Other Developing Technologies

Magnetic Resonance Imaging (MRI)

Magnetic field "excites" water and fat molecules producing a measurable signal which is then measured and analyzed. A person lies within the magnet as a computer scans the body and develop high quality images showing the amount of fat and where it is distributed. Images then must be analyzed by a technician to determine final results. Very useful in giving a ratio of intra-abdominal fat to extra-abdominal fat. While very accurate, high cost of equipment and analysis limits use.

Total Body Electrical Conductivity (TOBEC)

Individual lies in a cylinder that generates a weak electromagnetic field. The strength of the field depends on the electrolytes found in the persons water. About 10 readings are needed to estimate lean body mass. Provides highly accurate body fat estimates but use is limited due to the cost of equipment and analysis.

Computed Tomography (CT)

CT produces cross-sectional scans of the body. Photons are sent through the body to a detector. As the beam rotates a persons data is collected, stored and applied to algorithms to build images that determine body composition. CT is very useful in giving a ratio of intra-abdominal fat to extra-abdominal fat. Use is limited due to high cost of equipment and operation.

Air Displacement (Bod Pod)

Subject sits for 20 seconds in a capsule during which time sensors measure how much air is displaced. Results are based on the same principles as underwater weighing. Equipment and operation is very expensive.

For more information please contact your nearest Tanita representative.

For more information please contact your nearest Tanita representative.

TANITA®

TANITA Corporation of America, Inc.
2625 S. Clearbrook Dr.,
Arlington Heights, IL 60005 U.S.A.
Toll Free: 1-800-TANITA-8
Phone: +1-847-640-9241
Fax: +1-847-640-9261
Web: http://www.tanita.com
E-mail: 4health@interaccess.com

TANITA Corporation of Japan
14-2, 1-Chome, Maeno-Cho,
Itabashi-Ku Tokyo, Japan 174-8630
Phone: +81-3-3968-2123 Fax: +81-3-3967-3766
Web: http://www.tanita.co.jp

TANITA Health Equipment H.K. LTD.
Unit 301-303, Wing On Plaza, 3/F, 62 Mody Rd.,
Tsimshatsui East, Kowloon, Hong Kong
Phone: +852-2838-7111 Fax: +852-2838-8667

TANITA France
Villa Labrouste, 68 Boulevard Bourdon,
92200 Neuilly-Sur-Seine, France
Phone: +33-1-55-24-99-99 Fax: +33-1-55-24-98-68

TANITA Europe GmbH
Dresdener Strasse 25,
71065 Sindelfingen, Germany
Phone: +49-7031-6189-6 Fax: +49-7031-6189-71

TANITA UK LTD.
The Barn, Philpots Close, Yiewsley,
West Drayton, Middlesex, Great Britain, UB7 7RY
Phone: +44-1895-438577 Fax: +44-1895-438511

TANITA International
The Barn, Philpots Close, Yiewsley,
West Drayton, Middlesex, Great Britain, UB7 7RY
Phone: +44-1895-438588 Fax: +44-1895-438522

Primary Methods of Determining Body Fat

A Brief Review

TANITA®

Evaluating Body Fat Analysis Methods

This brochure has been developed to help you evaluate the many different methods in use for measuring and monitoring body fat. Some of the key categories we have outlined include:

Procedure: The steps required to achieve a reading that is as accurate as each method permits.

Number of Readings: How many readings should be taken to get results as accurate as method permits.

Test Time: Length of an average test.

Subject Comfort: Description of any significant discomfort felt by subject.

Technician Skill: The amount of training necessary for a technician to produce results that are as accurate as the method permits.

Subject Cost: Monetary cost of receiving an analysis.

Equipment Cost: Cost of owning the equipment.

Acceptance: Why is the method used and under what circumstances it is used.

Reliability and Reproducibility: The key to successfully monitoring and measuring body fat is how easy it is to produce reliable, reproducible results that correlate well with key clinical standards DEXA and Hydrodensitometry. Identifies key groups of people who are at risk for unreliable readings.

In addition to this summarized information, Tanita also has extensive independent research evaluating various techniques. This information is available on request.

