Perimeter bowl disinfection during the COVID-19 pandemic

Kique Romero; Robert Borque; Thomas Callan, OD; Katharina Foote, PhD; Eric Larson; Robert Sprowl, PhD; Ashwini Tamhakar; Brad Gilbertson
Carl Zeiss Meditec, Inc., Dublin, CA, USA

Poster # 3544841

PURPOSE

Automated bowl perimeters present unique challenges for disinfection between patients during the SARS-CoV-2 (COVID-19) pandemic. International public health guidelines recommend the use of 70% isopropyl alcohol (IPA) or Ultraviolet-C light (UV-C) for disinfection. In this study we evaluated the effect of repeated exposure on the visual field stimulus in Humphrey Field Analyzers.

METHODS

- We subjected perimeter bowls (HFA3 Model 860, ZEISS, Dublin, CA and HFA™ II-i, ZEISS, Dublin, CA) to highly accelerated life tests (HALT) for exposure to IPA or UV-C.
- For IPA, the device was sanitized with an IPA atomizing spray 15 times, followed by an 84hr IPA deep soak of components integral to the stimulus.
- For UV-C (Figure 1), materials of concern were irradiated with a 254nm light for a cumulative lifetime exposure of 22.8 kJ/cm^2. This represents an excess of 75,000 disinfection cycles at above the 1-Log Reduction (D90) dose for COVID-19.
- The effect on the visual field stimulus (combination of projected stimulus and background illumination) was evaluated either by auto verifying that the correct luminance values were recorded at calibrated positions on the instrument or by manually measuring the chromaticity and luminance of the bowl.

(a) (b) (c) (d)

Figure 1. UV-C test setups. (a) bowl, (b) chinrest, (c) yellow filter, (d) background illumination lamp.

Email: kique.romero@zeiss.com

Disclosures: KR (E), RB (E), TC (E), KF (E), EL (E), RS (E), AT (E), BG (E): Carl Zeiss Meditec, Inc.

RESULTS

- Automatic verification tests on an HFA3 after testing, showed that the instrument was within tolerance with a reading error spread less than 1dB for an attenuation range of 0-34dB (Table 1).
- UV-C exposure to the HFA II-i bowl itself resulted in a shift of less than 0.002 in chromaticity and 18fL in luminance.
- Other plastics (chin rest, cover, baffle, mounting bracket on background illumination lamp) were visibly affected by UV-C (Figure 2) and exhibited a shift in chromaticity (> 0.02) and luminance (> 114fL) but this did not affect the visual field stimulus.

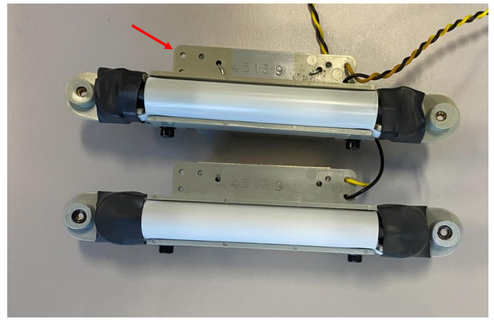

Figure 2. Red arrow points to solarized plastic on irradiated sample.

Automatic Verification on HFA3							
Luminance Reading Error		IPA				UV-C	
		Spray		Soak			
Parameter	Tolerance	Baseline	Final	Baseline	Final	Baseline	Final
dB Spread (0-4dB attenuation)	< 2 dB	0.62 dB	0.48 dB	0.48 dB	0.57 dB	0.64 dB	0.83 dB
dB Spread (4-34dB attenuation)	< 1 dB	0.5 dB	0.48 dB	0.42 dB	0.38 dB	0.86 dB	0.41 dB

Manual Verification on HFA II-i					
Material	Chromaticity			Luminance	
	x	y	Shift	Value	Shift
Bowl Baseline	0.4411	0.4169	0.0017	886 fL	18 fL
Bowl after UV-C	0.4431	0.4178		868 fL	
Cover/Baffle Baseline	0.4376	0.4163	0.0283	752 fL	114 fL
Cover/Baffle after UV-C	0.4701	0.4325		638 fL	

Table 1. Automatic and manual verification results for chromaticity and luminance.

CONCLUSIONS

There was no effect on the visual field stimulus in an HFA3 or an HFA II-i after repeated exposure to 70% IPA or UV-C at 254nm for the lifetime of the instrument. There was visible solarization on some plastics, however these did not affect the test performance; they were either outside the bowl or were compensated by the stimulus intensity.