Breaking the Chain of Infection: Ultraviolet Light to Disinfect Hospital Keyboards

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Disclosures

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Learning Objectives

At the conclusion of this activity, participants will be able to:

1. Recognize the role of high touch surfaces in healthcare-associated infections.

2. Identify two common healthcare-associated pathogens found on high-touch surfaces in the hospital setting.

3. Utilize various methods that decrease bacterial load on high touch hospital surfaces.

Outline

- Background & Significance
- Ultraviolet C (UV-C) introduction
- Patient/Problem, Intervention, Comparison, Outcome (PICOT)
- Project Design
- Intervention
- Results
- Lessons Learned
- Nursing Implications and Future Projects
- Conclusion

Background and Significance

- Healthcare Associated Infections (HAIs) :
  - Impact 6/100 hospital stays
  - ~ 90,000 deaths annually
  - > 40% are attributed to cross-contamination during patient care
  - Potential cost savings of $25 - $31.5 Billion

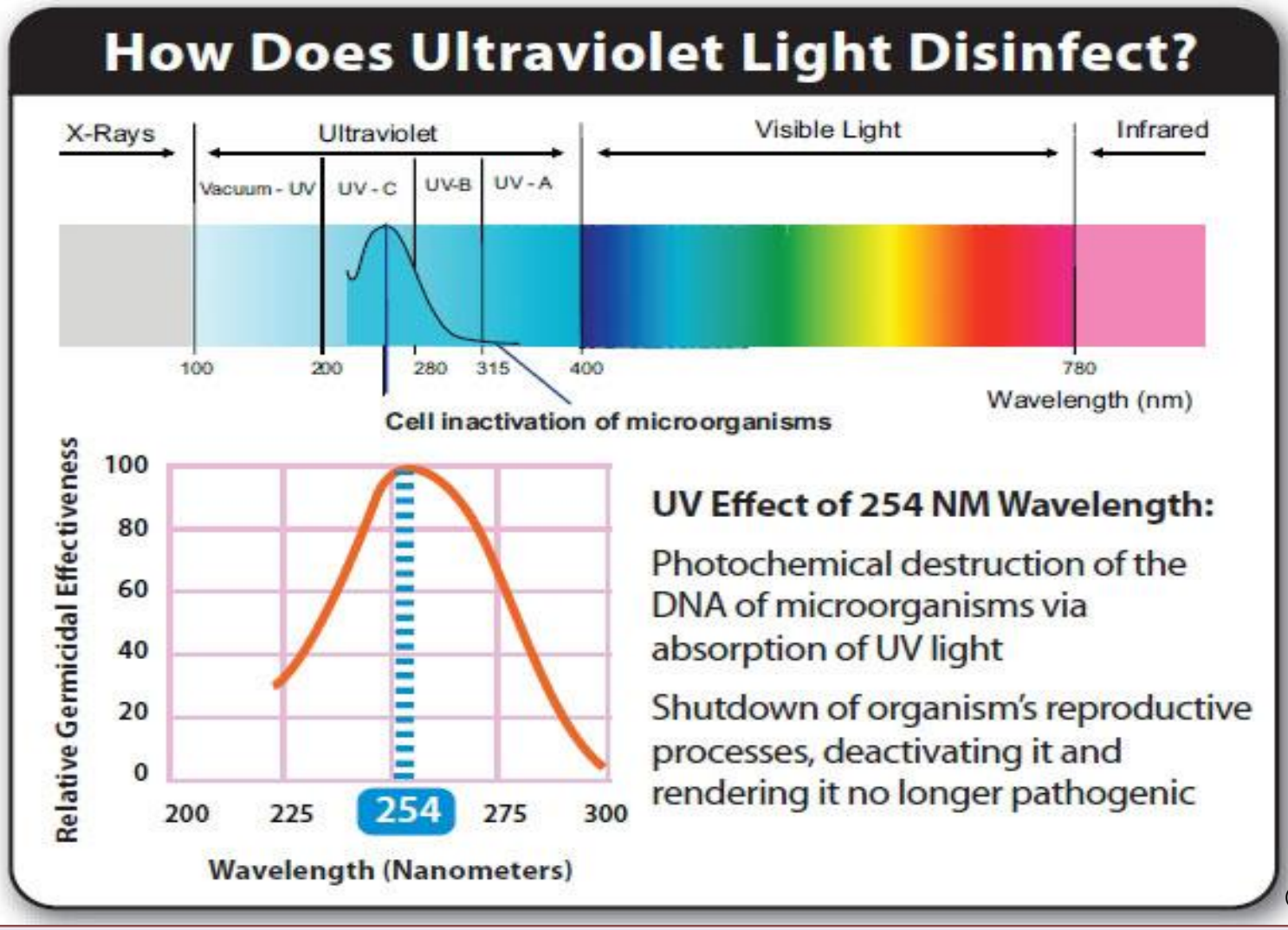
(Jones, A. 2011)

