AKERN
Science in body composition

How to cite Akern technology in medical writing

Recipients: All researchers and clinical users who publish or cite in peer-reviewed journals

Purpose: Standardize how Akern's technologies are cited to avoid misinformation or mis-belonging/ownership of the application of bioimpedance.

TABLE OF CONTENT

AKERN model	market entry	How to quote in the material paragraph and methods	technology (current, frequency, resolution, CV%)
BIA 101	1998-2009	Whole body bioimpedance (BIA 101 AKERN, Florence, Italy) was performed using an alternating sinusoidal electric current of 800 microampere at an operating frequency of 50 kHz. The device was calibrated every morning using the standard control circuit supplied by the manufacturer with a known impedance [resistance (R) = 380 ohm; reactance (Xc) = 47 ohm. The accuracy of the device was 1% for R and 2% for Xc. For the BI measurement, each participant was supine with limbs slightly spread apart from the body. Disposable tab electrodes (BIATRODES Akern Srl; Florence, Italy) were placed on the right side at metacarpal and metatarsal sites of the right wrist and ankle [a].	800 µA current at 50 kHz (+-1%), resolution Rz: ±1%, Xc: ±2%, CV% <3,5%
BIA 101 New Edition	2010-2019	Whole body bioimpedance (BIA 101 new edition AKERN, Florence, Italy) was performed using an alternating sinusoidal electric current of 400 microampere at an operating frequency of 50 kHz. The device was calibrated every morning using the standard control circuit supplied by the manufacturer with a known impedance [resistance (R) = 380 ohm; reactance (Xc) = 47 ohm. The accuracy of the device was 1% for R and 2% for Xc. For the BI measurement, each participant was supine with limbs slightly spread apart from the body. Disposable tab electrodes (BIATRODES Akern Srl; Florence, Italy) were placed on the right	400 µA current at 50 kHz (+-1%), resolution Rz: ±1%, Xc: ±2%, CV% <2,8%

		side at metacarpal and metatarsal sites of the right wrist and ankle [a].	
BIA 101 BIVA	2019	Whole body bioimpedance (BIA 101 BIVA AKERN, Florence, Italy) was performed by a phase sensitive device working with alternating sinusoidal electric current of 250 microampere at an operating frequency of 50 kHz (±1%). The device was calibrated every morning using the standard control circuit supplied by the manufacturer with a known impedance [resistance (R) = 380 ohm; reactance (Xc) = 42 ohm. The accuracy of the device was 0.1% for R and 0.1% for Xc. For the BI measurement, each participant was supine with limbs slightly spread apart from the body. Very low intrinsic impedance (<30 ohm) disposable electrodes (BIATRODES Akern Srl; Florence, Italy) were placed on the right side at metacarpal and metatarsal sites of the right wrist and ankle [a].	250 µA current at 50 kHz (+-1%), resolution Rz: ±1%, Xc: ±1%, CV% <1%
NUTRILAB	2014	Bioelectrical impedance was measured with a phase-sensitive touch screen impedance device (Nutrilab, Akern, Florence, Italy), which injects an alternating sinusoidal electric current of 400 microamperes (RMS) at 50 kHz (+-1%). Standard whole-body tetrapolar measurements were performed according to the manufacturer guidelines.	400 µA current at 50 kHz (+-0.1%), resolution Rz: ±1%, Xc: ±1%, CV% <2%
BIA 101 Anniversary	2010	Whole-body impedance (BIA 101 Anniversary, Akern, Florence, Italy) is generated in soft tissues to oppose the flow of an injected alternate current and is measured from skin Ag/AgCl electrodes placed at fixed-distance (5 cm) on the hands and feet. The device generates an alternating sinusoidal electric current of 400 microamperes at an operating single frequency of 50 kHz (±0.1%). Resistance (R, Ω) is the opposition to the flow of an injected alternating current through intra and extracellular ionic solutions, while reactance (Xc, Ω) is the dielectric or capacitive component of cell membranes and organelles, and tissue interfaces.	425 µA current at 50 kHz (+-0.1%), resolution Rz: ±0.1%, Xc: ±0.1%, CV% <2%
CARDIOEFG -RENALEFG	2009 - 2018	Bioimpedance vector analysis using tetrapolar impedance plethysmography that emitted 50 kHz alternating sinusoidal current (CardioEFG,	400 µA current at 50 kHz (+-1%), resolution

