

Generation of Aerosols through Standard Laboratory Procedures and an Analysis of Training and Staff Experience



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Introduction



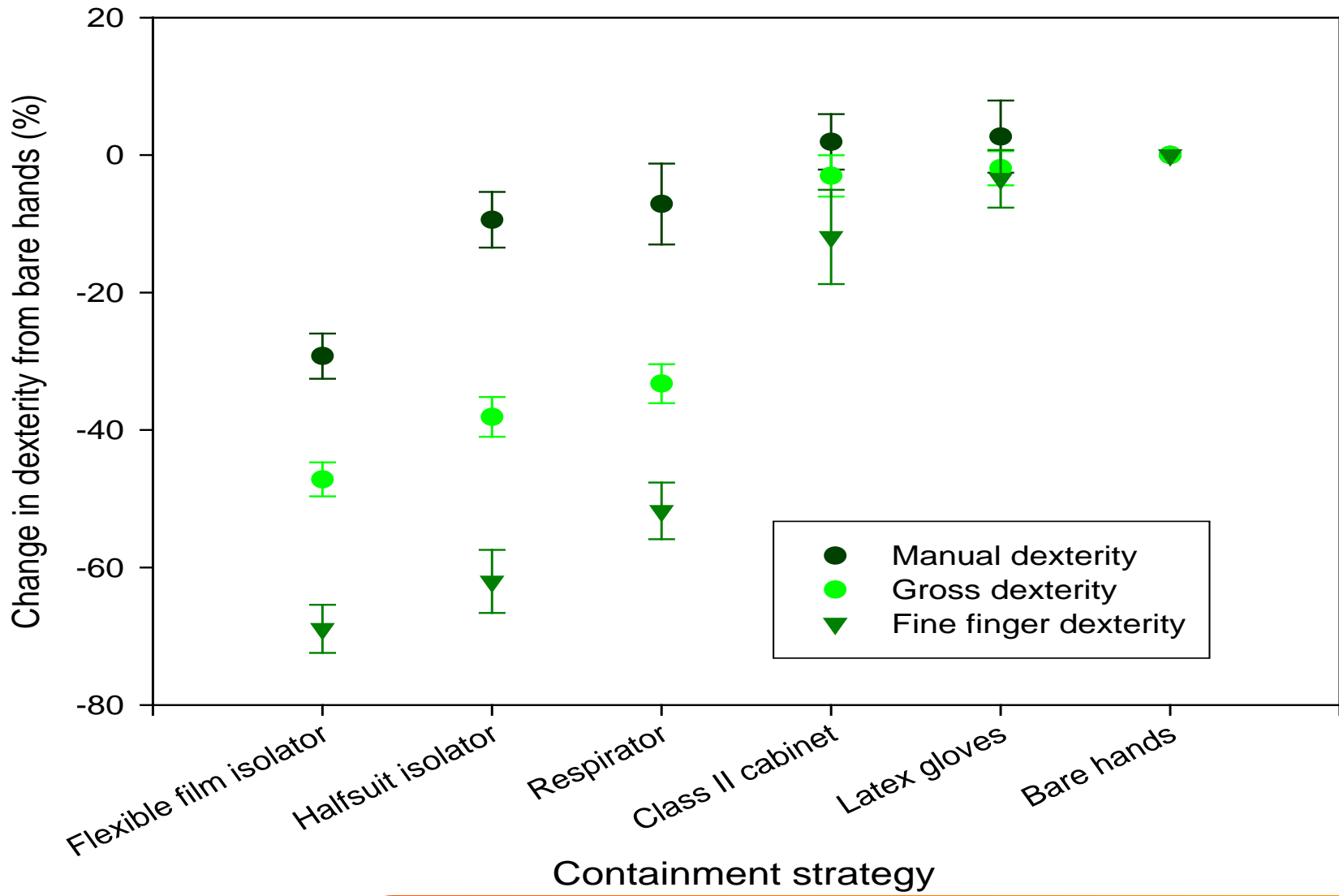
- **Initial studies and results**
 - Generation of aerosols
- **Looking at the effect of experience levels**
- Comparison biological and UV tracers
- **Effect of training for high containment labs**
- **Conclusion**

