

A whole-body model to distinguish excess fluid from the hydration of major body tissues¹⁻³

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ABSTRACT

Background: Excess fluid (ExF) accumulates in the body in many conditions. Currently, there is no consensus regarding methods that adequately distinguish ExF from fat-free mass.

Objective: The aim was to develop a model to determine fixed hydration constants of primary body tissues enabling ExF to be calculated from whole-body measurements of weight, intracellular water (ICW_{WB}), and extracellular water (ECW_{WB}).

Design: Total body water (TBW) and ECW_{WB} were determined in 104 healthy subjects by using deuterium and NaBr dilution techniques, respectively. Body fat was estimated by using a reference 4-component model, dual-energy X-ray absorptiometry, and air-displacement plethysmography. The model considered 3 compartments: normally hydrated lean tissue (NH_LT), normally hydrated adipose tissue (NH_AT), and ExF. Hydration fractions (HF) of NH_LT and NH_AT were obtained assuming zero ExF within the diverse healthy population studied.

Results: The HF of NH_LT mass was 0.703 ± 0.009 with an ECW component of 0.266 ± 0.007 . The HF of NH_AT mass was 0.197 ± 0.042 with an ECW component of 0.127 ± 0.015 . The ratio of ECW to ICW in NH_LT was 0.63 compared with 1.88 in NH_AT. ExF can be estimated with a precision of 0.5 kg.

Conclusions: To calculate ExF over a wide range of body compositions, it is important that the model takes into account the different ratios of ECW to ICW in NH_LT and NH_AT. This eliminates the need for adult age and sex inputs into the model presented. Quantification of ExF will be beneficial in the guidance of treatment strategies to control ExF in the clinical setting. *Am J Clin Nutr* 2007; 85:80-9.

KEY WORDS Excess fluid, tissue hydration, normal hydration, body composition, adipose tissue, ECW:ICW ratio

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