Assessing the Impact of Climate Change on Indoor Fungal Contamination in Lisbon Metropolitan Area Primary Schools: A Comprehensive Study

InChildHealth

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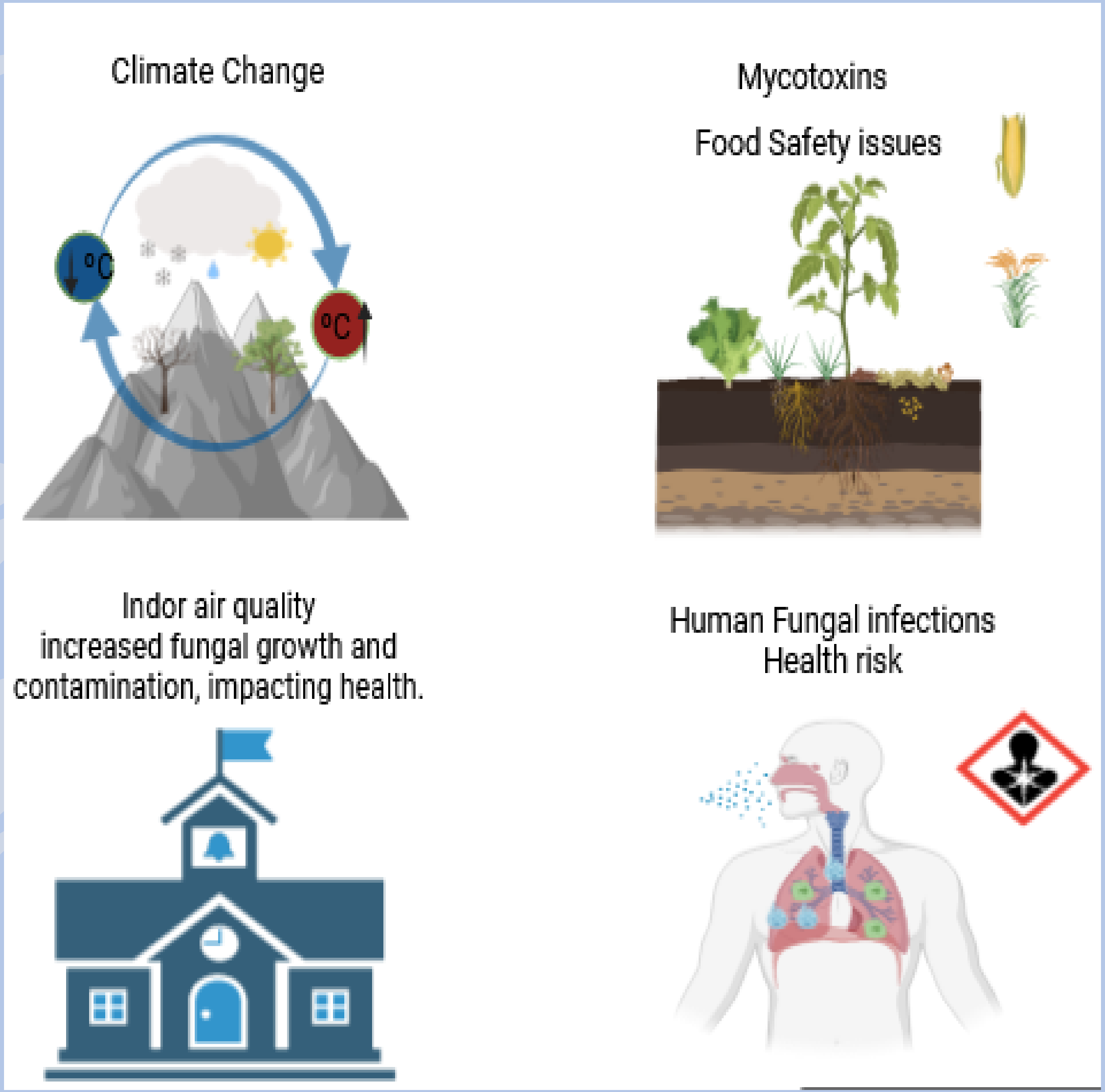
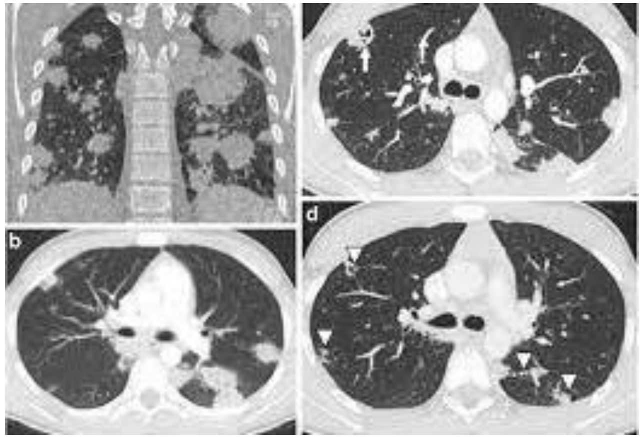
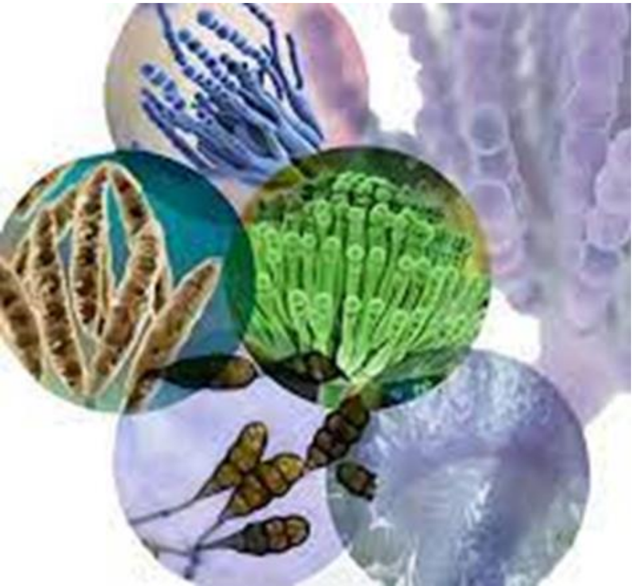
chrc COMPREHENSIVE HEALTH RESEARCH CENTRE

