

Demonstration of VHP Efficacy In Field using Hygien'Air 7

Challenge Study in Food Factory Environment

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Hygien'Air 7

- Nebulising (dry) spray machine, using 8% H₂O₂
- Flow rate 7 mL / m³



VAPOURISED HYDROGEN PEROXIDE

- VHP has many benefits
 - Relatively rapid sanitisation
 - Environmentally friendly
 - Cost effective
- Used in medical industry and some use in the food industry, but relatively little data available in the published literature with regards efficacy against microorganisms of relevance to the food industry



TEST SETTING

- Newly constructed food manufacturing (fermentation) facility located in Western Sydney



TEST MICROORGANISMS



Gram
negative
bacterium

Escherichia coli



Yeast

Zygosaccharomyces bailii



Gram
positive
bacterium

Lactobacillus plantarum



Mould

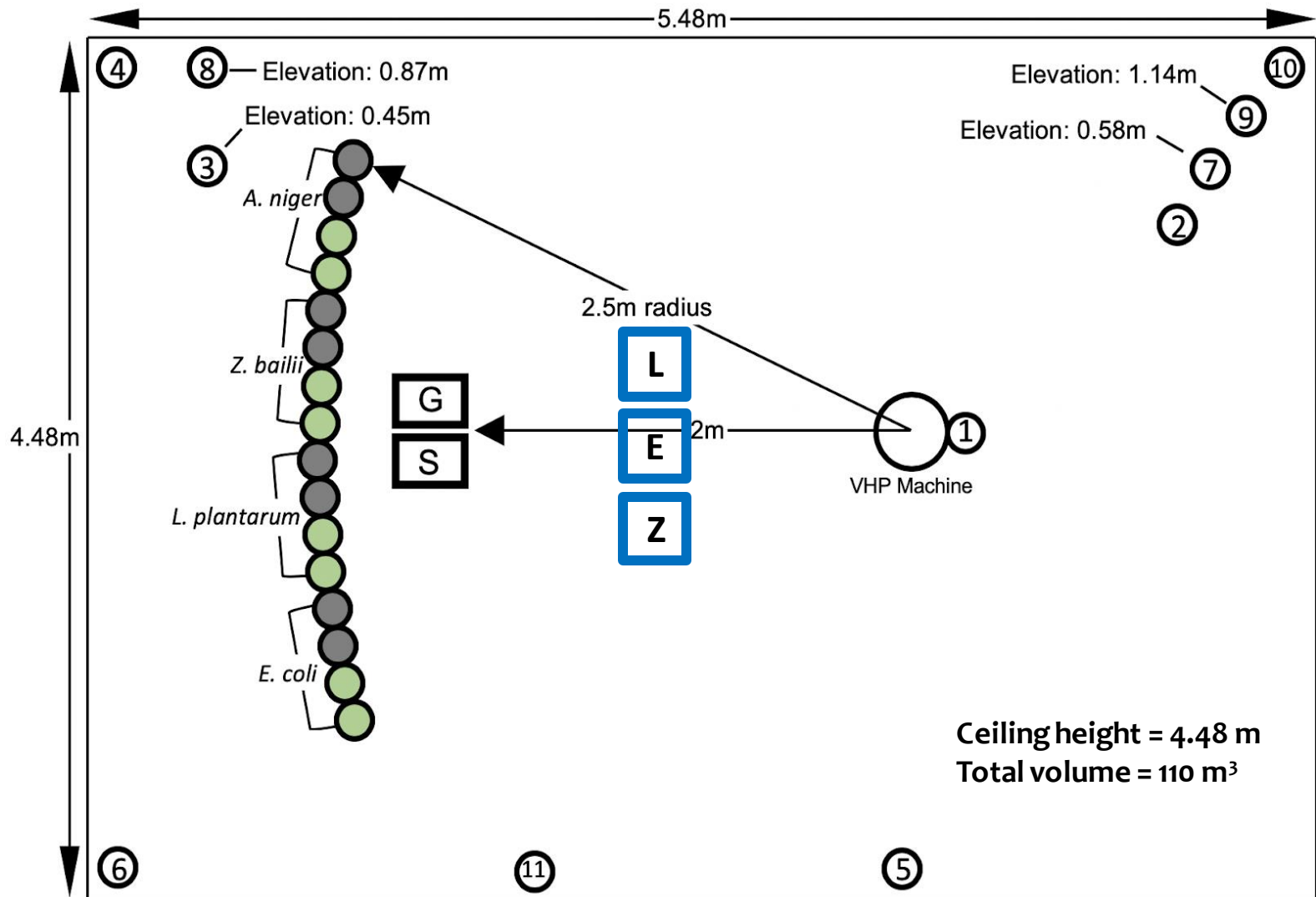
Aspergillus niger

TEST METHODOLOGY - DRY

- Non-growth environment
- Inoculation onto stainless steel (SS) and high density polyethylene (HDPE) coupons
 - *E. coli*, *L. plantarum*, *Z. bailii* 16 h cultures
 - *A. niger* spores (from frozen harvested stock)
- 100µL volumes dispensed in 10µL aliquots across surface of coupon and allowed to dry at room temperature for approx. 2 hours

TEST METHODOLOGY - WET

- Growth environment
- *E. coli*, *L. plantarum*, *Z. bailii* 16 h cultures inoculated into appropriate liquid growth media in 24 well plates
- *A. niger* spores (from frozen harvested stock) inoculated onto appropriate agar growth media in 24 well plates
 - Spores inoculated ~ 16 h prior = germinated
 - Spores inoculated ~ 2 h prior = non-germinated

