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Effects of Cellular Dehydration on Glucose Regulation in Healthy Males - A Pilot Study

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Abstract

Preliminary data from experimental animals have linked dehydration to glucose dysregulation via the action of vasopressin. Also epidemiological data suggest that humans with low water intake or elevated vasopressin are more prone to develop diabetes.

PURPOSE

Therefore, the purpose of this study was to investigate the effects of cellular dehydration on glucose regulation in healthy males.

METHODS

Four non-diabetic males ($28.4 \text{ y} \pm 1$, HbA1c $5.6 \pm 0.2\%$, BMI $23.6 \pm 1.2 \text{ kg} \cdot \text{m}^{-2}$) were recruited for this preliminary study. Each subject underwent two experimental trials, consisting of a 2 h intravenous infusion of saline (ISO 0.9% and HYP 3.0% of NaCl, $0.1 \text{ ml} \cdot \text{kg} \cdot \text{min}^{-1}$ infusion rate), followed by a 2h oral glucose tolerance test. Blood samples were taken from an antecubital intravenous catheter in 30min intervals.

RESULTS

Mean plasma osmolality was raised to $300 \pm 3 \text{ mmol/kg}$ for the HYP trial, while ISO maintained at $286 \pm 2 \text{ mmol/kg}$. Glycemic and insulin responses post glucose loading seemed

to be delayed but spiked during HYP (150.6mg/dl glucose at min 60) while displaying a normal response during ISO (136mg/dl at min 60) trials. Homeostatic model assessment index of insulin resistance (HOMA IR) was HYP 0.93 ± 0.24 vs. ISO: 0.85 ± 0.59 , while Matsuda index of insulin sensitivity was HYP: 12.4 ± 5.9 vs. ISO: 12.7 ± 6.5 . HYP seemed to cause increased insulin resistance and decreased insulin sensitivity compared to ISO.

CONCLUSION

The present data suggest that cellular dehydration induced by hypertonic saline infusion might be linked to glucose dysregulation in normal healthy adults.



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