

Impact of inflammation on wound healing

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Background

Inflammation is part of the physiological phases of wound healing. It serves the purpose to attract different immune cells in order to clean the wound from pathogens and debris and create an ideal environment for fibroblasts and keratinocytes to differentiate, migrate and divide in order to close the wound. Pathological inflammation caused by many different factors is often the underlying cause of prolonged wound healing and unfavourable outcome in burn patients. We wanted to investigate what influence an induced hyper-inflammation on wound healing has in a controlled environment.

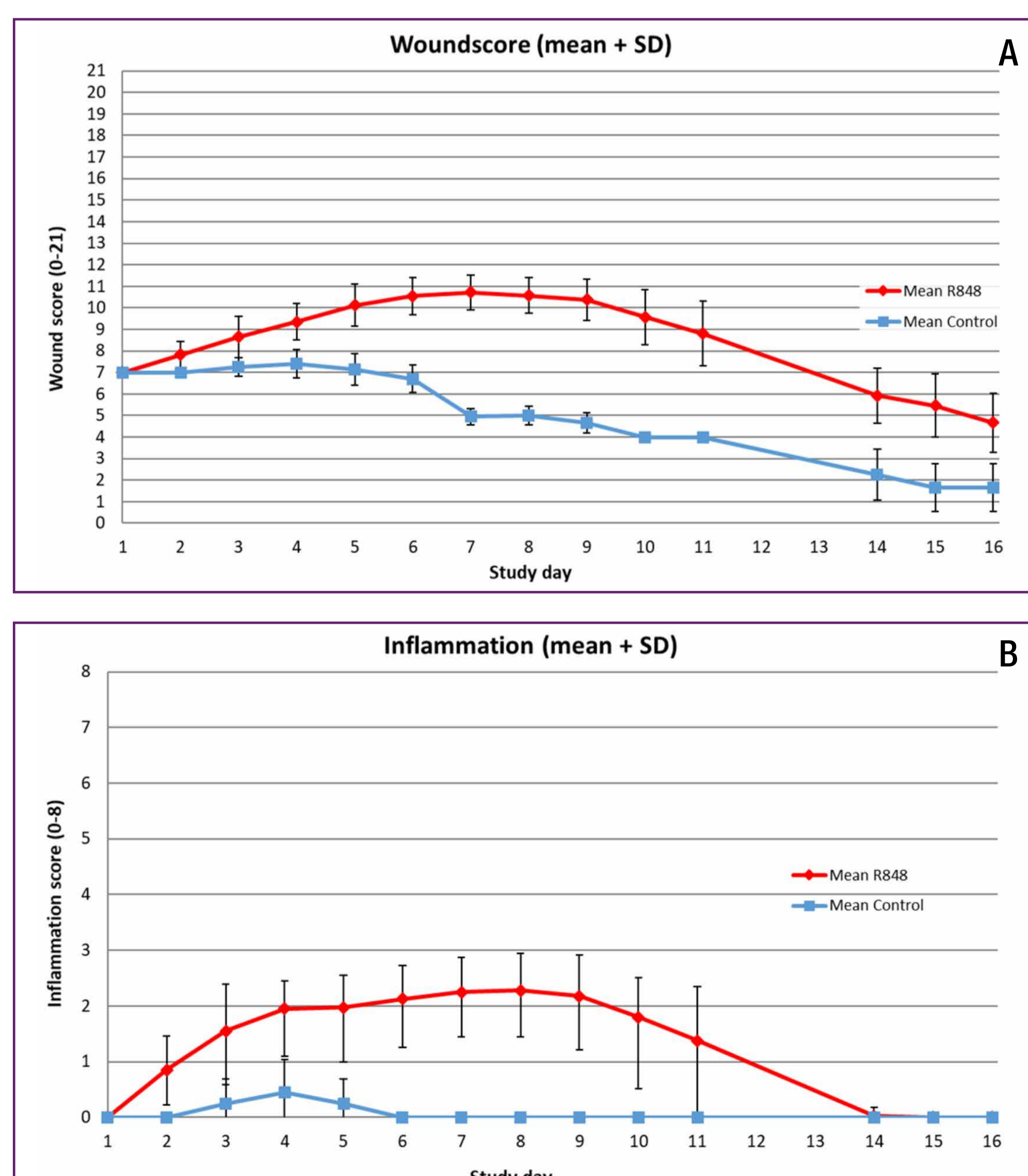
Material and Methods

In a porcine wound model, pigs received full-thickness wounds on their backs where hyper-inflammation was induced by application of a chemotherapeutic for 6 days. Control wounds were left without induction. Wounds were scored on a daily basis for 16 days in total and biopsies were taken for histological assessment.