- Severe weather events due to global climate change raise concerns about indoor fungi [1].
- Potential alterations in fungal communities and mycotoxin production pose health risks[2,3].
- Educational settings face increased fungal growth and contamination, impacting health[6].







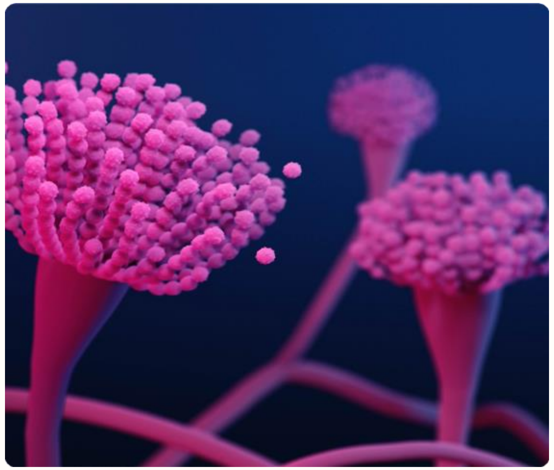
Factors that promote the presence of microorganisms in schools and the Public Health implications

- Potential Consequences of Fungal Infections:
- - Prolonged Hospitalizations,
- - Escalating Healthcare Costs,
- - Increased mortality rates.
- Social and economic Impact
- - Parental Work Absences,
- - Reduced Productivity,
- - Increased School Absenteeism,
- - Learning Disabilities,
- - Potential Long-Term Health Repercussions

Resistance profiles and pathogenic potential of fungi

Resistance profile

Fungi show increasing levels of resistance to antifungal drugs, which creates significant challenges for the control of fungal contamination[3,5].



pathogenic potential

Some types of fungi can cause respiratory or skin infections, while others can produce toxins that are dangerous to health, such as aflatoxin. In school environments, contact with fungi can also trigger allergic reactions in sensitive people, such as rhinitis, asthma, conjunctivitis and urticaria [3,5 6].

PROJECT GOALS

”Investigate the potential health impacts of exposure to azole resistant fungi and mycotoxins in school environments and explore how climate and geography might contribute to the overall air quality indoors”.

To characterize fungal contamination and azole resistance profiles.

To characterize mycotoxin contamination

To assess how **climate and geography might contribute to the overall air quality in schools**

To evaluate the impact of these environmental contaminants on children's health...

To provide support for the implementation of risk management measures.

