1356
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.91 SJR 1.308 SNIP 0.787
Web of Science (2017): Impact factor 2.609
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.51 SJR 1.254 SNIP 0.855
Web of Science (2016): Impact factor 3.299
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.56 SJR 1.196 SNIP 0.741
Web of Science (2015): Impact factor 2.479
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.37 SJR 1.076 SNIP 0.831
Web of Science (2014): Impact factor 2.818
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.5 SJR 1.248 SNIP 0.863
Web of Science (2013): Impact factor 2.436
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.56 SJR 1.192 SNIP 0.841
Web of Science (2012): Impact factor 2.462
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.54 SJR 1.221 SNIP 1.018
Web of Science (2011): Impact factor 2.403
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.043 SNIP 0.92
Web of Science (2010): Impact factor 2.279
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.977 SNIP 0.814
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.456 SNIP 1.02
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.231 SNIP 1.075
Scopus rating (2006): SJR 1.061 SNIP 1.084
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.208 SNIP 1.079
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.116 SNIP 1.205
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.664 SNIP 0.793
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.438 SNIP 0.396
Web of Science (2002): Indexed yes
Web of Science (2001): Indexed yes
Original language: English
Keywords: intracellular redox balance, oxidative stress response, Fungi Plantae (Fungi, Microorganisms, Nonvascular Plants, Plants) - Ascomycetes [15100] Saccharomyces cerevisiae species strain-MATa, strain-pRSGFP-YAP1, strain-MATa ura3-52, strain-MAL2-8C, strain-SUC2, strain-CEN.PK113-5D, strain-CEN.PK113-7D, carbon 7440-44-0 metabolism, ethanol 64-17-5, glycerol 56-81-5 biosynthesis production, NAD 53-84-9, oxidized glutathione 27025-41-8, selenium 7782-49-2 toxin metabolism, sulfur 7704-34-9 metabolism, Yap1, 10060, Biochemistry studies - General, 10062, Biochemistry studies - Nucleic acids, purines and pyrimidines, 13002, Metabolism - General metabolism and metabolic pathways, 22501, Toxicology - General and methods, 51519, Plant physiology - Metabolism, Metabolism, Toxicology
DOIs: 10.1111/j.1567-1364.2011.00757.x
Source: dtu
Source-ID: n:oai:DTIC-ART:biosis/320795197::24951
Research output: Research - peer-review; Journal article – Annual report year: 2012