Measurements of aerosol generation



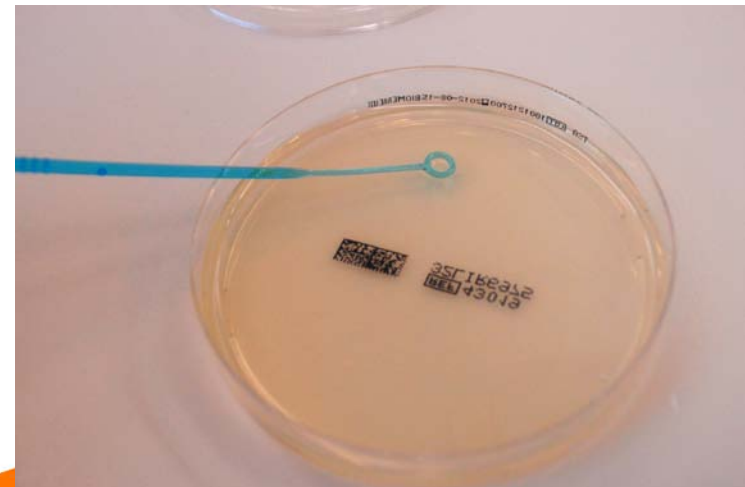
- **The potential for aerosols generation and consequent risk of links to laboratory acquired infections is well documented.**
 - Use of safety cabinets and the ergonomics problems that induces
 - Good laboratory practice is aimed at reducing aerosol generation
- **UV tracers are a commonly used method for teaching lab technique**
- Effective for gross contamination and splashes

The effect of containments systems on dexterity



Initial tests and methodology

- **Effect of good and bad working practices**
- **Protocols created outlining good and bad working practices for:**
 - **Vortexing**
 - **Serial Diluting**
 - **Plating out a sample and spreading using a 10 μ l loop**



Sampling set-up



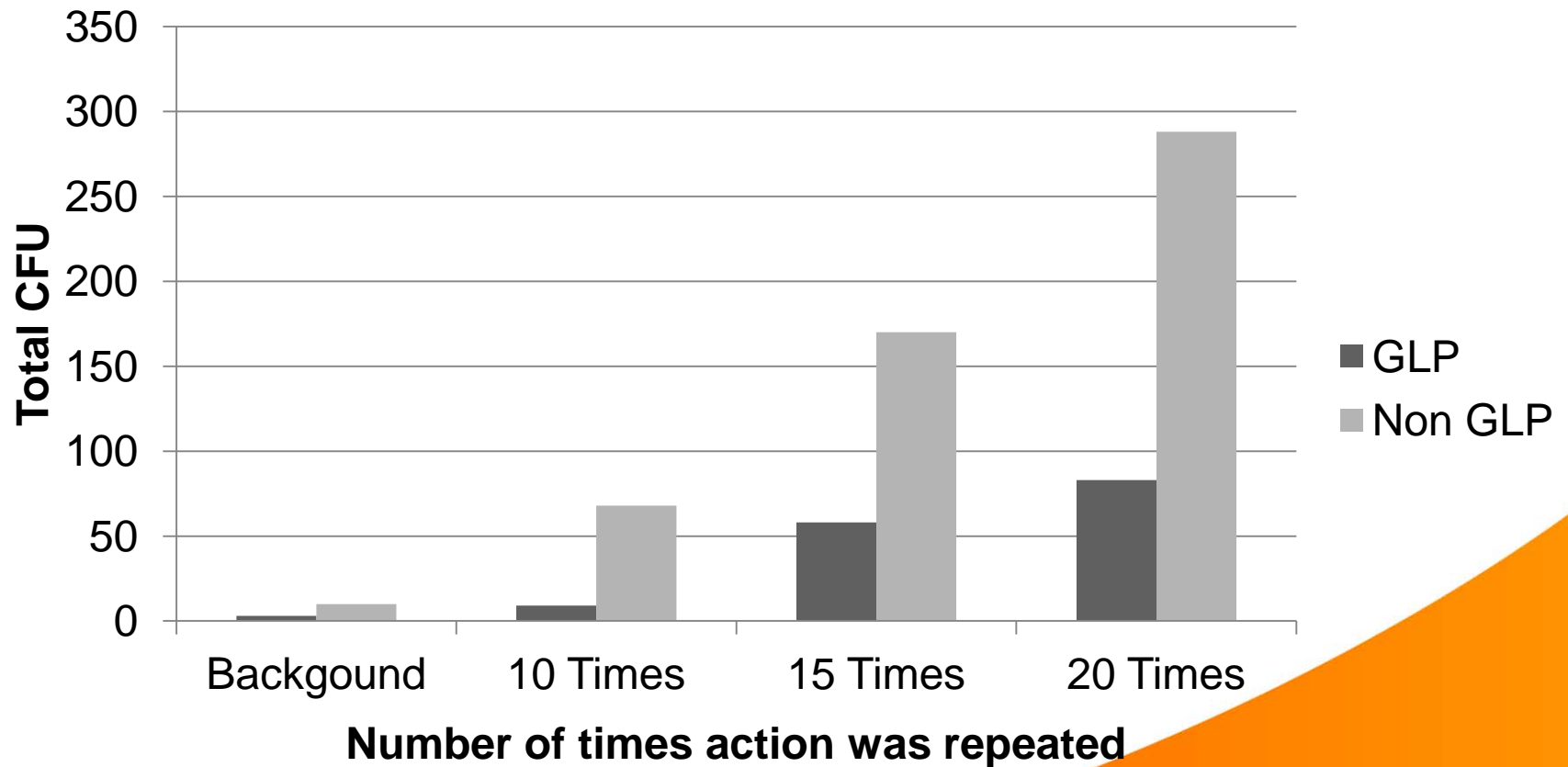
- **Inside Class 2 MSC –Fans not operating**
- ***Bacillus atrophaeus* suspension 10^9 spores ml⁻¹ with 0.01% Sodium fluorescein**
- **Sartorius MD8 sampling head with gelatine membrane filters ca. 100 l/min**
- **Gelatine filter can either be directly plated or dissolved in buffer for assay**



