
## Resting Metabolic Rate (RMR)

This is the quantity of calories your body consumes during a 24 hour period, at rest. This is of vital importance, for it determines your fat utilization. The percentage of fat utilization relative to carbohydrate utilization is greatest at lower activity, and during rest. Therefore the higher the resting metabolic rate, the more fat calories are utilized. Since the organs, heart, diaphragm, intestines, liver, brain etc remain the same size, the only variable that influences RMR is the addition or loss of lean muscle tissue. Maintenance or an increase in lean muscle tissue is critical to ongoing success in terms of fat loss, since this will maintain or increase RMR. Muscle tissue loss creates a scenario of diminishing returns.

## Resting Metabolic Rate (RMR) Table

| **Percentage of Calories utilized by the systems of the body.** | |
|---|---|
| Liver | 27% |
| Brain | 19% |
| Heart | 7% |
| Kidneys | 10% |
| Skeletal Muscle | 18% |
| Other Organs | 19% |

The above values are an average. The goal is to increase the role skeletal muscle plays in the equation above.

## Eating To Retain Lean Muscle & Spare The RMR

Firstly lean muscle is comprised of protein, which in turn is comprised of the following 20 amino acids

| Name | Gluconeogenic | Ketogenic | Properties |
|---|---|---|---|
| Alanine | yes | | |
| Arginine | yes | | Essential |
| Asparagine | yes | | |
| Aspartic Acid | yes | | |
| Cysteine | yes | | Essential |
| Glutamic Acid | yes | | |
| Glutamine | yes | | |

| | | | |
|---|---|---|---|
| Glycine | yes | | |
| Histidine | yes | | Essential |
| Isoleucine | yes | yes | Essential |
| Leucine | | yes | Essential |
| Lysine | | yes | Essential |
| Methionine | yes | | Essential |
| Phenylalanine | yes | yes | Essential |
| Proline | yes | | |
| Serine | yes | | |
| Threonine | yes | yes | Essential |
| Tryptophan | yes | yes | Essential |
| Tyrosine | yes | yes | Essential |
| Valine | yes | | Essential |
| | | | |
| | | | |

Firstly, essential amino acids are critical; with them all the other amino acids may be manufactured, so it is important to eat foods that supply an adequate level of amino acids, especially essential amino acids. But this is not enough. If the food combinations you eat do not consist of all the amino acids, then the lacking amino acid becomes the limiting amino acid, and significantly affects the absorption of all the other amino acids, and further increases nitrogen loss through deamination. This is the reason that being a vegetarian is a complete farce, and patently unhealthy. One can not obtain the necessary protein required from vegetables alone.

## Below Is A List Of The Essential Amino Acids

| |
|---|
| Isoleucine |
| Leucine |
| Lysine |
| Threonine |
| Tryptophan |
| Methionine |
| Histidine |
| Valine |
| Phenylalanine |

## Below Is A List Of Limiting Amino Acids In Various Foods:

| **Protein Source** | **Limiting Amino Acid** |
|---|---|
| Rice | Lysine |
| Maize | Lysine, Tryptophan |
| Wheat | Lysine |

| | |
|---|---|
| Legumes | Methionine, Cysteine |
| Beef | Phenylalanine, Tyrosine |
| Egg, Chicken | None, The standard reference for absorbable protein |
| Milk, Whey | Methionine, Cysteine |

To optimize amino acid utilization when eating the foods above, it would be wise to supplement the amino acids in the right hand column, or add foods that contain theses amino acids to the meal.