CITY OF LISBON

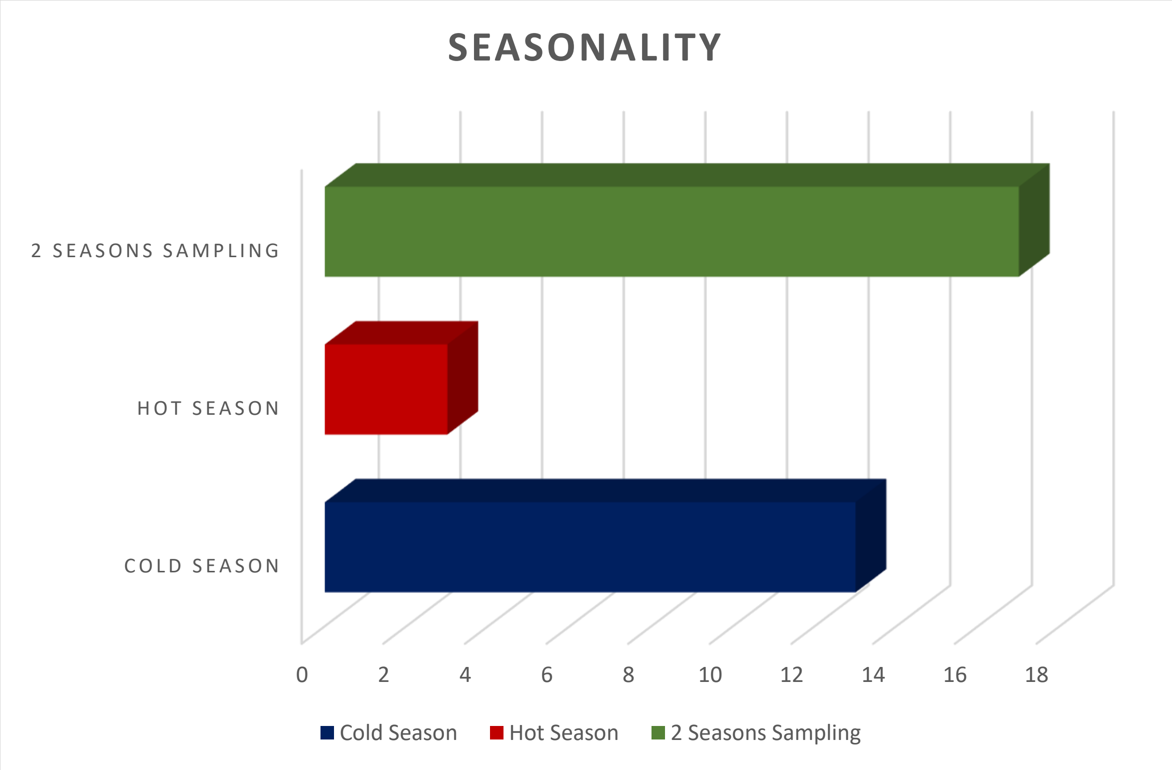
2 seasons:

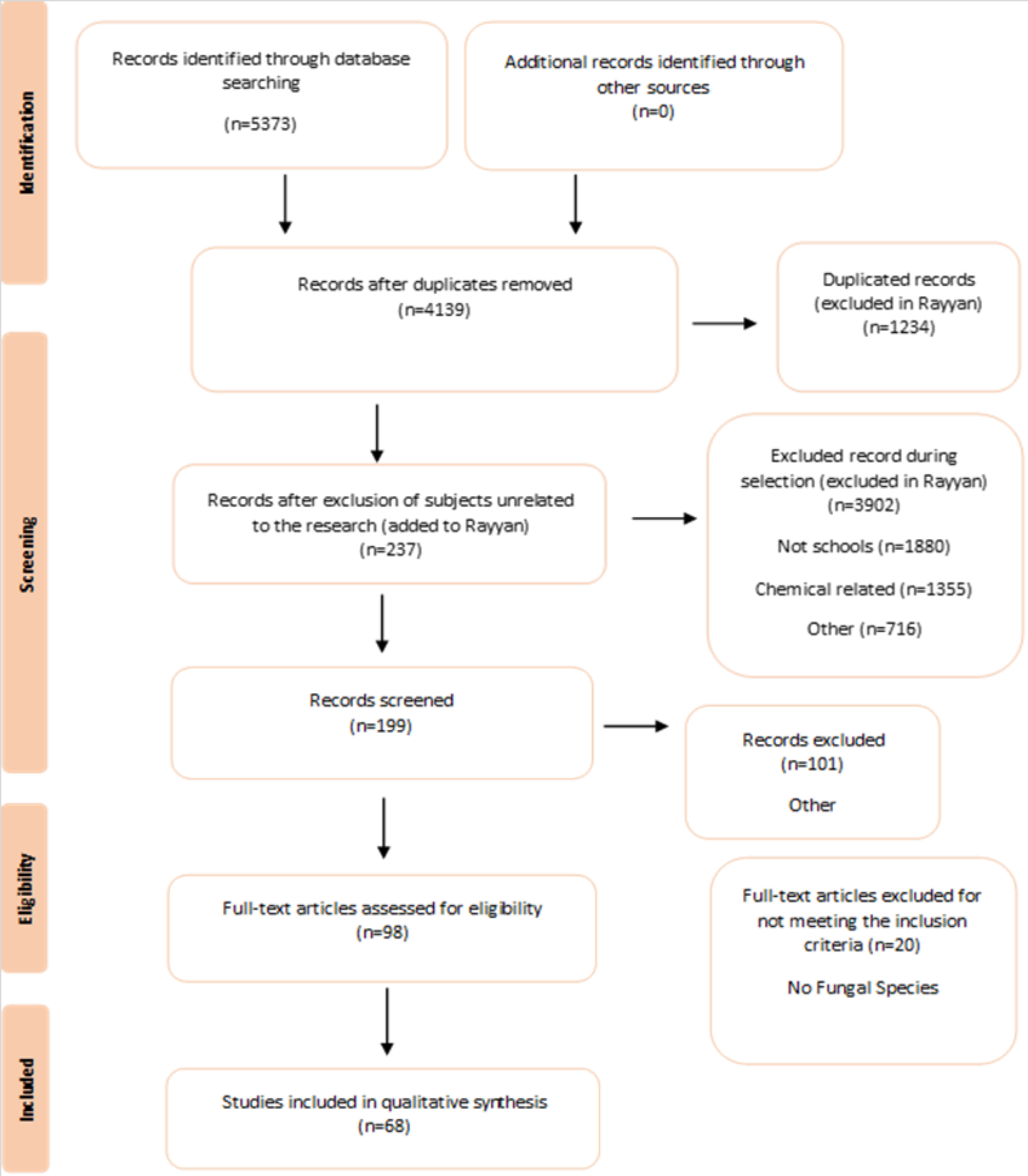
- Cold (autumn & winter)
- Hot (Spring & summer)

