Antibiotic Resistance Does Not Equate to Disinfectant Resistance

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Overview

Several research studies have shown that automated dilution systems can deliver inaccurate levels of disinfectant The increasing prevalence of anti-microbial resistant (AMR) pathogens has led to a perceived need that health care disinfectants must have an EPA registered pathogen kill claim against every AMR pathogen of concern.

Pathogen susceptibility to antimicrobial drugs is different than pathogen susceptibility to disinfection. Antimicrobials work by targeting specific bacterial components that the bacteria require to survive and proliferate. This ensures the drug targets only bacteria and exerts minimal activity in human cells, and antimicrobials are only provided at concentrations that are safe for humans. Antimicrobial resistance arises because some bacteria are innately resistant: the antimicrobial will remove the susceptible bacteria and allow the resistant ones to continue growing. By contrast, disinfectants are non-specific and work through multiple mechanisms such as protein denaturation, oxidative damage, and membrane disruption, and can be applied at concentrations that do not permit resistance (Figure 1A).

We found that 7 of our healthcare disinfectants that are effective against 6 wild-type strains of bacteria were just as effective at disinfecting hard, non-porous surfaces against 12 related antibiotic-resistant strains..

Key Findings

Figure 1A

How Antibiotics and Disinfectants treat Bacteria

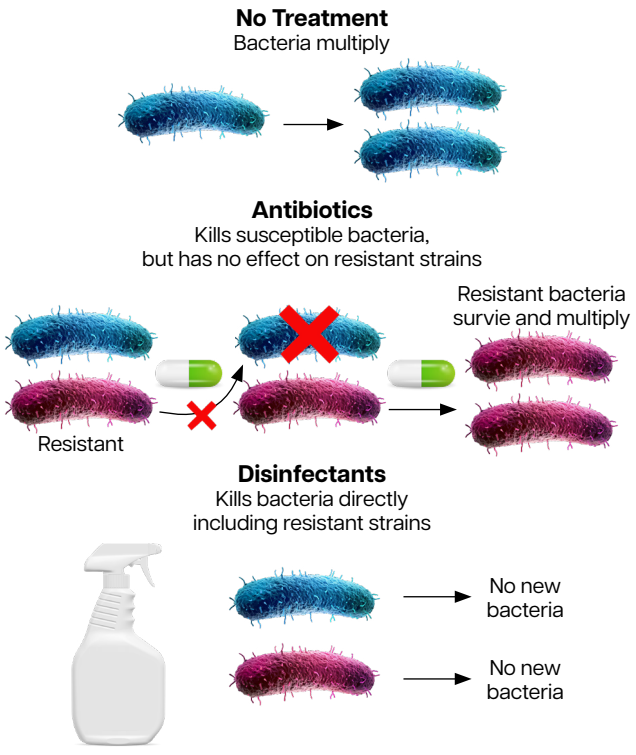

Figure 1B

Our Testing Showed Antibiotic Resistant Bacteria Are Not Resistant to Disinfection

7 Surface Disinfection Tested Against 18 Bacteria:

6 Wild Type

Enterococcus faecalis

Enterococcus faecium

Escherichia coli

Klebsiella pneumoniae

Staphylococcus aureus

Streptococcus pneumoniae

12 Antibiotic Resistant

Enterococcus faecalis VRE

Enterococcus faecium MDR

Escherichia coli, carbapenem-resistant, ESBL, NDM-1

Klebsiella pneumoniae, carbapenem-resistant, MDR, ESBL, NDM-1

Staphylococcus aureus CA-MRSA, VRSA

Streptococcus pneumoniae MDR

Disinfectants with Claims Against Wild Type Bacteria Were Effective Against 100% of Antibiotic-resistant Bacteria

Methods

We reviewed our Good Laboratory Practice (GLP) microbiology testing of 7 health-care disinfectants covering bleach, hydrogen peroxide, and quaternary ammonium active ingredients. We evaluated the efficacy of these products against 6 wild-type strains of bacterium and 12 corresponding antibiotic-resistant strains (Figure 1B).

Results

Across all 7 disinfectants tested, each had consistent efficacy against both the wild type and the antimicrobial-resistant strains of bacteria. Our findings indicate that when a disinfectant has an EPA-registered efficacy claim for one strain of a given bacterium, the absence of a specific claim for other antimicrobial resistance variants does not imply that the disinfectant will be ineffective. Our testing consistently shows that anti-microbial resistance does not equal disinfectant resistance.

Conclusions

While scientific evidence suggests that certain bacterial species may acquire resistance to disinfectants under selective pressure,[1–3] this only occurs when disinfection concentrations fall below the effective threshold. These improper thresholds can occur in real-world scenarios with dilutable disinfectants,[4] poor application practices, and failure to reach manufacturer-specified contact times, or using formulas that are not EPA-registered.

One of the best ways to ensure disinfectants are maintained at the effective concentration is to use ready-to-use disinfectants and follow instructions on the product label.

References:

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