

Water turnover by deuterium dilution in adult males

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Water turnover (WT) is the movement of ingested and metabolic water through the body and its elimination from the body. WT helps in the understanding of hydration and optimal water intake, and metabolism in disease states. Water turnover was studied in 18 adult males. Baseline saliva samples were collected after 2-hours of fasting. A 30 g dose of deuterium-oxide was administered to estimate total body water (TBW) and WT by the gold standard deuterium dilution method. Following equilibration, post-dose saliva samples were collected at 3 and 3.5 hours (enrichment) and again on day 3, 7 and 11 to assess deuterium elimination over time; water-turnover-rate (WTR). Deuterium enrichment in saliva was determined by Fourier Transform Infrared Spectroscopy. The characteristics of WT were determined by plotting deuterium enrichment against time for each participant. The elimination time intervals were categorized as day 1 to day 3 (early-phase), day 3 to day 7 (middle-phase), day 7 to day 11 (late-phase). Deuterium enrichment at 3 and 3.5 hours post dose was used to calculate TBW, from which Fat-Free-Mass (FFM)% was calculated. The shapes of the WT graphs of each individual were studied to determine the characteristics of water elimination and a protocol for calculating WT was developed in the early phase of elimination, which compared well with published work. Individuals with more FFM% had higher WTR ($p < 0.05$) which could be explained through higher metabolism. WTR assessed for the first time in Sri Lanka via deuterium dilution, showed a biologically expected relationship with FFM which is a reflection of metabolic rate. Our preliminary findings suggest that hydration advice can be tailored to FFM% to optimize fluid balance in health, and needs further investigation, especially in disease states.

Keywords: *Body composition, Water turnover rate, Water turnover, Deuterium dilution, Total body water*