

BiImpedance Analysis

Overview

The measurement Process

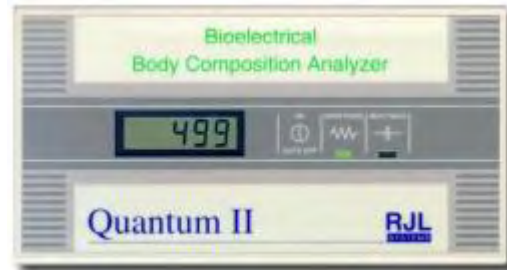
Prices

More Details

Overview

BIA systems provide a very good indication of the following aspects of health and offers a method of monitoring changes:

1. Electrical parameters of phase angles and capacitance that correlate with *cell vitality* and thus are an indicator of general health
2. Body composition and not just weight.
3. Basal metabolic rate (BMR)
4. Body water fluid balance: total, within the cells and external to the cells.



Experience within our clinic is focused on the vitality aspect. This is the tool we have found that:

1. Defines how much resource a client has and thus enables us to judge the appropriate level of therapy
2. Enables us to track cellular vitality levels.

The Measurement Process

Four small pads are attached to right foot and arm, connected to the BIA Instrument and measurements noted. This process takes 2-3 minutes.

The two measurements are analyzed on a computer program with full results and reports available in a few minutes.

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Electrical Vitality Measurements

Phase Angle: is a measurement of your body's overall health. Usually, a phase angle of 6 or greater is desired for men and 5 or greater is desired for women. If your phase angle is lower than normal, you should discuss this with the person doing the test to find out why.

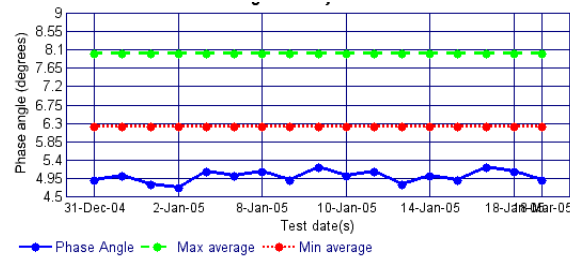
Impedance Index: is another measurement of your general health. Normal values for both men and women are greater than 1273. If your impedance index is more than 1273, you are at a better level of health and fitness than if it is below 1273.

Capacitance: Parallel capacitance is somewhat like phase angle, whereas it is not effected by weight or body fat. It is a measure of cell membrane health in all living substances and can change dramatically depending on disease or good health. A body builder, for example, would have a high parallel capacitance and low resistance, or more cell volume, because he is extremely muscular and fit. A malnourished AIDS patient would have a low parallel capacitance

BMR: Basal Metabolic Rate

Phase Angle

Phase angle is based on total body resistance and reactance and is independent of height, weight and fat. Lower phase angles appear to consistent with either cell death or breakdown of the cell membrane. Higher phase angles appear to be consistent large quantities of intact cell membranes and body cell mass. All living substances have a phase angle, in fresh uncooked vegetables phase angle can exceed 45 degrees. In cooked vegetables phase angle is zero because they are dead.



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Why is Phase Angle Important ?

Phase Angle is a predictor of outcome and indicates the course of disease or increases as the result of optimal health based on good nutrition and consistent exercise.

As we get older our phase angle will decrease and will be approximately 4 or less when we die. Fit adolescents may have a phase angle greater than 10. This effect is a result of cell integrity due to age. Low phase angles are consistent with:

1. Malnutrition
2. HIV/AIDS infection
3. Cancer (most types)
4. Abusive life style
5. Chronic Alcoholism
6. Old Age (80 - 100 years)

Good fitness and life style is the key to maintaining a healthy phase angle.

Phase Angle Conclusion

Phase angle is good indicator of disease progression although it is not used to diagnose a specific disease. It may be thought of as a thermometer with a broad range of normal. It may also be used to monitor the practice of good health, which would include healthy diets, the use nutritional supplements and exercise.

