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Battlestar™: A Biodegradable Delivery System for Addressing AMR and Biofilm-Associated Infections Using *in situ* Generated Oxidative Biocides

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Antimicrobial resistance (AMR) and biofilm-associated infections are critical global healthcare challenges. Battlestar™ is an innovative, biodegradable drug delivery system that uses in situ generation of oxidative biocides—peracetic acid (PAA) and hydrogen peroxide (H_2O_2)—to achieve broad-spectrum antimicrobial activity. With proven efficacy against planktonic, persister, and biofilm-associated pathogens, Battlestar™ simultaneously supports tissue regeneration, offering a dual-action solution for infection management.

The poly(lactic-co-glycolic acid) (PLGA) matrix encapsulates Tetraacetylethylenediamine (TAED) and Sodium Percarbonate (SP), releasing these precursors upon exposure to biological fluids. This generates PAA and H_2O_2 at a near-neutral pH, ensuring controlled and sustained antimicrobial activity. Key data demonstrate a 6-log reduction of methicillin-resistant *Staphylococcus aureus* (MRSA) and carbapenem-resistant *Escherichia coli* within 4 hours, with sustained efficacy for up to 72 hours. In vivo studies show minimal cytotoxicity, with no clinical or local signs of erythema or oedema at the implant site.

Unlike pre-formulated liquid PAA, Battlestar™ offers unparalleled stability and safety. Its ability to disrupt biofilm extracellular polymeric substances (EPS) while targeting multiple cellular components (proteins, lipids, and DNA) reduces the likelihood of resistance development, preserving the efficacy of existing antibiotics and protecting patients from emerging threats.

By combining broad-spectrum antimicrobial action with regenerative properties such as angiogenesis enhancement and procollagen activation, Battlestar™ addresses critical unmet needs across wound care, urinary tract infections, osteomyelitis, cystic fibrosis, and biofilm-associated cancers. Its sustained action reduces intervention frequency, improves patient outcomes, and minimises healthcare costs.

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