

## DEXA Bone Mineral Density Tests and Body Composition Analysis

# Information for Health Professionals

DEXA is an advanced technology originally used to, and still capable of assessing bone health (osteoporosis screening). In recent years it has become recognised as the preferred method for body composition assessment in research studies where changes in body fat and/or muscle mass are important.

### Who should be scanned?

Results from a DEXA scan can be used to monitor factors relating to, but not restricted to the following:

Medical Conditions		
Osteoporosis <ul style="list-style-type: none"> <li>• Elderly (primary osteoporosis)</li> <li>• Osteogenesis Imperfecta (present at birth)</li> <li>• Juvenile Osteoporosis</li> <li>• Adult Onset Osteoporosis</li> </ul>	Muscular dystrophy	Cystic Fibrosis
	Malabsorption	Neuromuscular disease
	Amenorrhoea	Cardiovascular disease
	Gastrointestinal disease	Diabetes
	Hyperthyroidism	Sarcopenia
	Testosterone deficiency	

**A DEXA body composition scan will expose a patient to an average of 0.4µSv, which is approximately 1/30th of normal daily exposure.**

Lifestyle & Activity Factors		
Overeating	Overtraining	Nutrition
Lack of exercise	Prolonged bedrest	• Lack of Calcium
		• Lack of Vitamin D

## DEXA Body Composition Analysis

# Pre-scan Information for Patients

If you're serious about improving your health, fitness or physique, it's best to have an accurate baseline with which to monitor your progress. A DEXA body composition assessment – along with advice from your personal trainer, dietitian or exercise physiologist – can provide you with the information you need to help you measure, manage and ultimately achieve your goals.

### What is body composition?

Body Composition refers primarily to the distribution of fat, muscle and bone, which are all important factors worth monitoring in order to track changes resulting from diet, exercise, medical conditions and/or medications.

Monitoring your training progress by weighing yourself periodically provides feedback on how heavy you are, but offers no insight into changes in your body composition, that is changes in muscle and fat. In contrast, technologies are available to assess changes in body composition, that is changes in body fat and muscle mass – traits important to anyone who takes their health, fitness and performance seriously.

**The most recognised technology for body composition analysis is DEXA or Dual-energy X-ray Absorptiometry.**

### What is DEXA?

DEXA is an advanced technology originally used to assess bone health. In recent years it has become recognised as the preferred method for body composition assessment in research studies where changes in body fat and/or muscle mass are important.

This factsheet explains the DEXA technology behind the Medilink MedixDR.

### How does DEXA work?

DEXA works by passing two (dual) very low dose x-ray beams at differing energy levels through the tissues of the body. Fat, muscle and bone each have different attenuating factors, i.e. different levels of absorption due to their unique densities. It is these attenuating factors that allow the DEXA to calculate relative masses of each tissue type.

What's unique about DEXA technology is that it not only provides detailed reports on whole body composition, but also specific regions of the body like arms and legs, something no other technology can provide.

A whole body composition scan performed by a Medilink DEXA provides feedback on a client's body fat, muscle and bone mass. It also produces a detailed composition image to visualise subcutaneous and visceral fat within the body.

**A whole body composition scan performed by a Medilink DEXA provides feedback on a client's body fat, muscle and bone mass.**

# DEXA Body Composition Analysis

## Post-scan Information for Patients

### What measurements do I receive and what do they mean?

A Medilink DEXA scan will give you the following measurements, accurate to one tenth of a gram:

- Bone mineral density, mass & area
- Muscle - density, mass & area
- Fat - density, mass & area
- Fat %, Lean % & Bone %
- Android/Gynoid Ratio
- Fat Mass Index
- Energy Requirements (Basal Metabolic Rate)

As seen on the BCA report the coloured image will firstly give us a visual representation of the fat distribution with fatty areas shown in the greenish areas appearing more yellow where the fat holds more density. The blue areas represent lean tissue and appear darker where muscle is denser.

The patient's bone, lean and fat attributes are then able to be viewed in the table below the image where densities, weight and area can be monitored regionally.

