Rapid Candida Species Identification; Is MALDI-TOF MS The Answer?

Background: The incidence of superficial and deep fungal infections has increased over the last two decades, so much so that Candida species now are the fourth most common cause of bloodstream infections in the United States. It is paramount in these cases that a rapid identification is possible to ensure an appropriate effective course of treatment is made available to the patient. Traditional fungal and yeast identification methods usually involve biochemical, morphological and physiological tests, that can be time consuming and labour intensive. These techniques also require a high level of skill, training and often the personal judgement/experience of a clinical mycologist. More recently molecular methods (e.g. PCR, RAPD, AFLP) have been reported as useful when identifying species and/or require a 24-72h following culture to obtain an identification.

MALDI-TOF MS: Using MALDI-TOF MS it is possible to obtain characteristic fingerprint patterns for Candida species cultured on a variety of media, in minutes rather than hours. The mass spectral fingerprint patterns obtained were used to identify yeast strains to species level and can reduce the time to identification to around 8 minutes.

Methods

- **Candida albicans:** CM0041, OXOID, Basingstoke, UK
- **Candida glabrata:** CM1002, OXOID, Basingstoke, UK
- **Candida dubliniensis:** CM1003, OXOID, Basingstoke, UK
- **Columbia agar with horse blood:** CBA, PHIL022, OXOID, Basingstoke, UK

Incubation Conditions:
- 24h at 37°C aerobically
- 24h at 30°C aerobically

MALDI Matrix:
- 0.1% formic acid, 0.01 M 18-crown-6.
- Matrix solvent: acetonitrile:methanol:water (1:1:1), 0.1% formic acid, 0.01 M 18-crown-6.

Peptide bonds are cleaved by the action of matrix-assisted laser desorption ionization and negative electrospray ionization. The resulting ions are identified using MALDI-TOF MS and database searching produced identification at the species level. The use of MALDI-TOF MS has been on the increase over the last decade, so much so that it is paramount in these cases that a rapid identification is possible to ensure an appropriate effective course of treatment is made available to the patient.

Conclusions

- A distinctive fingerprint for the Candida genus is evident, although culture dependent (Fig 1).
- Slight spectral differences between Candida species are observed when cultured on CBA and SAB (Fig 2 & 4).
- Spectral differences between Candida species are enhanced when cultured on Chromo agar (Fig 3).
- Database searching produced identification at the species level (Fig 5).

Further Work

- Extend work to include:
  - More strains
  - More species
  - More yeasts/hosts

References

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