UV-C light for Processing of Products and Surfaces

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Contents

- Introduction to UV-C light
- Applications of the technology for surface inactivation
- Factors to consider when specifying and validating a UV-C system

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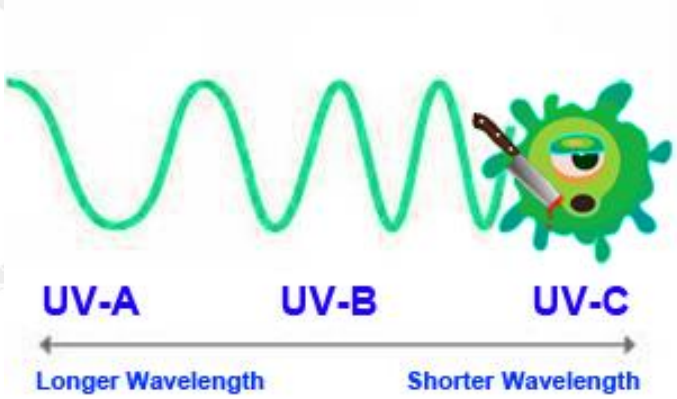
Principals and mechanisms

- Technology uses light to prevent microorganisms from growing
- Light is in the Band C part of the ultraviolet light spectrum (200-280 nm)
- Bacteria need direct exposure to the 254 nm light for inactivation
- UV-C light modifies microorganism DNA and prevents it from growing



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Microbial Susceptibility

- Level of susceptibility:

  Bacteria and yeast> virus and bacterial spores >moulds

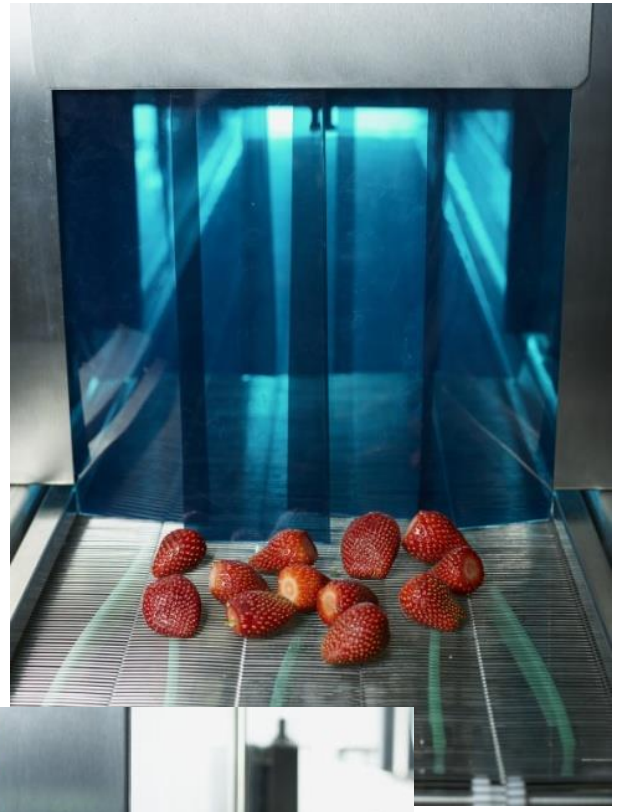
- *Aspergillius brasiliensis (niger)* being the most resistant

- Food products have complex matrix and surface topography that influence inactivation and you are typically likely to get 1-2 log reductions

- Smoother surfaces 3- 5 logs possible

UV-C tunnel

- System consist 16 x 95 watt ‘high output’ UV-C emitters
- Lamps top and bottom of a wire mesh belt



