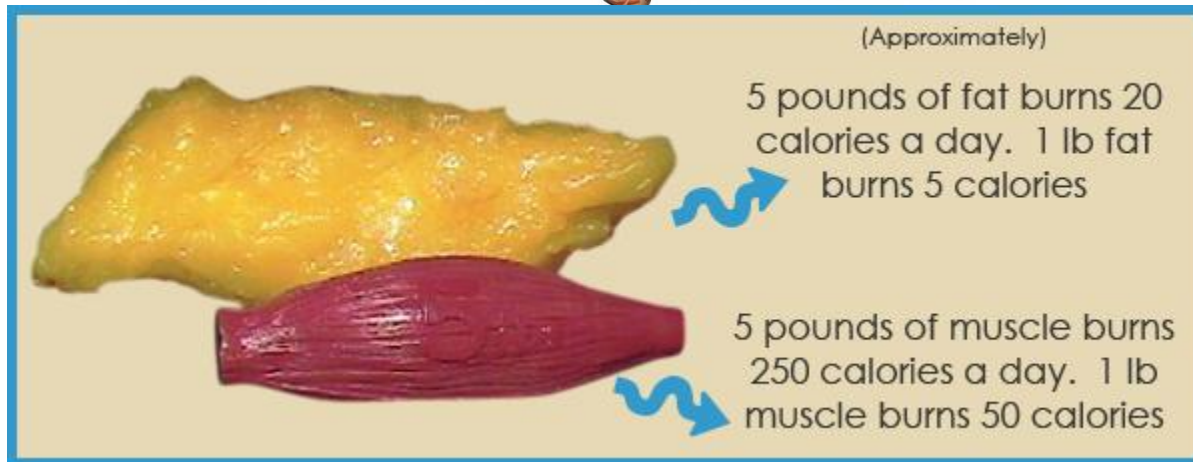
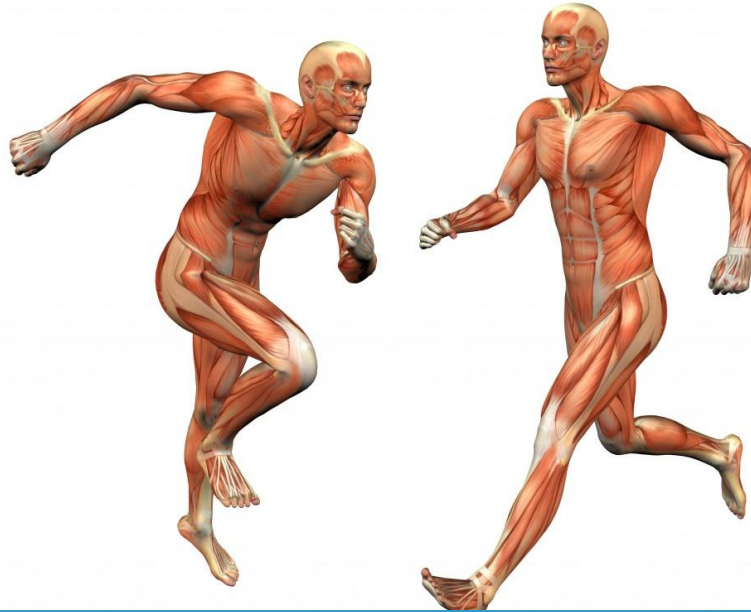


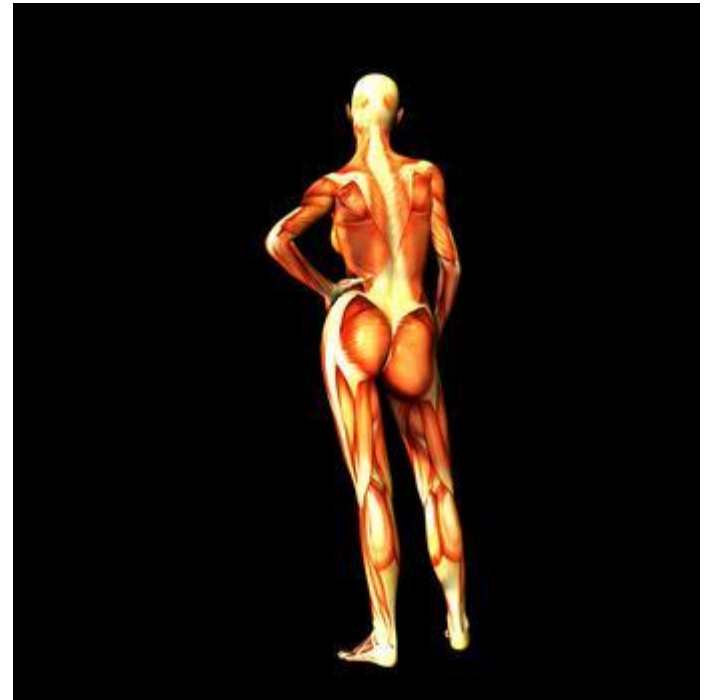
Reverse diabetes- contracting muscles have insulin-like effects