Results



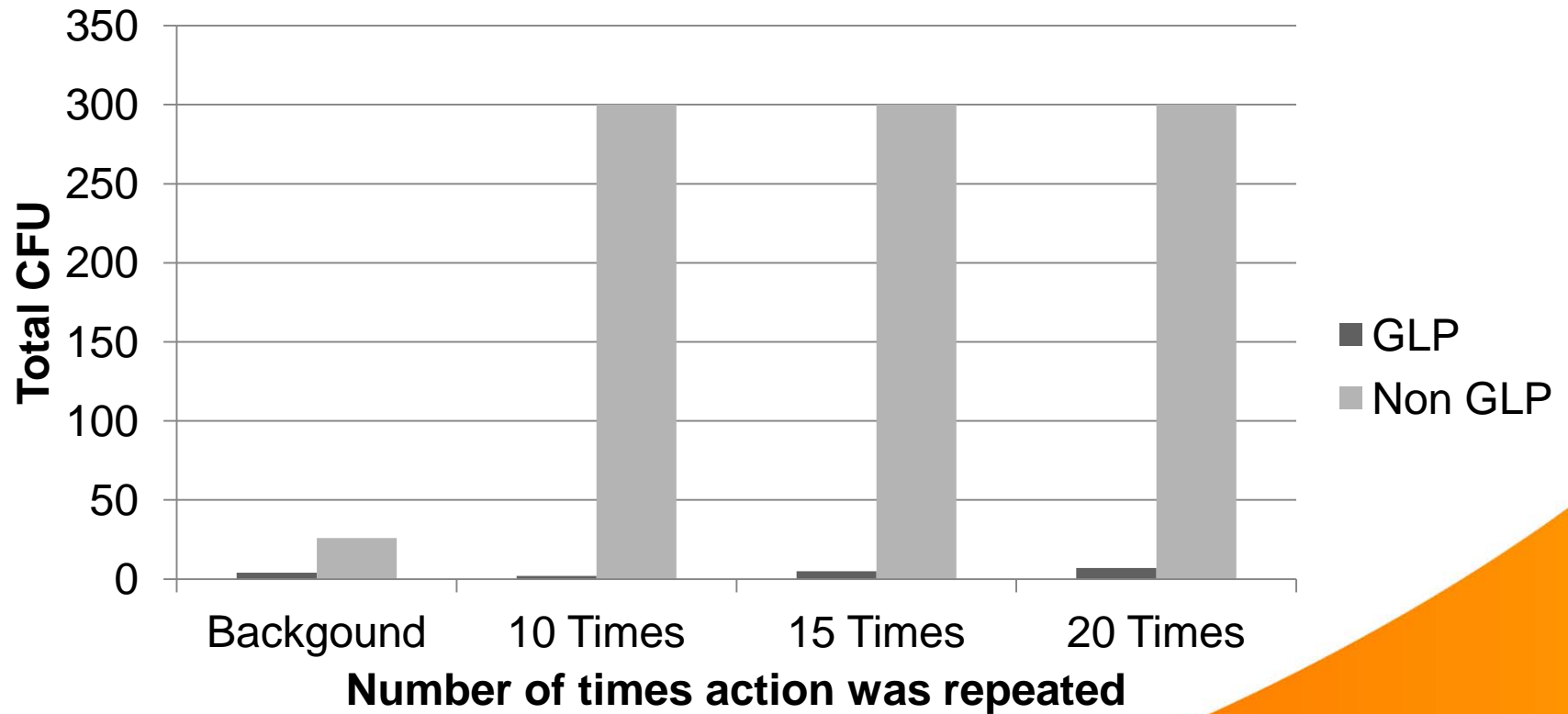
Vortexing a Solution



Results



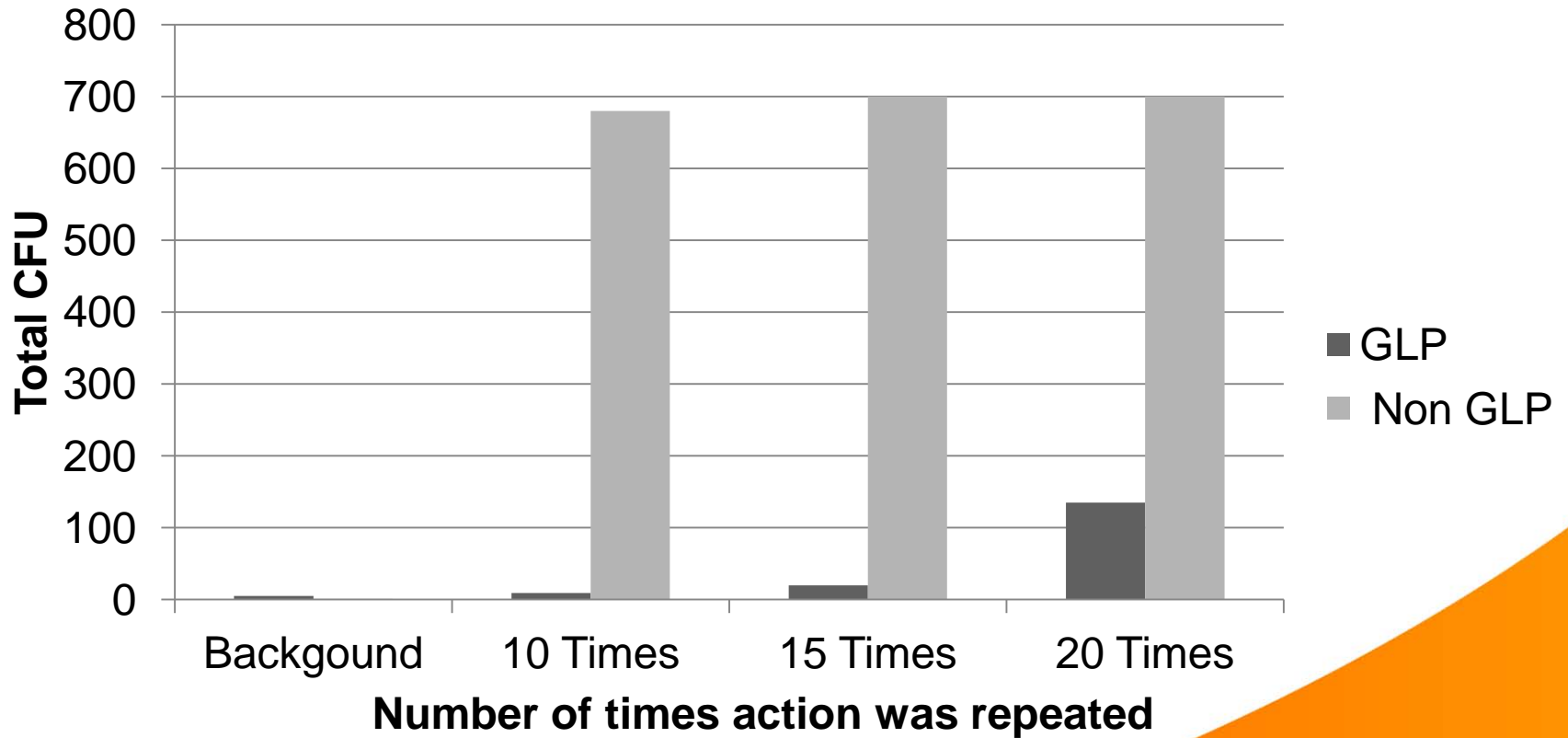
Serial Diluting



