

Introduction

Matrix metalloproteinases (MMPs) are involved in the removal of damaged extracellular matrix (ECM) during normal wound healing. As well as being secreted by cells involved in wound healing, proteases can be produced by immune cells stimulated by an inflammatory process or infection. Evidence suggests that there is elevated protease activity in wounds that fail to heal and that elevated MMPs can result in a highly destructive wound environment.

Reducing excess protease activity within a non-healing wound may transition the wound towards a healing state. Consequently, MMP modulating wound dressings present with useful clinical implications.

Methodology

- Recombinant human MMP-2 and recombinant human MMP-9 were prepared to known concentration.
- Test dressings Kliniderm® superabsorbent and negative control N-A® Knitted Viscose Primary dressings were prepared to (0.5 cm²) and placed in a 24-well plate, 0.5 ml of protease was added to each sample.
- Plates were sealed and incubated at 37° C ± 2°C and 50 rpm ± 5rpm for 1, 4 or 24 hours.
- Following incubation remaining supernatants were collected, and the concentration of the proteases within the supernatant was determined using MMP specific ELISA kits. ELISA kits were processed according to manufacturer’s instructions.

Results

MMP-2

An average of 0.33 ± 0.22 ngmL⁻¹ and 0.05 ± 0.06 ngmL⁻¹ MMP-2 were recovered after incubation with Kliniderm® superabsorbent for 1 and 4 hours respectively. This equated to a reduction of 84% and 95% respectively compared to the negative control. MMP-2 was not detected in wells incubated with Kliniderm® superabsorbent for 24 hours (Figure 1).

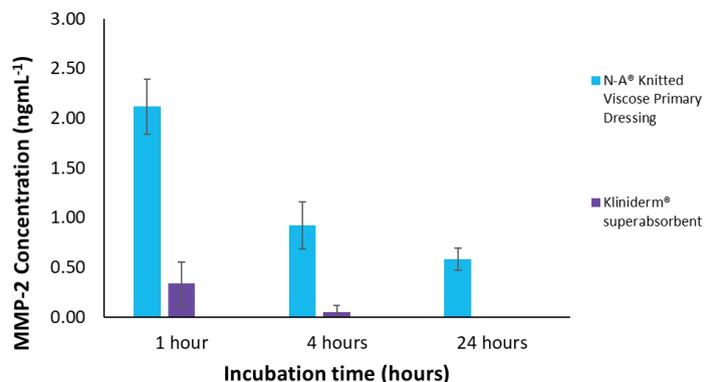


Figure 1. Concentration of MMP-2 remaining in supernatant following 1, 4 and 24 hours incubation with test dressings.

MMP-9

The concentration of MMP-9 detected in Kliniderm® superabsorbent decreased by 5.02ngmL⁻¹, 2.02 ngmL⁻¹ and 9.15ngmL⁻¹ following 1, 4 and 24 hours incubation respectively compared to the control. This equated to reductions of 62%, 32% and 74% however the differences between the time points were not significant.

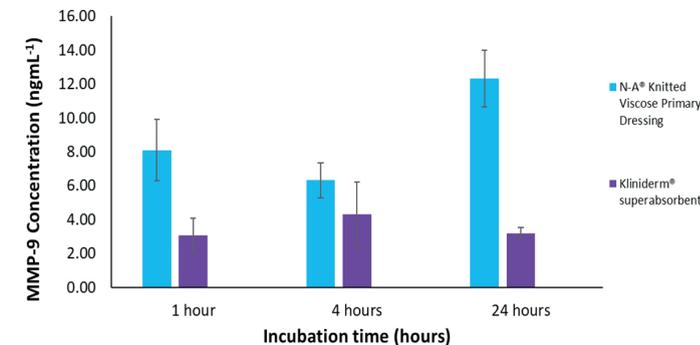


Figure 2. Concentration of MMP-9 remaining in supernatant following 1, 4 and 24 hours incubation with test dressings.

Discussion and Conclusions

Advanced wound dressings have been developed to sequester MMPs and control proteases within chronic wounds. Removal of these proteases from the wound bed is suspected to support successful wound closure.

This study demonstrates that Kliniderm® superabsorbent sequestered MMP-2 *in vitro* within 24 hours and reduced the concentration of MMP-9 by 74% in comparison to negative controls. This data suggests that application of Kliniderm® superabsorbent could help to reduce elevated protease levels within a wound, supporting successful wound healing. Further studies are required on patients with chronic wounds, in order to confirm this observation in a clinical scenario.