Muscles were created to do works-

Muscles control every movement in your body

- **Muscles** are your body's engine, and you couldn't **do** anything without them.
- You have more than 650 **muscles** in your body!
- **Muscles** are made up of many fibers. Each fiber is made of two types of proteins that react to each other depending on the signals from your nerves. The signal makes them pull closer together and the fibers contract.
- **Muscles** contract and relax to allow the body to perform crucial activity. Electrical signals tell the **muscles** when to contract and relax.



Skeletal Muscles-voluntarily controlled

- Skeletal muscles make up approximately 40 percent of the average adult's body weight;
- Your skeletal muscles work with your bones to give you the power and strength required for good posture and for moving things.
- In addition to movement and posture, your muscles help maintain your body's temperature. The contraction of your skeletal muscles helps produce the majority of the heat required to maintain your body's temperature.

Cardiac muscle-involuntary muscle

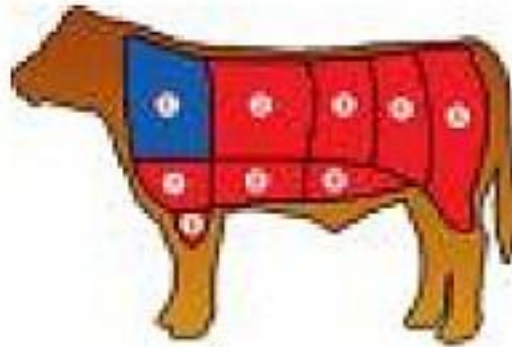
- Cardiac muscles make up the walls of the heart.
- These myocardial muscles contract and relax the heart to allow blood to pump throughout the body.
- Similar to smooth muscles, you have no control over how fast your heart muscles pump, though you can accelerate heart rate through exercise.

Smooth muscles-involuntary muscle

- Smooth muscle, often referred to as **involuntary muscle** or **visceral muscle**, makes up many of your internal organs.
- You have no physical control over this type of muscle. Your brain controls them without any conscious effort from you;
- Smooth muscles control the movement of blood through the blood vessels, the movement of food through the digestive system, the passage of urine to the bladder, the contraction of a the uterus to have a baby, the ability of the eyes to focus and many other automatic functions of the body.

Composition of muscles:

Muscles are created to do works (contraction), glycogen is the storage form of glucose, Total glycogen store in the skeletal muscles is about 400gram. Resistance exercise depletes the muscle of glycogen. This helps lower the blood sugar level..



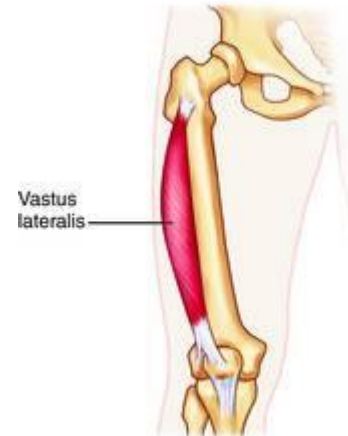
What are muscles composed of?