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UV-C transfer systems

Images courtesy of Steve O'Brien UV technology

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UV-C transfer systems

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Conveyor transfer system

Images courtesy of Richard Little Jenton Group

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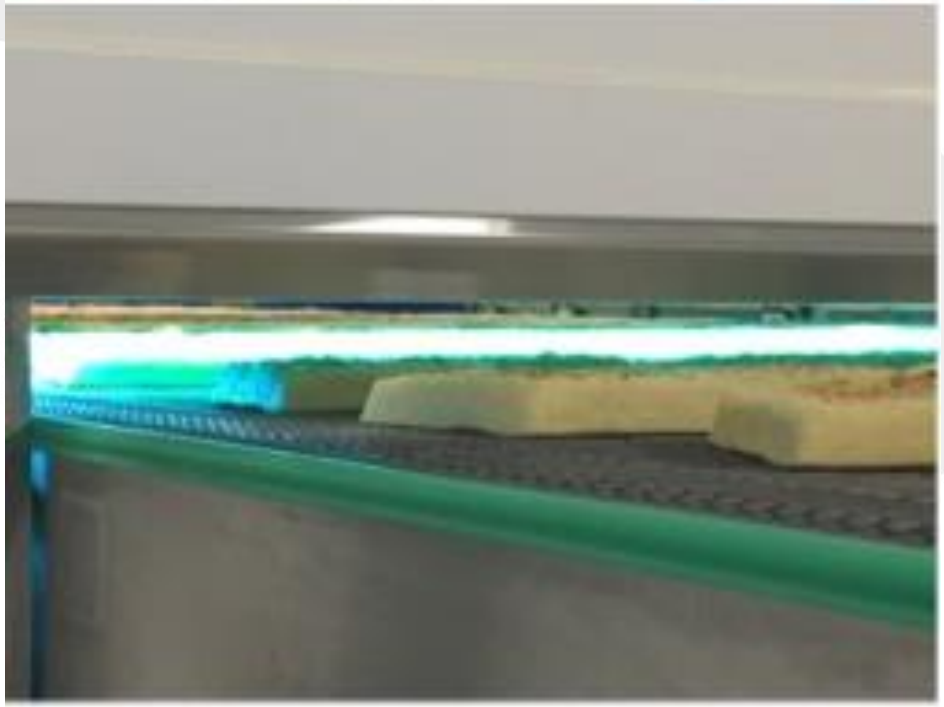

