

Zinc oxide reduces armpit malodor: A randomized, double-blind trial in healthy volunteers

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Background and Aim

Bothersome odor from the axilla is in most cases caused by *Corynebacterium* and *Staphylococcus*.^{1,2} Anti-bacterial effects of zinc oxide (ZnO) are well documented.³ *In vitro*, ZnO prevented bacterial generation of malodorous short-chain fatty acids. Interestingly, topical ZnO reduced the occurrence of *Corynebacteria* and malodor in pilonidal excisional wounds. Counteracting this anti-odor effect may be the release of odorants mediated by zinc-dependent bacterial enzymes.⁴

The axilla is warm, moist and nutritious; conditions that increase the pH. Because solubilization of ZnO is pH-dependent, the efficacy may vary with the skin surface pH. Moreover, there is no consensus on the effect of gender on pH in the axilla.⁵ The primary aim of this double-blind, placebo-controlled trial (ZINC-ON) was to study if repeated application of ZnO formulated in an oil-in-water emulsion reduces underarm odor in healthy volunteers. The association with the overall bacterial growth and specifically of *Corynebacterium spp.* and *Staphylococcus spp.* was also studied. Skin surface pH was monitored in parallel. Secondly, the anti-inflammatory and wound-healing effects of topical ZnO were studied by assessing the extent of skin erythema and wound closure in two standardized wound models: one inflicted by a contact-activated lancet and the other was induced by ablative CO₂ laser.

Methods

This randomized, placebo-controlled double-blind trial was conducted at including 30 healthy volunteers (15 males and 15 females). Participants' left, and right axilla was randomized to ZnO or placebo, and treated for 13 consecutive days with 5 visits to the hospital. The participants were enrolled, swabbed and started treatment on day -8, on day 0 bacterial swabs were obtained again and wounds were inflicted, and then the participants were seen on days 3, 4 and 5. *Corynebacteria* and other bacterial species were identified by light microscopy and microflex matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) mass spectrometer in duplicates (Bruker, Billerica, MA).

Results

Treatment with ZnO reduced (P=0.003) self-perceived malodor compared with placebo. The overall bacterial growth (P<0.0005) and specifically the odor-generating *Corynebacterium* (P<0.05) and *S. hominis* (P<0.05) were reduced with ZnO treatment despite increasing skin surface pH. Topical ZnO attenuated peri wound erythema around the lancet-induced wounds but did not accelerate wound healing.

Conclusions

Daily application of ZnO effectively reduced malodor and causative bacteria from the axilla, increased skin surface pH and attenuated wound inflammation.

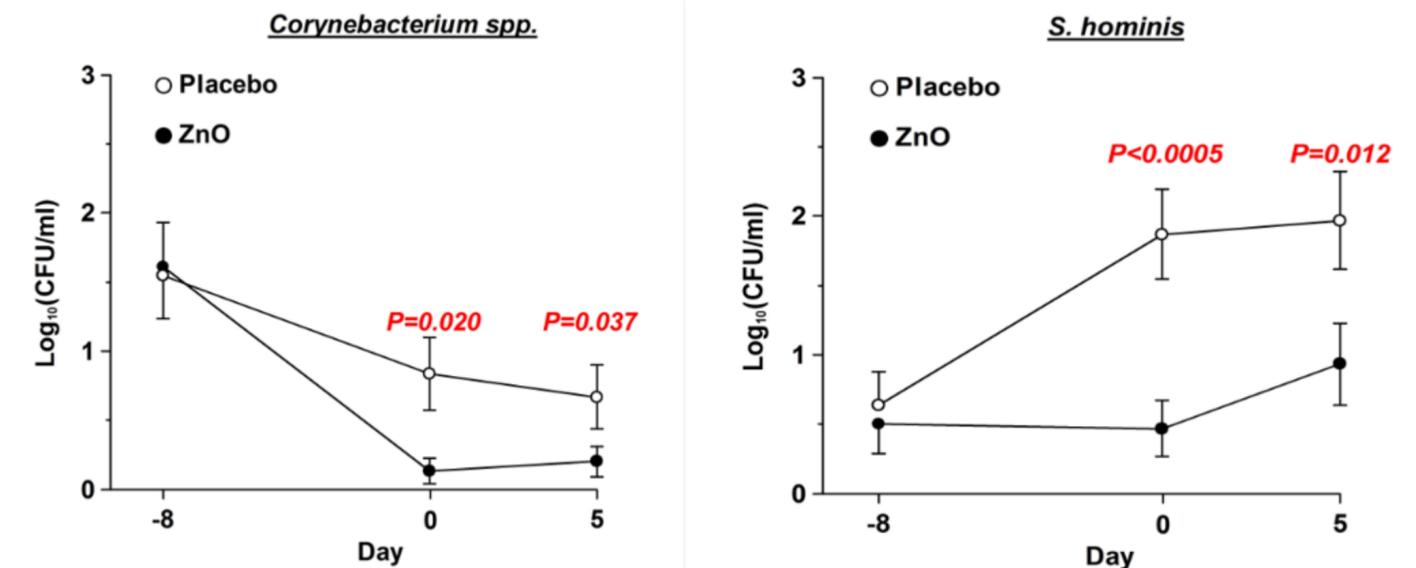


Figure 1. The effect of treatment on the growth of *Corynebacterium spp.* and *S. hominis*. Mean±SEM.

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