MEASURING CONSUMER GRADE FACE MASKS DEGRADATION UPON STERILIZATION USING BRIGHT FIELD MICROSCOPY

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Introduction

- Drop transmission is the main route of spreading viruses such as COVID-19. Wearing a face mask is the main preventive measure to contain its spread [1].
- To extend face masks' lifecycle and contribute to sustainability, these are meant to be re-used when properly sanitized [1, 2].
- Awareness on how a conventional facemask degrades by reducing its filtration efficiency after several uses and washing cycles is required to reassure facemask consumers that the product continues to provide suitable protection.

Materials and methods

Face mask mounting and sterilization

- Ten BMF images were averaged for each material and autoclave cycle.
- Thresholding was used to highlight the pore size distribution within the material.
- Image J Ferret’s diameter was used to measure the longest distance between any two points along the pores identified within the fabric.

Particle filtration pre-evaluation tests

- From the microscopy analysis results, bamboo fabric showed better resistance to sterilization cycles with an average pore size increase of ~1µm for each autoclave cycle.

Results

- The pre-evaluation obtained with our particle filtration testing system revealed bamboo fabric offers maximum protection when compared with woven fabrics such as silk cotton and flannel. This is due to bamboo fibers having a semi-random orientation.
- Bamboo fabric filtration properties were correlated with the pores size showing that approximately a ~20% drop in protection for the first three sterilization cycles followed by a reduced decrease in the fourth and fifth cycles.

Discussion and conclusions

- By pre-evaluating a batch of a given face mask fabric and relating this to its pore size, we can potentially use BMF as an indicative tool to assess consumer grade fabric face masks degradation without having to run particle filtration tests for each additional manufactured batch.
- This information can be used by the manufacturer to indicate the maximum number of washing cycles that face mask can tolerate still offering protection against viruses while contributing to its re-usability.

References