Results



Plating out a solution and spreading using a loop



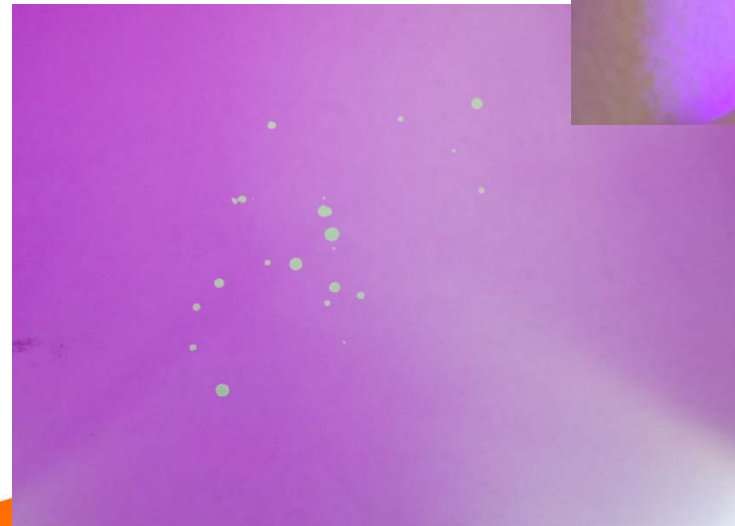
Looking at the effect of laboratory experience

