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Water Intake, Water Balance, and the Elusive Daily Water Requirement

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Discussion Research ID	DPR-2026-1287
Year	2018
Field	Medicine
DOI	10.3390/nu10121928
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Licence	CC-BY
Original source	Nutrients
Permanent link	https://discussionpublishers.com/research/7acbce8a-d261-4842-b472-7e3d57b504cc
Publisher	Discussion Publishers discussionpublishers.com

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Cite as: Lawrence E. Armstrong, Evan C. Johnson (2018). Water Intake, Water Balance, and the Elusive Daily. Discussion Publishers,

Abstract

Water is essential for metabolism, substrate transport across membranes, cellular homeostasis, temperature regulation, and circulatory function. Although nutritional and physiological research teams and professional organizations have described the daily total water intakes (TWI, L/24h) and Adequate Intakes (AI) of children, women, and men, there is no widespread consensus regarding the human water requirements of different demographic groups. These requirements remain undefined because of the dynamic complexity inherent in the human water regulatory network, which involves the central nervous system and several organ systems, as well as large inter-individual differences. The present review analyzes published evidence that is relevant to these issues and presents a novel approach to assessing the daily water requirements of individuals in all sex and life-stage groups, as an alternative to AI values based on survey data. This empirical method focuses on the intensity of a specific neuroendocrine response (e.g., plasma arginine vasopressin (AVP) concentration) employed by the brain to regulate total body water volume and concentration. We consider this autonomically-controlled neuroendocrine response to be an inherent hydration biomarker and one means by which the brain maintains good health and optimal function. We also propose that this individualized method defines the elusive state of euhydration (i.e., water balance) and distinguishes it from hypohydration. Using plasma AVP concentration to analyze multiple published data sets that included both men and women, we determined that a mild neuroendocrine defense of body water commences when TWI is 1.8 L/24h, that 1971% of adults in various countries consume less than this TWI each day, and consuming less than the 24-h water AI may influence the risk of dysfunctional metabolism and chronic diseases.

Keywords: daily water intake, water balance, vasopressin, hydration biomarkers, euhydration, hypohydration, ad

Full text

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Original record: https://doi.org/10.3390/nu10121928
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