Estimates of body composition in drug naïve asymptomatic HIV-infected rural Kenyan women

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Purpose
To compare methods that estimate body composition in drug naïve asymptomatic HIV-infected rural Kenyan women enrolled in a randomized nutrition intervention field study that will determine if meat added to the diet prevents the loss of lean body mass

Background
• HIV disease progression is defined, in part, by the loss of lean body mass1
• In other populations meat intake increased arm muscle in Kenyan school-aged children2 and increased fat free mass and skeletal muscle in elderly men.3

Population

USAID-AMPATH Patients

• The United States Agency for International Development-Academic Model Providing Access to Healthcare (USAID-AMPATH) Partnership operates under the joint direction of the Moi Teaching and Referral Hospital and Moi University and Indiana University Schools of Medicine.
• USAID-AMPATH has enrolled, since 2001, >100,000 HIV-infected adults and children in western Kenya.

Methods

Bioelectrical Impedance Analysis (BIA)
BIA is a non-invasive, rapid measure of resistance and reactance to an electrical current. Predicted values of fat free mass (FFM) and percent body fat (%BF), using a four terminal BIA system (BIA, Model Quantum X, RJL Systems, Clinton, Michigan), were calculated using published equations.4

Electrodes were applied to the dorsum of the dominant wrist and the flexor surface of the ipsilateral ankle with the subject supine. The system has electrodes containing electrolytic gel and will measure the conductance of a <1 m–A, 50 kHz current between them.

Equations for estimates of fat free mass (FFM), total body water (TBW) and percent body fat (%BF)

Total body fat (TBF) = WT* (kg) – FFM

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Total body fat (TBF) = WT* (kg) – FFM and %BF = TBW/WT (kg)

TBW = 3.747 + (0.113 x WT) + [(0.45 x HT2)/Resistance]

- Height (HT, cm), Weight (WT, kg)
- Electrodes containing electrolytic gel and will measure the conductance of a <1 m–A, 50 kHz current between them.
- The cross-sectional area of the limb is circular.
- The skin folds are twice the average adipose tissue rim diameter at the middle of the limb.
- The muscle compartment of the limb is circular in cross-section.
- The cross-sectional areas of neurovascular tissue and bone are relatively small and ignored.

Results
The following are the baseline data for the first 138 women enrolled:

Mean (SD)

Age (years) 36.4 (7.5) BMI (WT/HT)2 22.3 (3.6); 11% < 18.5 CD4 (cells/ul) 492 (191)

The following significant correlations were found using Development Core (2009) software; ISBN 3-900501-07-0, URL: http://www.R-project.org.

Anthropometric (ANTHRO) and BIA as estimates of lean or fat mass

All correlations: p<0.001

Conclusions
In drug naïve, asymptomatic, HIV-infected rural Kenyan women enrolled in an 18 month randomized controlled field trial that measures the impact of added protein and energy on body composition:

• BIA compared to anthropometry have a strongly significant relationship when estimating fat and lean mass at baseline.
• If the relationship between BIA and anthropometry methods for assessing body composition, remains significant for assessments repeated every 3 months, then BIA may prove to be a reliable tool to track changes in lean and fat mass.

References
2. Grillenberger M, Neumann CG, et al. (2003) "Food supplements have a positive impact on weight gain and the addition of animal source foods increases lean body mass of Kenyan school children." J Nutr 133:3957S-3964S.