11 schools:

- 2 to 4 classrooms
- Average 25 students/classroom
- + Canteen
- + Library
- Gymnasium

Using the review findings, we organized the study and created a protocol for collecting and analysing samples.





Research Objectives

- Explore the relationship between climate change and fungal diseases.
- Assess indoor contamination and human exposure in Lisbon primary schools.
- Comprehensive microbial characterization through sampling methods.

Sampling Methods

Active sampling using MAS-100 device and Anderson six-stage device

200L at a flow rate of 28.3 L/min

400L at a flow rate of 200 L/min

EDC

Passive sampling of mops, surface swabs, and settled dust.

Monitoring for seasonal Campaign

ONGOING

Sampling strategy

Targeted schools

Rural
- Natural ventilation
- AVAC system

Urban/Suburban
- Natural ventilation
- AVAC system

Locations and sampling sites

2 school/setting (N=10 schools):
- 4 Classrooms
- 1 Outdoor
- 1 School Building
- Library
- Gymnasium
- Canteen
- Toilets/Locker room
- Extracurricular activities room (lab, workshop room, etc.)

2 houses/school (N= 20 houses):
- Child room
- Livingroom
- Kitchen

Sampling methods

Active Sampling

Air sampling:

Passive Sampling

Qualitative methods to be applied :
- Walkthrough survey in schools
- Respiratory health survey (children health data to be collected)

Sampling duration

1 sample per location in each school/seasonally (Autumn/Spring)

All matrices:
1 sample per location in each school/ seasonally (Autumn/Spring)

Assays

Culture-based methods (fungi and bacteria) :
- Microbial quantification (fungi)
- Fungal identification

Toxigenic fungi species detection through ddPCR

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- Fungal identification
- Fungal azole resistance screening

Toxigenic fungi species detection through ddPCR

Detection of 38 mycotoxins

Cytotoxicity assessment (lung cells)

Monitoring for longitudinal Campaign

ONGOING

Longitudinal sampling strategy

Targeted schools

Rural
- Natural ventilation
- AVAC system

Urban/Suburban
- Natural ventilation
- AVAC system

Location and sampling sites

10 school's
4 classrooms/school
(N=40 EDC's):

Sampling methods

Passive Sampling

EDC

Sampling duration

EDC:
1 per classroom in each school/monthly (12 months)

Assays

Culture-based methods (fungi and bacteria):
- Microbial quantification (fungi and bacteria)
- Fungal identification
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Toxigenic fungi species detection through ddPCR

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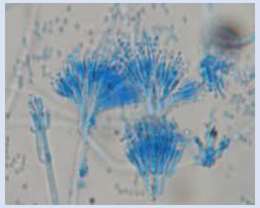
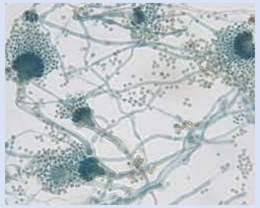
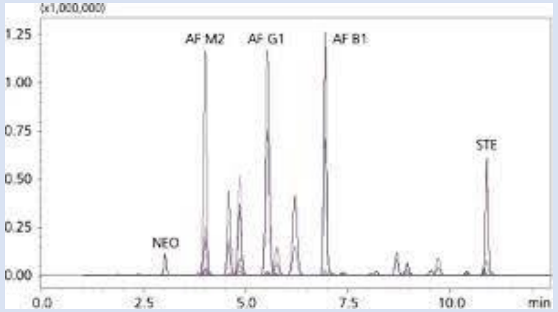
Analysis Techniques







