POLITÉCNICO DE LISBOA | POLYTECHNIC UNIVERSITY OF LISBON

ESCOLA SUPERIOR DE SAÚDE DE LISBOA

H&TRC Health and Technology Research Center

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InChildHealth

InChildHealth Project

Mycotoxins Contamination in European Schools: InChildHealth Study

ASSESSING HEALTH RISKS OF TOXINS IN EDUCATIONAL ENVIRONMENTS

INTRODUCTION AND RATIONALE

Why Mycotoxins in Schools Matter

Health Risks of Mycotoxins

Mycotoxins in schools pose significant health risks to children due to their developing immune and respiratory systems (1, 2).

Sources of Indoor Mycotoxins

Mycotoxins are produced by fungi thriving in moist, poorly ventilated school environments and damaged building materials (1, 3).

Exposure Pathways

Children can be exposed to mycotoxins through inhalation of contaminated air and ingestion of dust in classrooms (1, 2, 4)

Need for Research and Policy

Limited data on indoor mycotoxin exposure complicates risk assessment, highlighting the need for systematic school studies (5).

STUDY BACKGROUND AND DESIGN

The InChildHealth Project

InChildHealth investigates environmental exposures affecting children's health throughout Europe using harmonized methodologies for comparison.

Project Scope and Objectives

InChildHealth investigates environmental exposures affecting children's health throughout Europe using harmonized methodologies for comparison.

Focus on Indoor School Environments

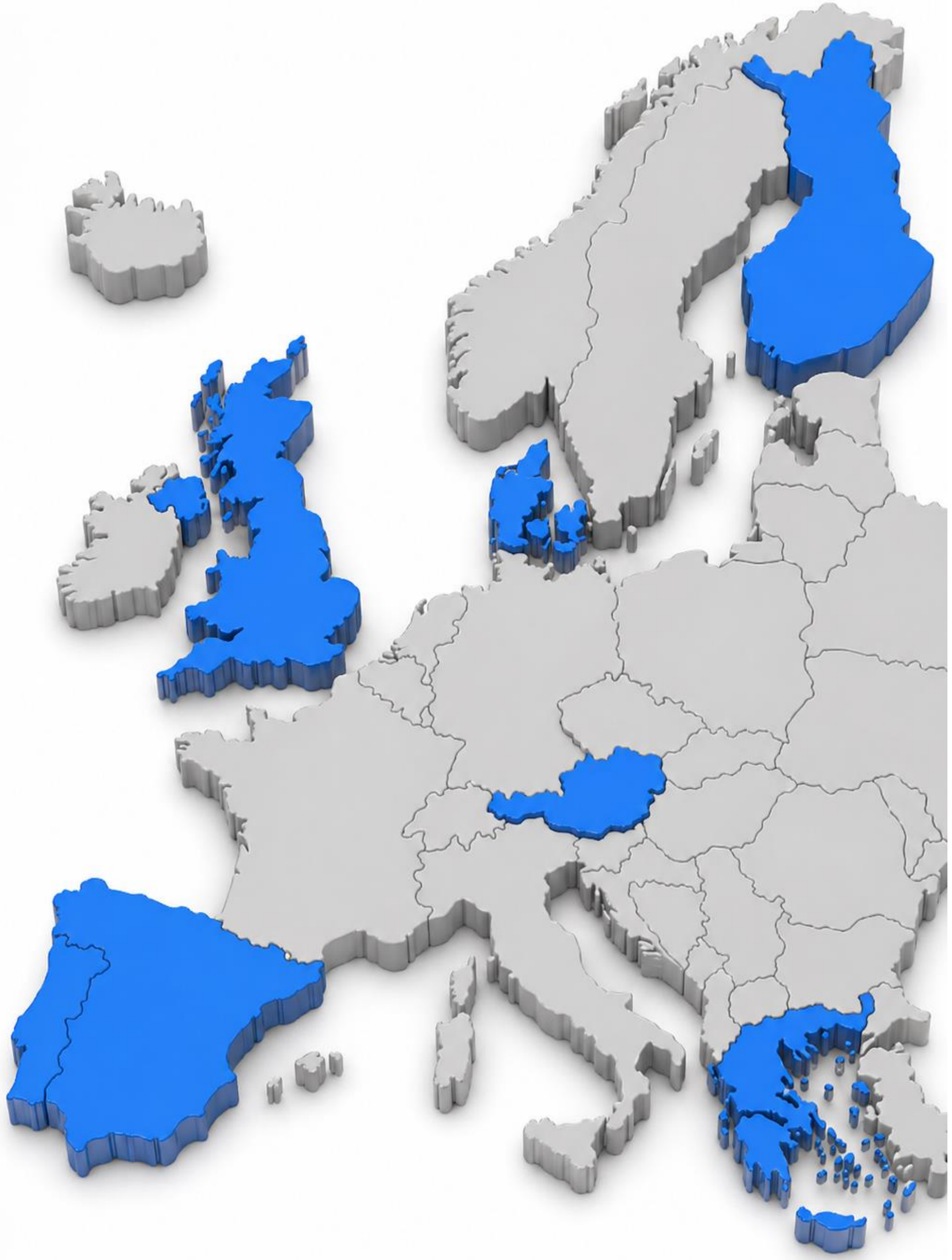
School indoor environments are key due to daily exposure and diverse building characteristics across European regions.