UV Technology

Specialists in Decontamination Technologies

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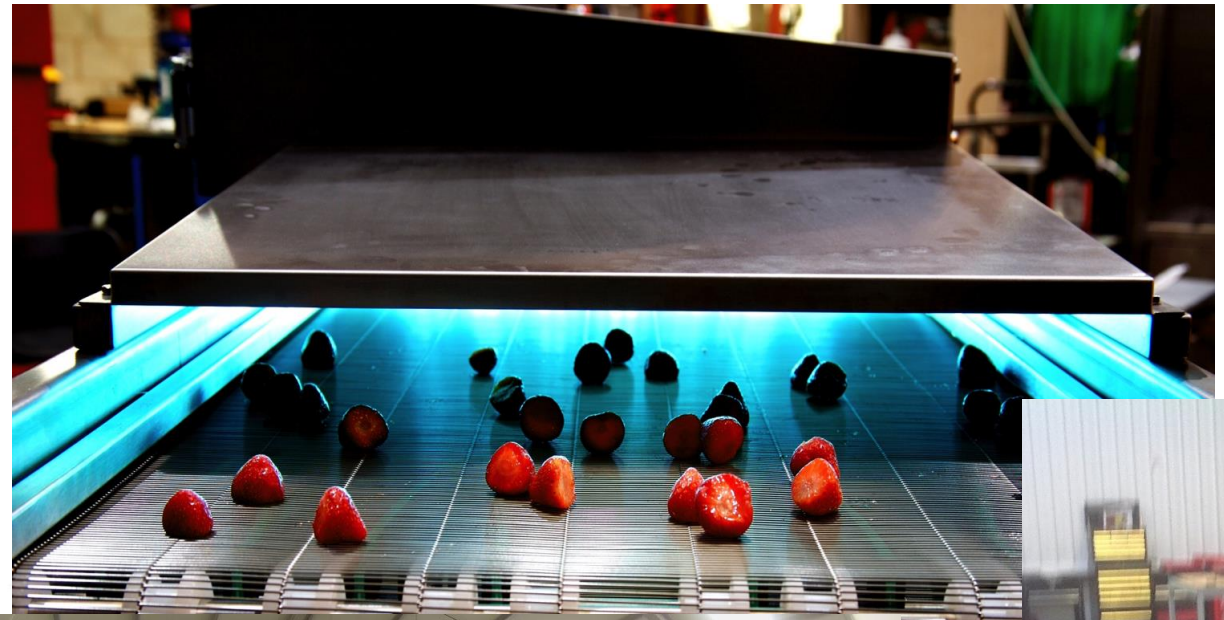
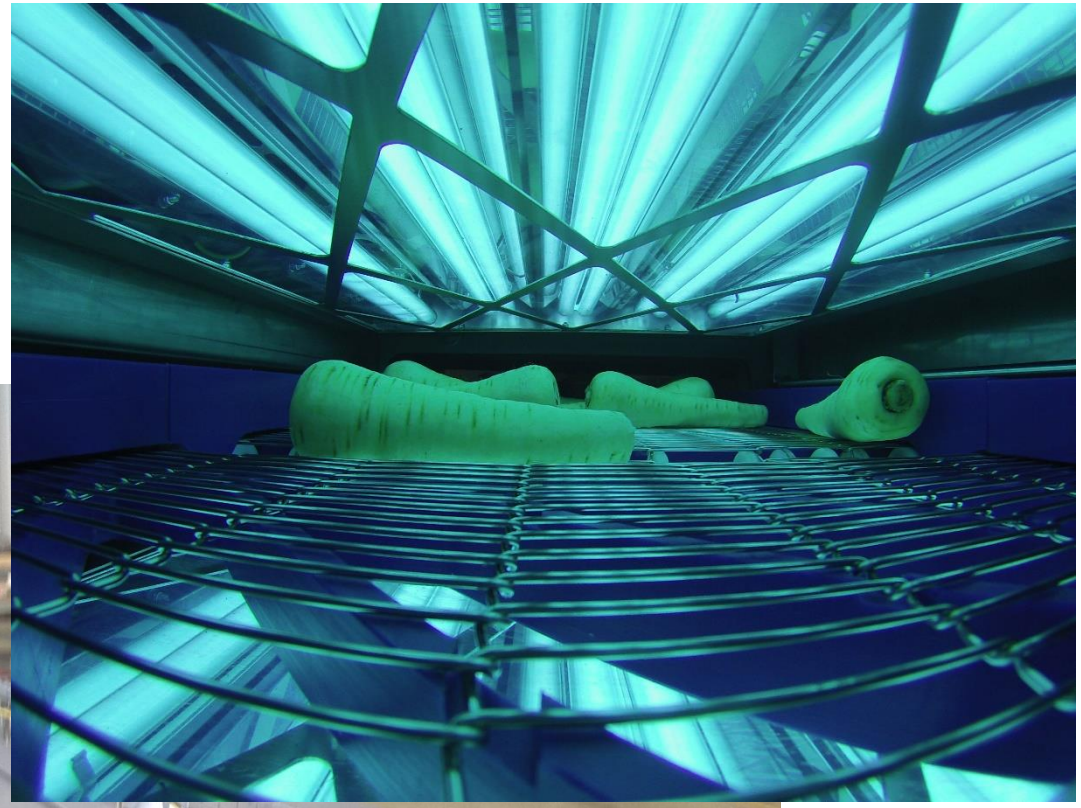
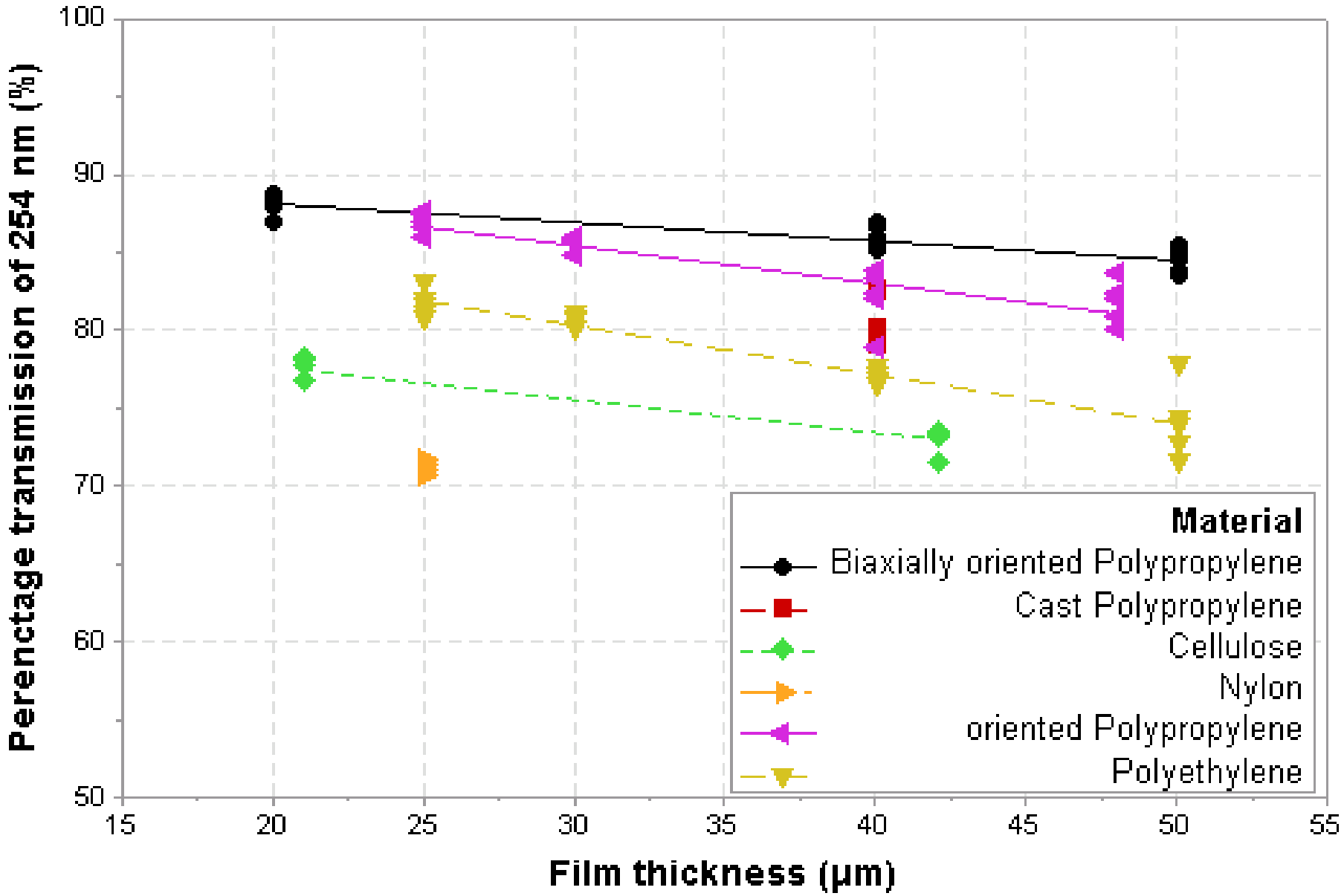