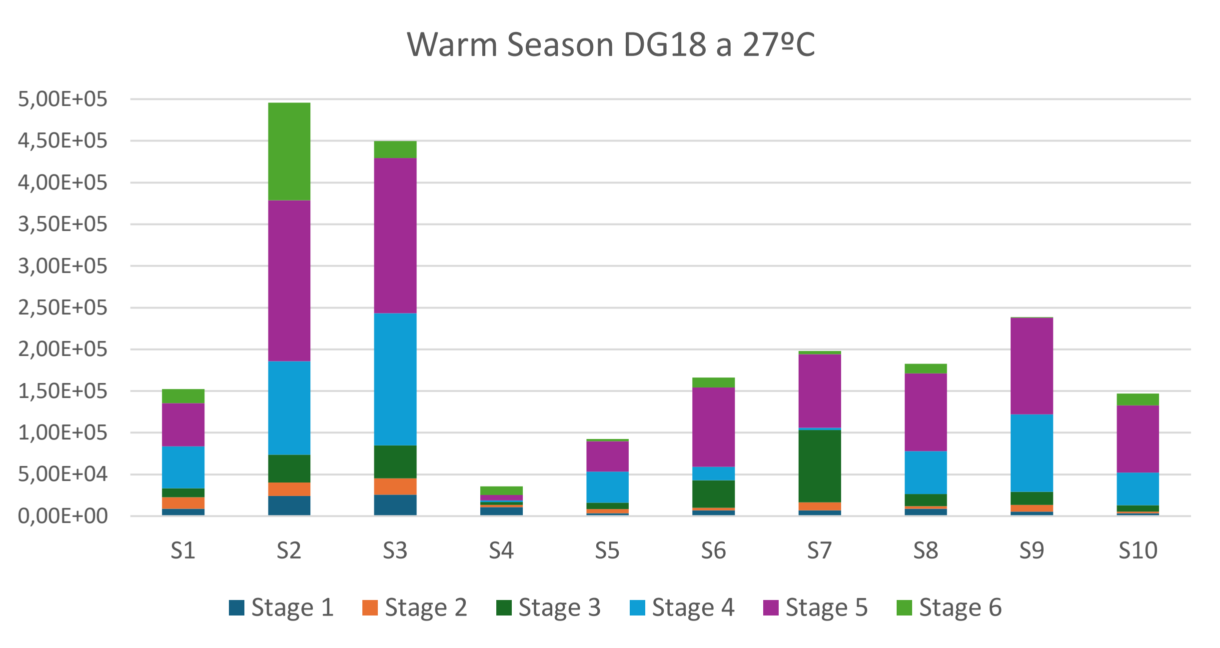
- Culture-based methods on MEA and DG18 culture media.
- Molecular detection of selected fungal sections (*Aspergillus*).
- HPLC for mycotoxin contamination assessment.

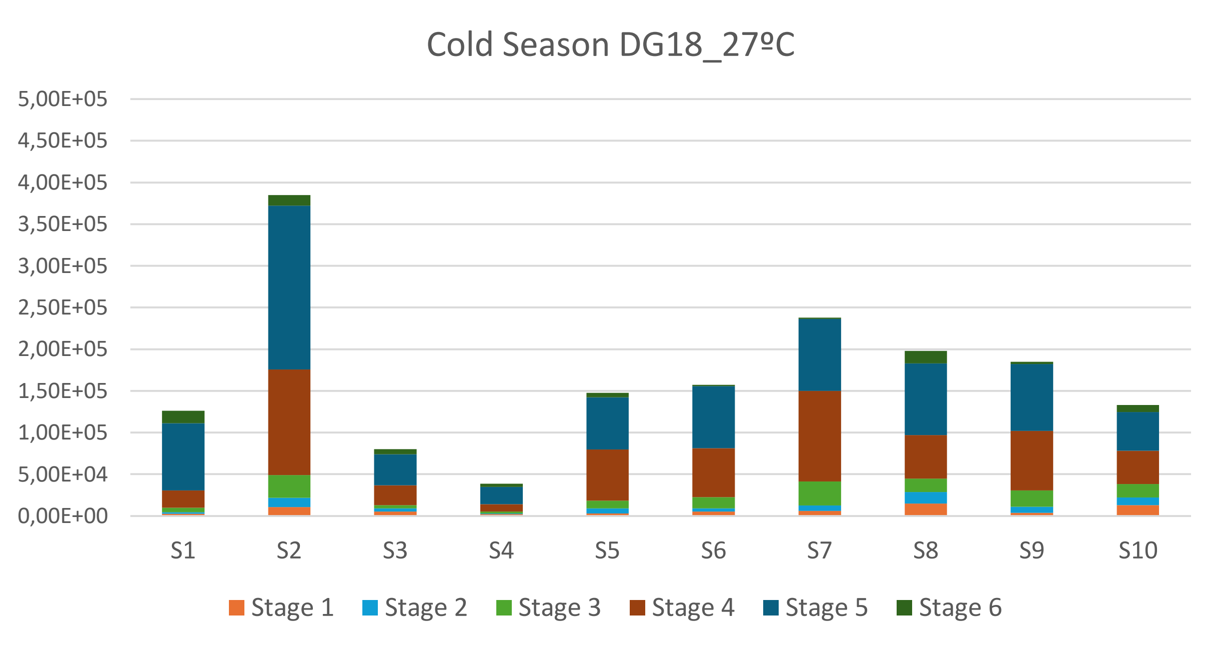
Preliminary Results

Anderson six-stage findings

Initial insights into fungal contamination levels

- DG18 27ºC:
  - No significant difference in counts from both seasons except for S3
  - Higher counts for S3 school on warm season
  - Higher load in stages 4, 5