Health risk based on Phase Angle	Female	Male
	Phase Angle (degrees)	Phase Angle (degrees)
Extremely healthy	Above 9.5	Above 9.4
Optimal health	7.8-9.4	8.5-9.4
Average	6.7-7.8	6.7-8.5
Below average	5.6-6.6	5.8-6.7
Low energy	4.6-5.5	4.9-5.8
Warning - alert	Below 4.5	Below 4.9

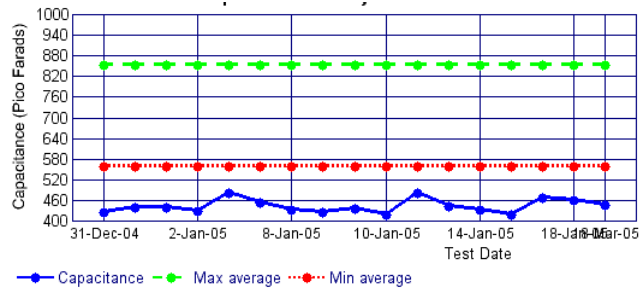
Parallel Capacitance

All living things are made of cells. Cells are membrane bounded compartments filled with a concentrated solution of chemicals and salts. Groups of cells perform specialized functions and are linked by an intricate communications system. The cell membrane maintains an ion concentration gradient between the intracellular and extracellular spaces. This gradient creates an electrical potential difference across the membrane which is essential to cell survival. Electrical gradients are necessary to support movement of oxygen, carbon dioxide, and nutrients. Therefore, the cell membrane has electrically insulating qualities or capacitance.

Electrical capacitance will increase or decrease depending on the health and the number of cells. Damage to the cell membrane, and its functions, is as lethal to the cell as direct damage to the nucleus itself.

Why is parallel capacitance important

The cell membrane functions as a permeable barrier separating the intracellular (cytoplasm) and extracellular components. The lipid membrane is transversed by proteins, which are soluble in water thus making pores through which water, ions and other chemicals can enter and exit the cell.



BIA prediction equations have been developed that use parallel resistance and reactance as predictors of extracellular mass and body cell mass. Comparisons to K40, DEXA and D20 were very good ($r > .9$) and are sufficient to be used in clinical practice and studies of wasting disorders in AIDS patients.[1]

Conclusion to parallel capacitance

Parallel capacitance is somewhat like phase angle, whereas it is not effected by weight or body fat. It is a measure of cell membrane health in all living substances and can change dramatically depending on disease or good health.

A body builder, for example, would have a high parallel capacitance and low resistance, or more cell volume, because he is extremely muscular and fit. A malnourished AIDS patient would have a low parallel capacitance.

Cell health based on parallel capacitance	Female	Male
	Capacitance (pico Farads)	Capacitance (pico Farads)

Extremely healthy	Above 1009	Above 1313
Optimal health	774-1008	1003-1312
Average	617-773	795-1002
Below average	460-616	589-794
Low energy	304-459	382-588
Warning alert	Below 303	Below 381

Impedance

This is a straight line or constant that can be a discriminatory indicator between healthy subjects and those in less health. A health person with a large amount of Body cell Mass (e.g. body builder) will have a high impedance index. An older, more sedentary person will have a lower value. In a healthy person a low value can be an indicator of a decline in health.

Impedance Index	Status
Above 1273	Normal
Below 1273	Below normal

BMR (Basal Metabolic rate)

	Energy level for females BMR range (K calories)	Energy level for males BMR range (K calories)
Extreme energy	> 1672	>2124
High energy	1468-1671	1809-2123
Average energy	1330-1467	1597-1808
Below average	1193-1329	1387-1596
Low energy	1057-1192	1176-1386
Warning - alert	< 1056	<1175

Energy is the most fundamental need of biological systems. Without it, the basic biological processes of life cannot occur. Survival depends on consistently finding the right fuel in the appropriate quantity to sustain the biochemical reactions of energy metabolism. The body extracts and uses energy through the process of metabolism. Metabolism occurs in two distinct and interdependent phases: 1.) *catabolism*, in which the body breaks down food into its component parts and harvests the energy stored in its atomic bonds, and 2.) *anabolism*, in which those component parts and energy are used to build new tissues and conduct basic life functions. Basal Metabolic Rate (BMR) is the

amount of energy your body requires every day to perform its most basic function including:

1. Breathing
2. Digesting
3. Heart beating
4. Muscle activity
5. Transportation of fluids and tissue
6. Circulation of blood

This is the amount of energy you would require if you laid in bed all day without ever moving a single muscle. Since most of us do a bit more than that, a daily activity level must also be factored in. This ranges from everyday activities to working out strenuously.