Images courtesy of Steve O'Brien UV technology

UV-C transmission

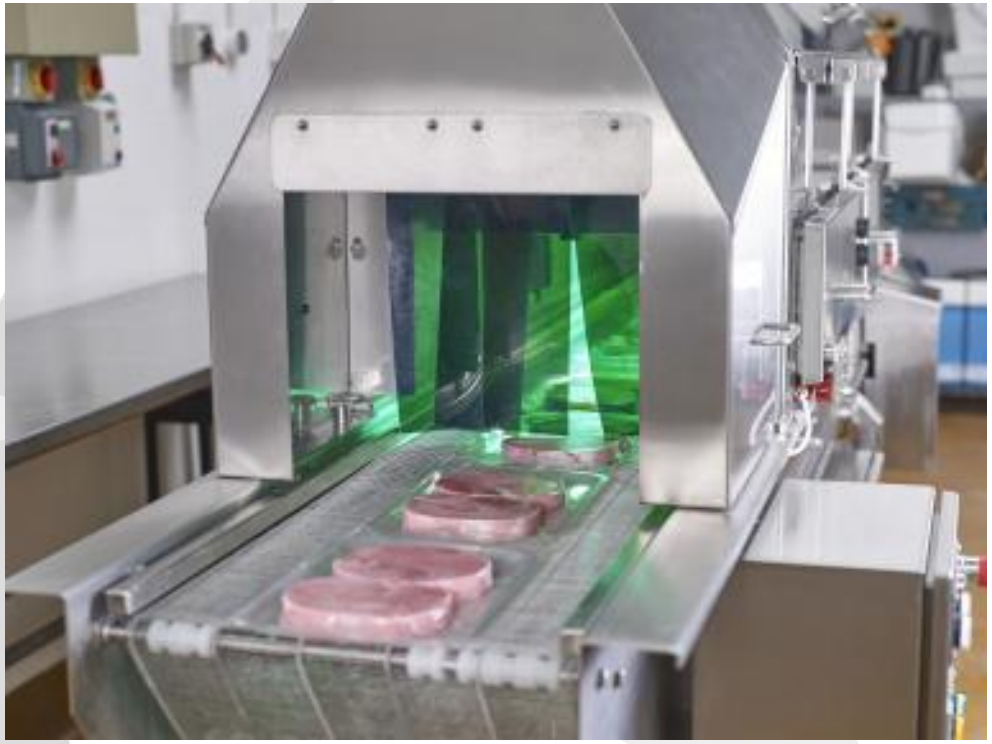


Validation considerations

- Things to consider when specifying a UV-C system and then validating the system.

