

Biodet Services Ltd

Consulting Industrial Microbiologists

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17 June 2022

Biodet Ref: 22/46022

Client Ref: [REDACTED]

ENGEO Ltd
124 Montreal Street
Sydenham
CHRISTCHURCH 8023

Attn: Jonathan Hupman

Dear Jonathan

Re: **SPORE TRAP AND SELLOTAPE® SAMPLES FOR MICROBIOLOGICAL EXAMINATION**

Building/Ref: [REDACTED]
Samples taken: 2 June 2022
Samples received: 8 June 2022
Samples analysed: 16 June 2022

| Laboratory Number | Sample Type | Location |
|-------------------|-----------------|------------------|
| 46022/1 | Spore Trap | Outside dwelling |
| 46022/2 | Sellotape® swab | Outside cladding |

METHODS:

The spore trapping sample (Non-culturable Method) was taken using a Buck BioSlide sampler and was analysed by ASTM D 7391 -20 'Categorisation and Quantification of Airborne Fungal Structures in an Inertial Impaction Sample by Optical Microscopy'.

The Sellotape® swab was analysed by ASTM D7658-17 (Reapproved 2021) Standard Test Method for 'Direct Microscopy of Fungal Structures from Tape'.

RESULTS:

Non-Culturable Air Spore Trapping Results:

See attached spore trapping report.

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Macroscopic and Microscopic Examination of the Sellotape® swab:

| Sample ID | Macroscopic features | Microscopic features and comments |
|-----------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46022/2 | <p>Sample: Sellotape® swab</p> <p>Appearance: Pale brown discolouration noted across the tape.</p> | <p><i>Stachybotrys</i> were not detected.</p> <p>A high level of amorphous particulate with occasional miscellaneous fungal spores.</p> <p>Conclusion: Likely an accumulation of dust/ debris including fungal spores. No evidence of active fungal growth.</p> |

Note: Active fungal growth can be determined by the presence of distinct fungal hyphae and structures that readily take up stain.

OVERALL CONCLUSIONS:

- The spore levels and types in the outdoor air were typical of an outdoor environment and were comparable to the Biodet averages for an outdoor air.
- The tape sample exhibited a high level of amorphous particulate.

RECOMMENDATIONS:

- The discolouration on hard surfaces can be cleaned off by washing with warm soapy water.

I hope this information is of help to you. If you have any queries please do not hesitate to contact me.

Yours faithfully



Kate Fletcher

B.Sc.

The samples were tested as received.

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NON-CULTURABLE AIR SAMPLING REPORT

DATE OF REPORT: 17 June 2022
BUILDING: [REDACTED]
DATE SAMPLE TAKEN: 2 June 2022
DATE SAMPLE RECEIVED: 8 June 2022
DATE SAMPLE ANALYSED: 16 June 2022
BIODET REF NO: 22/46022

CLIENT: ENGEO Ltd
 124 Montreal Street
 Sydenham
 CHRISTCHURCH 8023

Attn: Jonathan Hupman

Method: ASTM D 7391 -20 Categorisation and Quantification of Airborne Fungal Structures in an Inertial Impaction Sample by Optical Microscopy

Air Volume sampled: 150 litres of air. (Sampled using a Buck Bioslide sampler)

The final result is expressed as fungal structures per meter cubed (/m³). Limit of detection is 7 fungal structures per m³ (0 = <7)

| Sample Number | Slide Number | Location | <i>Cladosporium</i> | <i>Penicillium/Aspergillus</i> type | <i>Stachybotrys</i> | <i>Chaetomium</i> | <i>Alternaria/Ulocladium</i> | <i>Pitheomyces</i> | <i>Drechslera/Bipolaris</i> | <i>Epicoccum</i> | <i>Curvularia</i> | <i>Fusarium</i> | Basidiomycete | Hyphal Fragments | Other Spore Types | Fungal Structures TOTAL /m ³ | Spore Clusters | Pollen |
|---------------|--------------|----------|---------------------|-------------------------------------|---------------------|-------------------|------------------------------|--------------------|-----------------------------|------------------|-------------------|-----------------|---------------|------------------|-------------------|-----------------------------------------|----------------|--------|
| 46022/1 | 02328414 | Outdoor | 387 | 33 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 53 | 447 | 27 | 2867 | 3821 | 40 | 0 |

Particle Analysis - Extraneous Material

| Sample No. | Slide Number | Location | Bacterial clusters | Siliceous | Fibres | Skin | Rust | Amorphous |
|------------|--------------|----------|--------------------|-----------|--------|------|------|-----------|
| 46022/1 | 02328414 | Outdoor | 0 | + | + | + | + | ++ |

Particle Level Key

| | |
|-------------|-------|
| Abundant | +++++ |
| High | ++++ |
| Moderate | +++ |
| Light | ++ |
| Sporadic | + |
| Not present | 0 |

CONCLUSIONS:

The spore levels and types observed were typical of an outdoor environment, and were comparable to the Biodet averages for an outdoor air.

