

Problem

From Ebola in West Africa to *C. difficile* in hospitals, highly infectious diseases are difficult to kill, easily transmitted, and pose a serious threat to human health. During the Ebola crisis in West Africa, 1 out of every 20 people who died was a healthcare worker, and in US hospitals, 1 out of every 25 patients will contract a healthcare-associated infection (HAI), leading to over 75,000 deaths and \$28B lost in the US healthcare system each year. A recent report found that contamination occurs in over 50% of glove and gown removal procedures without proper intervention. Current disinfectants: 1) are transparent, making it easy to miss spots, 2) form droplets and roll off waterproof surfaces, leaving gaps in coverage (<33% surface area coverage), and 3) have no method for ensuring end-user compliance, with workers not waiting the required contact time to fully kill pathogens. This means that surfaces could still be contaminated even after cleaning. Furthermore, workers have reported eye and lung irritation from using bleach sprays.

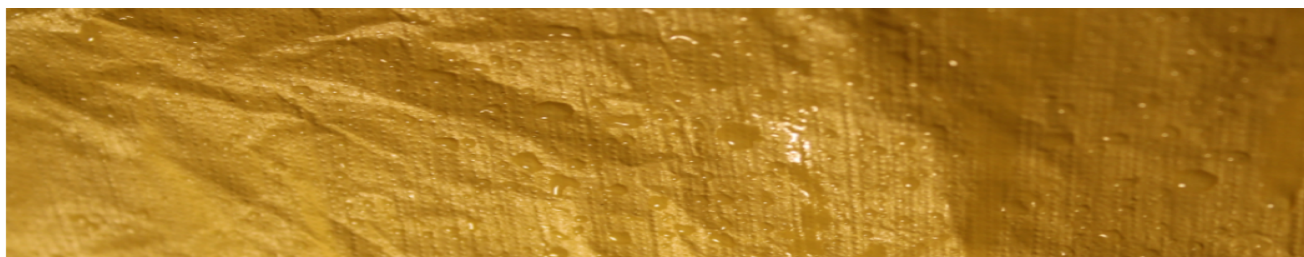


Figure 1. Current disinfectants are difficult to visualize and form droplets, leaving gaps in coverage.

Product and Solution

Our solution is Highlight[®], a patent-pending additive mixed into bleach solutions at point-of-use. Unlike current disinfectants, Highlight[®]-enhanced solutions are colorized, fully cover and stick to surfaces (raising coverage from <33% to >99%), and fade in color over time to prevent staining and provide real-time visual feedback for when decontamination is complete. The color-fading is synchronized with the contact time of a disinfectant to kill a pathogen (e.g. 3 minutes for *C. difficile* or 10 minutes for Ebola virus) so workers can intuitively see that a surface has been fully disinfected based on the color change. Studies have shown that increased compliance with waiting the correct contact time can reduce HAIs by more than 80%. The increased viscosity of Highlight[®] reduces bounce-back and misting during spraying, resulting in less generation of harmful disinfectant fumes and making it safer for workers and patients. Since it is just an additive, it can be easily implemented without the need for new training, equipment, or protocols.



Figure 2. Highlight[®] comes in bottles and can be mixed directly into disinfectants at point-of-use.

Highlight® comes in bottles that can be added directly to 0.2%-0.5% solutions of sodium hypochlorite, calcium hypochlorite, or NaDCC at point-of-use. Each bottle can treat 5L of disinfectant (other sizes available). The color will last 4-6 hours in the sprayer, and will fade in color after being applied on the surface after 3, 5, or 10 minutes (customization of fading times or colors possible for different applications). Highlight® for bleach wipes and alcohol-based hand sanitizers are currently in development.

Third-party testing has confirmed that Highlight® is non-toxic and maintains the antimicrobial potency of the disinfectant. Highlight® does not leave significant residue and can be applied on the same surface multiple times without affecting its performance, although its use is recommended only for hard, non-porous surfaces.

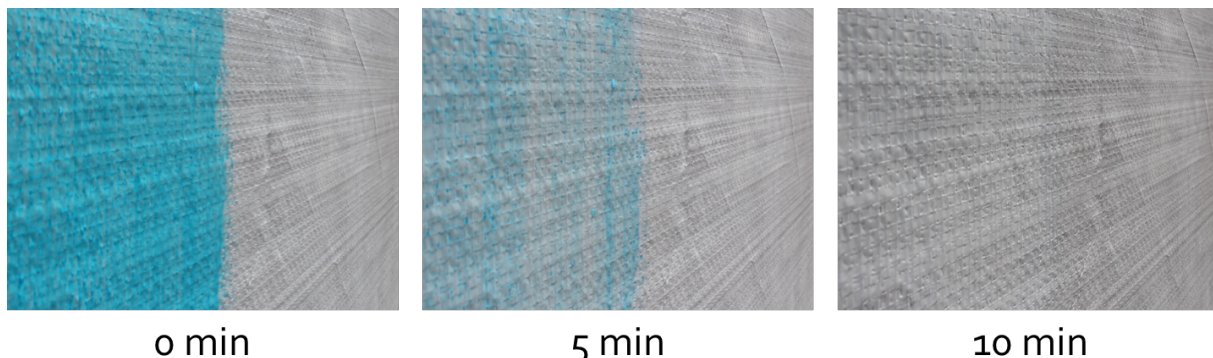


Figure 3. Highlight® fully covers surfaces and fades over time to indicate when decontamination is complete.

Highlight® has been field-tested by >100 healthcare workers in Liberia, Guinea, and Haiti. In our survey, 99% of respondents strongly agreed Highlight® greatly improves coverage, 97% found Highlight® very easy-to-use, and 100% would prefer Highlight® over current protocols. Field-testing also showed that healthcare workers felt empowered to be confident in their safety, and that Highlight® can be used as a safeguard to check that the correct concentration/freshness of chlorine is being used (based on color properties).



Figure 4. A hygienist sprays a healthcare worker with Highlight® at the PCI ETU in Ganta, Liberia.

Company Background

Kinnos Inc. (New York, USA) was founded in 2014 to protect healthcare workers, patients, and the general public from infectious diseases. Our first product, Highlight®, greatly enhances end-user compliance of disinfectants for infection prevention and is used by the Fire Department of New York's HazMat unit, was a Winner of the USAID Fighting Ebola Grand Challenge, and has been field-tested by healthcare workers in Liberia, Guinea, and Haiti, and by NGOs like International Medical Corps, Médecins Sans Frontières, and Jhpiego. Kinnos has additionally been recognized as winners of the Lemelson-MIT Student Prize, Collegiate Inventors Competition, and Columbia Venture Competition, and has been featured by Wall Street Journal, NPR, Scientific American, and as one of Forbes 30 Under 30 in Healthcare.