Evaluation and Validation of Optimal Laboratory Screening Methods using a Custom Dulcitol Agar and Commercially Available Chromogenic Agars in detecting Candida auris growth

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INTRODUCTION

Candida auris is an emerging multidrug resistant yeast that causes severe invasive infections and nosocomial outbreaks1 with mortality rates ranging from 30-72%. During the COVID-19 pandemic, C. auris outbreaks have been reported in healthcare facilities around the globe2,3,4,5,6, including nosocomial outbreaks of pan-resistant C. auris in the United States. In Canada, 26 cases of C. auris have been reported as of January 2021,7 with the first reported outbreak in a community healthcare facility in the spring of 2018.8

C. auris is considered to be a notable threat to global healthcare because a multidrug resistance is common, limited treatment options, b) its ability to colonize on skin and environmental surfaces allows it to spread between patients in healthcare settings, and c) it can be misidentified by commonly available laboratory identification methods.9 As such, developing a reliable and timely method of identifying C. auris is needed for its management worldwide.

Chromogenic agars are useful in differentiating different Candida species from each other; the novel chromogenic medium Colorex Candida Plus claims to allow for specific differentiation of C. auris from other Candida species which is unique compared to conventional mycological media and other chromogenic media10,11,12. The unique ability for C. auris to assimilate dulcitol, unlike other common Candida species13,14, makes dulcitol useful in selective broth15 and gives it potential for use as a selective agar. PCR is known to be a rapid and sensitive screening method for C. auris15,16.

This study aims to determine the optimal screening procedure that can reliably identify C. auris with the shortest turn-around time, by evaluating and comparing screening culture procedures using a custom dulcitol agar (CA), CHROMagar™ Candida (BD, Phoenix), (BD), and Colorex Candida Plus (Micronosty, Ottawa) (M), and molecular methods using polymerase chain reaction testing.

METHODS

- For PCR screening methods (Figure 1c), spiked specimen was directly tested for C. auris using PCR, or incubated for 24 hrs at 37°C in AEB or Brain Heart Infusion (BHI) broth before testing using BioGX C. auris research-use-only PCR using EasyMag (bioMérieux) extraction

RESULTS

Table 1: Proportion of presumptive positives, and MALDI-TOF MS identification from each set of culture parameters.

<table>
<thead>
<tr>
<th>Method</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Day 7</th>
<th>Proportion confirmed as C. auris by MALDI-TOF %</th>
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<tbody>
<tr>
<td>Direct PCR M 37°C</td>
<td>100.00</td>
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<td>AEB-enriched PCR 37°C</td>
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<tr>
<td>BHI-enriched PCR 37°C</td>
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Figure 2: Growth of spiked specimen samples at each set of culture parameters over 5 days. Samples contain C. auris (1) and background non-auris Candida isolates: C. parapsilosis (2), C. lusitaniae (3), C. albicans (4), and C. krusei (5).

CONCLUSIONS AND FUTURE DIRECTIONS

- Direct inoculation on Colorex Candida Plus incubated at 37°C results in growth of morphologically distinct C. auris colonies within two days of inoculation, which can be reliably identified using MALDI-TOF MS. It is the optimal culture-based screening method with the minimal turn-around time.
- Broth-enriched cultures minimized breakthrough of non-auris isolates, but require a 3-day turn-around time. Ability to identify C. auris from broth-enriched cultures inoculated to either CHROMagar™ Candida or Colorex Candida Plus is indistinguishable.
- Direct PCR from specimen had the lowest turn-around time amongst all tested screening methods, and PCR from AE enriched specimen also had a relatively low turnaround time.
- Assessing the limit of detection of these screening methods will be important in determining the potential benefit of AE enrichment.

ACKNOWLEDGEMENTS

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- BD for providing the CHROMagar™ Candida plates
- MicroStatys for providing the Colorex Candida Plus plates
- Thermo Fisher Scientific for providing the AURIS Enrichment Broth
- BioGX for providing the PCR kits

REFERENCES