- **Range of technical abilities used**
 - Classified as experienced with >1 years lab experience
 - Inexperienced <1 years lab experience
- **Total of 24 participants.**
 - 12 participants were in experienced group and 12 participants in the inexperienced.
- **Both experience and area of work recorded**
- **Inexperienced included new staff under training**

UV examination of tests



- **Suspensions spiked with fluorescein**
- **Subjects worked over BenchKote**
- **Gloves and disposable sleeves**
- **UV examination at the end of the sampling**



Methodology



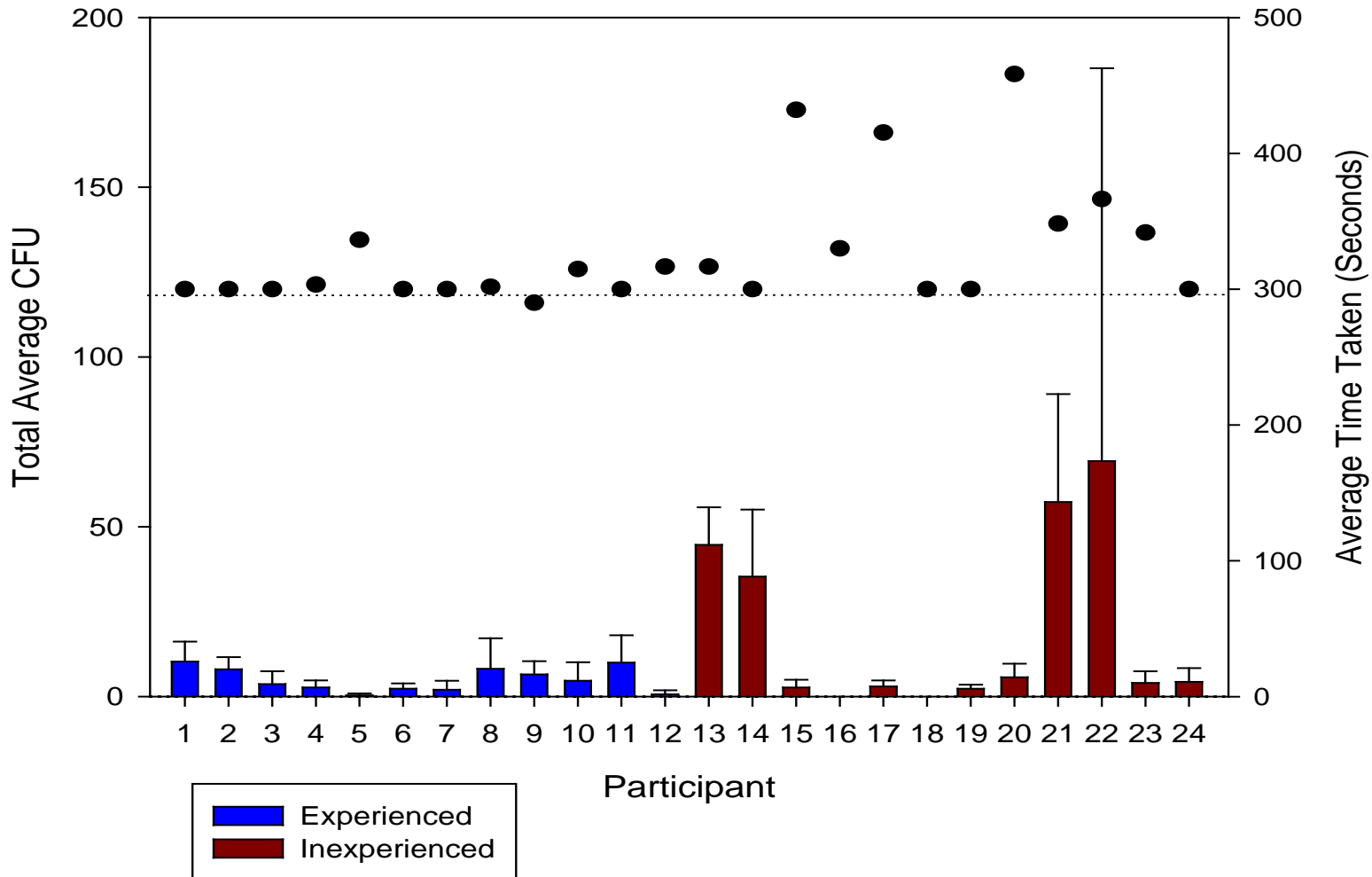
- **Sampling set-up as before**
- **Perform a 1 in 10 serial dilution 10 times**
- **Plating out 0.2ml onto 10 agar plates and spread using a 10 μ l loop**
- **Staff told that test is not against the clock but time taken recorded**



