Glucose-based microbial production of the hormone melatonin in yeast Saccharomyces cerevisiae - DTU Orbit (21/01/2019)

Glucose-based microbial production of the hormone melatonin in yeast Saccharomyces cerevisiae

Melatonin is a natural mammalian hormone that plays an important role in regulating the circadian cycle in humans. It is a clinically effective drug exhibiting positive effects as a sleep aid and a powerful antioxidant used as a dietary supplement. Commercial melatonin production is predominantly performed by complex chemical synthesis. In this study, we demonstrate microbial production of melatonin and related compounds, such as serotonin and N-acetylserotonin. We generated Saccharomyces cerevisiae strains that comprise heterologous genes encoding one or more variants of an L-tryptophan hydroxylase, a 5-hydroxy-L-tryptophan decarboxylase, a serotonin acetyltransferase, an acetylserotonin O-methyltransferase, and means for providing the cofactor tetrahydrobiopterin via heterologous biosynthesis and recycling pathways. We thereby achieved de novo melatonin biosynthesis from glucose. We furthermore accomplished increased product titers by altering expression levels of selected pathway enzymes and boosting co-factor supply. The final yeast strain produced melatonin at a titer of 14.50 ± 0.57 mg L⁻¹ in a 76h fermentation using simulated fed-batch medium with glucose as sole carbon source. Our study lays the basis for further developing a yeast cell factory for biological production of melatonin.

General information
State: Published
Organisations: iLoop, Novo Nordisk Foundation Center for Biosustainability, Research Groups, Applied Metabolic Engineering, Yeast Metabolic Engineering
Number of pages: 8
Pages: 717-724
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Biotechnology Journal
Volume: 11
Issue number: 5
ISSN (Print): 1860-6768
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.12
Web of Science (2017): Impact factor 3.507
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.2 SJR 1.29 SNIP 0.969
Web of Science (2016): Impact factor 3.649
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.91 SJR 1.172 SNIP 0.874
Web of Science (2015): Impact factor 3.781
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.98 SJR 1.189 SNIP 1.062
Web of Science (2014): Impact factor 3.49
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.01 SJR 1.136 SNIP 1.093
Web of Science (2013): Impact factor 3.708
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.4 SJR 0.944 SNIP 0.957
Web of Science (2012): Impact factor 3.446
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.94 SJR 0.785 SNIP 0.726
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.787 SNIP 0.798
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.695 SNIP 0.749
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.581 SNIP 0.806
Scopus rating (2007): SJR 0.568 SNIP 0.709
Web of Science (2007): Indexed yes
Original language: English
Keywords: Melatonin, Serotonin, Microbial production, EasyClone vectors, Saccharomyces cerevisiae
Electronic versions:
Glucose_based_microbial_production_of_the_hormone_melatonin_in_yeast_Saccharomyces_cerevisiae.pdf
DOIs:
10.1002/biot.201500143

Bibliographical note
This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.
Source: FindIt
Source-ID: 2290040427
Research output: Research - peer-review › Journal article – Annual report year: 2015