Results

The results showed a rise in inflammation of the wounds and the surrounding tissue due to the induction (Figure 1). The wounds healed slower, needing up to seven more days to completely heal (Figure 2). Histological assessment showed thick layers of necrosis, adipocyte as well as leucocyte infiltration in the hyper-inflamed wounds compared to completely healed control wounds with all layers of epidermis visible (Figure 3).

Figure 1: Mean overall wound score and mean inflammation score. A: Visible difference in the overall wound score between the induced and control wounds. B: Inflammation was significantly increased in the induced wounds. The rise in the inflammation score of the control wounds is based on physiological inflammation of wound healing.



Conclusion

Hyper-inflammation, even just for a short period of time, can significantly prolong the time of wound healing. These findings underline the importance of preventing and treating wound infections of burn patients in order to support physiological wound healing as well as to avert complications such as infections with multi-resistant microbes that are associated with prolonged hospital stays.

Figure 2: Mean area score and wound size reduction. A: The induced wounds show an increase in the area score correlating with the actual size of the wounds as they increased in size during the first days of induction. B: Control wounds showed a reduction in size after day 3 and a steady reduction afterwards. The induced wound needed longer to heal, up to 7 days in total.

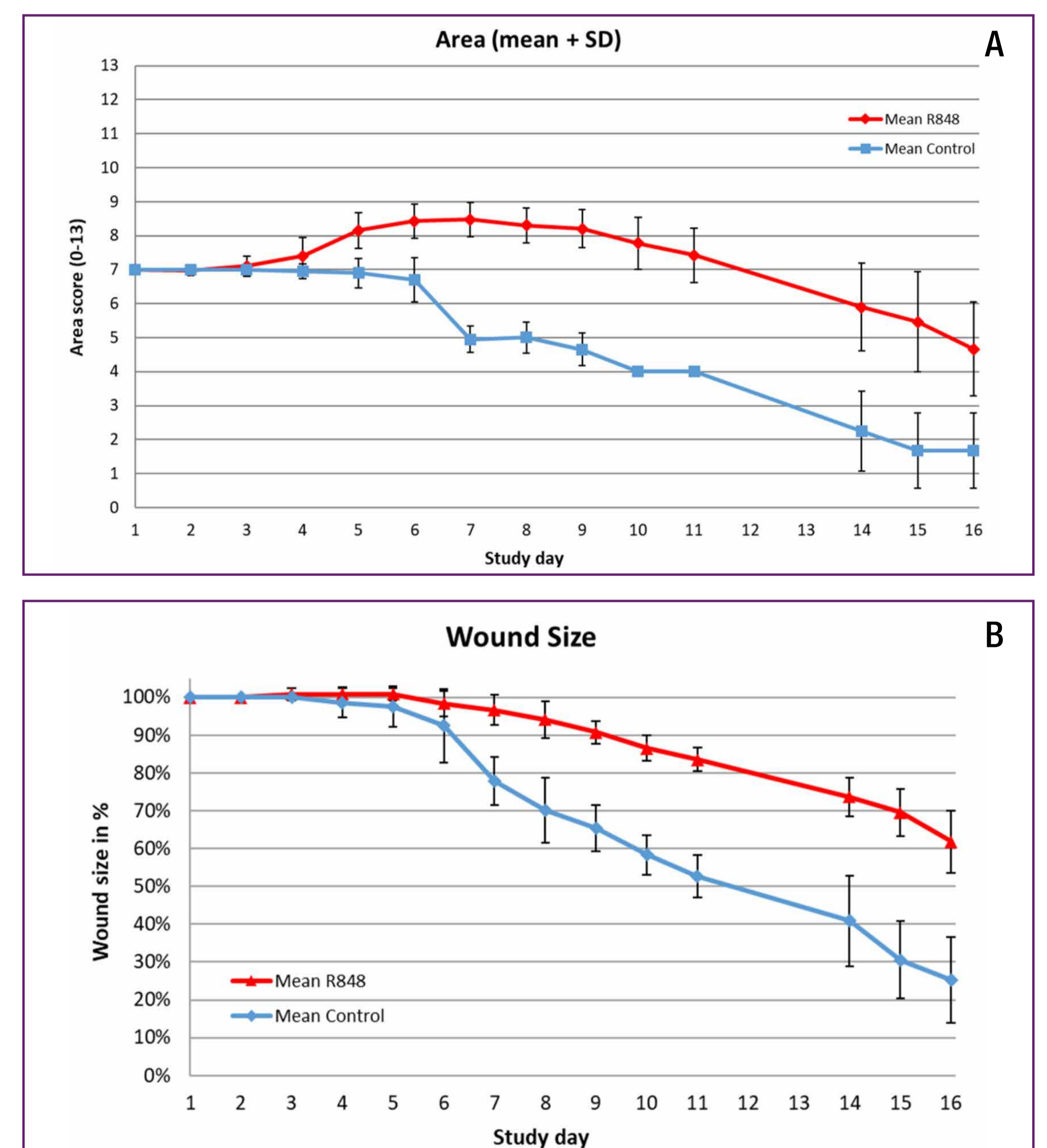
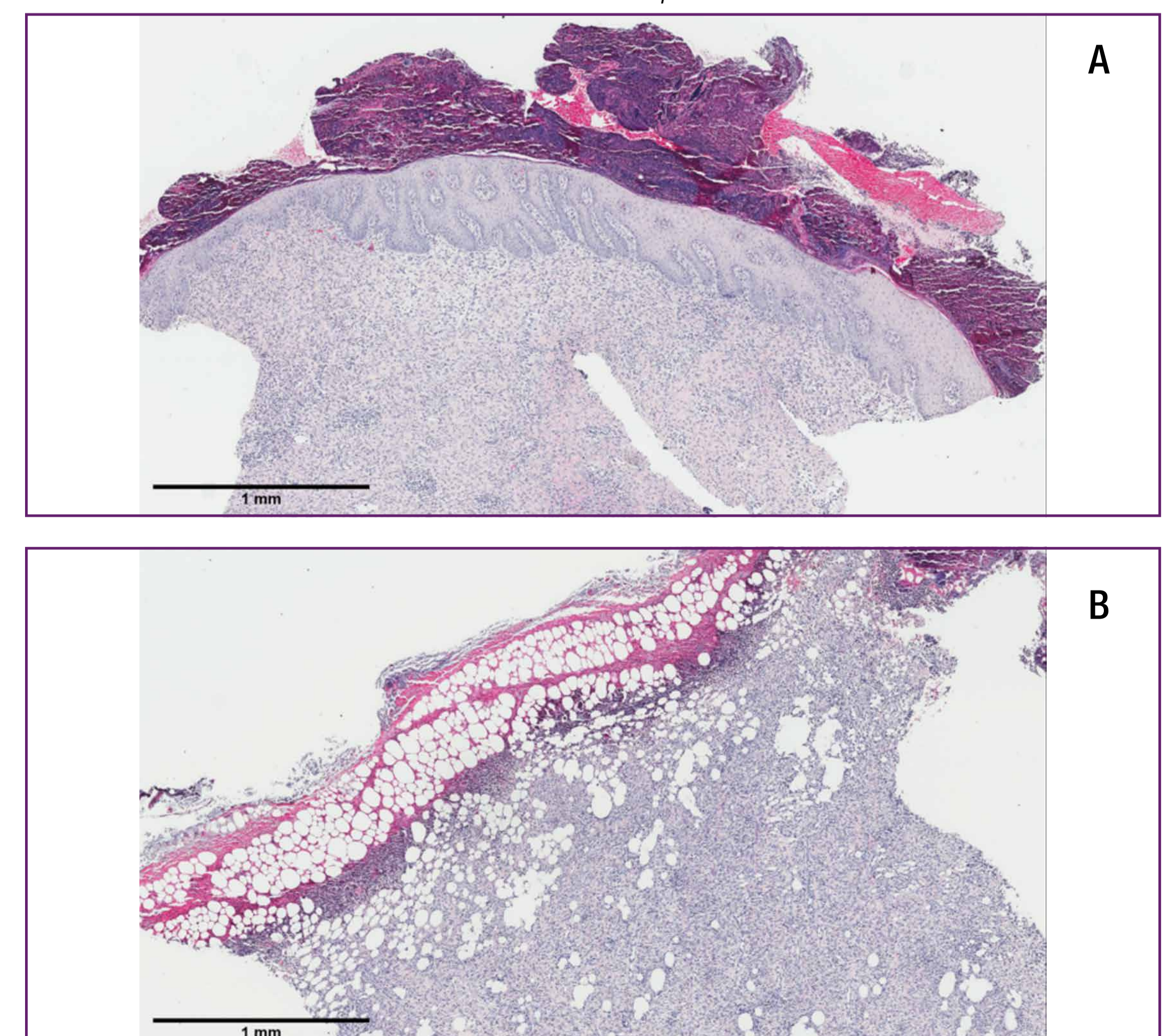


Figure 3: Histology. A: The control wounds were healed at day 16, showing physiological layers of dermis and epidermis. Some still displayed a scab. B: The induced wounds showed no physiological skin layers. Leukocytes as well as adipocyte infiltration can be observed as well as a thick layer of necrosis on top.



Disclosure

No author states a conflict of interest.
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