Primary Methods of Determining Body Fat

Method	BMI (Body Mass Index)	Hydrodensitometry (Underwater Weighing)	Anthropometry (Skinfold Measurements)	Near-Infrared Interactance	Dual Energy X-Ray Absorption (DEXA)	BIA (Bioelectrical Impedance Analysis)	Tanita BIA (Leg-to-Leg)
Procedure	Weight and height are measured then BMI is computed using a simple formula or chart.	Subject is weighed then immersed in a tank of water while fully exhaling. Measurements of immersed weight are repeated as many as 5 times and then averaged.	Skinfold thickness is measured by grasping the skin and underlying tissue, shaking it to exclude any muscle and pinching it with a caliper. Measurements are taken at 1, 3, 5, 7 or 21 locations and entered into a formula. Multiple readings at multiple sites improve accuracy.	A fiber optic probe connected to a digital analyzer indirectly measures tissue types at various body sites to a depth of about 1 cm. NIR data is combined with height, weight, frame size, and athletic level to estimate percent body fat. Multiple readings at multiple sites improve accuracy.	Based on a three-compartment model that divides the body into total body mineral, fat-free soft (lean) mass and fat tissue mass. A whole body scanner reads bone and soft tissue mass simultaneously. Scanner passes over reclining subject once collecting data at .5 cm intervals.	With traditional BIA a person lies down and spot electrodes (with electrolyte gel) are placed on a hand and bare foot. The resistance of a small electrical signal is measured as it passes through the body. This measurement is entered into a formula along with height, weight and gender to determine lean and fat mass.	Weight and impedance are measured in a single step while subject stands barefoot on the device. Measurements are combined with subject's gender, height and age (which are programmed into the device) to determine body fat based on multi-ethnic, diverse population formulas that have been highly researched and validated
Test Time	1-2 minutes	15-60 minutes	10-20 minutes	Under 5 minutes	10-20 minutes	5 to 10 minutes	30 seconds
Subject Comfort	No discomfort.	Difficult for subjects who dislike submersion or have difficulty expelling all the air in their lungs.	Subject must be "pinched" at exposed areas on various parts of their body.	Low discomfort, primarily with single site method.	Safe and non-invasive, requiring only that a subject must lie still throughout the procedure.	Electrolyte gel can be uncomfortable. Subject must lie down for procedure.	No discomfort.
Technician Skill	Low	High	High	Moderate	High	Moderate to low	Low
Subject Cost	Very low	High	Low	Low to moderate	High	Low	Low
Equipment Cost	Very low	Very high	Low to moderate	Moderate to high	Very high	Moderate to high	Low to high
Acceptance	Used in clinical settings as simple indicator of obesity. National Institutes of Health and World Health Organization have developed basic BMI screening guidelines.	The traditional reference method for body composition research.	Widely used due to low cost of equipment and portability. Over 3,500 equations have been validated to account for differences in gender, age and ethnic groups. To save time single readings are often taken providing only a rough estimate of body fat.	Popular outside the laboratory because it is simple, fast, non-invasive and relatively inexpensive. While single-site measurement at the biceps is often used, numerous sources report that more research is needed to substantiate the validity, accuracy and applicability of this method.	Quickly moving from the laboratory setting into clinical studies. Measures fat distribution throughout the entire body in a single scan. Originally used to measure bone density.	Long accepted because of simplicity, low cost, high reproducibility and non-invasiveness. New BIA techniques (phase angle and multi-frequency) are under development for estimating hydration and intra/extra-cellular breakdown. Additional research is needed to refine these method's accuracy in determining body fat percentage.	Offers advantages of traditional BIA as well as greater ease of use, speed and portability. Quickly being accepted in professional settings including hospitals, labs, health clubs, weight loss clinics and doctors offices.
Reliability and Reproducibility	Current guidelines do not differentiate for gender, ethnicity or age. Can be misleading for non-standard body size and shapes, athletes who are overweight but have low body fat, and for sedentary individuals who may have normal BMI but high body fat.	Readings may vary due to changes in hydration and proportion of bone minerals. Requires multiple readings that are then averaged. If remaining air in lungs is estimated, errors can occur.	Precision depends heavily on the skill of the technician. Accuracy is also affected by which sites are measured, the number of sites measured, the taking of duplicate readings, the quality of calipers, and the equation used. Calipers developed for home use (very inexpensive) are unreliable. The more obese a subject, the more difficult it is to grasp the skinfold correctly.	High degree of error has occurred with very lean and obese people. Amount of pressure applied to fiber optic probe, skin color and hydration levels may be sources of error. Low number of readings can increase error. Sold by only one manufacturer. Technician determines fitness level (body type) as in other methods. Measurements should be taken under constant and controlled conditions to minimize variations.	More reliable than other measurements due to three compartment model, no need to account for air mass in lungs, and accounts for variations in the distribution of body fat. High reliability and measures fat distribution with just one measurement.	Very high reproducibility and accuracy given proper electrode placement. Measurements should be taken under constant and controlled conditions to minimize variations caused by hydration level. Accuracy is heavily dependent on type of equation used. Most BIA research continues to use underwater weighing as reference.	Very high reproducibility not dependent on technician training. Equations and equipment validated by peer-reviewed research. As with all measurements, analysis should be done under consistent conditions. Uses DEXA as reference method for higher accuracy.