1. How many different products will be treated and their differences
2. Shadowing and shielding management with the system
3. Where is the dark (low dose) region in the tunnel or chamber.
4. Monitoring the dose
5. Target organisms and log reductions
6. Throughput and floor space

Multiple products



- Furthest from the lamps needs to be validated as it will receive the lowest intensity of light (mW/cm^2)
- Items closer to the lamps will be overdosed so need to consider quality impacts

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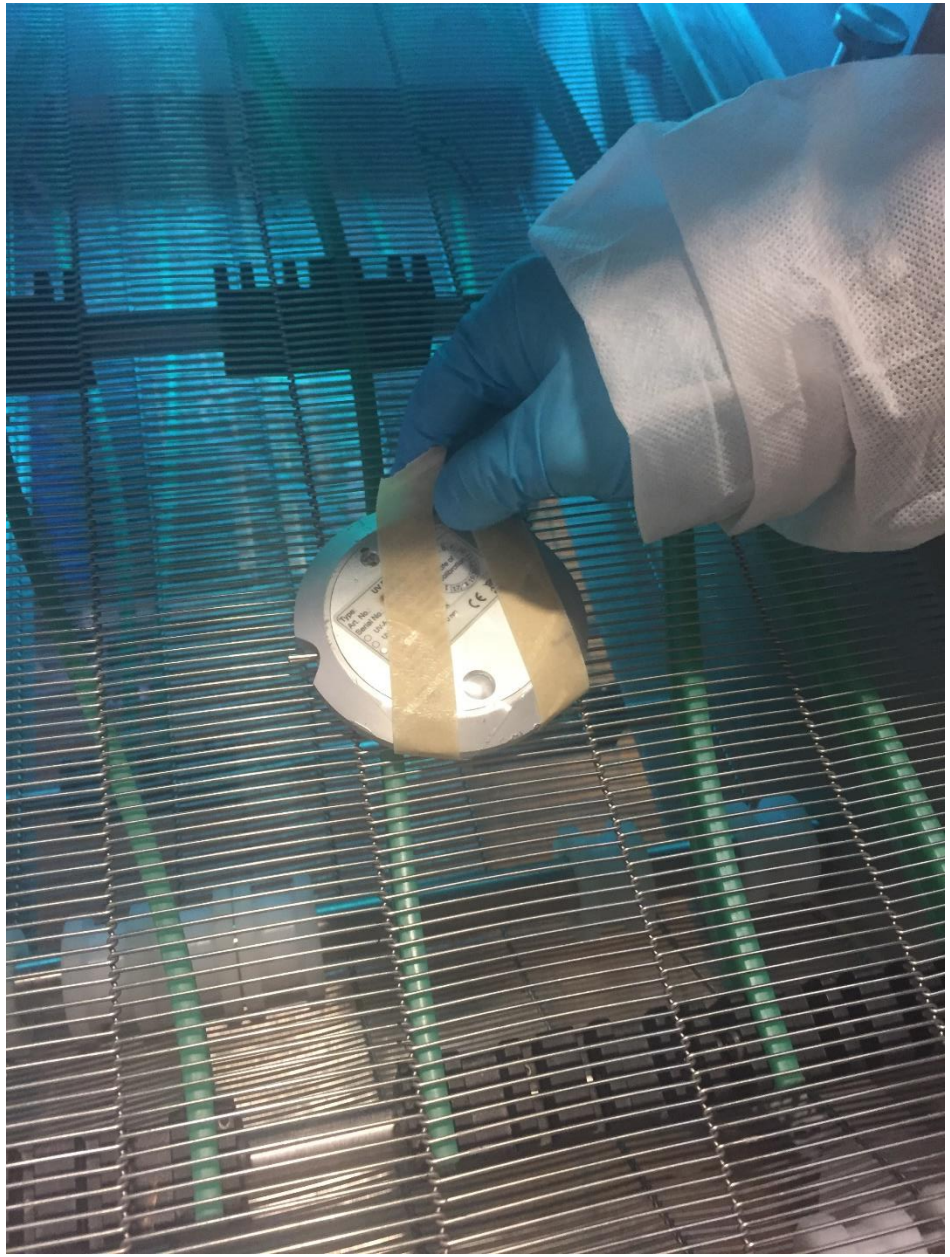
Shadowing and shielding

- Belt and its support structures will impact the dose delivered to the underside of the product