		Akern, Florence, Italy) of 400 microamperes. Resistance (R, Ω) is the opposition to the flow of an injected alternating current through intra and extracellular ionic solutions, while reactance (Xc, Ω) is the dielectric or capacitive component of cell membranes and organelles, and tissue interfaces. Data are shown directly in a LCD touchscreen and stored into a internal memory . The CV% was evaluated in (_) patients: the mean coefficients of variation for both parameter were 0.5% intra-patient and 1.6% inter-operator. Disposable proprietary low impedance electrodes (BIVATRODES Akern Srl; Florence, Italy) were placed on the right side at metacarpal and metatarsal sites of the right wrist and ankle [a].	Rz: ±0.1%, Xc: ±0.1%, CV% <2%
EFG3	2005-2010	Whole-body impedance data were obtained using a tetrapolar impedance plethysmography (EFG V.3 Akern, Florence, Italy). The bioelectrical parameters of resistance and reactance were measured using an electric alternating current flux of 400 amperes and an operating frequency of 50 kHz. Whole-body impedance measurements were taken according to the standard protocol of Lukaski et al [a]	400 µA current at 50 kHz (+-2%), resolution Rz: ±1%, Xc: ±1%, CV% <2%
BIATRODES	1998	Two pair of adhesive Ag/AgCl low impedance electrode (BIATRODES Akern Srl; Florence, Italy) were placed proximal to the phalangeal–metacarpal joint on the dorsal surface of the right hand and distal to the transverse arch on the superior surface of the right foot. Sensor electrodes were placed at the midpoint between the distal prominence of the radius and ulna of the right wrist, and between the medial and lateral malleoli of the right ankle at a fixed distance of 5 cm each other.	
BIVATRODES	2010	Two set adhesive Ag/AgCl low impedance electrode (BIVATRODES Akern Srl; Florence, Italy),designed for accurate and sensitive bioimpedance measurements were placed proximal to the phalangeal–metacarpal joint on the dorsal surface of the right hand and	

		distal to the transverse arch on the superior surface of the right foot. Sensor electrodes were placed at the midpoint between the distal prominence of the radius and ulna of the right wrist, and between the medial and lateral malleoli of the right ankle.	

MATERIALS and METHOD: sample paragraph

The impedance measurements were performed with a phase sensitive single frequency analyzer (MODEL () , Akern srl, Italy), which applies an alternating current of (___) μA at the frequency of 50 kHz. Measurements were made using tetrapolar configuration as described by Lukaski (1986) [a].
The subjects were in the supine position with a leg opening of 45° compared to the median line of the body and the upper limbs positioned 30° away from the trunk. After cleansing the skin with isopropyl alcohol, two Ag/AgCl very low-impedance electrodes (Biatrodes, Akern Srl, Florence, Italy) were placed on the back of the right hand and two electrodes on the corresponding foot, with a distance of 5 cm between each other [b]
To avoid disturbances in fluid distribution, subject was instructed to abstain from food and drink for >2h before the test. [c]

[a] Lukaski, Henry C., et al. "Validation of tetrapolar bioelectrical impedance method to assess human body composition." *Journal of applied physiology* 60.4 (1986): 1327-1332.

[b] Dunbar, Christopher C., et al. "Effects of small errors in electrode placement on body composition assessment by bioelectrical impedance." *Research quarterly for exercise and sport* 65.3 (1994): 291-294.

[c] Dixon, C. B., et al. "The effect of acute fluid consumption on measures of impedance and percent body fat using leg-to-leg bioelectrical impedance analysis." *European journal of clinical nutrition* 60.1 (2006): 142-146.