Results



Aerosol Generation from Serial Diluting a Spore Solution



Visual Contamination for Serial Diluting Procedure

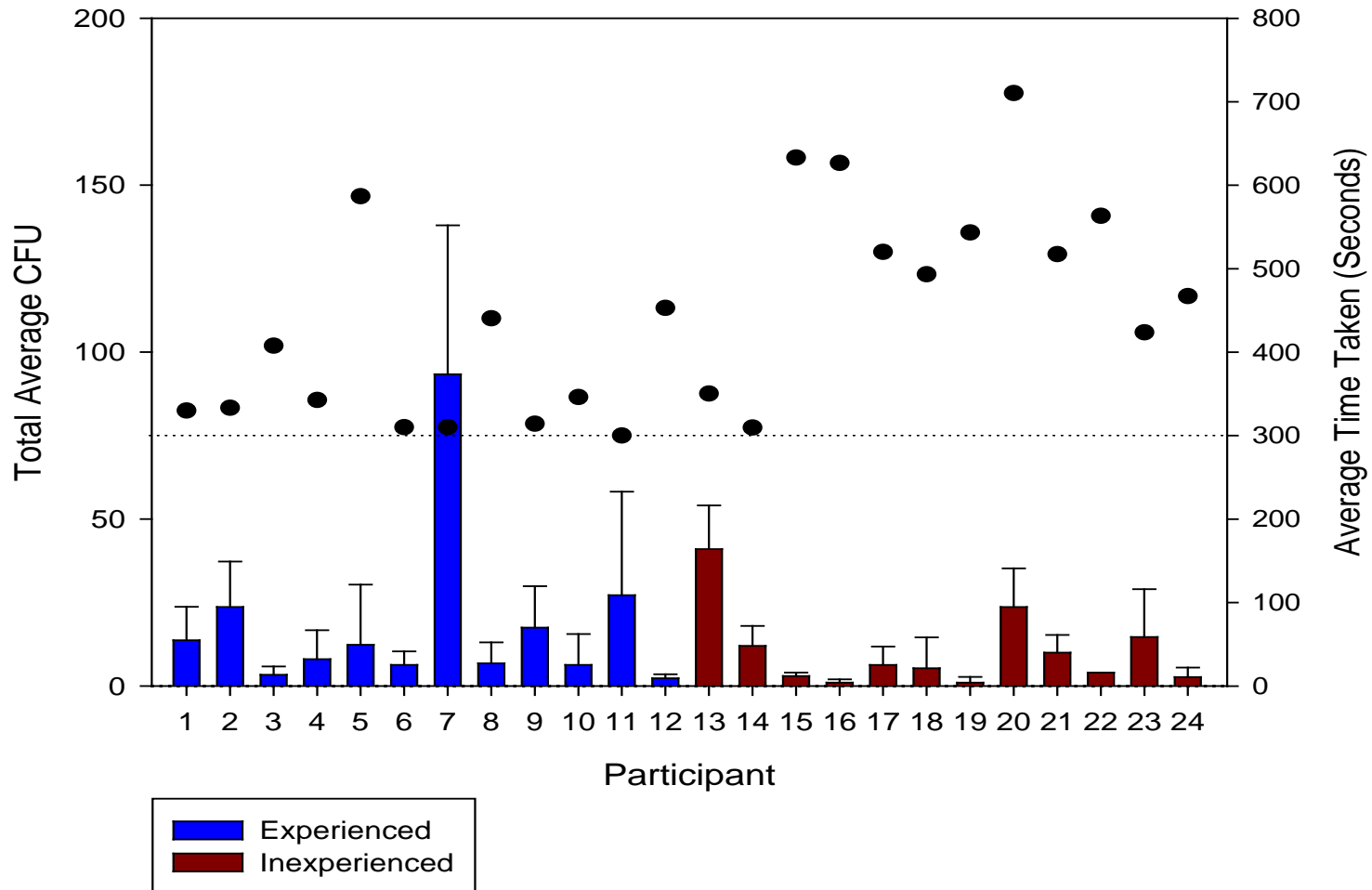


	Participant	BenchKote	Gloves
Experienced	1	<1	<1
	2	2	<1
	3	<1	<1
	4	<1	<1
	5	<1	<1
	6	<1	<1
	7	<1	<1
	8	2	3
	9	<1	3
	10	<1	<1
	11	<1	<1
	12	<1	<1
Inexperienced	1	22	<1
	2	<1	<1
	3	<1	<1
	4	<1	<1
	5	1	<1
	6	<1	<1
	7	<1	<1
	8	<1	<1
	9	2	4
	10	<1	3
	11	3	2
	12	1	<1