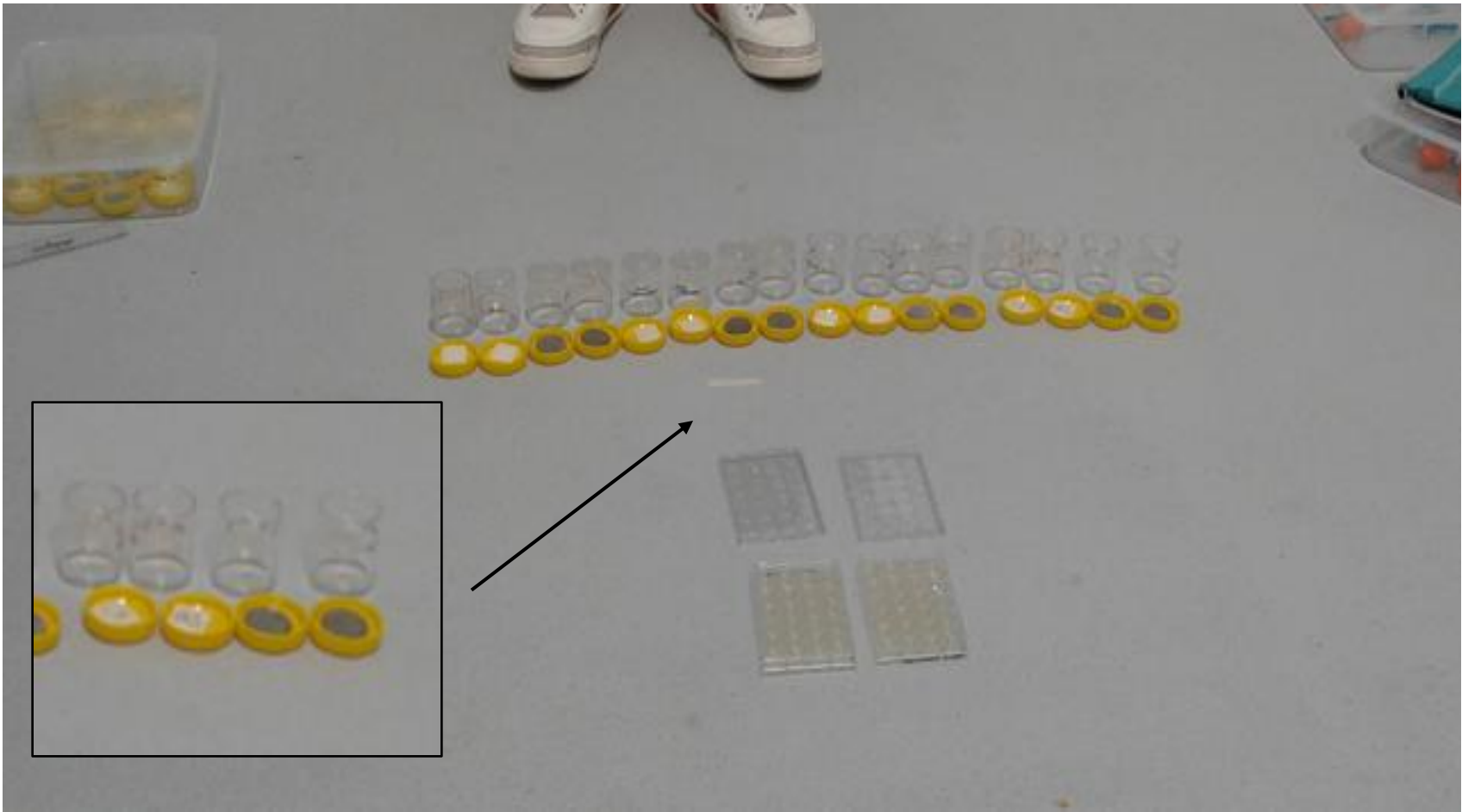


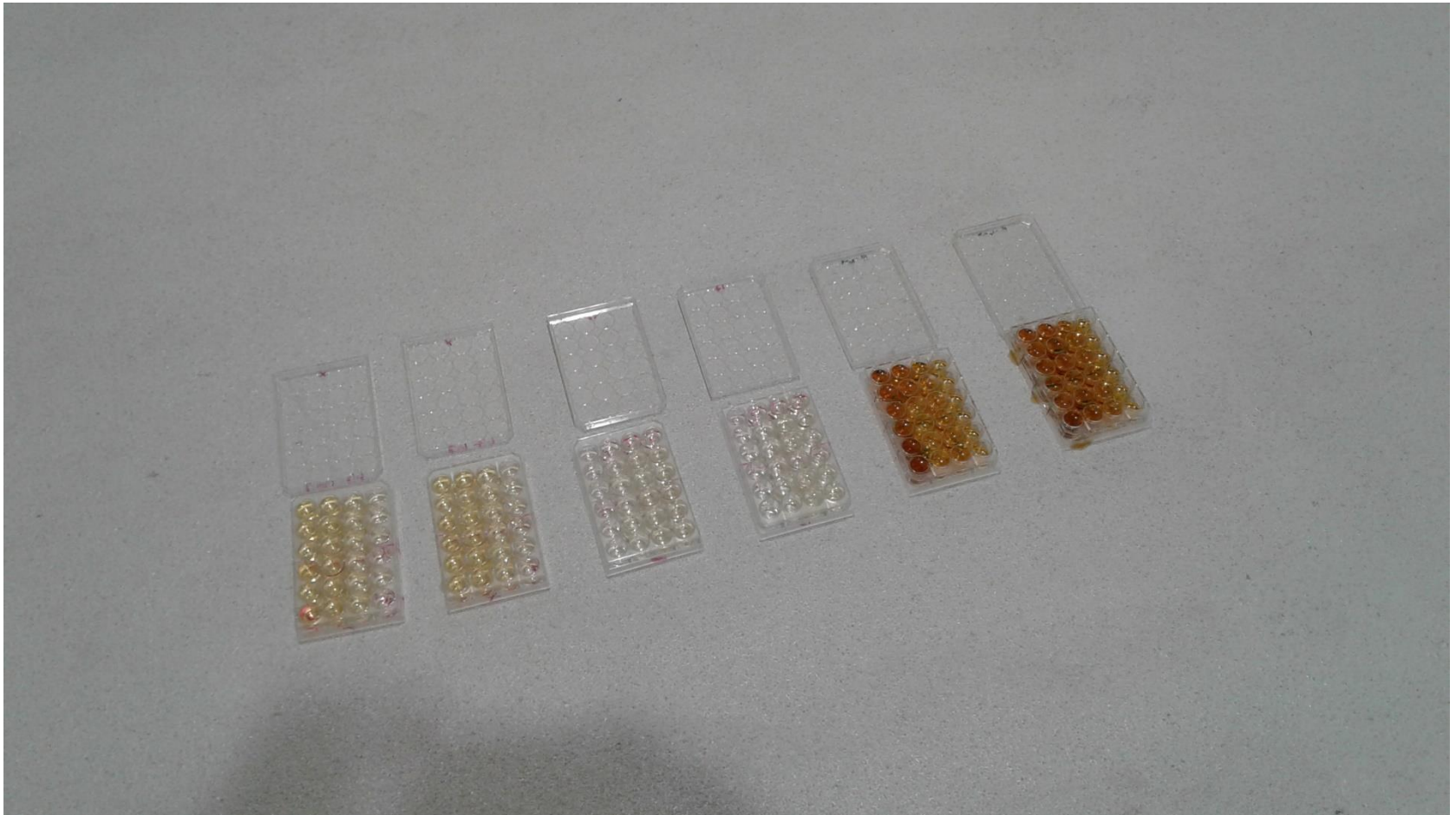
Legend: Liquid (Broth) Wells (L = *L. plantarum*, E = *E. coli*, Z = *Z. bailii*)

