

Skin *versus* diet L-menthol treatment effects on human metabolism and thermoregulation

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Abstract

L-menthol activates the cold-receptor (transient receptor potential melastatin 8) which is located on the cell membrane of brown adipocytes and sensory neurons on the skin. Both skin and diet L-menthol treatments increase metabolism, non-shivering thermogenesis activity, and body weight loss in mice. This study examined the effect of skin *versus* diet L-menthol treatment on metabolism and thermoregulation in humans. Nine healthy male volunteers were randomly distributed into either L-menthol skin (ST; n=4) and diet (DT; n=5) treatments groups. Fasted participants seated at thermoneutral condition were treated with 10 mg/kg L-menthol (ST: gel; DT: capsule) and placebo (ST: water; DT: lactose) in a random order on two different days. Core temperature (T_c), heat storage (S), metabolic rate (M), and mean skin temperature (T_{sk}) were assessed for 15 min at baseline, immediately following each treatment, and every hour thereafter for 7 hours. Kruskal–Wallis one-way ANOVA was used to assess the effect of each treatment on all variables showing a change across time for both ST and DT (p<0.05). Post hoc Mann-Whitney U tests showed that ST reduced T_{sk} within 2 hours and increased S, M, and T_c within 4 hours (p<0.05). A similar, albeit weaker, effect was observed following DT (p<0.05). Between-treatments comparisons showed that ST produced a strong vasoconstriction [evident by a greater reduction in T_{sk} (p<0.05)] that resulted in a greater increase in S, M, and T_c (p<0.05). Concluding, L-menthol ST and DT treatments result in cutaneous vasoconstriction and increased metabolic heat production showing a stronger effect by ST.

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