

综述

致病真菌抗药性机制的研究进展

马宁, 崔志峰

(浙江工业大学生物与环境工程学院, 浙江 杭州 310032)

收稿日期 2009-11-2 修回日期 网络版发布日期 2010-9-27 接受日期 2010-4-2

摘要 随着抗真菌药物的长期大量使用, 致病真菌对药物的抗药性逐年增多, 给真菌感染性疾病的防治带来了巨大的困难。目前, 危害人类健康最严重的3种致病真菌是烟曲霉 (*Aspergillus fumigatus*)、白色假丝酵母 (*Candida albicans*) 和新型隐球酵母 (*Cryptococcus neoformans*)。这些病原真菌产生抗药性的机制主要有4类, 通过改变细胞内药物靶点结构以阻碍药物与之结合, 提高多药转运蛋白的表达使药物从细胞中排除, 细胞的补偿机制及生物被膜机制。另外, 病原真菌在药物环境压力下可激活一系列感知和应对环境压力的信号传导级联机制和分子伴侣, 如钙调神经磷酸酶途径、分子伴侣热激蛋白90、环磷酸腺苷/蛋白激酶A信号传导途径、酪蛋白激酶2、蛋白激酶C细胞壁完整性信号传导途径、以及糖磷脂酰肌醇修饰蛋白均与真菌抗药性有关。本文综述了上述3种病原真菌产生抗药性的机制及其涉及的信号传导途径, 为进一步研究和有效防治真菌感染性疾病提供参考。

关键词 [抗药性, 多种, 真菌](#) [分子作用机制](#) [信号传导](#)

分类号 [R966](#), [R978.5](#)

Research progress of drug resistance mechanisms of fungal pathogens

MA Ning, CUI Zhi-feng

(College of Biological and Environmental Engineering, Zhejiang University of Technology, Hangzhou 310032, China)

Abstract

Over the past decades, due to the long-time and large-scale use of various antifungal drugs, drug-resistant isolates have kept emerging year after year, making extremely difficult the prevention and treatment of fungal infective diseases. *Aspergillus fumigatus*, *Candida albicans*, and *Cryptococcus neoformans* are currently three major harmful fungal pathogens, which, in most cases, are life-threatening. The fungal drug-resistance occurs mainly through four mechanisms: alterations in the drug target that block drug binding, increased production of multidrug transporters that remove the drug from the cells, development of bypass pathways, and formation of biofilm. Besides, there are six signal transduction pathways which have been proved to contribute to drug-resistance of fungal pathogens, such as calcineurin signaling pathway, molecular chaperones HSP90, cAMP-protein kinase A signaling pathway, casein kinase 2, protein kinase C cell wall integrity signaling pathway, and glycosylphosphatidylinositol. This review describes recent progress in drug-resistance mechanisms of three major human fungal pathogens. As the activation of chaperones and signal transduction cascades is crucial for the cell to cope with drug-induced stress, the fungal drug-resistance related signal transduction cascades are also summarized.

Key words [drug resistance](#) [multiple](#) [fungal](#) [molecular mechanisms of action](#) [signal transduction](#)

DOI: 10.3867/j.issn.1000-3002.2010.05.011

通讯作者 崔志峰 zfcui@zjut.edu.cn

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(873KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含“抗药性, 多种, 真菌”的 相关文章](#)
- ▶ [本文作者相关文章](#)

- [马宁](#)
- [崔志峰](#)