

Chapter 6

Aerobic Exercise

“I’m Melting Away My Fat!”



If “spot-reducing” really worked, then, everyone who chewed gum would have a skinny face!

The fact is, stomach and thigh exercises (and their related machines) are **not** aerobic or fat-burning exercises. That's because they fail to meet **one essential requirement**. The activities don't last more than **three minutes in continuous duration**. Therefore, the exercise remains **anaerobic**. The burning sensation is not fat being burned or "melting away." Instead, it's the muscles storage of **lactic acid as glycogen** (not fat) that has been used for energy during anaerobic metabolism.

The Truth About Fat-Burning

For activities more than three minutes, continuously, the body will continue to burn **sugar (carbohydrate)**. However, it will begin to burn and breakdown the sugar in the presence of **oxygen**. This is known as **aerobic glycolysis**.

There is only one difference between the **anaerobic glycolysis** and **aerobic glycolysis**. **Lactic acid does not accumulate** in the presence of **oxygen**.

In other words, the presence of **oxygen inhibits the accumulation of lactic acid**.

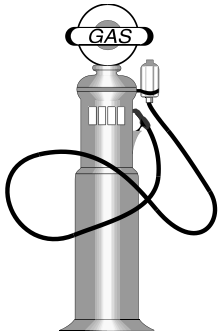


Duration & Amount

The relationship between the **duration of exercise** and the **amount of glucose** used as a fuel **depends upon the availability of oxygen**. Oxygen plays a key role in the workings of the muscle's metabolic engines. With ample oxygen, muscles can extract all available energy from glucose in three to 20 minutes of moderate exercise. During this

period of **aerobic glycolysis** the muscles and liver pour out their stored carbohydrate for use by the muscles.

However, the muscles and liver can only store and use a specific amount of glycogen before it will run out. Therefore, a person who continues to exercise moderately for longer than 20 minutes will need to find another source of fuel. At this point (after 20 minutes) the body will begin to use **less glycogen** and more and **more fat** for fuel.



Unlimited Energy

Unlike the glycogen stores, which are limited, **fat stores can fuel hours of exercise without running out.** Body-fat is (theoretically) an **unlimited source of energy.**

Free Fatty Acids

Just as **carbohydrate** provides basic usable form of energy in the body (glucose), so does **fat**. This usable form of energy in the body is called **Free Fatty Acids (FFA)**.

Fats taken in through the diet are first digested to produce fatty acids. After the fatty acids are absorbed they are converted to **triglycerides**. Triglycerides are the stored form of FFA. Stores of triglycerides are found in the **adipose (fat) tissue** and in the **skeletal muscles**.

Early in exercise the blood fatty acid concentration falls as the muscle begins to draw on the available fatty acids. But, if the exercise continues for more than a few minutes the hormone **epinephrine** is called into play. Epinephrine signals the fat cells to break apart their stored triglycerides and to liberate more fatty acids into the blood. After about 20 minutes of exercise the blood fatty acid concentration rises and surpasses the normal resting concentration.

It is during this phase of sustained, sub maximal exercise - beyond 20 minutes - that the fat cells begin to shrink in size as they empty out their lipid stores.

“How Long Do I Do It?”



In general, the longer the duration of exercise, the greater the percentage of energy produced by fat. Keep in mind, however, that during the first 20 minutes the body is merely **preparing** to burn fat at a more efficient rate. After the 20

minutes the body will start to **metabolize** stored fat. Therefore, if you wish to burn fat by exercising, you should know that **patient, persistent, consistent, low intensity training** is the road to **maximum use of fat** and **conservation of glycogen**.

It is agreed, then, that *frequent* hours of *long* and *consistent* exercise is the preferred methodology to *optimize* a fat-burning metabolism. In other words, your personalized program should include exercise as **much** and as **often** as possible.

Muscles Are Trained Fat-Burners

The more time spent during aerobic activity, the more **trained** the muscles will become in **fat metabolism**. Trained muscles can burn fat more efficiently and require less glucose, even during strenuous exercise.

After physical activity has ceased, "**fat-burning**" may continue at an **accelerated rate** for some time. Some reports suggests that fat metabolism remains elevated for at least *six* hours after completion.

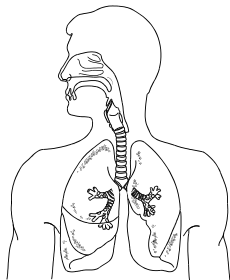
Another report suggests there is increased fat use *24 hours* after an hour-long aerobic session. The body's **adaptation** to strenuous and prolonged aerobic exercise burns more fat **all day**, not just during the exercise. In other words, consistent exercise for more than one hour will most likely **raise an individuals resting metabolic rate**, which means you consistently burn more fat even while not exercising.



“How Intense is *Intense*?”

As well as duration, **intensity** plays an important role in the efficiency of fat-metabolism during exercise. In general, the percentage of energy contributed by fat *diminishes* as the intensity of exercise increases.

Fat can only be broken down in the **presence of oxygen**. Oxygen serves as the **catalyst** that enables **proteins** and **enzymes** of the body to burn fat during an exercise metabolism.



The **heart** and **lungs** can provide only so much oxygen -- so fast. When muscle exertion is so great that the demand for energy *outstrips* the oxygen supply, the body cannot process oxygen fast enough. Therefore the body *cannot* burn fat. Instead, it reverts back to anaerobic metabolism and burns more glucose.