## How Does The Body Reduce RMR, Through Low Calorie, Low Protein Intakes?

This is complex biochemistry, but I'll try and simplify it. The body's primary energy pathway is glycolysis or the glycolytic pathway. This is when the carbohydrates you eat become useable glycogen and ATP, providing you with energy. Now if you increase your calorie expenditure through cardiovascular exercise, or decrease your calorie intake, (note: your body effectively reacts the same way to both) your body has to find an alternate fuel source, this being the Ketogenic and Gluconeogenic pathways. Now both of these pathways use amino acids and fat to create energy. On the one hand this is beneficial, as you are now burning fat, but on the other hand your body will inevitably be using amino acids that it is acquiring from skeletal muscle tissue. The Gluconeogenic pathway favors Alanine, and specifically Glutamine as its amino acids of choice to produce fuel. The problem arises in that the average diet is hopelessly inadequate to supply sufficient amino acids to fuel this process. And more importantly, your skeletal muscle amino acid pool is approximately 60% Glutamine, so if it needs it, this is where it will find it. So now the eating plan has to be designed in such a way, that there is an adequate supply of protein (amino acids), especially Glutamine, and a reduction in carbohydrate intake (the bodies primary fuel source), leaving it no option, but to use fat as a fuel source. However one can not go to extremes and eat no carbohydrates, as this creates other problems. The thyroid will attempt to slow your metabolic rate by reducing TSH (Thyroid Stimulating Hormone), causing a downward production of T4 (inactive thyroid hormone, stored in peripheral tissue), and T3 (Active thyroid hormone), which will drop body temperature and thermogenesis (the production of heat). One will notice that on any restrictive diet over time, body temperature will drop off. Carbohydrates which stimulate an Insulin response are necessary to some degree, as Insulin aids with the conversion of T4 to T3, and prevents the subsequent loss of thermogenesis. The protocol has to be designed in such a way, based on your RMR that also mitigates all these factors that can throw a spanner in the works. Remember your biochemistry and make up are the remnants of what allowed your ancestors to survive - not gaining muscle easily and accumulating fat VERY easily. This is what ensured the survival of our ancient ancestors. Hearing someone say they have a sugar craving is absurd, as the body doesn't need, or know what sugar is. Chemically, what is happening, especially during dieting, is that the pleasure centre in the brain, controlled by the dopamine pathway, wants to stimulate your appetite to eat, especially the things you enjoy. Funny how those foods you enjoy, tend to be bad for you, from a fat accumulation point of view. Your body is all about survival, and it makes you crave foods that store fat, ensuring its survival.

Furthermore, restricting calories inevitably restricts nutrient intake (vitamins, minerals, trace elements). Now if the body requires these substrates to perform functions relating to the organs, the creation of neurotransmitters, hormones, enzymes etc, it will look for them where they are stored – the muscle, the same place where the amino acids are found to fuel the gluconeogenic and ketogenic pathways. And this is how the human body reduces metabolism, by slowing the thyroid, and consuming its own muscle. This has to be avoided at all cost, if you are expected to keep the fat off. Failing to do so will result in more and more fat accumulation over time.

## The Havoc Fat Plays With The Endocrine System

The accumulation of fat has a more sinister side than merely its negative impact on the cardiac system. As you accumulate fat, there is a subsequent increase in aromatase enzyme produced by fat cells. This in turn increases estrogen production, by aromatizing testosterone into estrogen, and in turn stimulating more female pattern fat deposition (in men and women). But it doesn't stop there! Testosterone production is regulated by the hypothalamus, and the hypothalamus reads circulating estrogen levels to control its production of testosterone - if estrogen levels go up testosterone comes down. Now you have even more estrogen and even less testosterone to counter it, and this is a non stop spiral downwards. Men suffer even more side effects, as high estrogen increases depression, and will naturally lead to impotence. Alcohol also plays a role in increasing estrogen production, and will accelerate the side effects mentioned above, especially beer, since it has such a high glycemic index, and will promote a lot of fat deposition. It is of vital importance for longevity and health, that one keeps the endocrine system function properly.

## A Better Way To Eat

Assume you have performed a RMR test, and your resting metabolic rate is 2000 calories/day, and the calories burned through activity are 1000 calories/day, which equals a total of 3000 calories expended a day. Now, through a combination of increased activity and/or a reduced calorie intake, you create a deficit of 1100 calories/day. Since a kilogram of fat is 7700 calories, you should lose 1kg of fat/week. Theoretically this should hold true, but in practice it does not. How does the body's adaptive response work to eliminate this deficit? For if it did not negate the deficit, one should be able to lose weight indefinitely (which is theoretically possible). The body reacts to this deficit by dropping thermogenesis - reducing the production of thyroid hormone. Secondly, it uses up some muscle tissue, thus lowering the RMR. In the example above, the thyroid could negate about 200 calories of that deficit, which now leaves a deficit of 900/day, and the catabolism of muscle tissue (over a relatively short period of time) to the sum of 900 calories/day, which equates to a loss of approximately 10kg of muscle. Yes, the scale goes down by 10kg (of muscle), and now you plateau on the same eating plan. Now you're sitting with a Metabolic Rate (including activity) of 1900 calories/day, which includes your RMR of about a 1000. Now how do create a deficit from here? You cut

your calories again to create a deficit. But creating another deficit of 1100 calories a day would mean you can only eat 800 calories a day. Again, the body responds in the same way until you have to cut more calories. How long can you carry this on before you're eating no food at all, and anything you do eat is stored as fat, because now you have a non-existent RMR?