UV-C Introduction

- UV-C disinfection uses short range irradiation to deactivate Deoxyribonucleic acid (DNA) of bacteria, viruses, and other pathogens
- Intended to be adjunct of standard cleaning
- **No microorganisms resistant to UV-C**

(Source: Wikimedia Commons)

UV-C Introduction



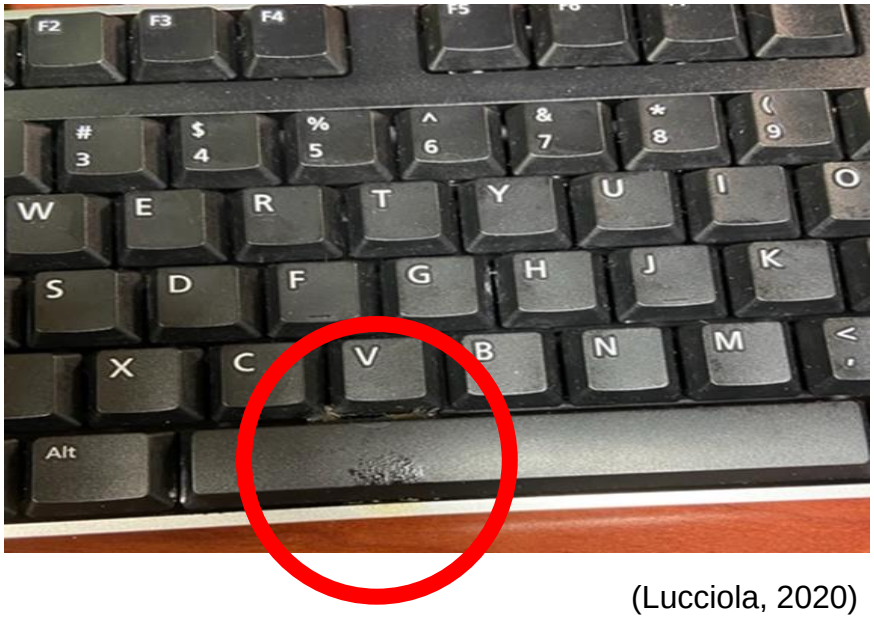
(cofounderstown.com)

Why UV-C?

- UV-C can eradicate pathogens in as little as 30 seconds
- UV-C may lower HAIs when used as adjunct for terminal room disinfection
- Useful for non-critical item high touch surfaces
- Increased interest given COVID-19

Why Keyboards?

- Inconsistent cleaning
- Hot topic - Joint Commission
- High touch, multiple user surface
- Hand hygiene/ glove use problematic



