

# Anti-inflammatory effects of a collagen-containing wound dressing in a cell-based inflammation model *in vitro*



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## Introduction

In contrast to physiological wound repair non-healing wounds are characterized by an imbalance of the underlying molecular processes resulting in an elongated inflammatory phase and severe tissue damage. As several studies have shown, the exudates of chronic wounds contain elevated levels of inflammatory immune modulators, e.g. the cytokines IL-1 $\beta$ , IL-6 and IL-8, leading to tissue damage and impairing healing [1,2]. Hence, reduction of these mediators is a suitable way to promote normal healing. Studies have shown that collagen is able to bind significant amounts of cytokines [3,4]. We investigated the influence of a collagen-dressing\* (figure 1) on the concentration of IL-8 and IL-6 in a cell-based inflammation model.

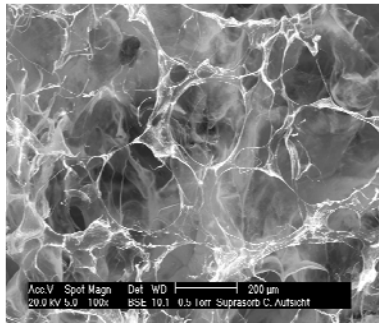


Figure 1: SEM picture of the collagen type I wound dressing\*.

## Material & Methods

The cell-based inflammation model (figure 2) comprised of HaCaT-keratinocytes stimulated with TNF- $\alpha$  to mimic chronic inflammation. Cells were cultured with or without addition of collagen-dressing\*. Viability of HaCaT-cells was investigated by luminometric measurement of the cellular ATP content (ATPLite Assay, Perkin Elmer). Concentrations of the cytokines IL-6 and IL-8 in the supernatants were determined by specific ELISA (IL-6 ELISA, Mabtech; IL-8 ELISA, Milenia biotec).

\*Suprasorb<sup>®</sup> C, Lohmann & Rauscher

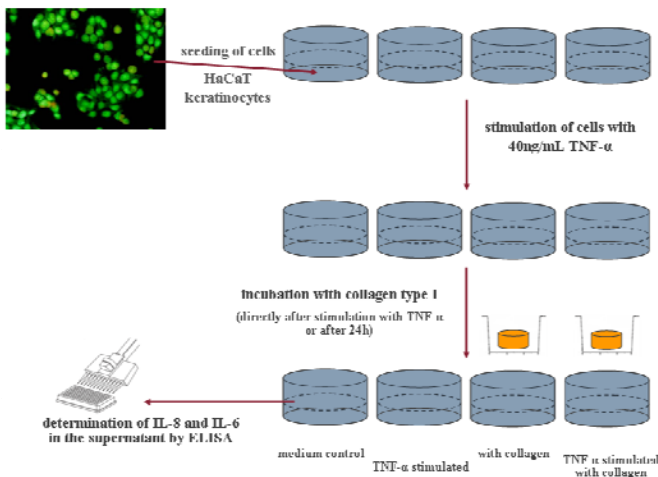


Figure 2: Experimental set-up of the cell-based inflammation model.

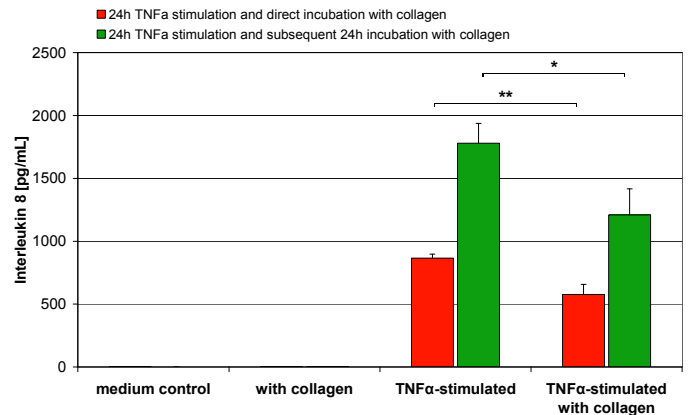


Figure 3: Collagen type I\* is able to reduce the TNF- $\alpha$  induced release of IL-8 significantly (mean  $\pm$  SE; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ).

## Results

TNF- $\alpha$  had no significant effect on HaCaT keratinocyte viability or proliferation but lead to a distinct increase in the release of the inflammatory cytokines IL-6 and IL-8 *in vitro*. The collagen-dressing alone neither had an effect on cell viability and proliferation nor did it induce the expression of IL-6 and IL-8. However, the use of the collagen sample on the TNF- $\alpha$ -stimulated HaCaT-cells led to a significant decrease in the amount of unbound IL-8 in the supernatant (figure 3) and a minor reduction in the concentration of IL-6 (figure 4).

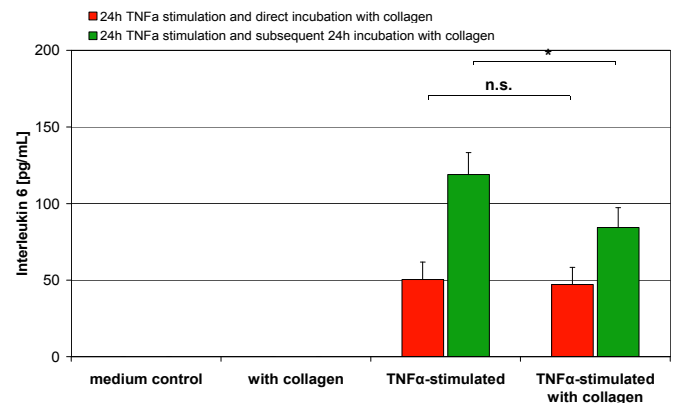


Figure 4: Collagen type I\* achieved a significant decrease of free IL-6 after 24h (mean  $\pm$  SE; n.s. – not significant; \*  $p < 0.05$ ).

## Discussion

Collagen dressings should be able to improve the healing outcome of chronic wounds by decreasing the excessive concentrations of inflammatory mediators. Using a cell-based inflammation model it could be shown that collagen\* directly influences the amount of IL-6 and IL-8 released by TNF- $\alpha$ -stimulated HaCaT cells most likely by binding these mediators as well as acting directly on the TNF- $\alpha$  present by reducing its concentration.

## References

- [1] Nwomeh BC et al. Clin Plast Surg 1998; 25(3):341-56
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- [3] Schönfelder U et al. Biomaterials 2005; 26:6664-73
- [4] Wiegand C et al. Arch Dermatol Res 2010; 302:419-28