

The High-level Disinfectant Formulation STEREX® ULTRA: From Bench Lab to Infection Prevention and Control Product of Thailand

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Background

The prevalence of antibiotic resistance among bacteria has been increasing worldwide. In our previous study, we developed a novel cationic disinfectant formulation, STEREX® ULTRA, targeting antibiotic-resistant microbial pathogens. This study aimed to develop novel cationic formulation to prevent and control cross-transmission and cross-contamination of antibiotic-resistant microbes.

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Methods

The antimicrobial activity of the formulation was tested against various antibiotic-resistant pathogens, including methicillin-resistant *S. aureus* ATCC 25923, vancomycin-resistant enterococci, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* ATCC 27853, ESBL-producing *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Salmonella enterica*, *Bacillus subtilis*, *Stenotrophomonas maltophilia*, *Clostridium perfringens*, *Cryptococcus neoformans*, *Trichophyton rubrum*, *Clostridioides difficile*, multidrug-resistant *Mycobacterium tuberculosis* (MDR-TB), *M. tuberculosis* H37Rv, and *M. avium* (Nontuberculous mycobacteria; NTM). Moreover, we investigated additional cationic disinfectant formulations for possible destruction effects of extracellular bacterial DNA, including resistance plasmids carrying *bla*_{NDM-1}, *bla*_{CTX-M}, and *mcr-1* genes, respectively.

Results

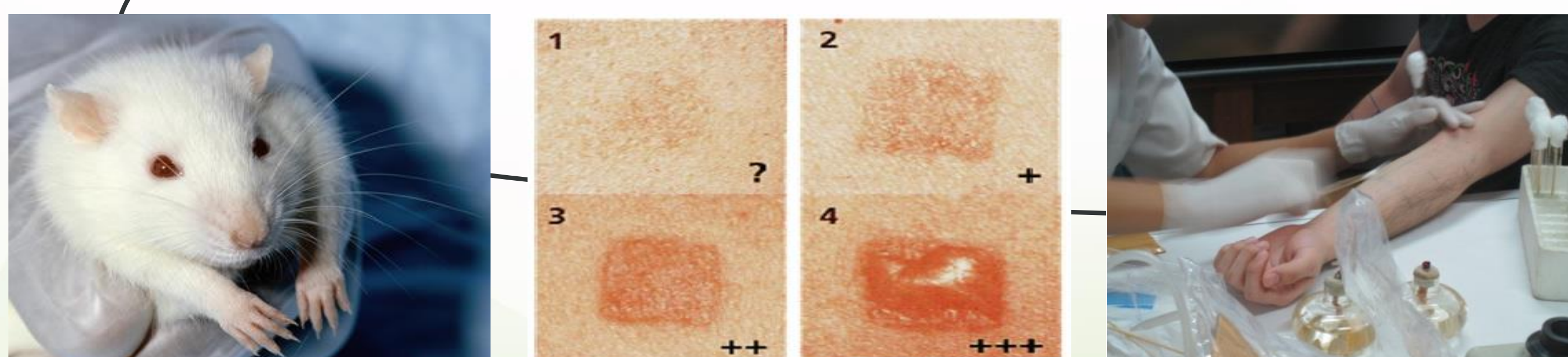
The novel cationic formulation at the concentration of 0.5% and 1.0% exhibited the antimicrobial activity against antibiotic-resistant pathogens within 1 minute of exposure time and 5 minutes for *P. mirabilis*. Notably, our formulations can eliminate the presence of bacterial DNAs in the mixing reactions with the exposure time of 5-10 minutes. Furthermore, the developed formulation showed no skin irritation (ISO10993-23), skin sensitization (ISO10993-10), mutagenicity (OECD471), and oral toxicity in mice.



Table I Time kill assay of STEREX®-ULTRA vs EU-Product

References cultures	Contact time (minute)			
	0.5% STEREX® ULTRA	1.0% STEREX® ULTRA	0.5% EU-Product	1.0% EU-Product
<i>S. aureus</i>	1	1	1	1
<i>B. subtilis</i>	1	1	1	1
<i>B. Cereus</i> ATCC11778	1	1	1	1
<i>P. aeruginosa</i> ATCC27853	1	1	>10	10
<i>P. aeruginosa</i> MT	1	1	>10	10
<i>P. mirabilis</i>	5	5	5	2.5
<i>S. maltophilia</i>	1	1	1	1
<i>K. pneumoniae</i>	1	1	1	1
<i>S. enterica</i>	1	1	1	1
MRSA	1	1	1	1
VRE	1	1	1	1
ESBL	1	1	1	1
<i>A. baumannii</i>	1	1	1	1
<i>C. difficile</i>	1	1	1	1

Figure I Effects of STEREX® ULTRA on resistant bacteria and their extracellular resistance plasmid DNA



We have produced the novel cationic disinfectant formulations effective in killing antibiotic-resistant pathogens along with their resistance genes that may be released upon killing action.

Conclusion

Positive control:
EC1 (CTX-M, MCR-1) &
EC2 (NDM)
Exposure time:
5 minutes

