0161 Biological response of silk-based fibers functionalized with antimicrobial peptides by mimicking bacterial infection *in vivo*

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Surgical site infections are often caused due to microbial contamination of surgical material, such as sutures, thus being necessary to explore new polymer with antimicrobial properties to impair such infections. Spider silk proteins present interesting properties, such as mechanical stability and biocompatibility, useful for tissue engineering. Furthermore, the accessibility of these proteins to bioengineering, allows the generation of spider silk proteins fused to other peptide domains not normally found in spider silks, thereby expanding their function. The *in vivo* functional behaviour of silk-based fibers that combine the mechanical properties of spider silk (6mer) with the antimicrobial properties of human neutrophil defensin 1 (HNP1) was addressed in this study. The local inflammatory response was assessed histologically and by gene expression, and compared with controls of spider silk alone (6mer), silk fibroin, commercial sutures (Perma-Hand® silk suture and VicrylPlus® suture) and empty defects. To mimic bacterial infections *in vivo*, silk-based fibers with 6mer-HNP1 and commercial suture controls were inoculated with methicillin resistant *Staphylococcus aureus* (MRSA) before implantation. Histological analyses of local inflammatory response indicated the presence of inflammatory infiltrates at the implant site after 1 day. Also, transcript levels of inflammatory mediators were upregulated in relation to the empty defects. No apparent differences were observed between the implanted materials after 7 days, suggesting that silk-based fibers with 6mer-HNP1 did not elicit a long-term immunological reaction. The materials inoculated with MRSA generated transcript levels of inflammatory mediators upregulated after 1 day, corroborated by histological analysis, suggesting a mild host response. After 7 days, the inflammatory mediators in the presence of silk-based fibers with 6mer-HNP1 and VicrylPlus® sutures were down regulated. In contrast, the inoculated Perma-Hand® sutures generated the formation of fibrous capsule in histological sections. It was still possible to identify inflammatory cells with phagocytised bacteria in the silk-based fibers with 6mer-HNP1, suggesting an ongoing immunologic response. The histological analysis of VicrylPlus® sutures showed a reduced presence of bacteria in the implanted sutures, probably due to the controlled released of the antibiotics. Overall, the silk-based fibers with antimicrobial peptides elicited no significant immunological reactions, and supported an active response to bacterial infection. These findings provide new insights to the *in vivo* functional response of bioengineered spider silk proteins with antimicrobial properties, highlighted by their immunological response to bacterial infection, representing a promising approach to reduce surgical site infections and improve medical care.

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