Mycotoxins and Microbiological Assessments

The project integrates chemical analysis of mycotoxins with fungal data for refined toxicological understanding beyond mould detection.

Multidisciplinary Research Approach

InChildHealth combines public health, environmental science, chemistry, and microbiology for comprehensive assessment.



Multinational Study Design

Cross-Country Study Implementation

The study was conducted in six European countries plus expanded sampling in Portugal, ensuring broad geographic coverage.

Harmonized Protocol

A standardized protocol was used for consistent sample collection, handling, and analysis across all countries.

Targeted School Environments

Study focused on typical school settings, especially classrooms and canteens, to reflect realistic exposure scenarios.

Data Integration and Analysis

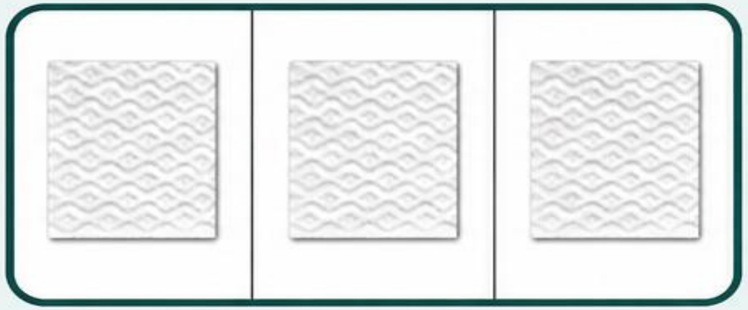
The study design supports comparisons across countries and integrates with data on building and health indicators.

SAMPLING AND ANALYTICAL METHODS

SAMPLING STRATEGY AND MATRICES

1 HARMONIZED SAMPLING STRATEGY

The study uses a harmonized sampling strategy with electrostatic dust cloths as a passive, non-invasive common matrix.



2 MULTI-MATRIX SAMPLING APPROACH

Additional matrices from Portugal include T-shirt EDCs, mop samples, and vacuum dust filters to capture diverse exposure pathways.

MOP SAMPLES

VACUUM DUST FILTERS

ADDITIONAL SAMPLING TOOLS

T-SHIRT EDCs

COMPREHENSIVE EXPOSURE ASSESSMENT

Using multiple matrices allows time-integrated sampling and comparison of matrix sensitivity and relevance for contamination.