Protein

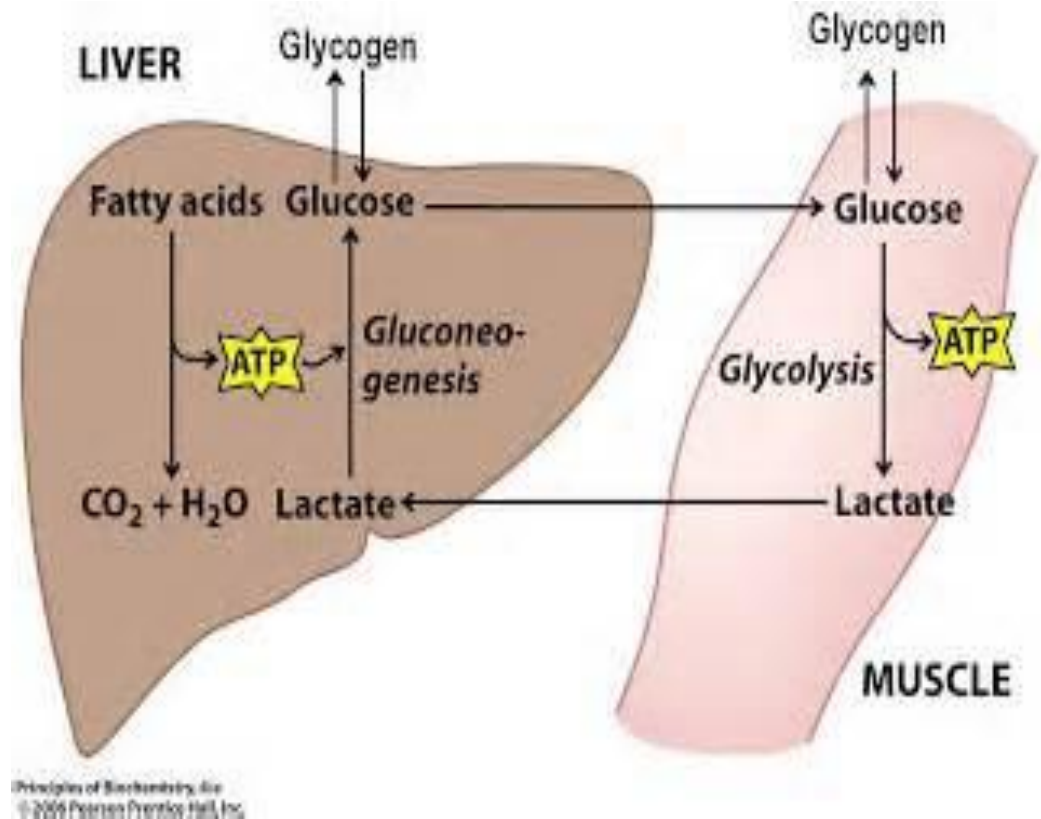
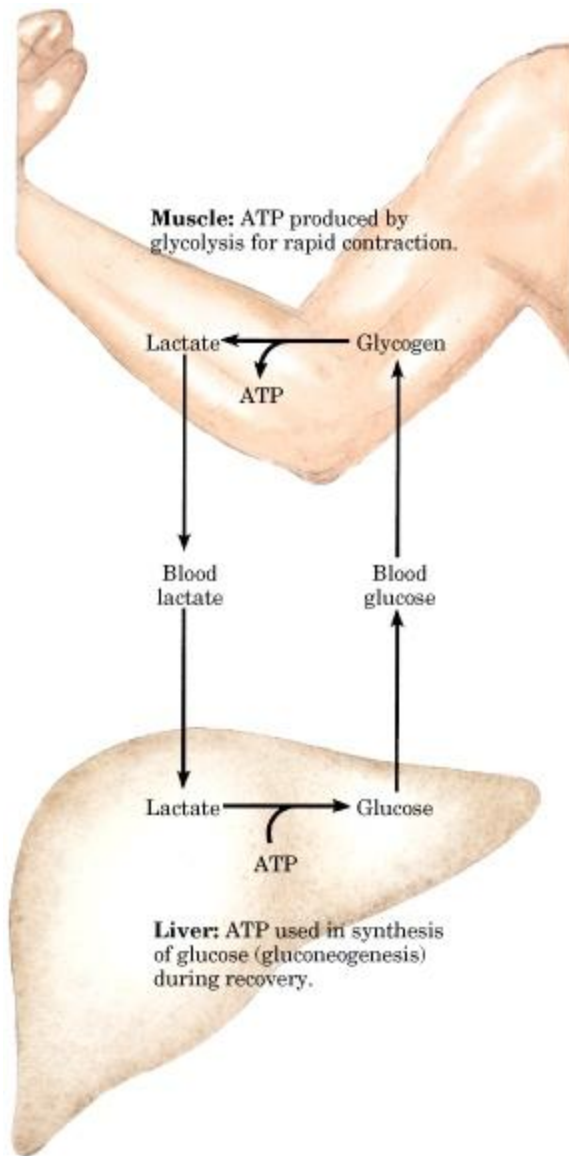
Glycogen

