BODY COMPOSITION PEER REVIEW SUMMARY

Accuracy of bio electrical impedance analysis in estimation of extra cellular space in healthy subjects and in fluid retention states.
Sergi G, Bussolotto M, Perini P, Calliari I, Giantin V, Ceccon A, Scanferla F, Bressan M, Moschini G, Enzi G.
Annals of Nutrition and Metabolism (1994) 38, 158-65
Department of Internal Medicine, University of Padova, Italy.
Bio electrical impedance analysis (BIA) is a noninvasive method recently introduced for body fluid evaluation in healthy subjects. The purpose of this paper is to verify the reliability of bio electrical measurements in extra cellular water (ECW) prediction in healthy subjects and in fluid retention states. We studied 40 subjects (19males and 21 females) aged 21-81 years; 22 were healthy subjects, 12 were affected by chronic heart failure, and 6 by chronic renal failure. In all subjects resistance (R) and reactance (Xc) at 1 and 50 kHz corrected for height were compared with ECW measured by the bromide dilution method. Our results suggested a different behavior of the current in fluid-retention states with respect to healthy subjects. ECW was best predicted by resistance at 1 kHz corrected for height, group(considered as dummy variable), weight and gender
($R2 = 0.89, p < 0.001$, SEE = 1.7 liters). The bio electrical impedance analysis at 50 kHz explained the 89% of ECW variability when resistance and
reactance corrected for height are considered with gender group and weight ($R2 = 0.89$, $p < 0.001$, SEE = 1.7 liters). In conclusion, the bio electrical method at 1 kHz can be considered sufficiently accurate in ECW prediction in healthy subjects and in fluid retention states. Also, the bio electrical impedance nalysis at 50 kHz is useful for predicting ECW, but this role must be further investigated.

Lean body mass estimation by bio electrical impedance analysis: a four-site cross-validation study.
Segal KR, Van Loan M, Fitzgerald PI, Hodgdon JA, Van Itallie TB.
American Journal of Clinical Nutrition (1988) 47, 7-14
Division of Pediatric Cardiology, Mount Sinai School of Medicine, New York, NY 10029.
This study validated further the bio electrical impedance analysis (BIA) method for body composition estimation. At four laboratories densitometrically-determined lean body mass (LBMd) was compared with BIA in1567 adults (1069 men, 498 women) aged 17-62 y and with 3-56% body fat. Equations for predicting LBM from resistance measured by BIA, height, weight, and age were obtained for the men and women. Application of each equation to the data from the other labs yielded small reductions in R values and small increases in SEEs. Some regression coefficients differed among labs but these differences were eliminated after adjustment for differences among labs in the subjects' body fatness. All data were pooled to derive fatness-specific equations for predicting LBMd: the resulting R values ranged from 0.907 to 0.952 with SEEs of 1.97-3.03 kg. These results confirm the validity of BIA and indicate that the precision of predicting LBM from impedance can be enhanced by sex- and fatness specific equations.

Body composition determination in children using bio electrical impedance.
Cordain L, Whicker RE, Johnson JE.
Growth, Development, & Aging (1988) 52, 37-40
Department of Exercise and Sport Science, Colorado State University, Fort Collins 80523.
Estimation of body composition by measurement of tetra polar bio electrical resistive impedance (R) is a technique only recently validated in adults. To evaluate this technique in children, 16 girls aged 11.6 +/- 0.9 yr(mean +/- SD) and 14 boys aged 12.5 +/- 1.0 yr were assessed for fat free mass (FFM) by hydrostatic weighing, total body potassium (TBK) by whole body counting of 40K, and R by an electrical impedance Plethysmograph. Significant relationships (P less than 0.001) were demonstrated between TBK and ht2/R ($r = 0.92$),and FFM and ht2/R ($r = 0.83$). The reliability coefficient for the impedance measurements was $r = 0.97$. The following equation describes FFM in the present group of children: FFM (kg) = 6.86 + 0.81 x (ht2/R), $r = 0.83$,P less than 0.001, SEE = 4.08. These data suggest that impedance measurements are valid and reliable predictors of FFM in pediatric populations.