Are we neglecting the importance of azole resistance screening in Indoor Air Quality assessments?

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The microbial exposure as well as their metabolic products has been frequently reported as a high risk of respiratory effects and general health hazards[1].

Regarding the Portuguese legislation for IAQ, the microbial assessment covers **only air sampling and culture-based methods** (malt extract agar as only culture media to be applied)[2]

Fungal legal criteria consist of fungal load ratio between indoor and outdoor, which should be lower than 1 (I/O<1)[1].

Purpose: Analyze the importance of including the characterization of the azole resistance profile in indoor air quality assessments.

METHODS

Primary health care centers (PHCC) (N=10) Firefighters headquarters (FFH) (N=11)	Samples extraction	Fungal culture	Azole screening	Fungal identification and susceptibility
Active sampling methods (air sampling)	• 0.1% Tween™ 80 saline solution (NaCl 0.9%) • 30 min, 250 rpm	• Malt extract agar (MEA) with 0.05% chloramphenicol • Dichloran-glycerol agar (DG18) • 5-7 days, 27 ºC	• Azole-supplemented Sabouraud (SAB) media • 4 µg/mL itraconazole (ITR) • 2 µg/mL voriconazole (VOR) • 0.5 µg/mL posaconazole (POS) • 3-4 days, 27 ºC	• Macro and microscopic morphology • Minimum inhibitory concentration (MICs for amphotericin B, POS, ITR and VOR with *Aspergillus* section *Fumigati* isolates by E-test gradient tips
Passive sampling methods (EDC, swabs, settled dust, mops and cleaning cloths, HVAC filters, ….)				






RESULTS

- In six PHCC, four fungal species, collected from the HVAC filters, were observed in at least one azole-supplemented media: *Chrysosporium* sp., *Cladosporium* sp., *Mucor* sp. and *Penicillium* sp..
- The most prevalent species were *Cladosporium* sp. (91.5%, 50%, and 81.3%) and *Penicillium* sp. (6.4%, 45.5%, and 18.8%) on ITR-, VOR- and POS-media, respectively.
  - No *Aspergillus* sp. was observed in azole-supplemented media.

- The highest *Cladosporium* sp. prevalence among passive sampling (electrostatic dust cloths - EDC, cleaning cloths, mops, uniform name tags, filters, and settled dust) was observed on filters (91.1%, 72.1%, and 77.9%) on ITR-, VOR- and POS-media, respectively.
- *Aspergillus* sp. low frequencies (0.1% to 1.1%) were observed, mostly from EDC (3.4% and 3.2% on ITR- and VOR-media, respectively), and in filters (0.03% on ITR).
  - Six *Aspergillus* sections were observed on SAB (80.6% *Candidi:* 8.9% *Fumigati*; 3.3% *Nidulantes*; 3.3% *Circumdati*; 2.9% *Nigri*; 1.2% *Flavi*); 100% *Fumigati* on ITR; and 97.1% *Fumigati* and 2.9% *Nidulantes* on VOR.
- Considering the MIC values of >2 µg/ml for amphotericin B, ITR or VOR, or > 0.25 µg/ml for POS as cutoff values, 36% *Fumigati* isolates could be considered resistant.

DISCUSSION

- The **passive sampling methods allowed to obtain the azole resistance profile in both indoor environments**, enabling the characterization of contamination from a longer period of time than air sampling [1].
- Even when complying with IAQ legislation (quantitative cut off), fungal species should be identified[1].
- **Significant levels of azole resistance**, specifically for *Aspergillus* section *Fumigati,* **was found on FFH** , following the trend of other non-clinical environments[3].

CONCLUSION

- The occurrence of fungi with reduced azole susceptibility in PHCC and FFH raises awareness and concern about **antifungal resistance in these settings**.
- **Passive sampling** should be considered when assessing IAQ.
- Other indoor environments besides health care facilities should be assessed for **azole resistance when performing IAQ assessments.**

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