Fat

Water



Muscle is a fuel burner, Liver is the fuel provider



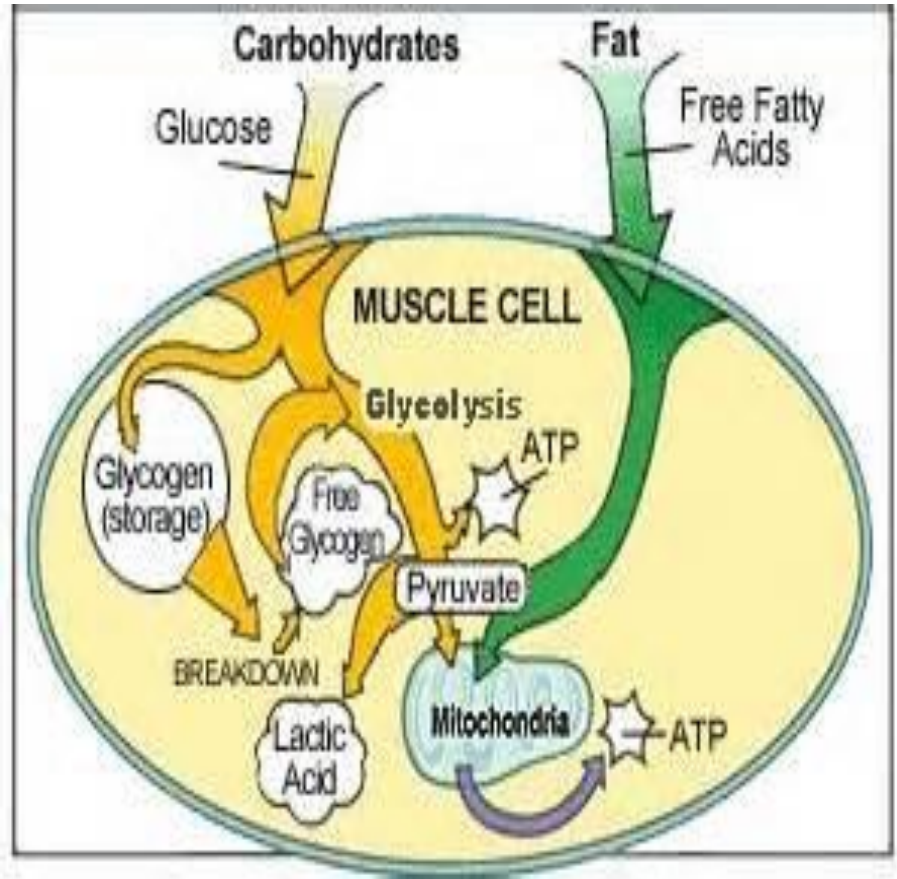
Muscle contraction has insulin-like effects

- During exercise, blood insulin levels drop, while blood glucagon levels increase. These changes take place to counterbalance the insulin-like effect of muscle contraction.
- As the muscles contract during exercise, they do not require much insulin to transport glucose into the working cells. The exercising muscle may increase the uptake of glucose **7-to 20-fold** during the first 30 to 40 minutes, depending on the intensity.



