



US DEPARTMENT OF DEFENSE

# BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

## Wound Infection

### Antibiotic-loaded Biopolymer Sponge for Prevention of Polymicrobial Wound Infection

In the field, musculoskeletal injury, from blast exposure or otherwise, often causes large wounds that are susceptible to infection by multiple microbes and/or biofilm formation. These infections are difficult to treat, particularly in theater with limited medical resources. Under a grant from the Defense Medical Research and Development Program (DMRDP) managed by the Congressionally Directed Medical Research Program (CDMRP), researchers from the University of Memphis have created a customizable, dual antibiotic-loaded chitosan sponge delivery system to provide reliable, low-cost infection prevention that can be used in conjunction with surgical debridement and irrigation. The study team previously provided data to show the effectiveness of the sponge against polymicrobial bacterial infections in animal models, and their commercial licensing partner Bionova Medical Inc. has since commercialized and launched the chitosan technology as the Sentrex BioSponge™.<sup>1</sup> To date, the Sentrex BioSponge™, which was added to the Federal Supply Schedule in 2015, has been used in more than 30 facilities in over 1,500 cases, including applications in orthopedic trauma, diabetic foot ulcers, sternal wounds, chronic venous ulcers, spinal hardware revisions, foot and ankle procedures, upper extremity injuries, abdominal injuries, and amputation sites. Additionally in 2016, the study team provided evidence that the chitosan sponge system can also prevent bacterial contamination of or around the bone and fixation pin when higher antibiotic dosages are used.<sup>2</sup> The effectiveness of the sponge in removing and preventing biofilm formation was tested in an established mouse model. Although the sponge technology is not effective against established mature biofilm infections, data from the team's complex extremity model and infected fixation model show effectiveness in preventing infections in polymicrobial contaminated wounds with and without hardware. The Sentrex BioSponge™ has already improved treatment outcomes for extremity fractures in military patients. The customizable aspect of this innovative technology has and will continue to lend itself to many applications of wound healing, and infection prevention and control in the military environment.

1 Parker, A. C., Jennings, J. A., Bumgardner, J. D., Courtney, H. S., Lindner, E., & Haggard, W. O. (2013). Preliminary investigation of crosslinked chitosan sponges for tailorable drug delivery and infection control. *Journal of Biomedical Materials Research. Part B, Applied Biomaterials*, 101(1), 110–123. <https://doi.org/10.1002/jbm.b.32822>

2 Parker, A. C., Beenken, K. E., Jennings, J. A., Hittle, L., Shirliff, M. E., Bumgardner, J. D., ... Haggard, W. O. (2015). Characterization of local delivery with amphotericin B and vancomycin from modified chitosan sponges and functional biofilm prevention evaluation. *Journal of Orthopaedic Research : Official Publication of the Orthopaedic Research Society*, 33(3), 439–447. <https://doi.org/10.1002/jor.22760>