Yours faithfully



Kate Fletcher

B.Sc.

The sample was tested as received.

This report must not be reproduced except in full.



Elaine Khor

B.Sc.



Fungal Direct Examination Test

Biodet Services Ltd status: **Proficient**

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BIODET OUTDOOR SPORE TRAP DATABASE

(Average counts taken from indoor sources throughout New Zealand between 2017 and 2020)

| | <i>Cladosporium</i> | <i>Penicillium/Aspergillus</i> type | <i>Stachybotrys</i> | <i>Chaetomium</i> | <i>Alternaria/Ulocladium</i> | <i>Pithomyces*</i> | <i>Drechslera/Bipolaris</i> | <i>Epicoccum</i> | <i>Curvularia</i> | <i>Fusarium</i> | Basidiomycete | Hyphal Fragments | Other Spore Types | Fungal Structures TOTAL/m ³ | Spore Clusters | Pollen Grains |
|----------------------------------------------------|---------------------|-------------------------------------|---------------------|-------------------|------------------------------|--------------------|-----------------------------|------------------|-------------------|-----------------|---------------|------------------|-------------------|----------------------------------------|----------------|---------------|
| Spring (Taken 1 September to 30 November) | 787 | 54 | 0 | 0 | 2 | 1 | 0 | 4 | 0 | 25 | 151 | 19 | 3871 | 4914 | 83 | 156 |
| Summer (Taken 1 December to 28/29 February) | 2160 | 129 | 0 | 0 | 21 | 8 | 7 | 33 | 9 | 51 | 504 | 46 | 8969 | 11937 | 216 | 55 |
| Autumn (Taken 1 March to 31 May) | 1013 | 122 | 0 | 0 | 16 | 0 | 1 | 20 | 2 | 50 | 676 | 24 | 9418 | 11342 | 122 | 28 |
| Winter (Taken 1 June to 31 August) | 172 | 77 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 39 | 254 | 14 | 6479 | 7038 | 47 | 66 |

* This category was separated out from *Alternaria/Ulocladium* in 2020

INTERPRETATION OF RESULTS

Unless stated all sample traces are 100% examined at 1000x magnification which is higher than recommended in the methodology. This is to ensure the minute differences between fungal spores are more easily identified allowing them to be accurately categorised.

Due to the numerous variations observed with sporetrapping it is important that a microbiologist with experience interpret the results.

Bidet staff take part in the AIHA Proficiency Analytical Testing Program for Fungal Direct Examination. This is an international interlaboratory comparison program comprising of laboratories across the world. Results may be supplied upon request.

Bidet staff interpret the results based on the information given by the client, previous results (if known) and our experience gained from analysing spore trap samples and assisting with air quality investigations since 2003.

Many fungal types found in outdoor air can also be the types that grow indoors in response to moisture. This is why it is recommended to take an outdoor sample with each job to show what current 'normal' levels and types are for each geographical location. This allows Bidet staff to compare the indoor fungal species and levels with the outdoor fungal species and levels, as well as with our database, to determine whether there are any indications of moisture issues.

In areas where there are no moisture issues it is typical to find that fungal spore counts taken from non-air-conditioned indoor areas are similar to or lower than the outdoor air, where as fungal spore counts taken from well maintained HVAC air-conditioned areas are typically significantly lower than the outdoor air.

The presence of some fungal spores in an indoor environment even in low levels, such as *Stachybotrys* and *Chaetomium*, can be an indication that there are moisture issues. For other fungal types such as *Cladosporium* or Basidiomycete spores a 10-fold increase may indicate a site of fungal amplification. These subtle variations show why it is important that a microbiologist with experience interprets the results.

The 'Other Spore Types' category are comprised of microscopically unidentifiable fungal spores, Smuts/Myxomycete/Periconia and a range of ascospores (fungal spores produced in a sac or body in response to adverse environmental conditions) and some basidiospore types. The majority of these spores are not associated with specific health issues, but exist in the natural environment, especially where there is dense vegetation or soil. Levels will vary due to seasonal variation and proximity to vegetation etc. Occasionally a spore type not represented by any of the other categories is noted in this category, and if the level of this spore type was significantly different to the outdoor air or other indoor samples, it would be specifically commented on.