Muscle contractions increase sensitivity of insulin receptor

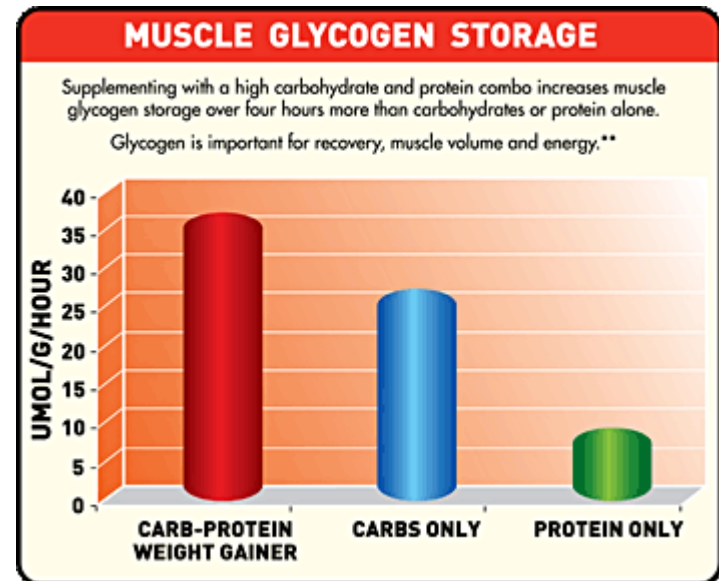
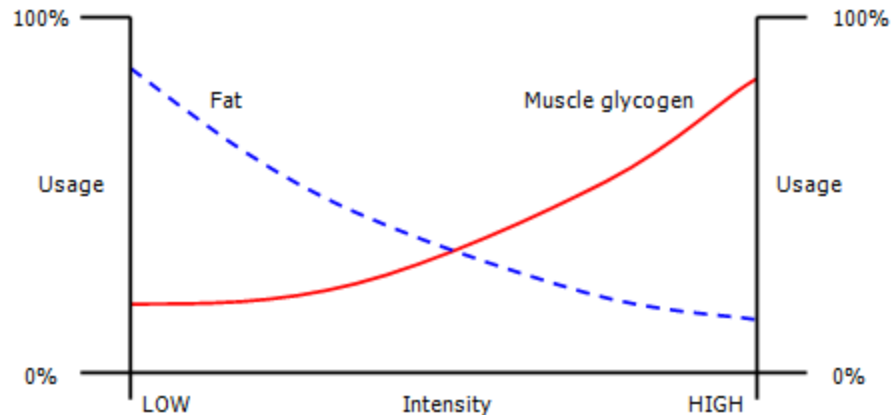
- In addition, the insulin receptors become more “sensitive” to the lower amount of insulin present during exercise.
- This improvement in insulin receptor sensitivity can last for many hours after the exercise bout is over, even for as long as two days if the exercise is of long duration and high intensity.



Body's fueling mode switches to fit exercise intensity

Note: 1, Too much stress pushes us toward muscle burning (muscle can be burned as sugar) and fat storage. 2, persisting low intensity exercise burns more fat than vigorous exercises

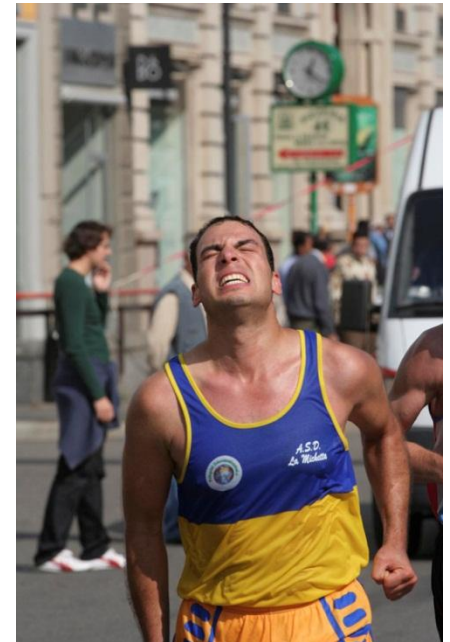
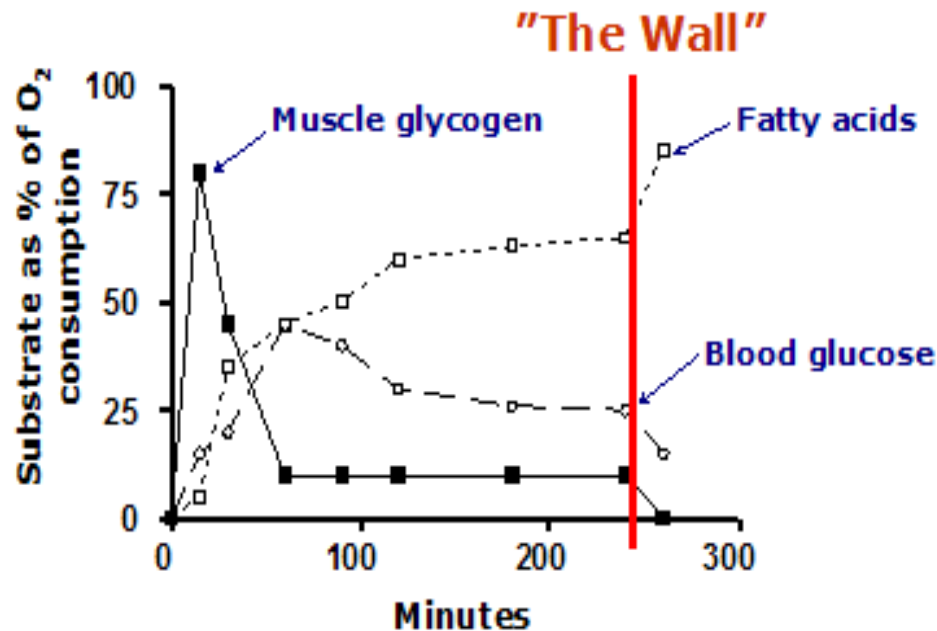
Aerobic and anaerobic exercise



