TPEN, zinc chelator, inhibits biofilm and hyphae formation by *Trichosporon asahii*

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Background

Trichosporon species are the second most common etiological agent in catheter-related fungemia, followed by *Candida* species. However, the clinical outcome of disseminated trichosporonosis is poorer than that of disseminated candidiasis, and the mortality rate is > 70 %. *Trichosporon asahii* is the major causative agent of both disseminated and deep-seated trichosporonosis. This fungus exists both as a yeast and as hyphae and arthroconidia. The assimilation of essential nutrients is critical to the ability of *T. asahii* to proliferate, and to form and maintain biofilms (BFs), an important cause of fungemia. To identify the role played by metal cations in the process, we evaluated the effects of cation chelators on BF formation by *T. asahii*, and on the morphological versatility of this fungus.

Scanning electron micrograph of *T. asahii*

Yeast form of *T. asahii*

Arthroconidia form of *T. asahii*

Anti-biofilm effect by chelators

TPEN, N,N,N',N'-Tetrakis(2-pyridylmethyl)ethylenediamine; DFO, Deferoxamine; TETA, Triethylenetetramine

TPEN (zinc chelator) reduced BF formation more efficiently than did other chelators.

Effect of zinc on biofilm formation

Incubate with TPEN and Zn
Method of BF formation
0 h 1 h 24 h 48 h

Incubate with TPEN → Change medium containing Zn

Adding zinc not only recovered, but also promoted BF formation.

Effect of zinc on morphology

Capacity to produce biofilms

High-BF (H1, H2, H3) and Low-BF (L1, L2, L3) strains were used for the following experiments.

Cell surface hydrophobicity

The cell surface hydrophobicity of the High-BF strains exceeded that of the Low-BF strains.

Relationship between the capacity to form biofilms and morphology

Biofilm formation of *T. asahii*

The adherence of arthroconidia and maturation by hyphal elongation may be critical to BF formation by *T. asahii*.

High-BF strains produced abundant arthroconidia, while Low-BF strains mainly produced hyphae, with a few arthroconidia.

Results and Discussion

- Cation chelation using TPEN (zinc chelator) reduced BF formation more efficiently than did cation chelation using other chelators.
- Adding zinc not only recovered, but also promoted BF formation.
- Zinc promoted hyphal elongation.
- High-BF strains of *T. asahii* produced abundant arthroconidia, while Low-BF strains produced mainly hyphae, with a few arthroconidia.
- The cell-surface hydrophobicity of the High-BF strains exceeded that of the Low-BF strains.
- These results indicated that the arthroconidia of *T. asahii* may contribute to BF formation by promoting cellular adhesion, whereas hyphae form may play a role in BF maturation.