Analytical Methods for Mycotoxin Detection

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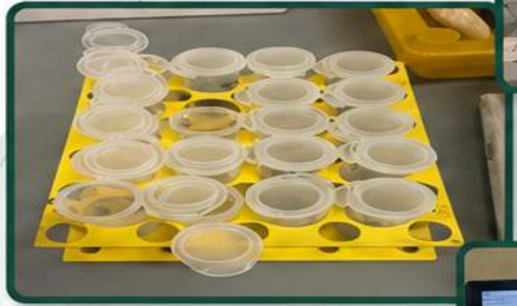
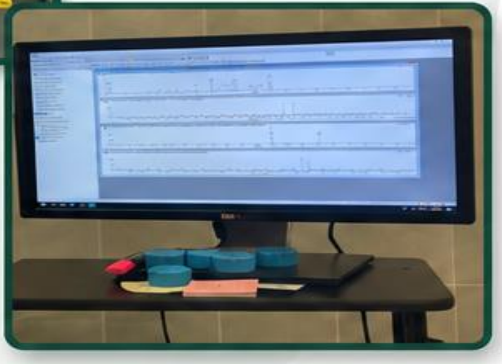
Work to be developed in Kazimierz Wielki University, Faculty of Biological Sciences, Department of Physiology and Toxicology, Chodkiewicza

Mycotoxins in passive samples will be identified and quantified.





LC-MS/MS Technique

Liquid chromatography coupled with tandem mass spectrometry offers high sensitivity and specificity for multi-analyte mycotoxin detection.

Broad Mycotoxin Panel

Analysis covered 38 mycotoxins, including common and less studied types relevant to indoor environments.