Preliminary Results

Anderson six-stage findings

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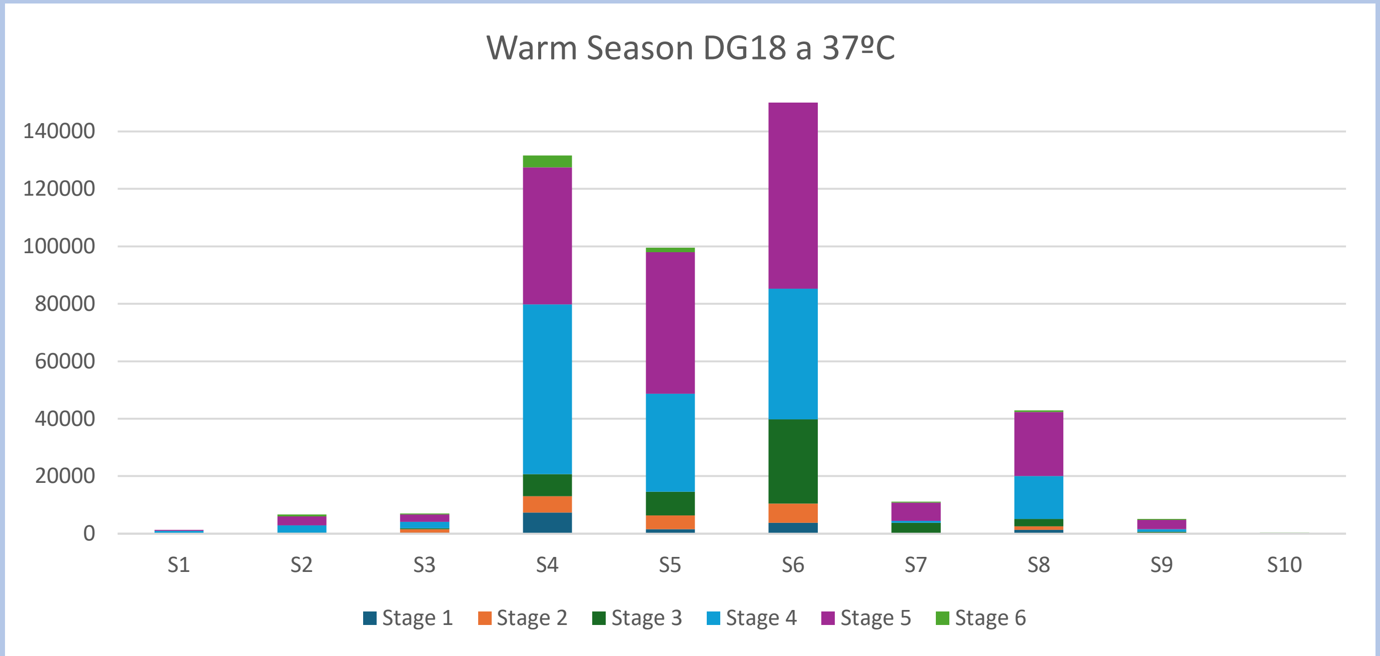
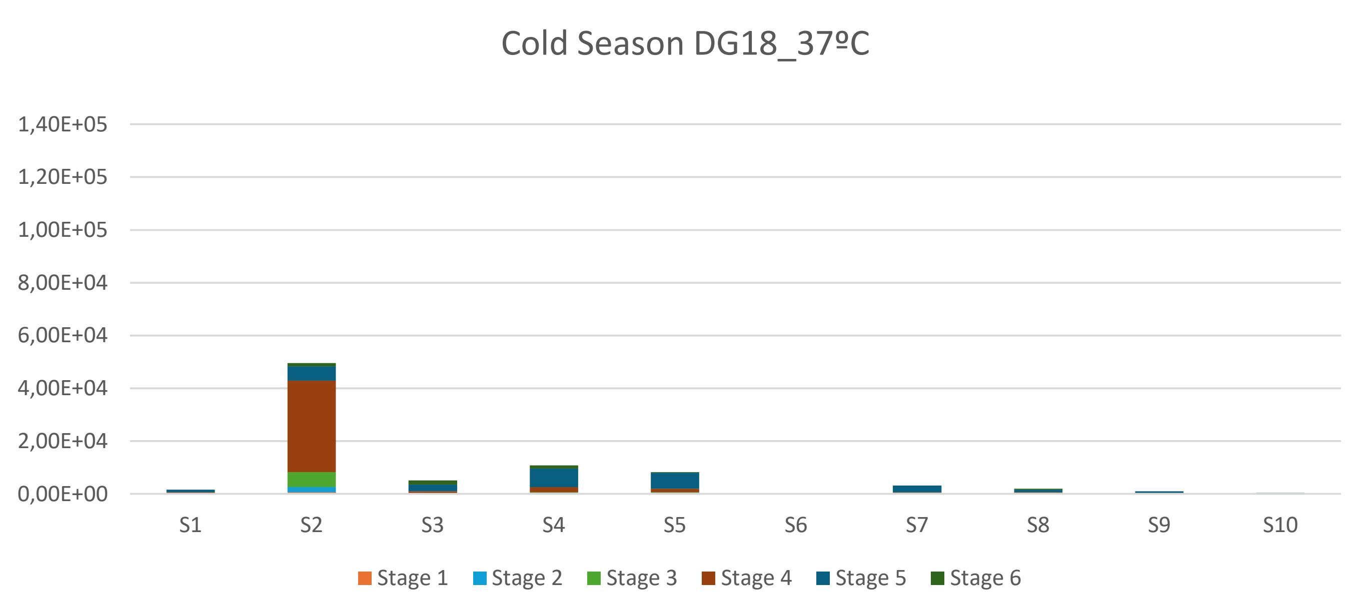


