

Benefits of the oral administration of a probiotic mixture on skin inflammation in mice

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Introduction :

A correlation between the composition of gut microbiota and chronic inflammatory skin disorders (including atopic dermatitis and psoriasis) has recently been demonstrated. Thus, there is a growing interest in the possible use of ingested probiotics in dermatology. However, the benefits of treatment with probiotics depend on many factors, such as the bacterial strains used. We investigated the efficiency of a probiotic mixture (Lactibiane Enfant®) on skin homeostasis and integrity in a model of inflammation induced by 12-O-tetradecanoylphorbol-13-acetate (TPA).

METHODS

The probiotic mixture (Lactibiane Enfant, 1.10^9 CFU) or the vehicle was administered by gavage daily for 3 consecutive weeks from Day 1 to Day 21. Chronic skin inflammation was induced by application of an acetonic solution of TPA on the back of SKH-1 hairless mice daily, from Day 15 to Day 21 (Fig. 1). From Day 15 to day 22, the degree of skin inflammation was macroscopically scored daily for 3 different zones from the back of each mouse. The scores ranged from 0 (no skin inflammation) to 4 (very important skin inflammation) and were attributed to each of the 3 assessed zones. The addition of the 3 scores defined the overall macroscopic score of skin inflammation (scores from 0 to 12).

On Day 22, histological evaluations of epidermal (score from 0 to 15), dermal (scores from 0 to 18), and hypodermal (scores 0 to 11) alterations were performed. The addition of the 3 scores defined the global microscopic score of skin inflammation (scores from 0 to 44).

The serum levels of cytokines were measured 24 hours after the last application of TPA.

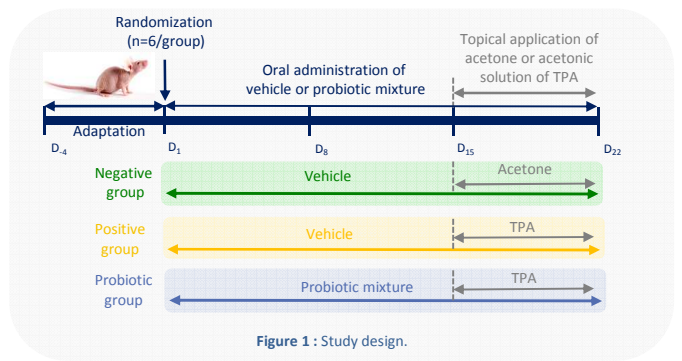


Figure 1 : Study design.

RESULTS

Macroscopic evaluation of skin inflammation:

On Day 22, macroscopic scores of inflammation were significantly reduced by 30.2% in the probiotic mixture group compared to the vehicle group. The macroscopic score was significantly different between the two groups from Day 17 to Day 22.

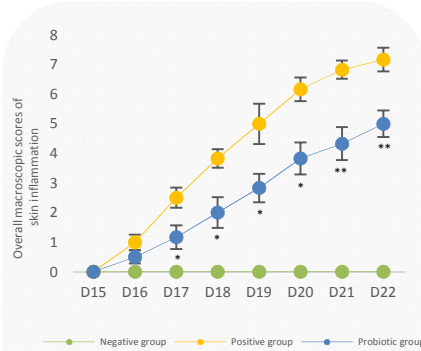


Figure 2 : Overall macroscopic scores of skin inflammation. * $p < 0.05$, ** $p < 0.01$ when compared to the positive group.

Microscopic evaluation of skin inflammation:

On Day 22, global microscopic scores of inflammation were significantly reduced by 27.1% in the probiotic mixture group compared to the positive group (18.83 \pm 1.40 versus 25.83 \pm 1.62, $p = 0.008$).

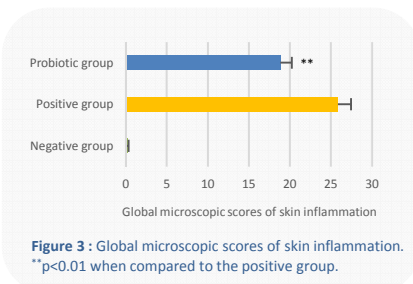


Figure 3 : Global microscopic scores of skin inflammation. ** $p < 0.01$ when compared to the positive group.

Serum cytokine levels:

Three weeks of probiotic treatment led to a significant decrease in serum levels of pro-inflammatory cytokines such as IL-1 β , IL-6, TNF- α , IL-22 ($p < 0.005$), and IL-17 ($p < 0.01$) and a significant increase in the serum level of the anti-inflammatory cytokine IL-10 ($p < 0.005$).

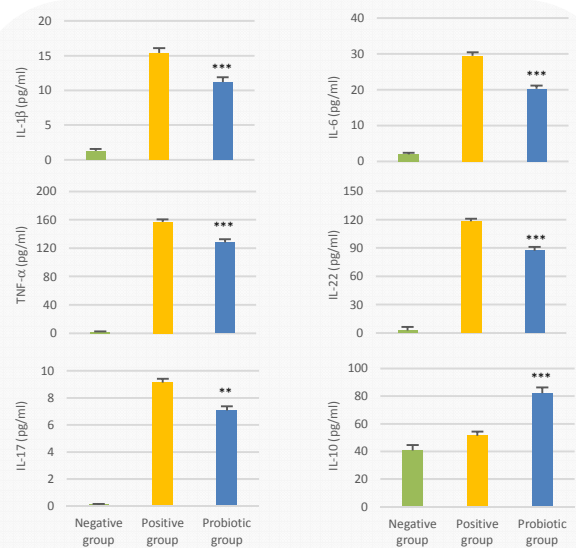


Figure 4 : Serum levels of cytokines. ** $p < 0.01$, *** $p < 0.005$ when compared to the positive group.

CONCLUSION

Our results show that the probiotic mixture tested can prevent the development of skin inflammation, possibly through the modulation of cytokine expression, and that it could be a good candidate for preserving skin integrity and homeostasis.