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Phenotypic switch *Candidozyma auris* (*Candida auris*) modulates biofilm formation and virulence genes SAP5 and ALS5 in mono- and co-culture environments with *Staphylococcus aureus*

[Biofouling](#) • Article • 2026 • DOI: 10.1080/08927014.2026.2688203 [Zainal, Mukarramah](#)^{a, b, c} ; [Ibrahim, Mohammad Johari](#)^d; [Mohd Sarmin, Nurul 'Izzah](#)^{b, e}; [Ismail, Soraya](#)^f; [Cirillo, Nicola](#)^g; [+2 authors](#)^a Department of Fundamental Dental & Medical Sciences, Kulliyyah of Dentistry, International Islamic University Malaysia, Kuantan, Malaysia[Show all information](#)

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Abstract

Candidozyma auris (formerly *Candida auris*) (*C. auris*), an emerging multidrug-resistant fungal pathogen, forms biofilms as a virulence factor. This study aimed to determine the effect of phenotypic switch on *C. auris* biofilm formation and virulence gene expression in mono- and co-culture with *Staphylococcus aureus*. Phenotypic switching was induced by prolonged incubation, and biofilms were developed in RPMI-1640, YEPD, SDB, and BHIYE. The biofilm biomass and total cell count were measured. SAP5 and ALS5 gene expression was quantified using qPCR. The 4th switched generation mono-culture biofilm in BHIYE produced the highest biomass (3.34 ± 0.08) and total cell count ($5.66 \pm 0.03 \log_{10}$ cells mL⁻¹). In addition, SAP5 and ALS5 expression peaked in the 2nd switched generation mono-culture by 10.43 $\pm$ 0.44-fold and 4.764 $\pm$ 0.01-fold, respectively. Co-culture biofilms

exhibited significantly higher ALS5 expression in selected switched generations compared to unswitched *C. auris* ($p < 0.05$). In conclusion, phenotypic switching enhanced biofilm formation and modulated the expression of SAP5 and ALS5 in *C. auris*. © 2026 Informa UK Limited, trading as Taylor & Francis Group.

Author keywords

ALS5; biofilm; *Candida auris*; phenotype switch; SAP5; *Staphylococcus aureus*

Indexed keywords

MeSH

Biofilms; *Candida auris*; Coculture Techniques; Fungal Proteins; Gene Expression Regulation, Fungal; Phenotype; *Staphylococcus aureus*; Virulence; Virulence Factors

EMTREE drug terms

fungal protein; virulence factor

GEOBASE Subject Index

bacterium; biofilm; biomass; drug resistance; fungus; gene expression; phenotype; virulence

EMTREE medical terms

biofilm; *Candida auris*; coculture; gene expression regulation; genetics; growth, development and aging; metabolism; pathogenicity; phenotype; physiology; *Staphylococcus aureus*; virulence

Chemicals and CAS Registry Numbers

Unique identifiers assigned by the Chemical Abstracts Service (CAS) to ensure accurate identification and tracking of chemicals across scientific literature.

Fungal Proteins

Virulence Factors

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