- Systems can index products to move it on the belt to expose shielded areas



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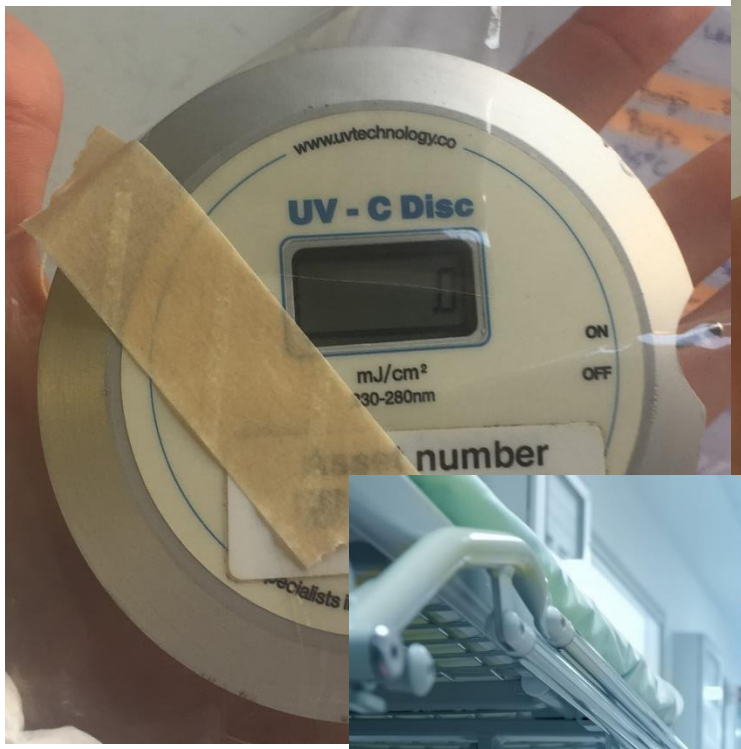
Dose monitoring

- Systems can vary so be aware!
- Different spectral ranges
- Use vs how it was calibrated
- Alternative quick checks