- DG18 37ºC:
  - Higher load in stages 6
  - Lower counts on cold season except for S2
  - Significative difference from warm to cold season in particular S4, S5 and S6

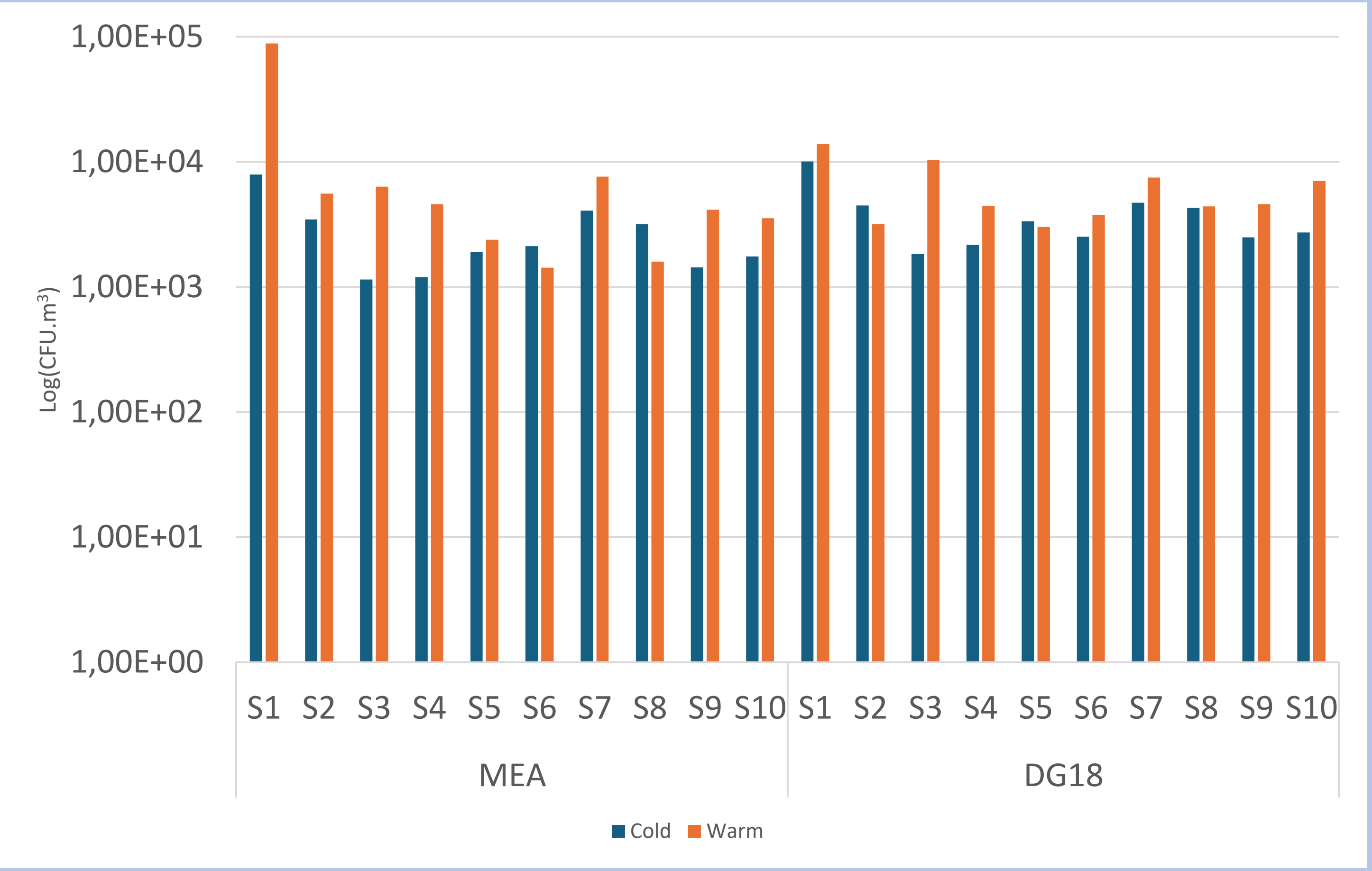


Preliminary Results

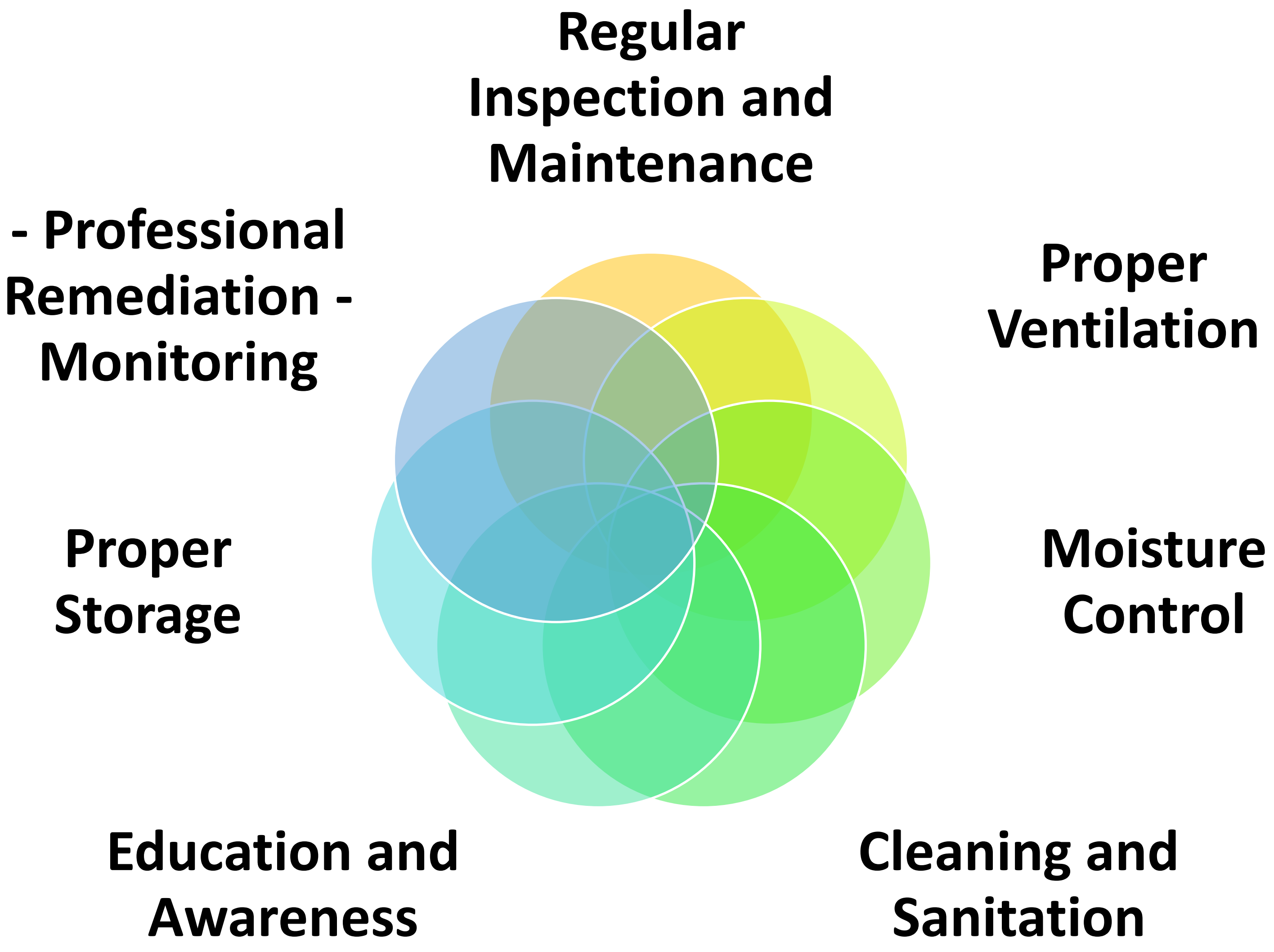
MAS 100 findings

Initial insights into fungal contamination levels

- DG18 37ºC:
  - Higher load in stages 6
  - higher counts on Warm season except for S6 and S8 on MEA, and S2 and S5 on DG18
  - Significative difference from warm to cold season in most schools on both media



Development of effective risk management strategies



Conclusion

- Importance of understanding climate-fungi-health nexus.
  - Respiratory health Survey data collection
  - Additional data from other matrixes contamination
  - Further characterize the relation between fungal seasonal contamination

- Necessity for proactive measures to mitigate risks.
- Potential for further research and intervention.

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING

By characterizing the occupational microbial exposure and the potential health risk for workers aiming to reduce the adverse health effects and enhancing good working conditions (3).

4 QUALITY EDUCATION

By protecting Childrens rights and promoting safe environmental conditions for all (3).

13 CLIMATE ACTION

By quantify the potential risks posed by climate change on both natural habitats and human communities.

Acknowledgments

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Q&A

Open floor for inquiries and discussions.

Thank you