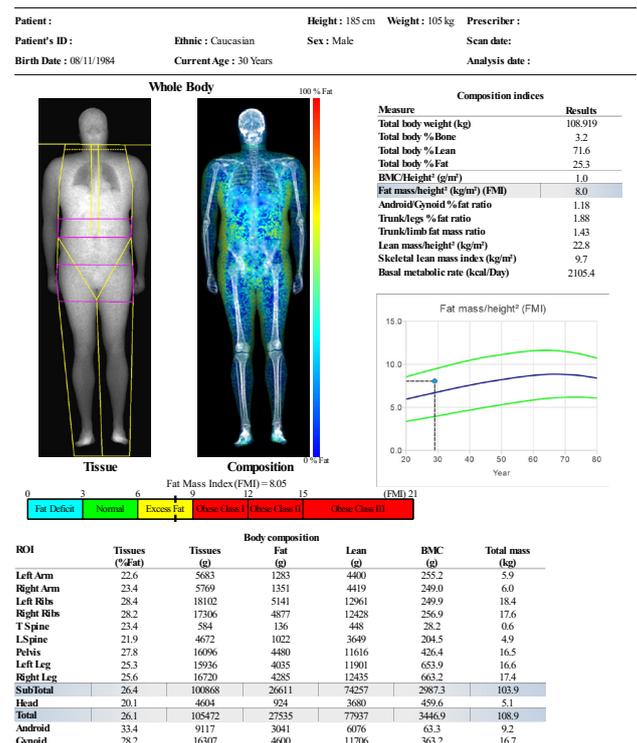
Lastly, the patient's calculated weight and composition percentages are shown at the base of the report.

### How can these results be used?

A DEXA scan will give you a highly accurate baseline to help you achieve your goals. By knowing your body fat and lean tissue percentage, you can make lifestyle changes to improve your health and reduce your risk for various diseases.

The results of your scan, along with RMR and  $VO_2$  testing, can also be used to recommend specific information on your ideal caloric intake and energy expenditure, helping you achieve your goals of fat loss or muscle gain quantitatively, virtually eliminating opinion based feedback.

By having your body composition monitored periodically, you will also be able to objectively track your progress towards goals. Quantifying these changes also helps with updating dietary and activity requirements. Feedback from DEXA scans can also be a powerful motivational tool for this purpose.



**Sample Medilink DEXA body composition report**

## Body Composition Facts

Body composition measurements require the body to be divided into separate compartments. The two most common compartments used are fat mass (FM) and fat-free mass (FFM). Most methods of body composition measurement are restricted to these 2 compartments (referred to as a Two-Compartment model), but the Medilink DEXA has the capability to give results reflecting greater accuracy.

### Two-Compartment Model

As stated above the Two-Compartment (2-C) model simply divides the body up into Fat and Fat Free Mass (FFM). A common laboratory based example of this is Under Water Weighing (UWW).



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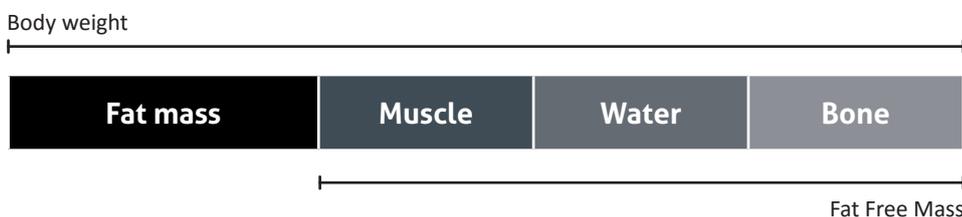
The premise here is that as bone and muscle are more dense than fat, a person with more FFM will weigh more in water. This test relies on expelling all the air from the patient and weighing them whilst submerged in water. This weight is used in conjunction with a calculated body volume and bone density formulas and applied to either a Siri or Brozek equation to calculate Body Fat levels.

DEXA is technically a 2-C model calculation but instead of assuming bone density using a formula, it measures it. DEXA is traditionally based on the UWW 2-C calculations.

**The obvious limitation of this model is that it does not account for different types of FFM which include muscle, bone and other elements. This is the reason why, although still widely used, this model is becoming obsolete for similar reasons why BMI is no longer regarded as a scientifically sound indicator of health.**

### Four-Compartment Model

Resulting from the 2-C model's known limitations we now have the resources to account for bone, muscle and water as part of our FFM.



**The Four-Compartment (4-C) model accounts for muscle, water and bone as part of our Fat Free Mass (FFM).**

The Four-Compartment (4-C) model is the gold standard in body composition measurement, however due to the difficulty of accessing the resources required to perform this highly accurate test, it is not done very often. This method however is the more accurate measure of true body fat.

**Body Fat results from the 4-C model entail greater scientific accuracy although have only recently been introduced. When the fitness industry is fully up-to-date with this information it will form the latest basis for which body fat information is drawn from.**

## What is a Normal Body Fat Percentage?

InMed offers the option for practitioners to deliver body composition results according to a 2 compartment and 4 compartment model. Please refer to the 'Pre-Scan Factsheet' for an introduction to compartment models.