Why is BMR important

BMR is the only a way to estimate how fast you burn calories. The slower your metabolism, the more weight you will retain. If you burn your daily calorie intake, you will maintain your current weight. Burning more than your daily intake, causes weight loss. There are many factors that vary your metabolism. However, exercise and daily activity level are key to increasing your BMR. There can be major nutritional consequences to the decline of the BMR in advanced age. Decreased caloric requirements may lead to decreased food intake. Sufficiently low caloric intake can lead to deficient intake of essential nutrients.

Conclusion to basal metabolic rate

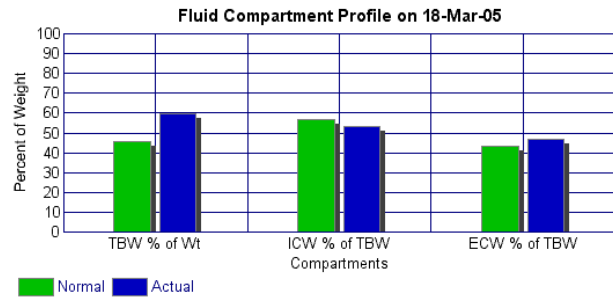
BMR varies between the sexes. Lean body mass is a major determinant, and women tend to have less lean muscle mass. As a result, their BMR is lower than that of otherwise comparable males. BMR is at peak during infancy, then it declines rapidly through childhood and adolescence. It continues to fall slowly with increasing age and declines further with old age largely due to a loss of muscle mass. However, this is not inevitable, because weight-bearing (resistance) exercise will prevent or reverse muscle loss among the elderly.

Body Fluid Content

Fluid Assessment: this section of the results tells you about fluid in your body. Your total body water is measured in liters (L) and is made up of Intracellular Water (ICW) and Extracellular Water (ECW). The ICW is fluid inside all of your body cells. Your muscle and organs will have more ICW than your fat cells. Your ECW is fluid that circulates throughout your body. If you are dehydrated or losing a lot of fluid, your total body water may be low. If you are retaining fluid or have an infection, your total body water may be high.

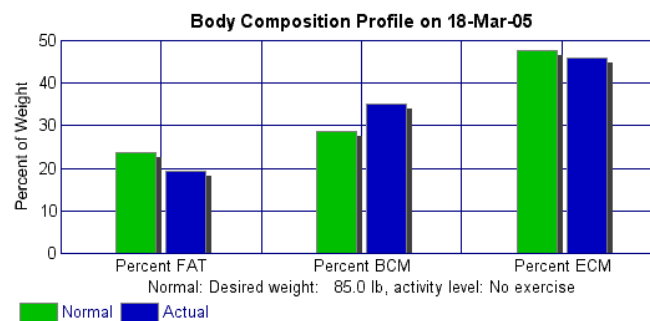
Body Composition

BIA instruments and software assess body composition relating body fat, lean body mass, total body water and intracellular-extracellular volume for wellness, clinical practice, and research. BIA products utilize bioelectrical impedance analysis (BIA) to assess the function (body cell mass), transport (extra-cellular mass) and storage (fat) compartments of the human body.



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Why is body composition important?



Scale weight is not an indicator of an individual's fat, lean or health. Body composition is the amount of lean tissue compared to fat. Body composition data can form the basis for a wide variety of therapeutic health and fitness prescriptions. In clinical applications body composition analysis along with non-pharmacologic nutrition and exercise prescriptions provide the foundation upon which further treatment is based. Only body composition analysis can determine how much muscle and fat are lost or gained as the result of any nutrition, exercise, or pharmaceutical prescription.

- **BCM: Functional Mass (Body cell Mass)** is where metabolic work is done and calories are burned.
- **ECM: Transport Mass** (Extra cellular mass) transports nutrients and oxygen to cells and removes waste products.
- **FM: Storage Mass** (Fat mass) is the fat where energy is stored.

Body cell mass is defined as the intracellular mass of the body, which contains the majority of the body's potassium (98 - 99%). All oxygen consumption, CO₂ production, glucose oxidation, protein synthesis and other metabolic work takes place within the body cell mass. The body cell mass is, in effect, the total mass of all the cellular elements in the body, and therefore represents the metabolically active component of the body. In the normally nourished individual, muscle tissue accounts for approximately 60% of the body cell mass, organ tissue for 20% of body cell mass, with the remaining 20% made up of red cells and the cells of tissue with a sparse cellular population such as adipose, tendon, bone and cartilage.

Body Cell Mass (BCM): this number is the amount of your body weight in pounds that is made up of active tissue like your muscles and organs. The body cell mass is the part of your body that works hard in keeping you healthy. When the body cell mass goes up, you

are usually putting on muscle weight. But, when it goes down, you are losing muscle mass.