Now that we have established the RMR via the Fitmate, how do we eat? Well assuming the RMR + activity calories are as above (3000 calories/day) and you decide on creating a 500 calorie a day deficit - either by eating less or exercising more or both. To create a 500 calorie/day deficit, you could lose roughly 0.5kg/week. Lets assume you did this through eating, and now you're eating 2500 calories/day. Do you think you would have the same effect if you ate 2500 calories in one meal, or over 6 meals? A pizza is less than 2500 calories a day, and I assure you, if you only ate one pizza a day you would gain fat. Firstly, there is insufficient protein to maintain skeletal muscle, so your RMR would drop to match the pizza's calorie value. Secondly, your body cannot process that many macronutrients and calories in one sitting, which would result in fat storage.

Let's stop thinking about calories and food per day, but per hour. How many calories can it process? If 3 meals are better than 1, 6 would be better than 3. The key is to feed the body, eat sufficient protein to support the muscle, maintain RMR and take in adequate macro and micro nutrients. A rule of thumb is 2 grams of protein /kg of body weight, split over 5 or 6 meals, with equal amounts of protein in each meal which are spaced evenly throughout the day, starting first thing in the morning.

## Training For A Leaner Body

This may be controversial, but the facts are right in front of us. Cardiovascular exercise **DOES NOT WORK** to lose body fat long term, period!! Why is this? Let's take a hypothetical individual: female, 30 years old, 55kg, sedentary. She decides she wants to get toned (a word I hate). So she takes up running on the treadmill for an hour a day 5 days/week. Nothing else in her life changes, her diet and lifestyle remain the same. In the first week she loses 0.5kg. If she maintained her consistency 5 days a week, would she lose 25kg this year? Leaving her weighing in at 30kg? Of course not and why is this? Firstly cardiovascular activity is very efficient at chewing up muscle tissue, the steps are as follows:

1. Conversion from fast twitch muscle fiber to slow twitch muscle fiber, by acquiring mitochondria and relinquishing contractile protein. Smaller fiber, less RMR.
2. Excessive Cortisol released in response to the damage to the fiber as a result of the exercise. Cortisol acts as a natural analgesic, but severely hampers protein synthesis and muscle repair. It also damages the immune system, and ultimately will contribute to all of our deaths - so I'm not sure why anyone would do anything that would accelerate this process.
3. It has been shown, that high volume cardiovascular exercise can completely deplete satellite cells in muscle fiber, which means no new fiber can grow or existing fiber be repaired.
4. Growth Hormone levels decline with high volume cardiovascular exercise, which also hampers the repair process. Low growth hormone also accelerates aging.

5. To sum it up, you can't train all day, and you can't eat no food, but you can always build a bit more muscle, and in so doing, elevate the RMR.

Eat and train to build or maintain muscle: 3-4 half hour resistance workouts per week, trying to go progressively heavier will go a long way to increasing longevity, increasing RMR, and slowing the aging process.

### Basics Of Resistance Training

1. 3-5 sessions/week not longer than 40 minutes each
2. Keep it to about 10 heavy sets per muscle group, except legs would be about 15.
3. Rest no longer than 90 seconds between sets. If your rests are too short, you probably aren't going heavy enough.
4. Start off with 3 light warm up sets prior to the first exercise. After that you will be sufficiently warmed up, no further warm up sets for that muscle group are required.
5. Keep to between 8 and 12 repetitions per set; this is the ideal rep range to stimulate growth. Higher repetitions are counterproductive, although a few heavy sets with as low as 4 repetitions to the max are fine from time to time.
6. Each muscle group should be trained only once per week, an example would be: Monday: Chest, Biceps. Tuesday: Back, Calves. Wednesday: Rest. Thursday: Legs, Abs. Friday: Shoulders, Triceps. Saturday and Sunday: Rest. The muscle needs adequate time to rest, and repair.

