Indoor Air Quality: Focus on Fungi

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Aim:

To perform an indoor air quality evaluation assessing the fungal communities present in the air and surfaces of four selected Portuguese Archives. The study also includes the surface sampling of ancient documents.

Chemical assessment and Biological Assessment

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Methods:

– Chemical assessment

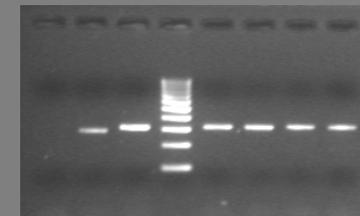Handheld 3016 IAQ

Multi Rae and Babuc

Equipment used in the chemical evaluation of the environment. 15 rooms were analysed so far

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Methods:

– Biological assessment

Culture media: Agar, MEA and DG18

DNA extraction

Amplification of the ITS2 and D2 genomic regions

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Results: Chemical assessment

Parameter	Sampling site				
	Exterior (ref. point)	A	B	C	D
O_3 (ppm)	<u>0,59</u>	<u>0,7</u>	<u>0,69</u>	<u>0,7</u>	<u>0,68</u>
Formaldehyde (ppm)	0	0,003	0,002	0	0
CO (ppm)	0	1	0	0	0
VOCs (ppm)	0	0	<u>2</u>	<u>2,6</u>	0
CO2 (ppm)	449	604	504	471	451
Particulate matter (PM10) mg/m3	0,042	0,129	0,047	0,033	0,147
Temp.(ºC)	9,9	17	18,1	18,6	15,4
RH(%)	51,4	47,5	<u>70,2</u>	<u>77,1</u>	46,2

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Results: Biological assessment

Site	Fungi identified	CFU/m^3	Total
Exterior	*Aspergillus terreus*	4	**136**
	Aureobasidium sp.	16	
	Fusarium incarnatum	12	
	Alternaria sp.	12	
	Aspergillus ochraceus	4	
	Ulocladium sp.	4	
	Cladosporium sp.	56	
	Penicillium sp.	12	
	Rhodotorula sp.	4	
	Yeasts	12	
Office	*Aspergillus* sp.	8	**96**
	Penicillium sp.	12	
	Alternaria sp.	12	
	Graphium sp.	12	
	Cladosporium sp.	24	
	Paecilomyces sp.	4	
	Yeasts	24	
Archive	*Aspergillus ochraceus*	8	**36**
	Paecilomyces sp.	4	
	Geotrichum sp.	4	
	Yeasts	20	

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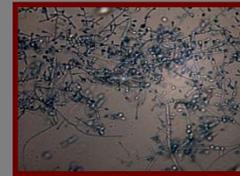## Results : Biological assessment

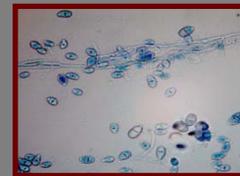*Stachybotrys* sp, a potentially toxinogenic fungi
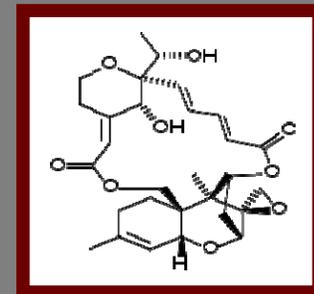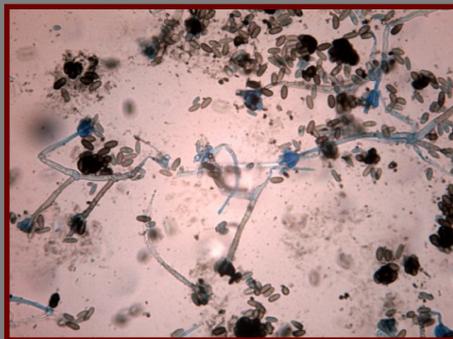
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Results: Biological assessment

When there is growth, identification of fungi in culture media

Chaetomium sp. and *Chrysosporium* sp. (400x)

Curvularia sp. and *Tricothecium* sp. (400x)

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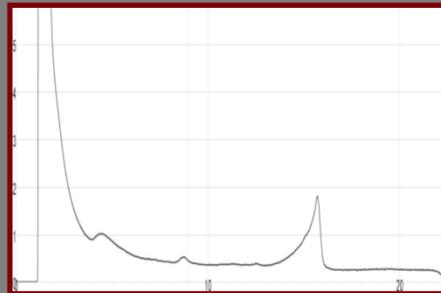
Results: Biological assessment

When there is no growth the identification of fungi is performed through molecular biology methods

DNA extraction
ITS2 and D2 amplification

DHPLC chromatograms:
DNASep Cartridge 0.5mL/min,
Wave optimized buffers A and B,
gradient 55%B at 61°C

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Conclusions (so far..):

1.The chemical assessment performed alerted for values above the national norm (annex VII, decree-law n. 79/2006) regarding human health (O_3 and VOCs). For conservation purposes, the ozone level was also found to be higher than desirable.

2. The biological assessment of the environment yielded the identification of *Stachybotrys sp.* (potentially toxinogenic) which was followed by remedial action. This same assessment in documents surfaces made it possible to identify keratinophylic and cellulolythic fungi.

3. The dHPLC method is a non-labour intensive method for resolving complex mixtures of fungal DNA.

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Future work

1.Full development of the dHPLC method as a tool for resolving fungal communities

2.More sample collection and analysis to account for seasonal variations.

Thank you….