Fat: this number is the amount of your body weight in pounds that is fat. Normal values are based on age and gender. Just as you don't want too much fat, you also want to avoid too little. For both men and women, having too little fat can cause your body to stop producing important hormones. For men, this means testosterone.

ECM: stands for extracellular mass. This number is the amount of your body weight in pounds that is made up of your skeleton and other support structures, as well as ECW. When this number changes, it is showing that there was a change in the ECW. This number does not show changes in bone density.

Fat Free Mass: is the combination of body cell mass and ECM

Obesity is not just based on food intake, each person is predisposed to their own quantity of body fat. This may be a result of genetic, environmental, social and perhaps racial influences. The Cyprus 2.5 Calorie and Fat Manager does not take all of these factors into account. Therefore, the table below is based on ratiometric principles that interpolates your current body composition data as determined BIA analyzers to your ideal weight and fat. Result are primarily based on an accurate prediction of basal metabolism from three compartment BIA body composition analysis. The table also assumes that your weight has been stable over the last year. If your weight has change radically you should consult with a physician and not use this report.

BMI (Body Mass Index)

BMI stands for "Body Mass Index," a ratio between weight and height. It is a mathematical formula that correlates somewhat with body fat.

BMI Risk table *this is indicative only, is one measurement only and should be viewed in conjunction with other information.*

	Health risk based solely on BMI	Risk adjusted for the presence of co-morbid conditions and/or risk factors
19-24	Minimal	Low
25-26	Low	Moderate
27-29	Moderate	High
30-34	High	Very high
35-39	Very high	Extremely high
40+	Extremely high	Extremely high

Why is BMI Important ?

If your BMI is high, you may have an increased risk of developing certain diseases, including:

1. Hypertension
2. Cardiovascular Disease
3. Dyslipidemia
4. Adult-Onset Diabetes (Type II)
5. Sleep Apnea
6. Osteoarthritis
7. Female Infertility

Prevention of further weight gain is important and weight reduction is desirable.

Exceptions to BMI

BMI is a better predictor of disease risk than body weight alone. However, there are certain people who should not use BMI as the basis for estimating body fat content: competitive athletes and body builders, whose BMI is high due to a relatively larger amount of muscle, and women who are pregnant or lactating. Nor is it intended for use in growing children or in frail.

How is abnormal body composition managed?

When there is an imbalance between calorie intake and calorie burn we change our body composition. The quantitative management of abnormal body composition, i.e. obesity, anorexia, disease, etc. must be associated with daily calorie intake and expenditure. The successful application of body composition analysis must have a three compartment assessment. These compartments are:



The energy storage compartment, Fat Mass

Fat is the energy storage mass of the body and is the total lipid mass (triglycerides) with a density of .9 g/ml. Fat mass is equal to actual weight minus fat free mass



The functional compartment, Body Cell Mass

BCM is the functional mass of the body where work is done. All oxygen consumption, carbon dioxide production, glucose oxidation, protein synthesis and other metabolic work takes place within the body cell mass. The body cell mass is, in effect, the total mass of all the cellular elements in the body, and therefore, represents the metabolically active component of the body. In the

normally nourished individual, muscle tissue accounts for approximately 60% of the body cell mass, organ tissue for 20% of body cell mass, with the remaining 20% made up of red cells and tissue cells. It also contains the majority of the body's potassium, (98 - 99%).



**The support
compartment,
Extracellular
Mass**

ECM is the support mass of the body and is metabolically inactive, consumes no oxygen, produces no carbon dioxide and performs no work. The extracellular mass consists of extracellular fluids and solids, such as bone and cartilage, with its primary function that of support and transport. ECM is located outside of the cellular compartment or outside of the body cell mass. Lean body mass is the sum of body cell mass and extracellular mass.

BIA systems assess three compartment body composition with accuracy and repeatability. Software facilitates management of the three compartment information and interaction with the data to create and evaluate custom prescriptions for change. This is a significant step beyond most other analyzers, which only report body composition as fat and fat-free mass.

What are the long-term benefits of a good body composition prescription?

The ability to (1) analyze body composition data interactively, (2) create prescriptions for change and (3) visualize the effectiveness of those prescriptions and professional recommendations with projected and historical graphs helps increase motivation for positive change.

The ultimate outcome is improved health and increased longevity!