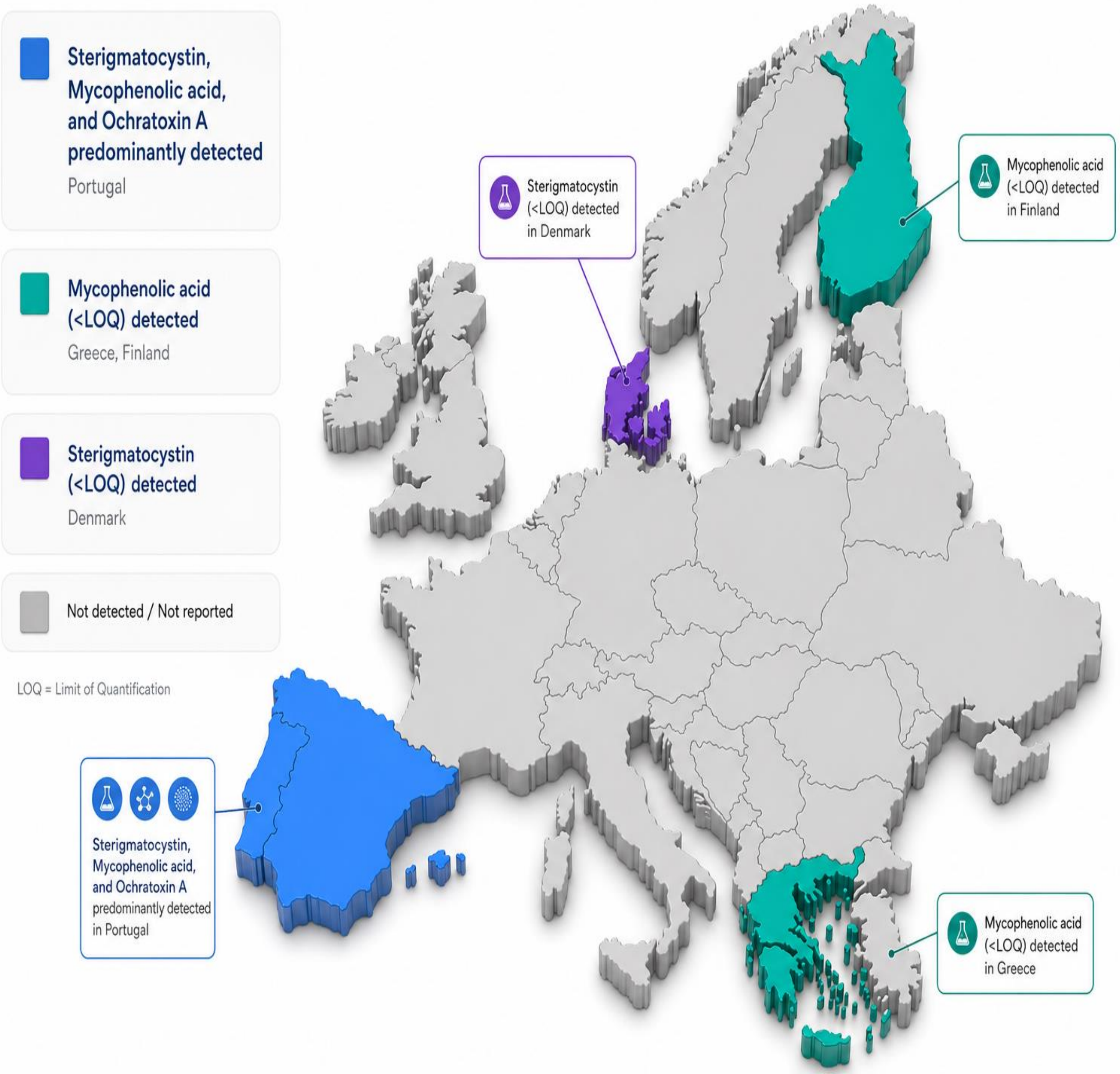
Quality Control Measures

Strict quality control ensured reliable and comparable results across different samples and countries.

Advancement Over Traditional Methods

LC-MS/MS directly measures toxic metabolites, improving accuracy beyond culture-based fungal detection methods.

KEY RESULTS



Detection Patterns Across Countries

Selective Mycotoxin Detection

Sterigmatocystin, Mycophenolic acid, and Ochratoxin A were predominantly detected in Portuguese samples. Trace levels of Mycophenolic acid (<LOQ) were also observed in Greece and Finland, while Sterigmatocystin (<LOQ) was found in Denmark.

Geographical Distribution

No mycotoxins were detected in samples from Austria, Spain, or the UK, indicating a country-specific occurrence pattern.

Importance of Analytical Sensitivity

Sensitive methods and proper sampling are vital to detect rare or localized contamination events.

Matrix- and Space-Specific Findings

Mycotoxin Detection Matrices

Mycotoxins were detected in electrostatic dust cloths (EDCs) and settled dust filters, highlighting these matrices as effective for environmental monitoring.

Contamination by School Space

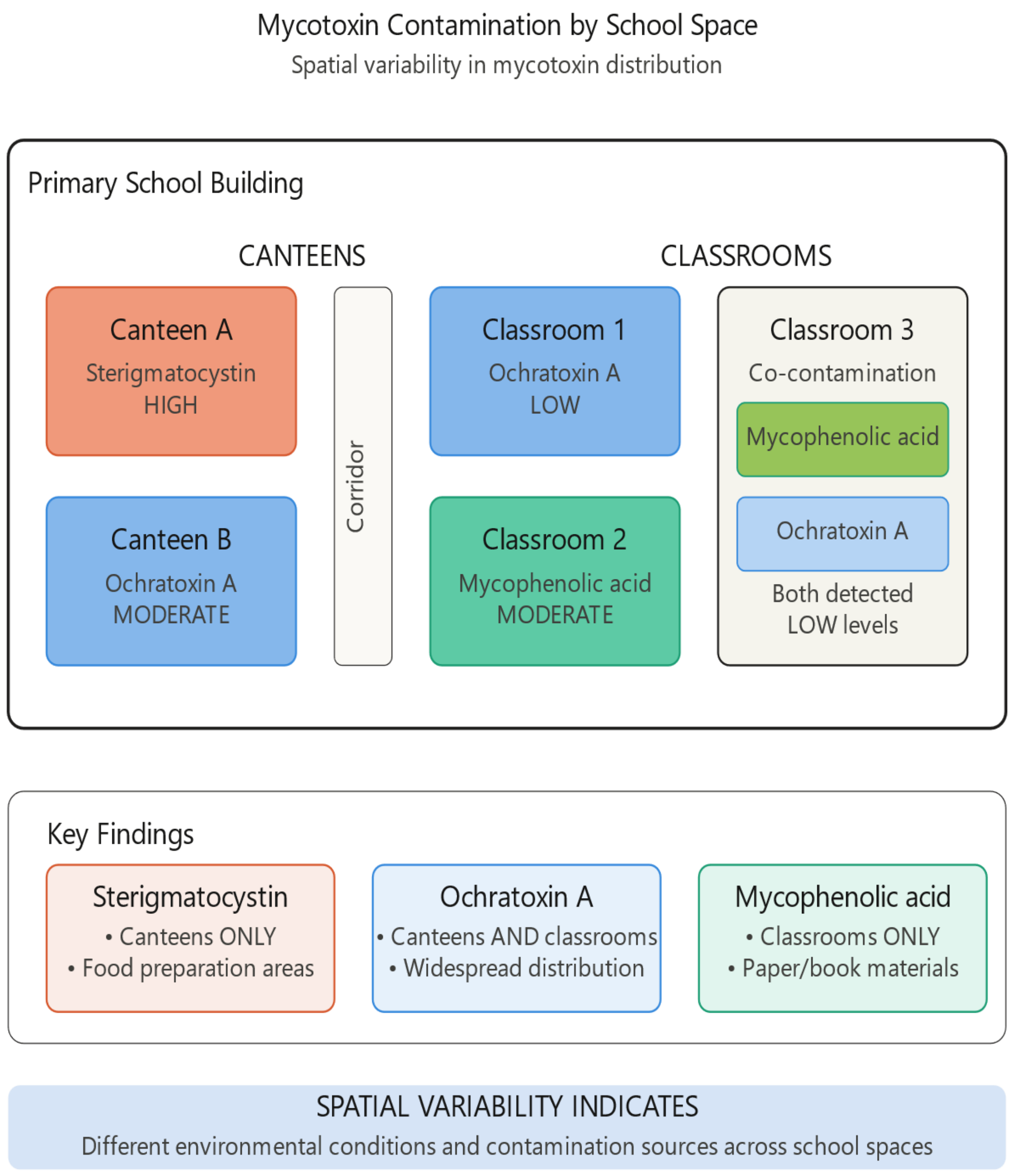
Sterigmatocystin and Ochratoxin A were found in canteens, whereas classrooms showed both Ochratoxin A and Mycophenolic acid, indicating possible spatial variability in mycotoxin distribution.

