The effects of Ramadan fasting on energy expenditure in healthy non-obese individuals

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Introduction: Fasting during the month of Ramadan entails abstinence from eating and drinking between dawn and sunset. Weight loss may be seen in some patients, but is often followed by weight regain after Ramadan. It has previously been shown that changes occur to the hormonal environment and to circadian rhythms during fasting, but it is unclear whether these are accompanied by changes in energy metabolism. We have investigated the effect of Ramadan fasting on resting metabolic rate (RMR), activity energy expenditure (AEE) and total energy expenditure (TEE).

Methods: Healthy non-obese volunteers (n=7, male : female = 3:4, age=27.9 ± 6.6 years) fasting during Ramadan were recruited from staff working at the Imperial College London Diabetes Centre. Measurements were performed during and after Ramadan. RMR was measured following nine hours of fasting using indirect calorimetry (Cosmed Quark RMR). AEE was measured using the fitbit One accelerometer (Fitbit inc); TEE was measured using doubly labelled water method (University of Aberdeen, United Kingdom) and body composition was estimated using the SECA 515 Medical Body Composition Analyser (SECA, Hamburg, Germany) using a bio-impedance technique.

Results: No significant difference in mean RMR (1389.6 ± 212.5 kcal/day v 1311.7 ± 185.0 kcal/day, total calories burned measured by Fitbit One (2098.2 ± 296.2 kcal/day v 2018.3 ± 346.4 kcal/day) or TEE (2066.9 ± 428.1 kcal/day v 2174.1 ± 516.0 kcal/day) was observed between the Ramadan and post-Ramadan periods. Weight (71.6 ± 12.4 kg v 70.6 ± 12.7 kg), fat mass (23.2 ± 7.3 kg v 22.4 ± 7.7 kg) and fat free mass (48.8 ± 11.1 kg v 48.8 ±10.6 kg) were similarly unchanged between the two periods. There were marked intra-individual differences in energy metabolism trends in Ramadan and post-Ramadan periods (ΔRMR +68 kcal/day to -249 kcal/day, ΔTEE +480 to -570 kcal/day). There were no specific predictors of the direction and magnitude of RMR and TEE change.

Conclusions: In the healthy population studied, no overall change in RMR and TEE was seen with Ramadan fasting. However, major intra-individual differences in the direction and magnitude of RMR and TEE changes were observed. The reason for the variability in RMR trends with Ramadan fasting among different individuals merits further investigation. Differences in diet and activity are likely to be more important contributors to weight change with Ramadan fasting.