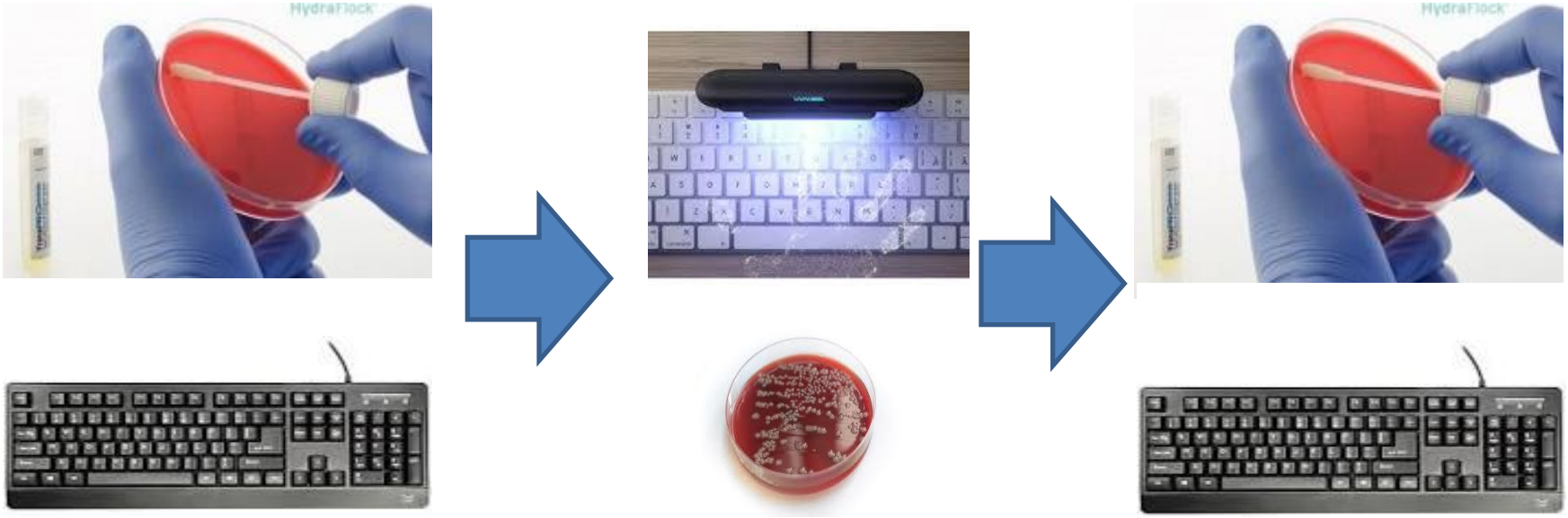
(Lucciola, 2020)

PICOT

In the (P) medical surgical inpatient environment does (I) ultraviolet disinfection of keyboards compared to (C) current practice (O) decrease the total number of bacteria found on keyboards over a (T) 16-week period.

Project Design

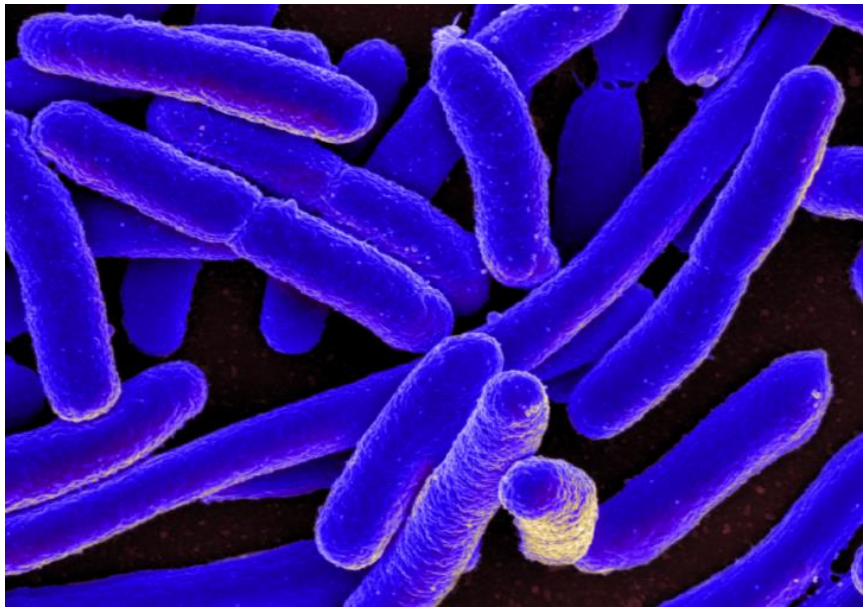
- Baseline Sampling
- Intervention & Staff Training
- Repeat Sampling
- Compare colony-forming unit (CFU) counts