Importance of Sampling Diversity

No mycotoxins were detected in mop samples or EDCs placed on children's T-shirts, underscoring that different sampling methods capture distinct aspects of contamination.

Risk of Single Matrix Reliance

Dependence on a single sampling matrix may underestimate overall mycotoxin presence in complex indoor environments.



INTERPRETATION AND IMPLICATIONS

Integration with Microbiological Findings

Fungal Species Identification

Fungal species producing sterigmatocystin, Ochratoxin A and Mycophenolic acid were identified in schools across multiple countries, indicating hidden contamination risks (6).

Mycotoxin Detection Limitations

Absence of detected mycotoxins does not guarantee lack of risk due to intermittent production and environmental influences on fungal metabolism (6,7).

Importance of Data Integration

Combining chemical and microbiological data provides a deeper understanding of indoor contamination and risk assessment (5,6,7).

Public Health Relevance and Conclusions

Multi-Matrix Sampling Strategy: Harmonized multi-matrix sampling effectively detects indoor mycotoxins in schools.

Public Health Implications: Mycotoxin presence in schools highlights the need for air quality assessments.

Regulatory Framework Implications: Future IAQ legal frameworks should include mycotoxins as emerging pollutants requiring standardized thresholds and monitoring protocols.

Standardized Sampling Importance: Extensive standardized sampling enables reliable regional comparisons and risk assessment.

Guidance for Future Research: Study provides baseline methodology for linking mycotoxin exposure to health outcomes.

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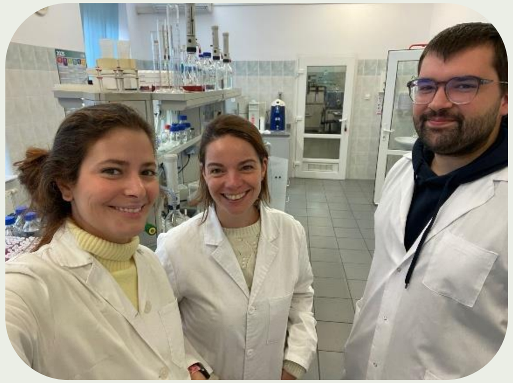

References

https://inchildhealth.eu/

https://htrcenter.wordpress.com/

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