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Exploring the potential ergogenic effects of glycerol hyperhydration.

Nelson JL, Robergs RA.

Exercise Physiology Laboratories, University of New Mexico, Albuquerque, New Mexico 87131-1258, USA.

During athletic competition or recreational pursuits, a body's hydration level can become compromised, resulting in a decrement in performance. Glycerol (1,2,3-propanetriol) has been used to induce hyperhydration in an attempt to offset the deleterious effects of dehydration. When glycerol is consumed orally, it is rapidly absorbed primarily in the small intestine. It is reported to be evenly distributed among all fluid compartments, with the exception of the cerebral spinal fluid and aqueous humour, and promotes hyperhydration by inducing an osmotic gradient. Through an increase in the kidney's medullary concentration gradient, water absorption in the nephron is enhanced. When glycerol is consumed, the plasma glycerol concentration increases in proportion to the dose ingested, which easily exceeds the glycerol saturation point resulting in urinary glycerol excretion. Thus, without supplemental glycerol ingestion, there will be a decrease in the osmotic gradient resulting in a loss of hyperhydration. The ergogenic nature of glycerol has been investigated as to its effect on fluid retention, thermoregulation, cardiovascular responses and performance. While many studies provide evidence of hyperhydration, others do not. Only two studies reviewed showed a thermoregulatory advantage. Furthermore, the preponderance of evidence neither weighed for or against cardiovascular or performance advantages. What makes one study provide favourable results while another study does not is unclear. Possible explanations may include subject characteristics, environmental factors, research design, whether fluids with or without glycerol were given during exercise, the rate at which fluids are initially given to induce hyperhydration, the time between peak hyperhydration/peak plasma glycerol concentration and the trial (i.e. exercise), the glycerol dose (i.e. 1.0 g/kg body mass) and what it is based upon, the percentage glycerol solution (i.e. 5%, 20%), the variation of time between the end of the hydration protocol and the beginning of exercise, or perhaps the intensity of exercise (fixed, variable, percentage maximum oxygen uptake). What is clear is that glycerol has the capacity to enhance fluid retention. In so doing, glycerol hyperhydration may be a logistically preferred method due to concomitant decrease in urine output and free-water clearance, which may give a performance advantage by offsetting dehydration. Future research should focus on maintaining plasma glycerol concentrations at levels necessary to maintain osmotic forces required to support continued hyperhydration. Potential benefits of glycerol should be further explored to identify the circumstances or factors that may contribute to an ergogenic effect.

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