○ *L. plantarum* on HDPE Coupon ● HDPE Coupon ● Stainless Steel Coupon

G Germinated *A. niger* spores multiwell plate S *A. Niger* Spores multiwell plate











RESULTS OF TESTING – DRY S/S

Microorganism	Log reduction* (log cfu/mL)
<i>Escherichia coli</i>	≥ 3.00
<i>Lactobacillus plantarum</i>	≥ 4.21
<i>Zygosaccharomyces bailii</i>	≥ 4.19
<i>Aspergillus niger</i>	2.47

* Compared with recovery from non-VHP-exposed coupons, thus accounting for inactivation due to drying on coupons alone

RESULTS OF TESTING – DRY HDPE

Microorganism	Log reduction* (log cfu/mL)
<i>Escherichia coli</i>	≥ 4.07
<i>Lactobacillus plantarum</i>	≥ 3.58**
<i>Zygosaccharomyces bailii</i>	≥ 4.55
<i>Aspergillus niger</i>	0.75

* Compared with recovery from non-VHP-exposed coupons, thus accounting for inactivation due to drying on coupons alone

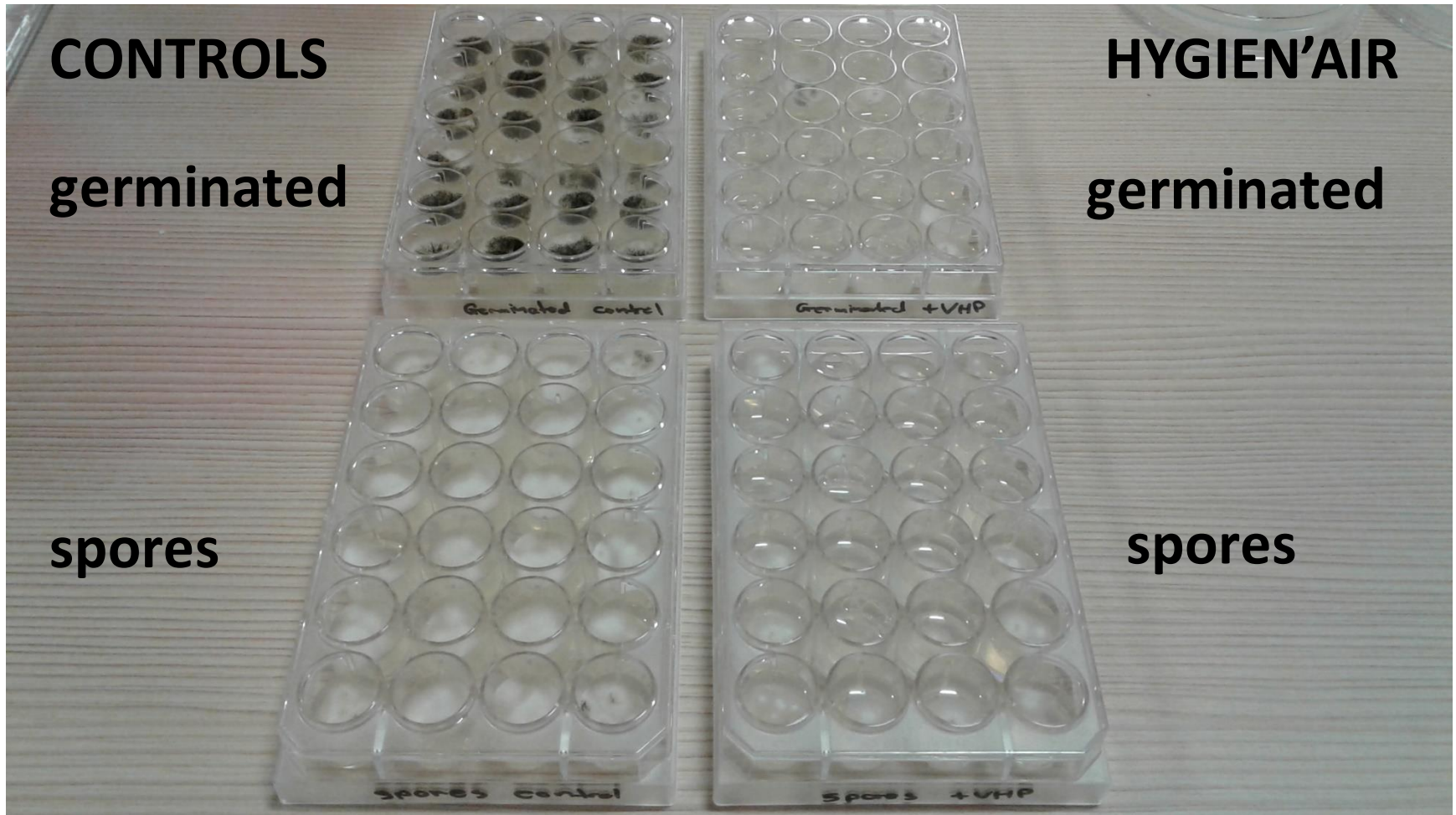
** For all tested coupons, regardless of location in room / proximity to Hygien'Air