Oxygen Debt

When your body reverts back to this anaerobic metabolism, it has incurred an **oxygen debt**. Oxygen debt occurs when you become out of breath.

When intensity of exercise is so great as to incur **oxygen debt**, aerobic metabolism cannot sufficiently meet energy needs.

Slow Down

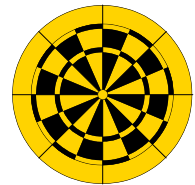
Muscles must instead draw more heavily upon their limited supply of **glucose**. When this happens, glucose is spent rapidly. As a result, fragments of glucose molecules accumulate in the muscle tissue and cause fatigue. This is why, if you exercise intensely, you may have to stop or slow down to "catch your breath" (replenish your oxygen supply). By slowing back down your body will once again rely upon aerobic metabolism.

Therefore, exercising with **too much intensity** will **inhibit the body's ability to burn fat**. Keep intensity in check by engaging in moderate, low-intensity aerobic activity. This includes activities where energy demands **do not exceed** the available oxygen, and **fat** can supply much of the energy, permitting glycogen to be conserved.

Target Heart Rates



The most effective method of monitoring exercise intensity is to check your **target heart rate (THR)**. The target heart rate gives an approximation of where your heart rate should be at a certain percentage of its maximum capacity in order to burn fat.



An individual exercising at 75% of his/her maximum heart rate will be exercising in an aerobic fashion.

It's also helpful to establish a **THR Zone**. This is done by taking the maximum heart rate (220 - Age) and multiplying that number by both 65% and 85%.

These numbers will establish the **upper** and **lower** limits of your the zone. By keeping your heart rate during exercise between these two numbers your body will burn fat.

Dividing the Target Heart Rate and Target Heart Rate Zone numbers by 6 will determine 10 second guidelines for easier heart rate checks during exercise. This can be

accomplished by counting your pulse either at the arteries on your neck or wrist with your first two fingers for 10 seconds.

Remember, exercising at an intensity greater than the upper target heart rate zone limit ($220 - \text{Age} \times 85$) requires more energy consumption than the body can handle (working too hard). It will start to break down glycogen to keep up. Exercising below the lower limit ($220 - \text{Age} \times 65$) is not working hard enough. The body will not need to engage its aerobic pathways. In both cases, the body's ability to burn fat becomes **less efficient**.

There is a basic "**rule of thumb**" concerning aerobic exercise. You should exercise at an intensity that allows you to carry a normal conversation. If you are out of breath, you are in oxygen-debt and not burning fat.

“How Often Should I Be In My Target Heart Rate Zone?”

For the person interested in maintenance or moderate reduction of body fat, 3 to 4 days a week may be all the body requires to achieve these goals.

However, for the individual interested in making a noticeable reduction in body-fat, then, 5 to 6 days per week of 45-60 minute aerobic conditioning may be necessary. The final determinant of how much cardiovascular activity is required to reach your goal, however, cannot be answered in these pages. The final decision comes from how **your body** reacts to the **amount** and **frequency** of aerobic exercise you perform during your program. Some individuals may lose their body-fat with 4 days at 45 to 60 minutes while others may require 6 days a week or even twice a day to reach their goal.

Get All Your Muscles Involved



To **maximize** efficient fat-burning metabolism, your activities should involve as many muscle groups as possible. The more muscle mass required to perform, the more energy required to feed that exercise.

Activities such as **walking/jogging/running** outdoors or on a treadmill, are effective fat-burners as long as you're in your **target heart rate**. These are efficient activities because you are supporting your own body-weight in an upright position and your upper body is free to move.

The same holds true for aerobic type classes. However, be sure to stay within your THR during these classes. Even though you may participate in an hour-long class, actual cardiovascular activity may last only 35 to 40 minutes.

Equipment such as the stair climber will be a little less efficient if you hold on to the rail. This is because the upper body is not moving freely to burn energy. The stationary bicycles will even be less efficient because the seated positions does not burn the same amount of energy as the person supporting their own weight.

Efficient Fat-Burning

We can summarize that the human body uses available fuel sources in a very efficient way. **Utilization** and **efficiency** is dependent upon timing. Knowing this, it's obvious we should use efficiency to our advantage. Individuals interested in performing both **anaerobic activities** (to improve and/or increase their lean muscle mass) and **aerobic activity** (to burn body-fat) should perform these activities in the proper sequence to obtain maximum results.



Performing anaerobic activities **before** aerobic activities will enable the exerciser to utilize their fresh stores of available ATP and glucose for their anaerobic activities when needed. Also by using a portion of the stored ATP and glycogen prior to aerobic exercise the body may start to burn fat sooner than the standard 20 minute guideline, thus increasing exercise efficiency.

Fat-Burning Summary

For efficient metabolism of fat during exercise:

- ◆ Exercise at least 30 minutes and up to 45-60 minutes
- ◆ Exercise as often as possible (5-6 days per week, even twice a day)
- ◆ Exercise in your target heart rate zone (65 to 85%) of your maximum).
- ◆ Perform anaerobic activities prior to aerobic activities to optimize your workout performances.
- ◆ Exercise consistently and in moderate intensity