(Source: Wikimedia Commons)

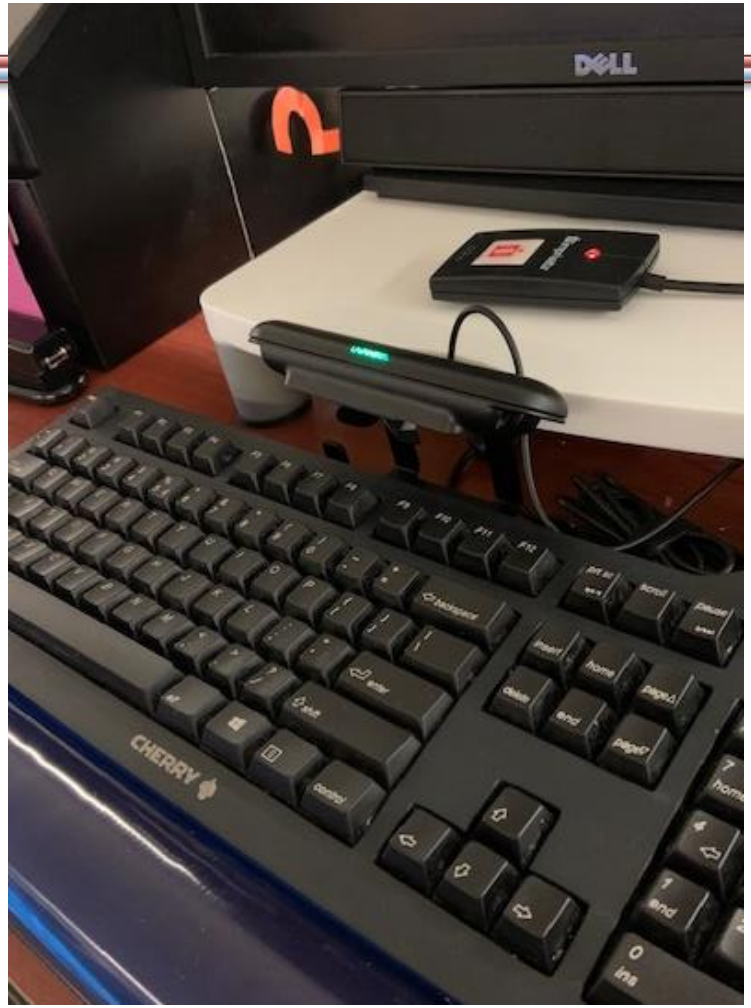
MALDI-ToF

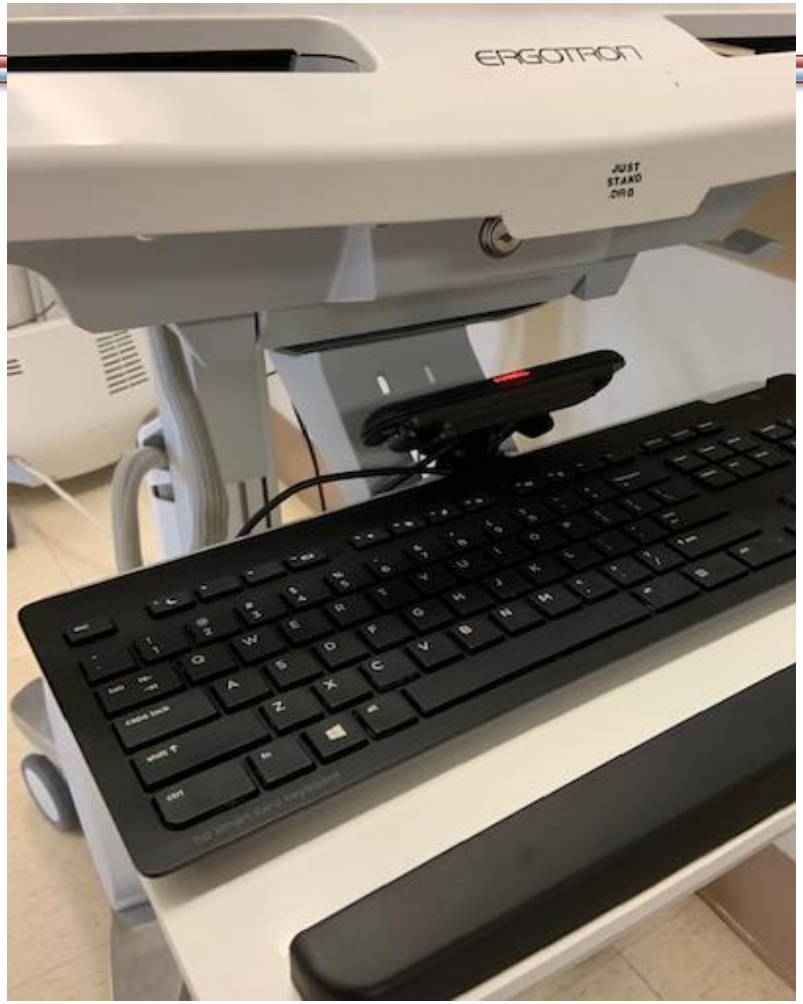
- MALDI-ToF
  - Matrix Assisted Laser Desorption Ionization-Time of Flight
    - Identification of the TYPE of bacteria present