RESULTS OF TESTING - WET

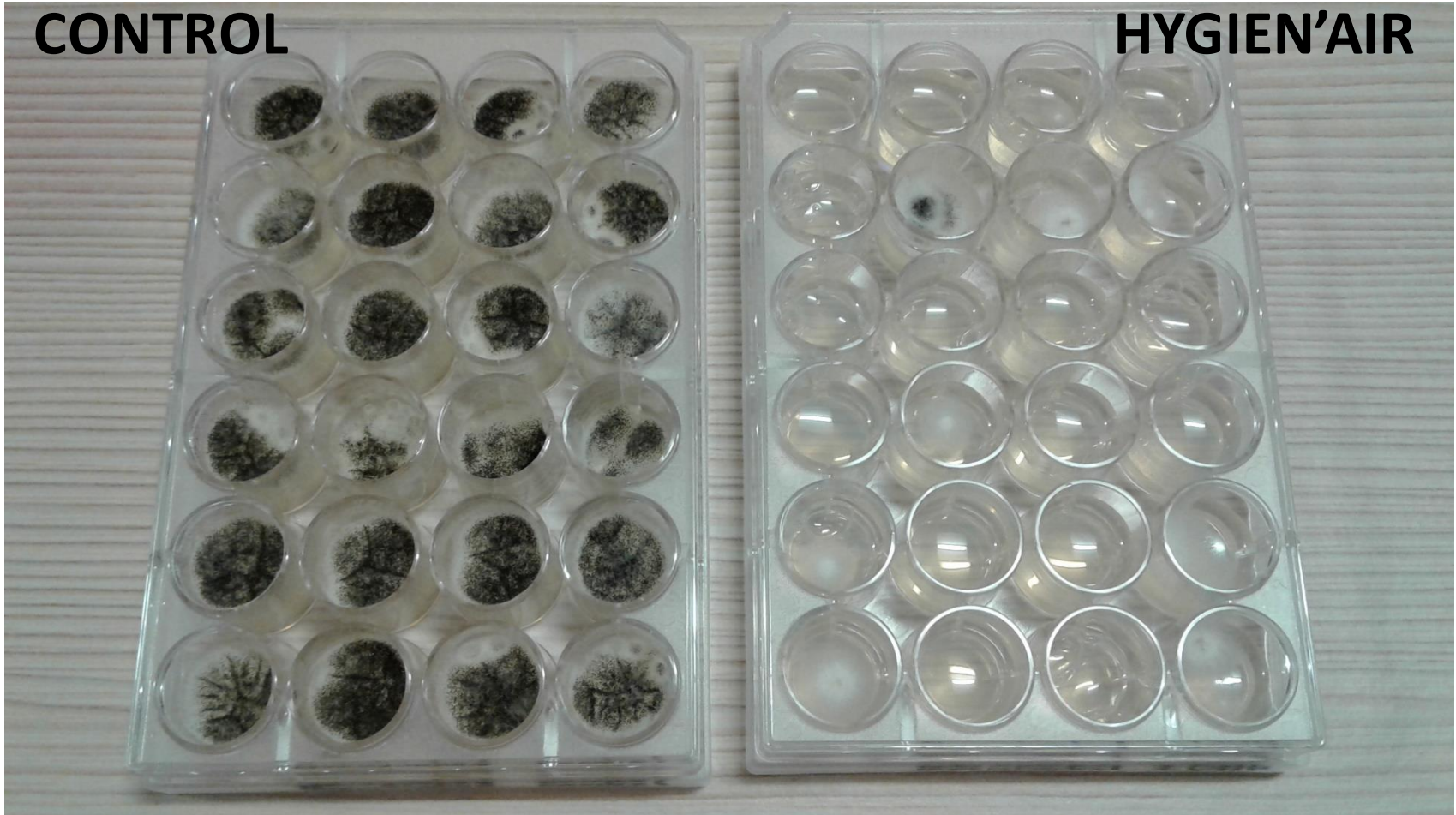
Microorganism	Log reduction* (log cfu/mL)
<i>Escherichia coli</i>	≥ 4.17
<i>Lactobacillus plantarum</i>	≥ 5.58
<i>Zygosaccharomyces bailii</i>	≥ 5.68

