P-29

INSULIN DELIVERY TO THE BRAIN BY INTRANASAL INSULIN ADMINISTRATION ENHANCES THERMOREGULATORY RESPONSES IN HUMANS

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Background: We have reported that thermoregulatory responses were enhanced with glucose ingestion prior to passive heating compared with fructose ingestion. We hypothesized that insulin increased by glucose ingestion might enhance thermoregulation responses via central mechanisms.
Aim: To assess whether insulin delivery to the brain by intranasal insulin administration enhances thermoregulatory responses during passive heating in humans.
Methods: Five healthy male subjects (24.2±6.0 yrs, mean±SD) were participated. After fructose solution (75g of fructose with 300 mL of water) was ingested, insulin (Insulin trial, 160 IU/1.6mL in total) or normal saline (Control trial, 1.6 mL in total) was administrated intranasally during 15 min. Twenty minutes after ingestion, the subjects were passively heated by lower legs immersion (42°C of water) for 60 min. Esophageal (T_{es}) and skin temperatures, cutaneous blood flow and sweat rate at the forearm and chest were continuously measured.
Results: There were no significant effects of insulin on blood glucose concentration and relative changes in plasma volume, and mean skin temperatures. T_{es} was lower, chest sweat rate and sweat loss were higher in the Insulin trial than the Control trial with marginal significance ($P = 0.10$, 0.12, and 0.07, respectively).
Conclusion: Insulin delivery to the brain by intranasal insulin administration enhances thermoregulatory responses and reduces thermal strain during passive heating in humans.

Key words: sweat rate, skin blood flow, body temperature, insulin