(Source: Wikimedia Commons)

Intervention





(Lucciola, 2020)

Results

	Baseline	After UV
Mean CFUs All	70	
Range	2- 150+	
Intervention Mean		28
Intervention Range		1-114
Control Mean		75
Control Range		1 -150+
Keyboards Sampled	35	32
Desktop keyboards	18	16
WOW keyboards	17	16

(Lucciola, 2020)

Statistical Analysis

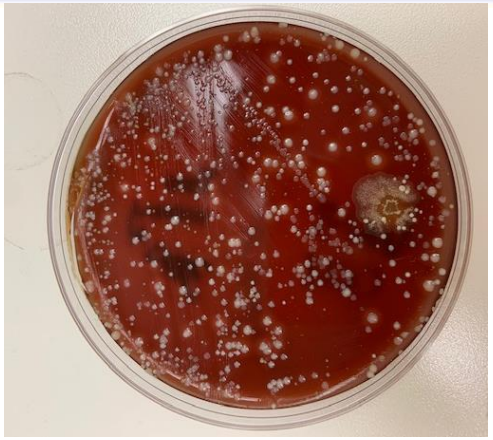
	Baseline Sampling		After UVC Intervention			95% CI for Mean Difference			
Outcome	M	SD	M	SD	n		r	t	df
Intervention group	74.81	57.96	28.25	30.40	16	11.17, 81.95	.036*	2.81*	15
Control group	73.50	62.42	74.69	86.06	16	-52.43,50.05	.191	-.049	15

Results of Paired t-test and Descriptive Statistics for Intervention and Control Keyboards * $p < .05$.

(Lucciola, 2020)

HAI Bacteria Results

- MALDI-ToF
- Pre:
  - *Staphylococcus aureus* on 40% of the keyboards (14/35)
  - *Micrococcus* on 60% of the keyboards (21/35)
- Post:
  - *Staphylococcus aureus* on 6% of the keyboards (2/32)
  - *Micrococcus* on 6% (2/32) of the keyboards



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Lessons Learned

- Of the 31 UV-C lights that were installed, only 16 were functioning during post-intervention swabbing
- 4 keyboards not functioning, 7 USB cords missing, 4 ‘red blinking’ lights in need of firmware update

(Source: Wikimedia Commons)

Key Takeaways/Nursing Implications

- Educate co-workers on dangers of high touch surfaces
- Read manufacture guidelines and use correct product to clean items
- Pay particular attention to housekeeping/nurse underlap in cleaning
- If UV-C available **use it**

Conclusions

- UV-C lights are effective at reducing the number of CFUs on keyboards
- Project monitoring would be enhanced/simplified if devices could be on hospital network

(Lucciola, 2020)

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