* Compared with inoculum counts

Aspergillus niger inhibition results



Aspergillus niger inhibition results

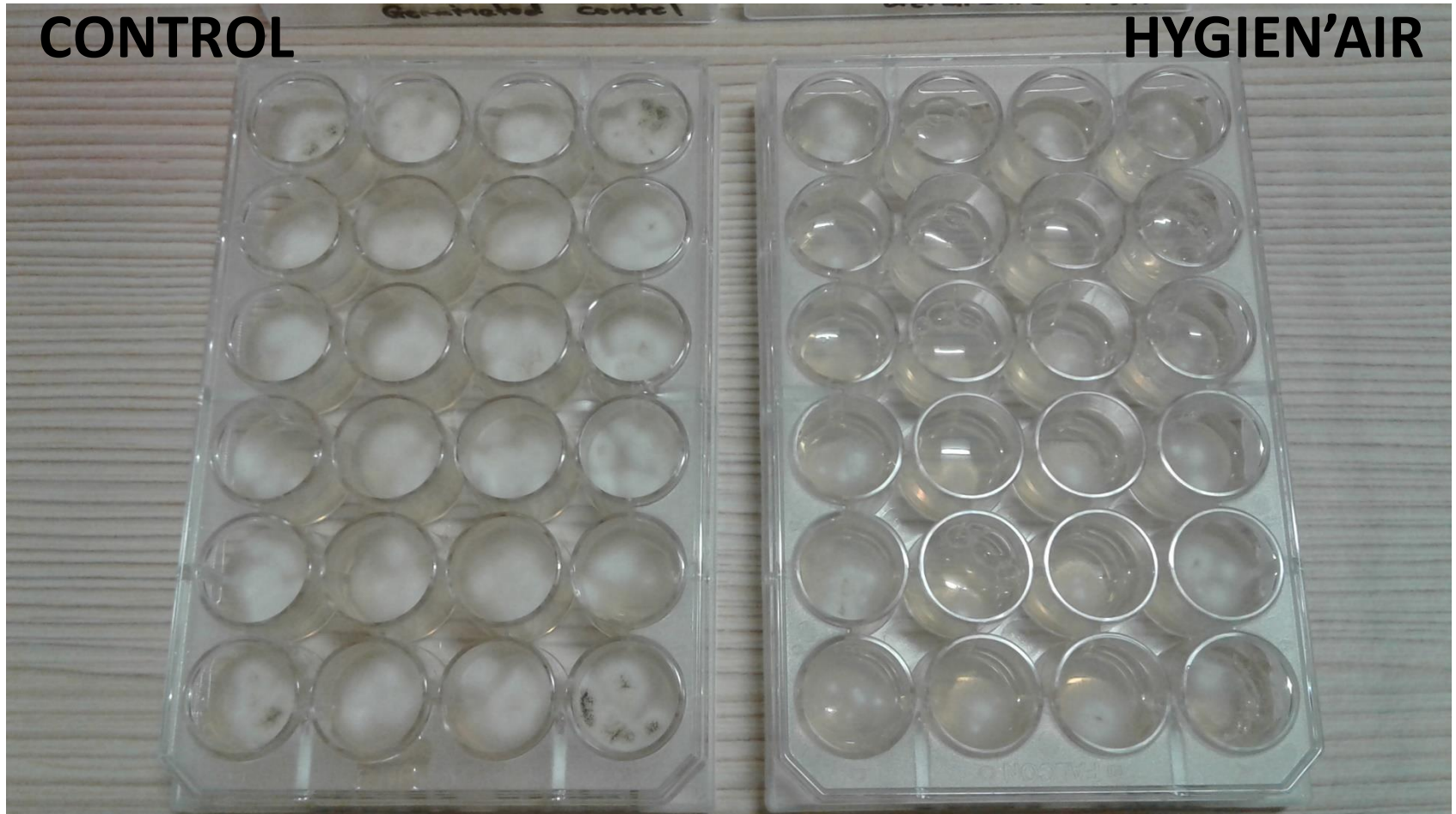


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SUPERIOR DISINFECTION SOLUTIONS

germinated



Aspergillus niger inhibition results



CONCLUSIONS

- Demonstrated inactivation of:
 - Gram negative bacteria
 - *E. coli* is representative of important foodborne pathogens including EPEC, EHEC, etc. and *Salmonella* and (antibiotic resistant) pathogens including *Klebsiella*, *Acinetobacter* and *Pseudomonas*
 - Gram positive bacteria
 - *L. plantarum* representative of important spoilage organisms for the food industry and (antibiotic resistant) pathogens including *Staphylococcus*, *Enterococcus* and *Enterobacter*

CONCLUSIONS

- Demonstrated inactivation of:
 - Yeast
 - *Z. bailii* representative of important spoilage organisms for the food industry and medically important pathogenic yeast, e.g. *Candida* species
 - Mould
 - *A. niger* important “guideline” mould for the food industry and representative of moulds involved in economic loss of horticultural products post harvest as well as mould of concern in healthcare settings, e.g. *Aspergillus fumigatus*