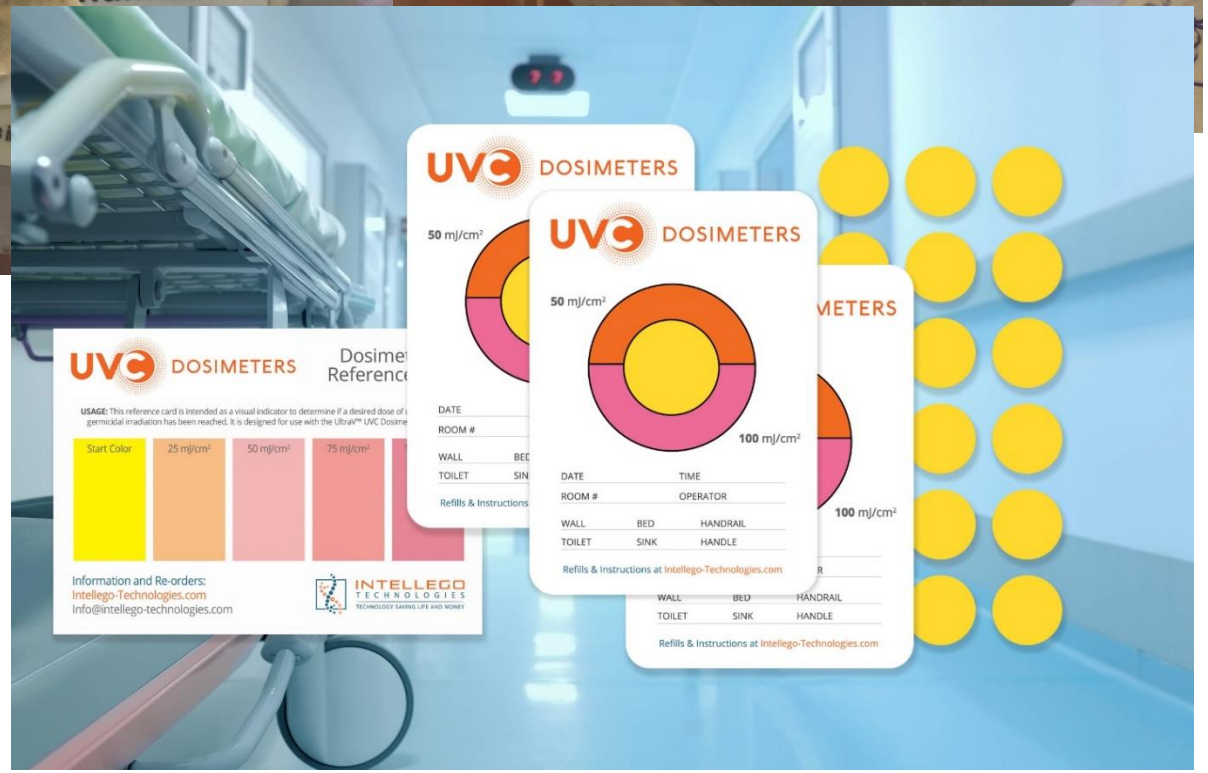
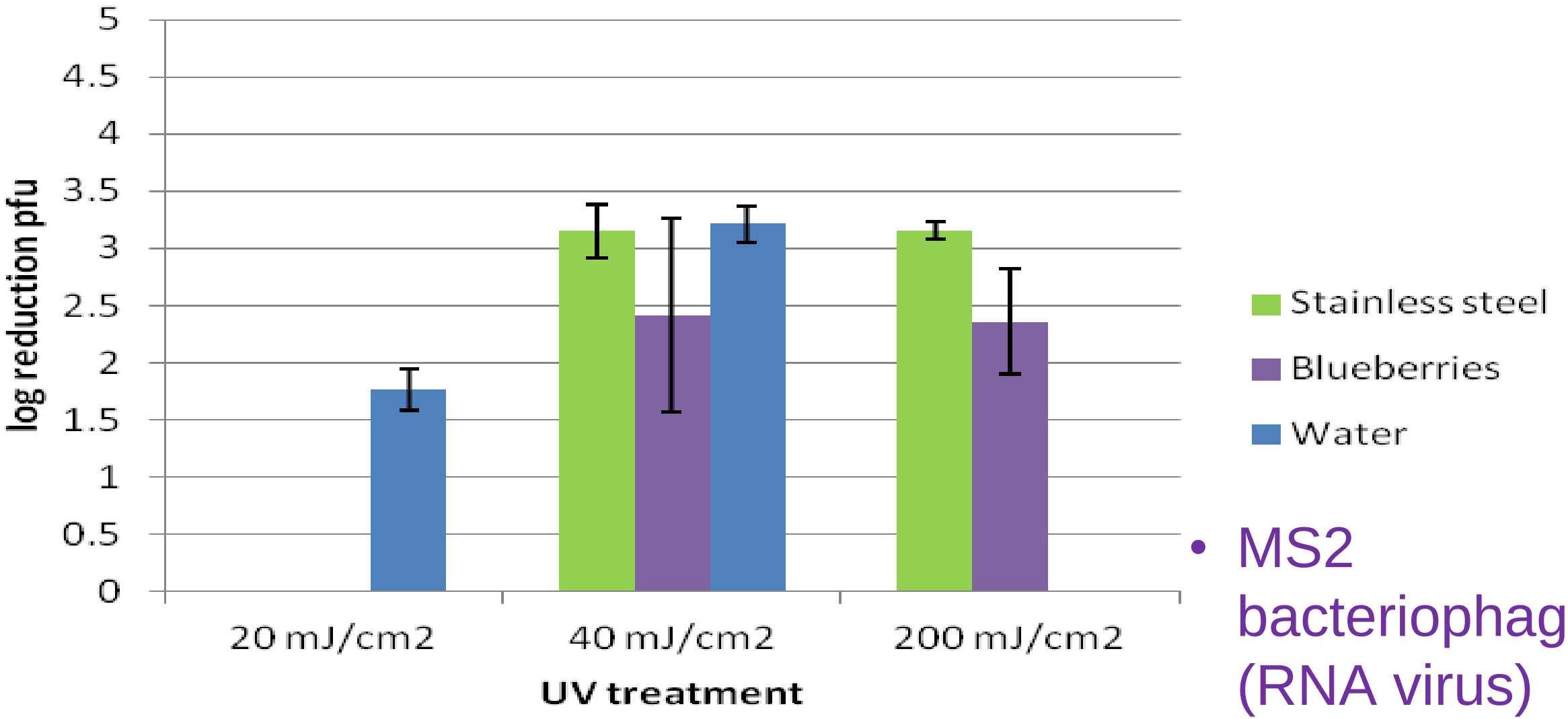