Hitting the wall=shortage of energy in the muscles

Energy Sources in Working Muscle

Time Interval and Choice of Substrate

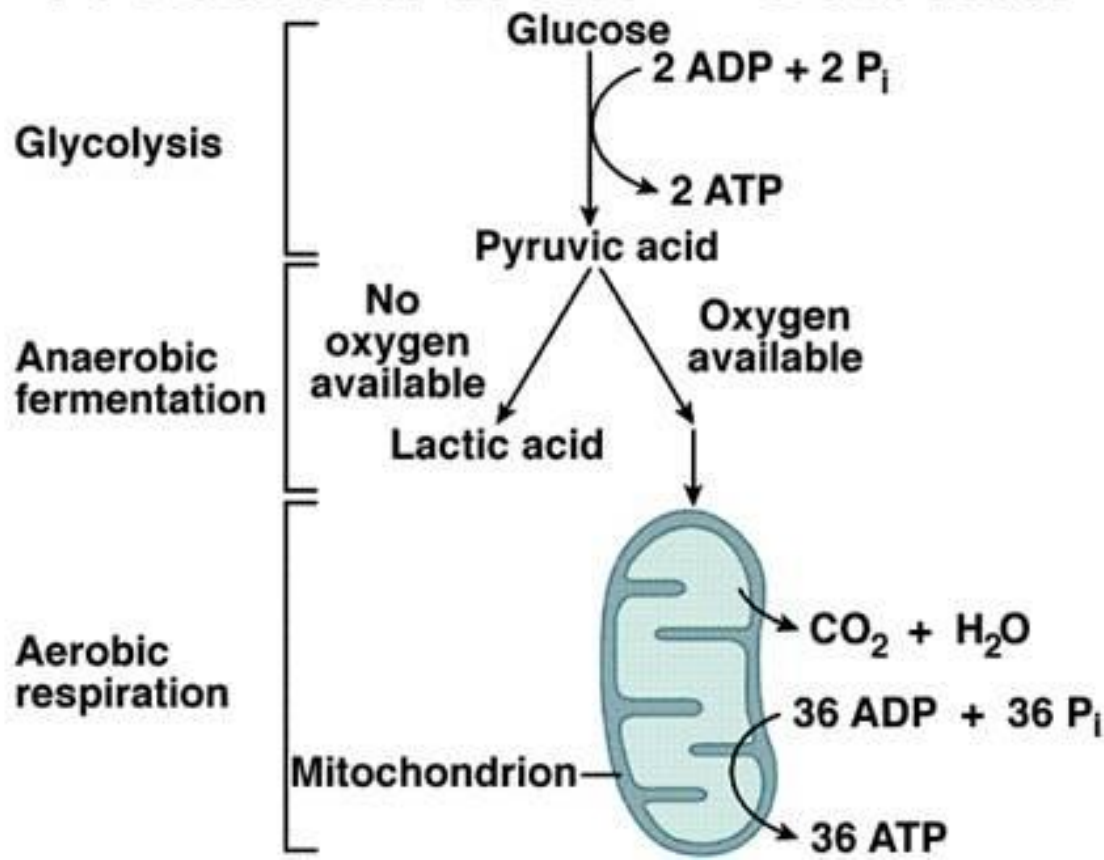


Aerobic exercises followed by resistance exercises burn more fat

Proper sequences of exercises: aerobic 10min then resistance training then aerobic exercises

Kenneth S. Saladin, ANATOMY AND PHYSIOLOGY: THE UNITY OF FORM AND FUNCTION, Copyright © 1998, The McGraw-Hill Companies, Inc. All rights reserved.