To review studies on cardiovascular vs resistance exercise visit
http://www.jacn.org/cgi/content/full/18/2/115

## Blood sugar

Blood sugar is a term used to refer to the amount of glucose in the blood. Glucose, transported via the bloodstream, is the primary source of energy for the body's cells.

Blood sugar concentration, or glucose level, is tightly regulated in the human body. Normally, the blood glucose level is **maintained between about 4 and 8 mmol/L (70 to 150 mg/dL).** The total amount of glucose in the circulating blood is therefore about 3.3 to 7g (assuming an ordinary adult blood volume of 5 liters). Glucose levels rise after meals and are usually lowest in the morning, before the first meal of the day.

Failure to maintain blood glucose in the normal range leads to conditions of persistently high (hyperglycemia) or low (hypoglycemia) blood sugar. Diabetes mellitus, characterized by persistent hyperglycemia of several causes, is the most prominent disease related to failure of blood sugar regulation.

Though it is called "blood sugar" and sugars besides glucose are found in the blood, like fructose and galactose, only glucose levels are regulated via insulin and glucagon.

## Cholesterol

Cholesterol is a sterol (a combination steroid and alcohol), a lipid found in the cell membranes of all body tissues, and is transported in the blood plasma of all animals. Because cholesterol is synthesized by all eukaryotes, trace amounts of cholesterol are also found in membranes of plants and fungi.

Most of the cholesterol is synthesized by the body and some has dietary origin. Cholesterol is more abundant in tissues which either synthesize more or have more abundant densely-packed membranes, for example, the liver, spinal cord, brain, and atheromata (arterial plaques). Cholesterol plays a central role in many biochemical processes, but is best known for the association of cardiovascular disease with various lipoprotein cholesterol transport patterns and high levels of cholesterol in the blood. Cholesterol is insoluble in blood, but is transported in the circulatory system bound to one of the varieties of lipoprotein, spherical particles which have an exterior composed mainly of water-soluble proteins.

In recent years, the term "bad cholesterol" has been used to refer to cholesterol contained in LDL (low-density lipoprotein) which, according to the lipid hypothesis, is thought to have harmful actions, and "good cholesterol" to refer to cholesterol contained in HDL (high-density lipoprotein), thought to have beneficial actions.

The American Heart Association provides a set of guidelines for total (fasting) blood cholesterol levels and risk for heart disease:

| **Level mg/dL** | **Level mmol/L** | **Interpretation** |
|---|---|---|
| <200 | <5.2 | Desirable level corresponding to lower risk for heart disease |
| 200-239 | 5.2-6.2 | Borderline high risk |
| >240 | >6.2 | High risk |

# Blood pressure

Blood pressure refers to the force exerted by circulating blood on the walls of blood vessels, and constitutes one of the principal vital signs. The pressure of the circulating blood decreases as blood moves through arteries, arterioles, capillaries, and veins; the term blood pressure generally refers to arterial blood pressure, i.e., the pressure in the larger arteries, arteries being the blood vessels which take blood away from the heart. Blood pressure is most commonly measured via a sphygmomanometer, which uses the height of a column of mercury to reflect the circulating pressure (see Non-invasive measurement). Although many modern blood pressure devices no longer use mercury, blood pressure values are still universally reported in millimetres of mercury (mmHg).

The systolic pressure is defined as the peak pressure in the arteries, which occurs near the beginning of the cardiac cycle; the diastolic pressure is the lowest pressure (at the resting phase of the cardiac cycle).

**Typical values for a resting, healthy adult human are approximately 120 mmHg systolic and 80 mmHg diastolic (written as 120/80 mmHg, and spoken as "one twenty over eighty"), with large individual variations**. These measures of blood pressure are not static, but undergo natural variations from one heartbeat to another and throughout the day (in a circadian rhythm); they also change in response to stress, nutritional factors, drugs, or disease. Hypertension refers to blood pressure being abnormally high, as opposed to hypotension, when it is abnormally low.

## Normal values

While statistically normal values for blood pressure could be computed for a given population, it needs to be remembered that, not only does blood pressure vary from person to person, it also varies in individuals from moment to moment. Additionally, since there's no guarantee the norm of the population in question should even be considered healthy, the relevance of such values would be questionable.