The 4-C model will offer more scientifically valid results although a fat related health classification scale for this model is yet to be developed.

**DEXA body fat percentages from the 4-C model will hold greater scientific accuracy although reflects a state-of-the-art interpretation which the fitness sector is yet to fully take on board. It reflects the latest scientific findings which reveal that a 'normal' body fat percentage is higher than we once assumed.**

The 2-C model results do not deliver the best representation of actual body composition and will heavily undershoot a patient's actual body fat percentage. However The American College of Sports Medicine endorse a widely used 2-C normative chart giving client's an idea of their fat related health status.

**As this chart is based on a 2-C model, it will line up with 2-C DEXA results, but should only be referred to for the purpose of normative comparison bearing in mind the percentage itself has limitations similar to the BMI concept and will undershoot a patient's actual body fat percentage.**

## 2-C Body Fat Norms (ACSM endorsed)

Shown below is an extract showing body fat percentage norms for males aged 20-30:

Body Fat %	Classification
≤ 10.5%	Low
10.6%-14.8%	Excellent
14.9%-18.6%	OK
18.7%-23.3%	High
≥ 23.4%	Critical

**By showing results from both the 2-C and 4-C models we can produce both an accurate body fat percentage and the most comprehensive indication of fat related health status to date.**

## What can I do to improve my results?

Following a DEXA scan, results can be drawn from to provide further advice regarding

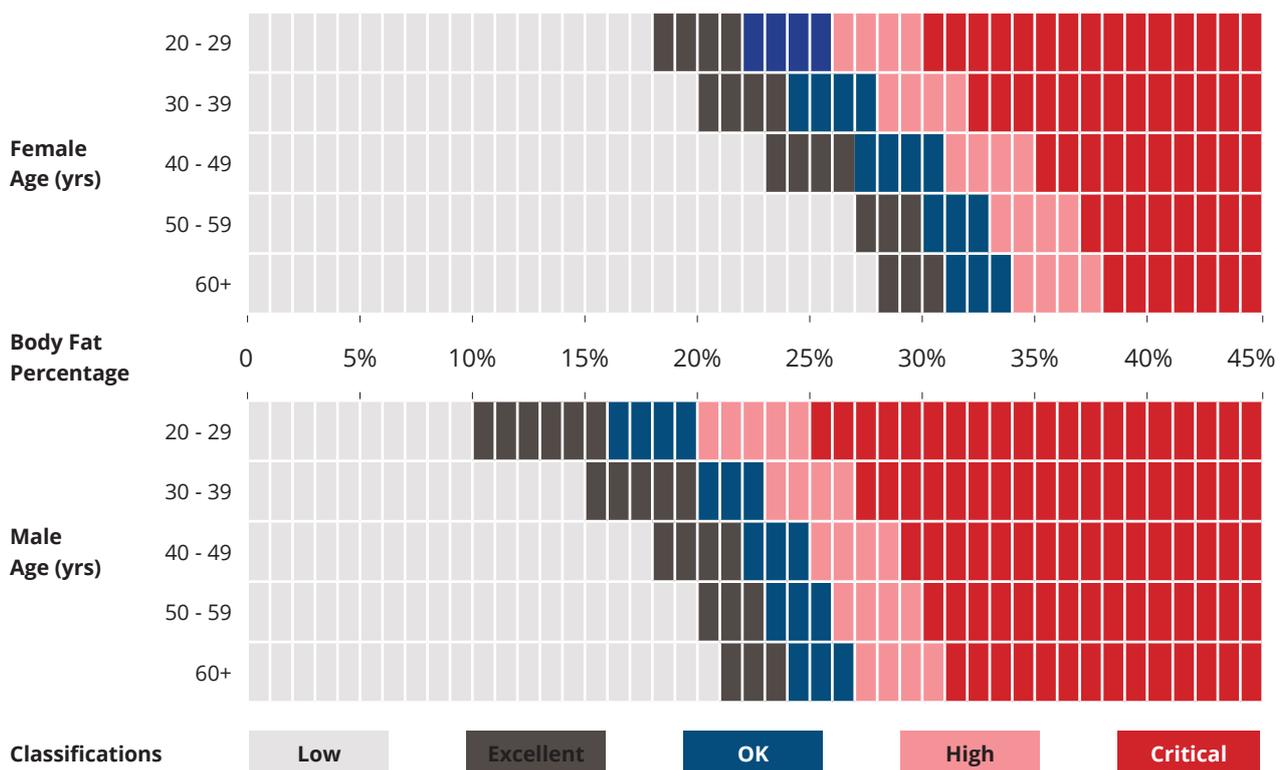
a client's caloric intake and physical activity. In order to minimize opinion based caloric recommendations, it is recommended to undergo metabolic testing to measure one's resting metabolic rate (RMR) that is, the amount of energy a body burns at rest, so only accurate recommendations are made rather than guessing based on a formula.

