The effect of chronic administration of sibutramine on body composition in dietary-induced, obese female Wistar rats – An evaluation of the Foss FoodScan™ analyser

Keith Dickinson¹, Namrata Mody¹, Nigel Slater¹, Richard Brammer¹, Helen Jackson¹, Matthew Fyfe², Terri-Anne Cock², Sharon Cheetham¹

¹RenaSci Consultancy Ltd, Nottingham, UK, ²Prosidion Ltd, Oxford, UK

One of the key requirements for anti-obesity agents is to show that weight loss is mediated by a specific loss of body fat rather than undesirable changes in muscle mass and/or body water content. Classically, rodent carcasses are ground and then analysed using chemical techniques, which are highly precise, but time-consuming and potentially hazardous. Predictive techniques such as DEXA and NMR can be of considerable value, but are indirect and cannot determine protein content. The FoodScan™ NIR (near infra-red) meat analyser (Foss UK) has recently received AOAC (Association of Official Analytical Chemists) approval as a reference method for the analysis of moisture, fat and protein in meat and meat products, but it has not previously been evaluated for the determination of body composition in rodents. This study has compared results obtained with a FoodScan™ analyser with those obtained using classical chemical analysis techniques in a rodent model of human obesity.

Nineteen, dietary-induced obese, female Wistar rats were dosed with vehicle po or the 5-HT and noradrenaline reuptake inhibitor anti-obesity drug, sibutramine (5mg/kg po) for 34 days. The animals were maintained on a simplified cafeteria diet (Research Diets D12451 45 kcal % fat chow, ground peanuts and ground chocolate) for at least 12 weeks prior to the study to induce obesity and then for the duration of the study. At the end of the study, rats were killed, milled at the temperature of liquid nitrogen and carcass composition was determined on thawed samples using the FoodScan™ analyser (using the default meat products equation). Conventional chemical analysis techniques were also performed on the milled samples for water (freeze drying to constant weight), fat (modified Soxhlet extraction), protein (Kjeldahl analysis). Separate statistical analyses for each technique were performed to compare the effect of sibutramine to vehicle using a robust regression model including treatment as a factor and baseline (Day 1) bodyweight as a covariate followed by the multiple t-test. Standard errors of the mean were calculated from the residuals of the statistical model.

The final carcass weight of the vehicle-treated rats was 414.7 ± 4.6 (n=10, SEM). Sibutramine significantly reduced final carcass weight to 365.5 ± 5.5 (n=9, SEM) when compared to vehicle. The chemical analyses and FoodScan™ analyses for individual rats were highly correlated for %water ($r^2 = 0.954$), %fat ($r^2 = 0.951$) and %protein ($r^2 = 0.789$). Sibutramine (5mg/kg po) significantly reduced total fat by an average 37.3g (chemical analysis) or 34.4g (FoodScan™ analysis), but had no significant effect on total water or protein content (g) when compared to vehicle. In terms of body composition, sibutramine (5mg/kg po) significantly increased %water (3.5% and 3.4%), %protein (1.8% and 1.1%) and decreased %fat (-5.6% and -5.0%) when compared to vehicle (chemical and FoodScan™ data, respectively). Thus, the FoodScan™ analyser produced results in these dietary-induced obese, female Wistar rats that were essentially identical to those produced by conventional chemical analyses. These data demonstrate that the FoodScan™ analyser provides an excellent cost-effective alternative to conventional chemical carcass analysis.