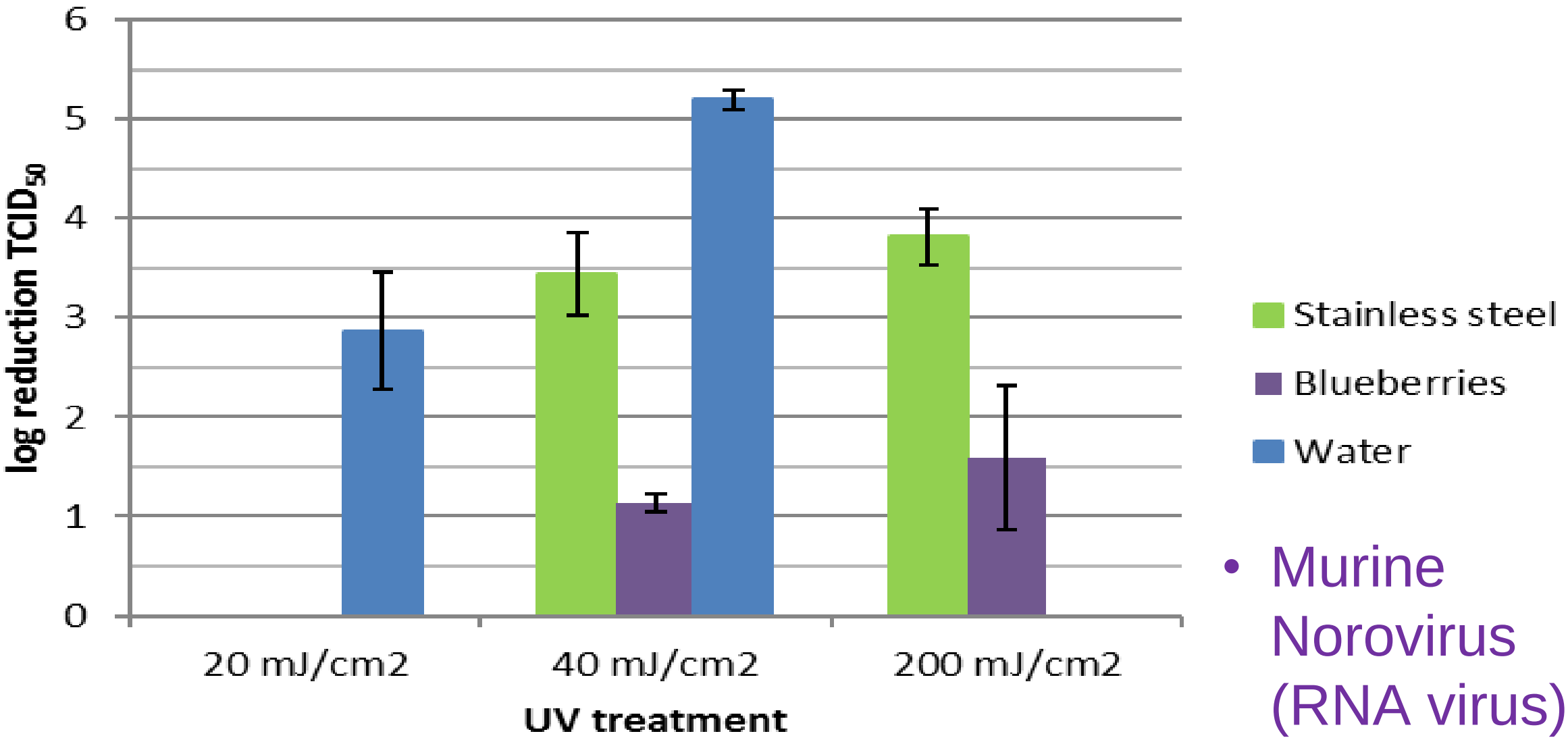
Image provided by Claes Lindahl at Intellego Technologies

Virus surrogate inactivation



- MS2 bacteriophage (RNA virus)

Virus surrogate inactivation



- Murine Norovirus (RNA virus)

Technical advantages/limitations

Advantages	Limitations
Broad antimicrobial activity	Low penetration
No residues after decomposition	Shadowing issue
Non-thermal, dry decontamination method	Only surface decontamination
Do not store hazardous materials	Can cause some oxidation and damage the product at high dosages
Relatively low running costs/lack of extensive safety equipment	

Summary

- Technology has a wide range of possible application for surface microbial reductions
- Validation of all the parameters that can impact on the efficacy of the process need to be considered so suitable worst case conditions can be tested.
- Suitability of the product needs to be determined on a case by case basis
- Important to consider the organisms targeted and the dosages required and the impacts on key nutrient components

Thanks you for listening!!!

- Any questions or comments please get in touch

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