

ORIGINAL RESEARCH COMMUNICATION

# Trace element supplementation after major burns increases burned skin trace element concentrations and modulates local protein metabolism but not whole-body substrate metabolism<sup>1, 2, 3</sup>

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**Background:** After major burns, patients exhibit an intense catabolism, and the wounds require surgery and grafting for closure. Complications, such as weight loss and delayed wound healing, are worsened by trace element (TE) deficiencies.

**Objective:** We aimed to assess the effects of TE supplements on systemic substrate turnover and local protein metabolism during wound healing after major burns.

**Design:** This was a prospective, randomized, placebo-controlled trial in 21 patients aged  $35 \pm 11$  y with burns on  $45 \pm 16\%$  of their body surface area; 12 had skin biopsies performed on days 3, 10, and 20, and 10 patients underwent a stable-isotope investigation on day 10. Intravenous copper, selenium, and zinc (TE group) or vehicle (V group) was given with a saline solution for 14–21 d. On day 10, [<sup>13</sup>C]phenylalanine (600- $\mu$ g/kg bolus followed by  $12 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ) plus 6-[<sup>2</sup>H<sub>2</sub>]glucose and [<sup>2</sup>H<sub>5</sub>]glycerol were infused for 6 h to determine skin protein turnover. Biopsies were performed 1 and 6 h after the start of infusion to determine [<sup>13</sup>C]phenylalanine enrichment.

**Results:** The patients' mean age and burn severity did not differ significantly between the groups nor between the skin investigations subgroups. Plasma TE concentrations were significantly higher in the TE group. In the burned areas, the skin contents of selenium ( $P = 0.02$ ) and zinc ( $P = 0.03$ ) increased by day 20. The supernatant-to-plasma <sup>13</sup>C enrichment ratio in burned skin was  $0.363 \pm 0.094$  (TE group) and  $0.286 \pm 0.130$  (V group) after 1 h (NS) and  $0.592 \pm 0.153$  (TE group) and  $0.262 \pm 0.171$  (V group) after 6 h, which reflected lower catabolism in the TE group ( $P = 0.03$ ). No significant differences in whole-body substrate turnover were found between the groups.

**Conclusion:** TE supplementation was associated with an increased skin tissue content of selenium and zinc and with a reduction in skin protein catabolism.

**Key Words:** Critical illness • burns • supplementation • protein turnover • wound healing • trace elements

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