The binding capacity of the collagen wound dressing Suprasorb© ® for inflammatory cytokines

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Introduction

Chronic non-healing wounds, e.g. diabetic or venous ulcers, differ significantly from healing wounds. As severals studies have shown, the fluid from chronic wounds contains elevated levels of inflammatory cytokines [1, 2]. Due to this environment, the wound remains in the inflammatory phase of the normal healing process. The reduction of inflammtory mediators seems to be a suitable way to support the healing process. The aim of the presented study was the investigation of Suprasorb® C, a special wound dressing consisting of bovine collagen type I, regarding its ability to bind the interleukines IL-1β, IL-6 and IL-8.

Materials and Methods

Suprasorb® C samples were cut into pieces by means of punch biopsies (8 mm diameter, corresponding to 0.5 cm^2). Each specimen was taken in a final volume of 1 mL of interleukine solution (125 pg/mL) or chronic wound fluid (6.4 mg/mL total protein content), obtained from a from a 50 year old male patient suffering from venous insufficiency and peripheral occlusive disease. Samples were incubated up to 24 h at 37°C on a plate mixer. After incubation supernatants were collected, immediately frozen and stored at -20 °C until testing. The concentration of unbound cytokine in the supernatants was determined by means of interleukine specific ELISAs (Milenia, Germany).

Results

As shown in fig. 1, Suprasorb® C is able to bind IL-1β. Its concentration decreases significantly after 1 h in the solution and after 30 minutes in the wound fluid sample.

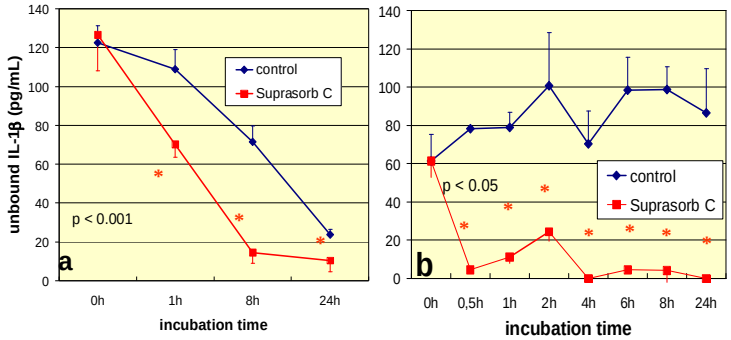

Fig 1a: Binding of IL-1β by Suprasorb® C from IL-1β solution. Fig 1b: Binding of IL-1β by Suprasorb® C from an wound fluid sample (Means ± SE).

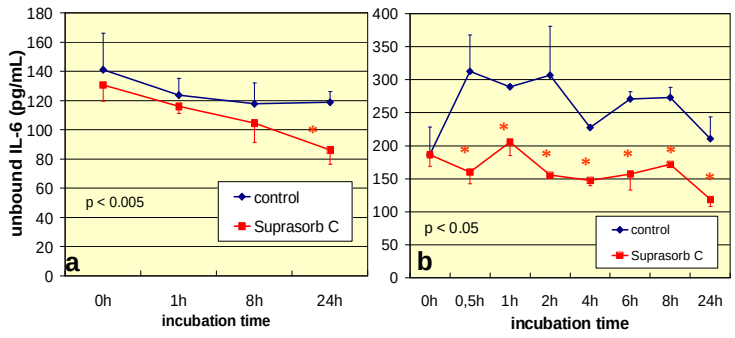

Fig 2a: Binding of IL-6 by Suprasorb® C from IL-6 solution. Fig 2b: Binding of IL-6 by Suprasorb® C from an wound fluid sample (Means ± SE).

Similar to IL-1β, Suprasorb® C binds considerable amounts of IL-6. After 24 h incubation a significant decrease of IL-6 concentration was determined in the cytokine solution (Fig. 2a). In the wound fluid IL-6 decreases already after 30 minutes significantly (Fig. 2b). In contrast to these results, Suprasorb® C shows only a minor binding capacity for IL-8. As shown in fig. 3a, only 4-fold sized pieces of the wound dressing are able to decrease the concentration of unbound IL-8 significantly. In the chronic wound fluid no significant binding of IL-8 by Suprasorb® C could be observed.

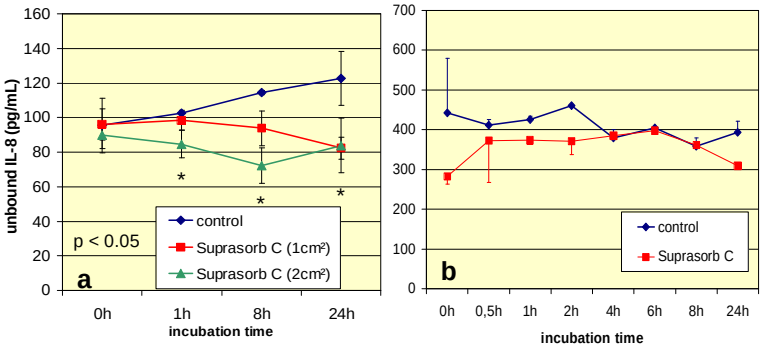

Fig 3a: Binding of IL-8 by Suprasorb® C from IL-8 solution. Fig 3b: Binding of IL-8 by Suprasorb® C from an wound fluid sample (Means ± SE).

Conclusions

Because of its porous structure (Fig. 4), collagen has a capillary activity and is able to absorb quantities of fluid [3]. As the presented data show, the collagen wound dressing Suprasorb®C is able to bind interleukines at different rates.

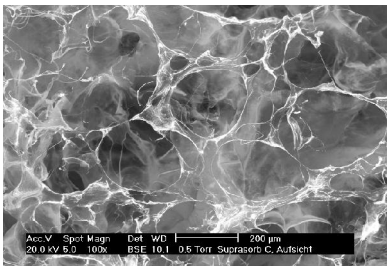

Fig. 4: Scanning electron micrograph of Suprasorb® C

In particular, Suprasorb®C has a considerable binding capacity for IL-1β. This cytokine plays a central role in the inflammatory phase of the healing process.

IL-1β stimulates the synthesis of several matrix metallo proteinases (MMPs) from fibroblasts and macrophages and inhibits the formation of TIMPs [4]. In exsudates from chronic wounds up to 100-fold concentrations of IL-1β were determined compared to acute wound fluid [4]. Due to the binding by Suprasorb ® C, the availability of IL-1β in the wound fluid decreases. Therefore the binding of IL-1β could have a positive impact on the wound healing process.

References

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