Our practices offer breath analysis based RMR testing as a compliment to DEXA. The process requires clients to be fasted for 4 hours prior, to not have exercised during the day of testing and takes approximately 10 minutes to complete.

## DEXA Body Composition Analysis

# Body Fat Percentage Reference Chart

The following ACSM endorsed chart is based on a 2-C model, it will line up with 2-C DEXA results, but should only be referred to for the purpose of normative comparison bearing in mind the percentage itself has limitations similar to the BMI concept and will undershoot a patient's actual body fat percentage.



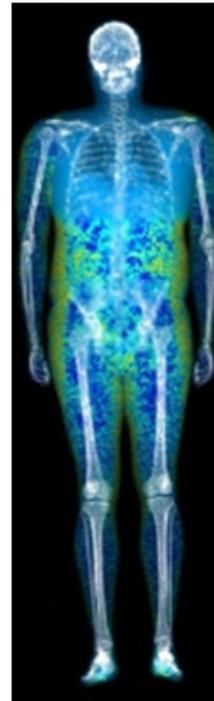
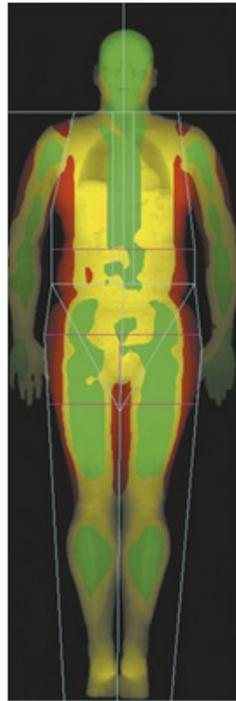
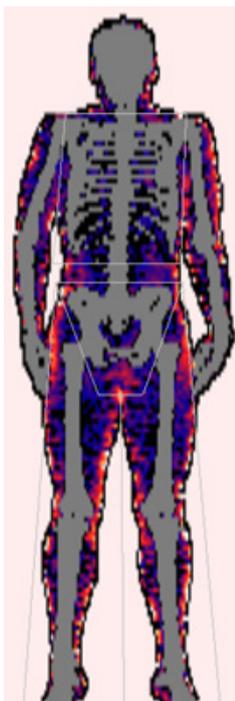
## DEXA Image Composition

# Comparison Chart

### Why choose Medilink?

The Medilink MedixDR DEXA system produces the highest image resolution out of the four major brands. It has 256 detector elements, compared with Lunar with 64 and Hologic with 128. Medilink elements are also stacked, which allows multiple focal depths, meaning better sensitivity.

Higher resolution images increase the accuracy of compartmental differentiation and visual representation of adipose tissue. This is evident by the images produced by the Medilink Medix DR.



### DEXA Comparisons

Some DEXA brands are prone to beam hardening, where the machine is unable to detect the smaller lower density fatty deposits within the higher density muscle/lean tissue.

Lower resolution scanners produce a simplified composition image, where entire regions are 'painted' with colours and fail to show any detail or fat deposits.

# MediLink DEXA Machine vs Others

## Comparison Chart

DEXA COMPARISON CHART	MEDI LINK	HOLOGIC <sup>®</sup> <small>The Science of Sure</small>	GE Healthcare
Government and AIR Accredited Training Course	YES	NO	NO
Lowest Patient Radiation Dose for the Whole Body	YES	NO (42 Times Higher) <sup>1</sup>	NO (20 Times Higher) <sup>2</sup>
Lowest Radiation Doses for Spine and Hip	YES	NO (5 Times Higher) <sup>1</sup>	NO (3 Times Higher) <sup>2</sup>
Highest Resolution Detector	YES (256 Elements)	NO (216 Elements)	NO (64 Elements)
Lowest Operator Radiation Dose	YES	NO	NO
Has detailed cross calibration phantoms for ALL regions	YES	NO	NO
Has expert sports and clinical staff available for advice	YES	NO	NO

1. Based on Discovery W whole body scan doses as published by National Osteoporosis Society (UK) 2. Notes from GE's own literature.