Results



Aerosol Generation from Assaying a Spore Solution



Visual Contamination for Plating Out Procedure



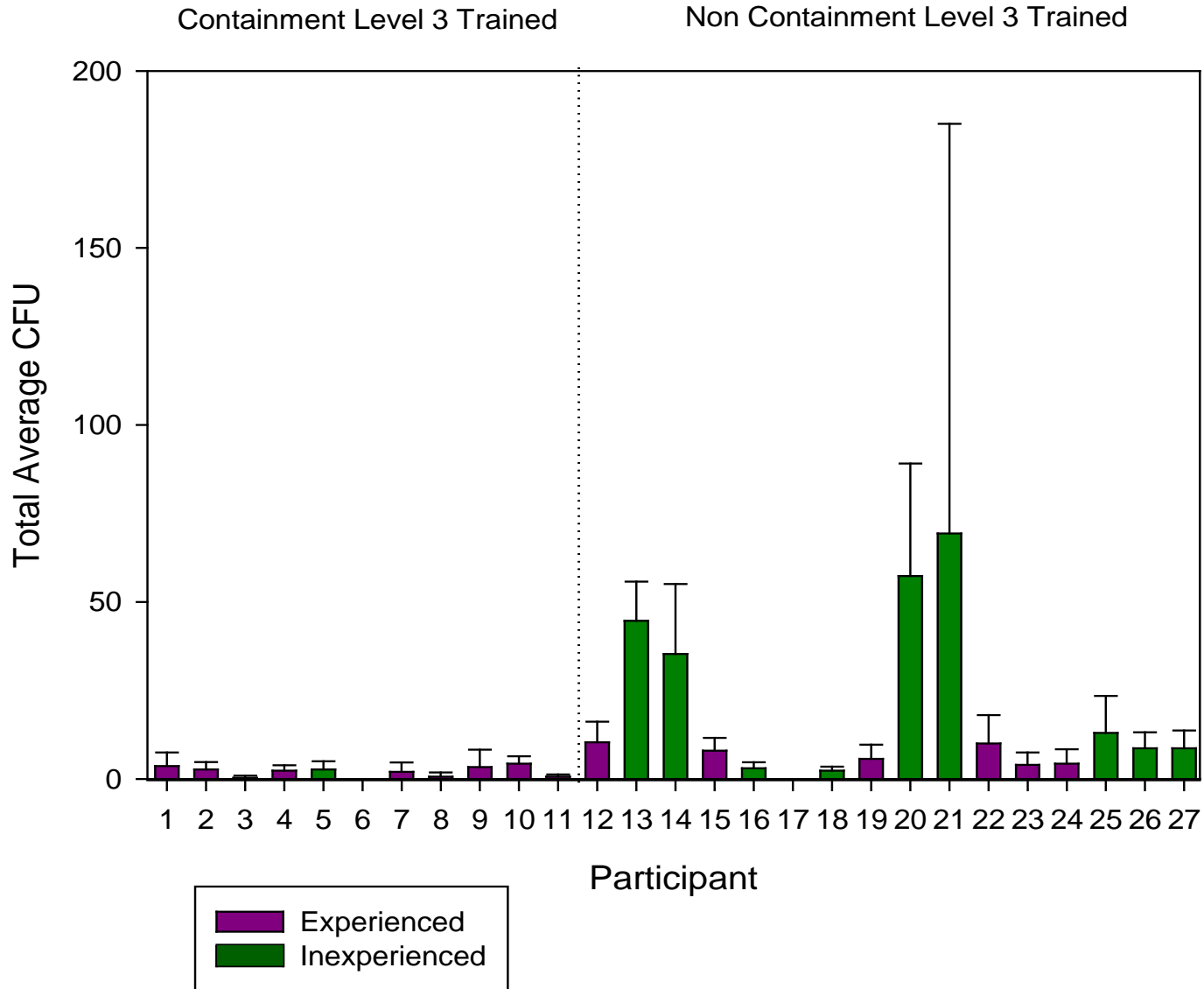
	Participant	BenchKote	Gloves
Experienced	1	9	<1
	2	12	<1
	3	12	3
	4	5	<1
	5	7	<1
	6	7	<1
	7	9	1
	8	7	2
	9	50	4
	10	1	2
	11	4	3
	12	13	<1
Inexperienced	1	18	<1
	2	8	<1
	3	2	<1
	4	5	2
	5	20	2
	6	<1	1
	7	<1	<1
	8	<1	2
	9	<1	5
	10	>100	>100
	11	1	2
	12	3	2

