Evaluation of moisture donating capacity of six different wound gels *in vitro*

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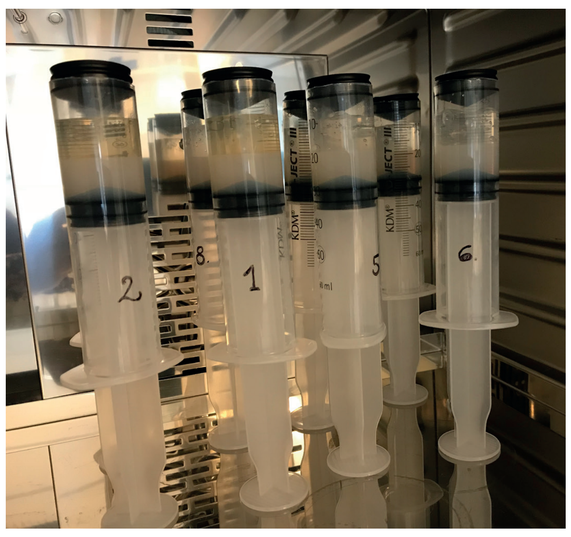
Introduction

Moist wound healing is considered optimal for re-epithelialization and granulation and may also improve healing through autolytic debridement [1,2]. In dry and low-exuding wounds, moist wound healing is commonly achieved by applying a wound gel beneath a secondary dressing.

The property of the wound gel to donate or absorb moisture is determined by it´s components; mainly the gel-former and humectant. Our objective was to evaluate different wound gels *in vitro*, regarding their moisture donating/absorbing properties.

Method



The tests were performed according to the European standard method EN-13726-1. Pre-weighed samples of each wound gel (n=3) were applied in syringes containing 10 gram of substrate composed of either gelatin (measurement of fluid donation) or agar (measurement of fluid absorption). The syringes were incubated for 48 hours in 25°C and the wound gel was subsequently removed. The substrate beneath was weighed to determine % weight gain or loss of the tested wound gel, depending on fluid movement.

Results

The selected wound gels showed large variations in their moisture donation/absorption capacity. A polyacrylic acid (PAA)-based wound gel showed the highest moisture donation (16 % of gel weight donated, $P<0.01$) whereas the other gels tested were able to donate between 4-9% of their weight (Figure 1). The moisture absorption capacity varied even further, ranging between 2-32% in the gels tested, of which Carboxymethylcellulose (CMC)-based gels were able to absorb more moisture than PAA- and Guar-gum based gels (Figure 2).

*1-PAA: Polyacrylic acid-based gel (Sorbact Gel Dressing); 2-GG: Guar gum-based gel (Tegaderm™ Hydrogel); 3-CMC: CMC-based gel (Purilon® Gel); 4-CMC: CMC-based gel (Intrasite Gel) ; 5-CMC: CMC-based gel (Suprasorb® G); 6-CMC: CMC-based gel (Duo-DERM® Hydrogel).

