See our full scientific file (116 publications).

SOD B® & Acne Reduction

Acne is a common dermatological concern, affecting 80-90% of adolescents and young adults. Acne causes important psychological suffering for 40% of people. Acne is a hormonal dependent process which includes three major steps: increased sebum production, follicular hyper-keratinization and abnormal bacterial colonization. Both oxidative stress and inflammation are largely involved in the development of acne, and result in altered endogenous antioxidant defenses. Thanks to its antioxidant and anti-inflammatory properties, Superoxide Dismutase (SOD) has been reported to be efficient in the management of acne.

Acne generates oxidative damages

There is close relationship between the production of Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS) and the development of acne. People with acne have increased levels of Nitric Oxide ($NO^{\bullet}$) and superoxide anions ($O_2^{\bullet -}$)[1, 2].

The overproduction of ROS observed in acne results in lowered antioxidant defenses. In particular, SOD levels are significantly altered in people with acne (Figure 1)[1, 2].

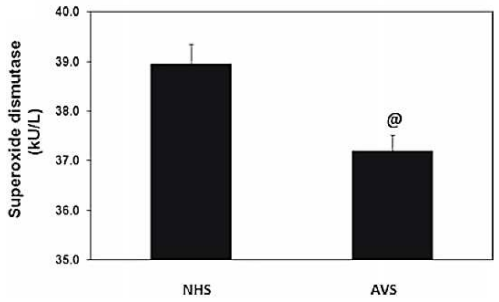

Figure 1: SOD activity in the sera of people with acne (AVS, n= 50) compared to normal human sera (NHS, *n* = 40). $^{@}P < 0.05$ vs NHS[1].

The two others antioxidant enzymes Catalase (CAT) and Glutathione Peroxidase (GPx) levels are also altered in acne patients. Therefore, a restoration of endogenous antioxidant defenses, including SOD, CAT and GPx represents an efficient solution in order to prevent and reduce acne.

Oxidative damages to lipids and proteins are higher in people with acne. Serum analysis showed significantly higher levels of carbonyl contents and malondialdehyde (MDA), respectively products of protein and lipid oxidation, in acne people compared with controls (Figure 2)[1].

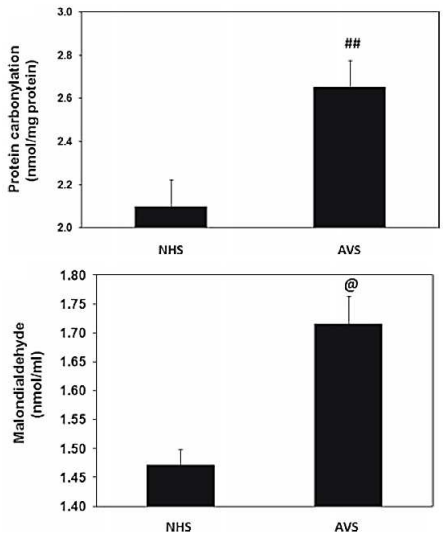

Figure 2: Oxidative damages in the sera of people with acne (AVS, n= 50) compared to normal human sera (NHS, n= 40). $^{@}P < 0.05$ vs. NHS; $^{\#\#}P < 0.05$ vs. NHS[1].

Emerging studies have shown that oxidative stress may not be a mere consequence of acne, but an early event that helps to drive the acne process[3]. Further supports to this theory have reported that lipid peroxidation is evident in acne, and might be involved in initiating the damaging inflammatory reactions[4].

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Acne: an inflammatory process

Lipid peroxides have recently been reported to set an inflammatory cascade mediated by the bacteria *Propionibacterium acnes* (*P. acnes*). The oxidation of sebum, a lipids-rich substance, results in the recruitment of *P. acnes,* and inflammation. These steps lead to a subsequent increase of ROS production, and especially $O_2^{\bullet -}$, which promotes the release of pro-inflammatory cytokines[3]. This amplification loop finally results in acne inflammatory lesions.

SOD inhibits sebum oxidation

The addition of SOD in a keratinocyte cell line has been reported to inhibit the release of $O_2^{\bullet -}$ by *P. acnes in vitro*[5]. This suggests that a restoration of SOD levels could be able to inhibit the sebum oxidation and prevent the formation of acne inflammatory lesions (Figure 3).

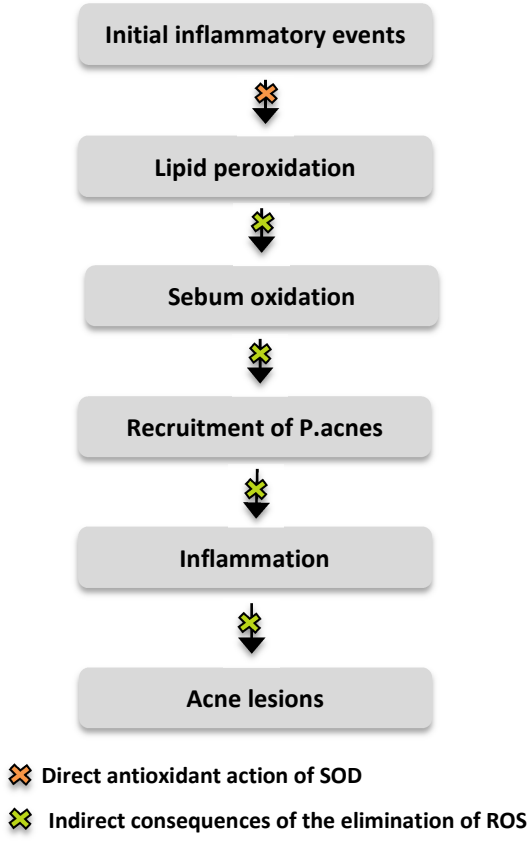

Figure 3: SOD mechanism of action against acne.

The ability of SOD to inhibit the process of lipid peroxidation has been largely demonstrated[6,7].

SOD prevents acne inflammation

Mechanistic studies have highlighted the anti-inflammatory activity of SOD, and its ability to prevent acne inflammation[5]. The addition of SOD in a keratinocyte cell line has demonstrated to inhibit the release of pro-inflammatory cytokines. Especially, studies have reported an inhibition of interleukin-8 (IL-8), which mediates the acne inflammatory process[5]. A restoration of endogenous SOD levels could therefore prevent the development of acne inflammatory lesions.

SOD corrects acne scarring

When the acne inflammatory process is abnormally prolonged, severe acne forms appear. These ones are characterized by the development of scars. 30% of people with inflammatory acne are prone to significant scarring. Scars are often cosmetically unacceptable to people. Scarring is a consequence of a fibrosis process that occurs in the sebaceous follicle during acne inflammation. SOD has been largely demonstrated to be an anti-fibrotic agent[8]. A little less than 150 scientific publications have already highlighted the SOD anti-fibrotic activity. This explains why a restoration of SOD levels could help to prevent and relieve severs types of acne scarring.

Conclusion

Oxidative stress and inflammation are involved in the pathophysiology of acne. As the first line of antioxidant defenses, the addition of SOD has been demonstrated to:

- **prevent sebum oxidation**
- **prevent acne inflammation**
- **correct acne scarring**

Thanks to its mechanism of action, SOD represents an efficient solution to alleviate moderate and severe acne types.

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