CL3 training at HPA Porton

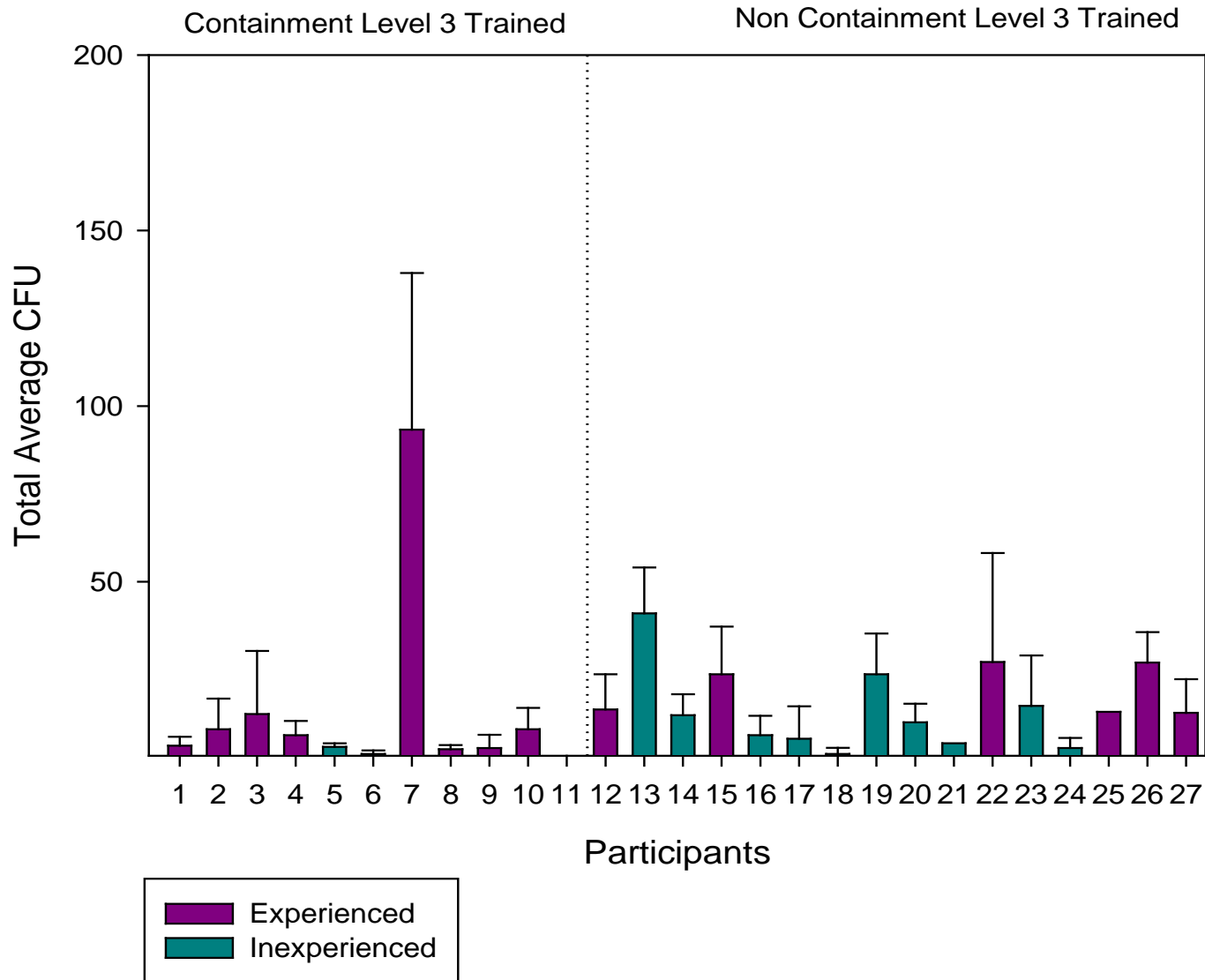


- **Combination of lectures and practical sessions**
- **Basic lab techniques are not covered**
- **Strong emphasis on understanding the risks**
- **Highlighting the consequences of poor practice**

Aerosol Generation from Plating Out and Spreading a Spore Solution



Aerosol Generation from Plating Out and Spreading a Spore Solution



Attendance of CL3 training



- **Those trained to work at containment level 3 generated lower total average aerosols regardless of experience.**
- **When tested before and after CL3 training, staff showed significant improvement**
- **When results discussed with staff, the raised awareness was sited as effecting their working practice**

Conclusions

- **Detectable aerosol levels are being generated even by well trained and experienced staff**
- **Variation seen across the inexperienced staff is higher, but experience alone does not preclude poor performance**
- **Training is a combination of good practice and a understanding of consequences**
- **Those trained to work at containment level 3 generated lower total average aerosols regardless of experience.**

QUESTIONS?