Fluid affinity of wound gels tested *in vitro**

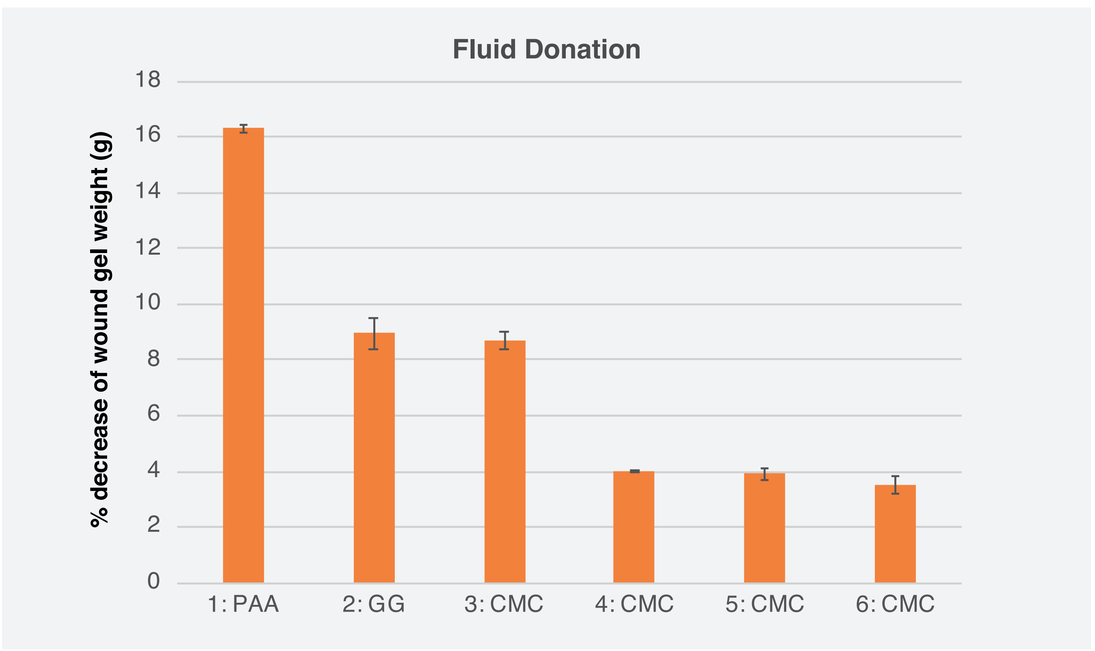


Figure 1

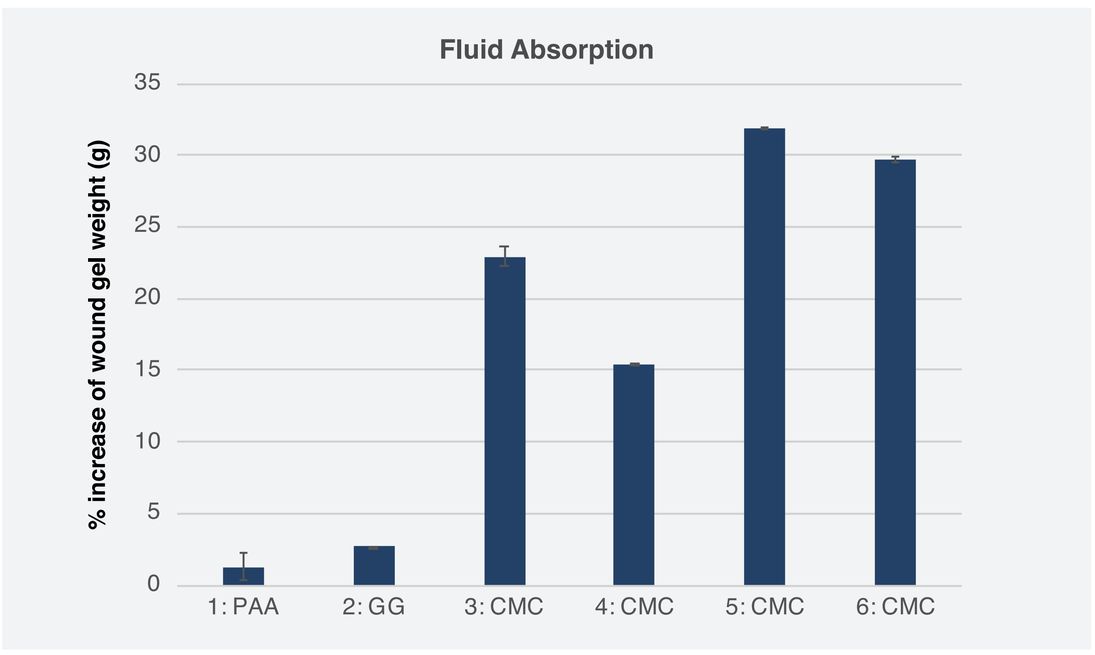


Figure 2

Discussion

In dry wounds, healing can be enhanced by increasing wound hydration. An important aspect of wound gels is therefore the capacity to donate fluid. The wound gels tested in the present study show significant differences regarding this ability in an *in vitro* model.

The capacity for fluid absorption varied even further among the tested wound gels. In a clinical setting, moisture absorption can be achieved both through the wound gel applied, or through an absorbing secondary dressing covering the wound. Wound fluid from chronic wounds have been shown to contain an excess of protein degrading enzymes [3] and is suggested to not help the wound to heal [4,5]. It might therefore be of benefit to remove fluid from the wound surface into an absorbent layer.

In order to determine the impact of differences in *in vitro* moisture donation on *in vivo* autolytic debridement efficiency and wound healing, clinical studies are needed.

Conclusion

A PAA-based wound gel was able to donate significantly more moisture than wound gels based on guar gum or CMC *in vitro*.

References

[1] Winter GD. Formation of the scab and the rate of epithelialization in the young domestic pig. Nature 1962; 193: 293-294. **[2]** König M, Vanscheidt W, Augustin M, Kapp H. Enzymatic versus autolytic debridement of chronic leg ulcers: a prospective randomised trial. J Wound Care 2005 Jul; 14(7):320-3 **[3]** Yager DR, Chen SM1, Ward SI, Olutoye OO, Diegelmann RF, Kelman Cohen I. Ability of chronic wound fluids to degrade peptide growth factors is associated with increased levels of elastase activity and diminished levels of proteinase inhibitors. Wound Repair Regen. 1997 Jan-Mar;5(1):23-32 **[4]** Rippon MG, Ousey K, Cutting KF. Wound healing and hyper-hydration: a counterintuitive model. J Wound Care 2016 Feb; 25(2):68-75 **[5]** Thamm OC1, Koenen P, Bader N, Schneider A, Wutzler S, Neugebauer EA, Spanholtz TA. Acute and chronic wound fluids influence keratinocyte function differently. Int Wound J. 2015 Apr;12(2):143-9