

analyses. Contrary to Abernathy's assertion, smoking is quite unlikely to account for the increased mortality in heavier people because in virtually all studies heavier people have smoked less than thin people.

Although Abernathy would prefer to discard height and weight tables, the excess mortality and morbidity associated with overweight is not eliminated just by dismissing the tables. We concur that long-term weight loss for obese people is seldom achieved. This is all the more reason to have clear and sound weight guidelines that can be used as a criteria for avoiding weight gains as

we age. Clearly, the focus must be primarily on prevention of weight gain rather than on treatment after it has already occurred.

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Importance of electrode position in bioelectrical impedance analysis

Dear Sir:

Mayfield et al (1) recently used two reference methods ($H_2^{18}O$ and bromide dilution) to demonstrate that resistance and reactance in newborns are correlated with total body water and extracellular water, respectively. This work represents an important step forward in the application of bioelectrical impedance analysis (BIA) in young children because it is the first to propose predictive equations for aqueous body compartments. Unfortunately, these equations can only be used by teams that use the same positions for the four electrodes. However, no standard position has yet been established in young children and it is of great importance to consider this parameter.

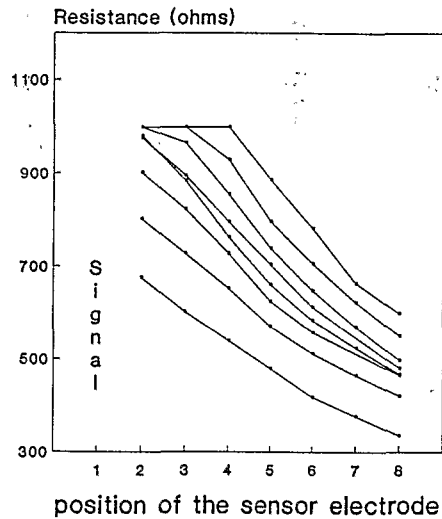
The majority of BIA measurements use a tetrapolar system to minimize skin reactions caused by the adhesive electrodes. To measure total body impedance, a pair of electrodes is placed at the extremity of the upper limbs and another pair at the extremity of the lower limbs. Current is applied between the hand and foot-signal electrodes and the resistance (R) to the current detected between the sensor electrodes of each pair. Because impedance is related to the length of the conductor, the measurement of R is therefore closely linked to the position of the

Maire, F Delpuch, D Rieu, unpublished data presented at the Sixth International Congress of Auxology in Madrid, 1991). Mayfield et al report R values $> 1000 \Omega$, which is incompatible within the context of BIA standardization in that the machines used have a measurement range of between 0 and 1000Ω .

The positioning of the various electrodes has never been tested in newborns. To perform these tests we positioned the electrodes as for adults and added six electrodes side by side on the arm and leg in fixed numbered positions, something that is easier to do in newborns. The electrodes were 1.2 cm wide. The R values we obtained (Fig 1) with adult positions (positions 1 and 2) were in the same region as R values obtained by Mayfield et al (1). The farther the selected sensor electrode from the signal electrode, the more R values decreased. The interaction tested with the sensor electrode in position 8 disappeared as soon as the signal electrode moved toward the fingers (Fig 1).

These conclusions were similar to those found by Barillas-Mury et al (2), who performed the same tests in young children. According to them the minimal interelectrode distance is 5.5 cm. A child's hand is not sufficiently large for such a distance to be used and this led to the proposal that electrode application could be extended in young children to the forearm and the leg

The effect of sensor position
with fixed signal at position 1



The effect of signal position
with fixed sensor at position 8

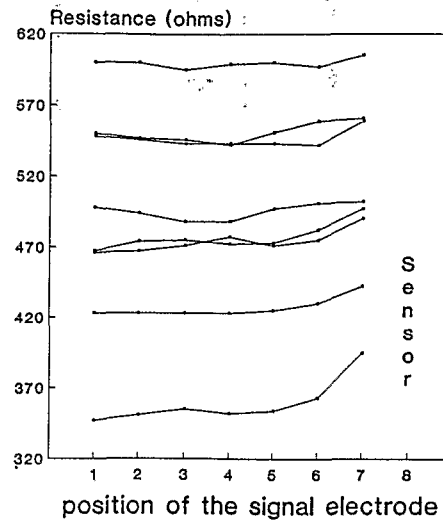


FIG 1. Effect of electrode position on bioelectrical impedance analysis measurement in newborns. Resistance was measured by using an AKERN (Firenze, Italy) analyzer. Positions 1 and 2 correspond to the standard positions in adults. The other positions correspond to electrodes (1.2 cm wide) placed side by side along the arm or leg from position 2 and above. The sensor electrode at position 8 was 6 cm from position 2. The value 999 Ω is the maximum of the machine.

of the sensor electrode, is one of the most critical factors in BIA measurements. Standard electrode positioning must at least describe an anatomic site for one of the electrodes and the precise distance that separates the electrodes within each pair. To date, a small number of BIA studies in young children have been

2. Barillas-Mury C, Vettorazzi C, Molina S, Pineda O. Experience with bioelectrical impedance analysis in young children: sources of variability. In: Ellis KJ, Yasumura S, Morgan WD, eds. *In vivo body composition study*. London: IPSM 3, 1987:87-90.
3. Fjeld CR, Freundt-Thurne J, Schoeller DA. Total body water measured by ^{18}O dilution and bioelectrical impedance in well and mal-