Production of ATP — Overview



More workouts more stronger

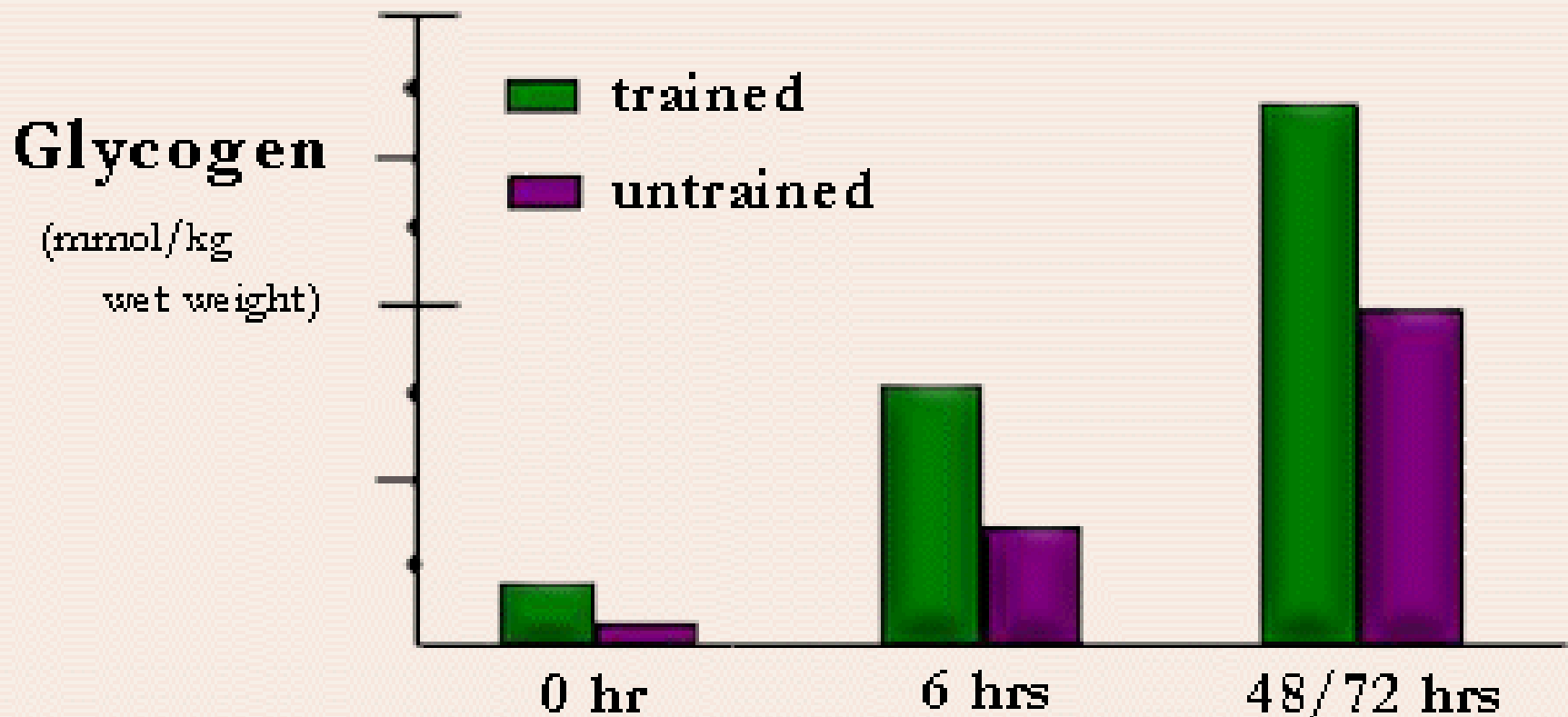
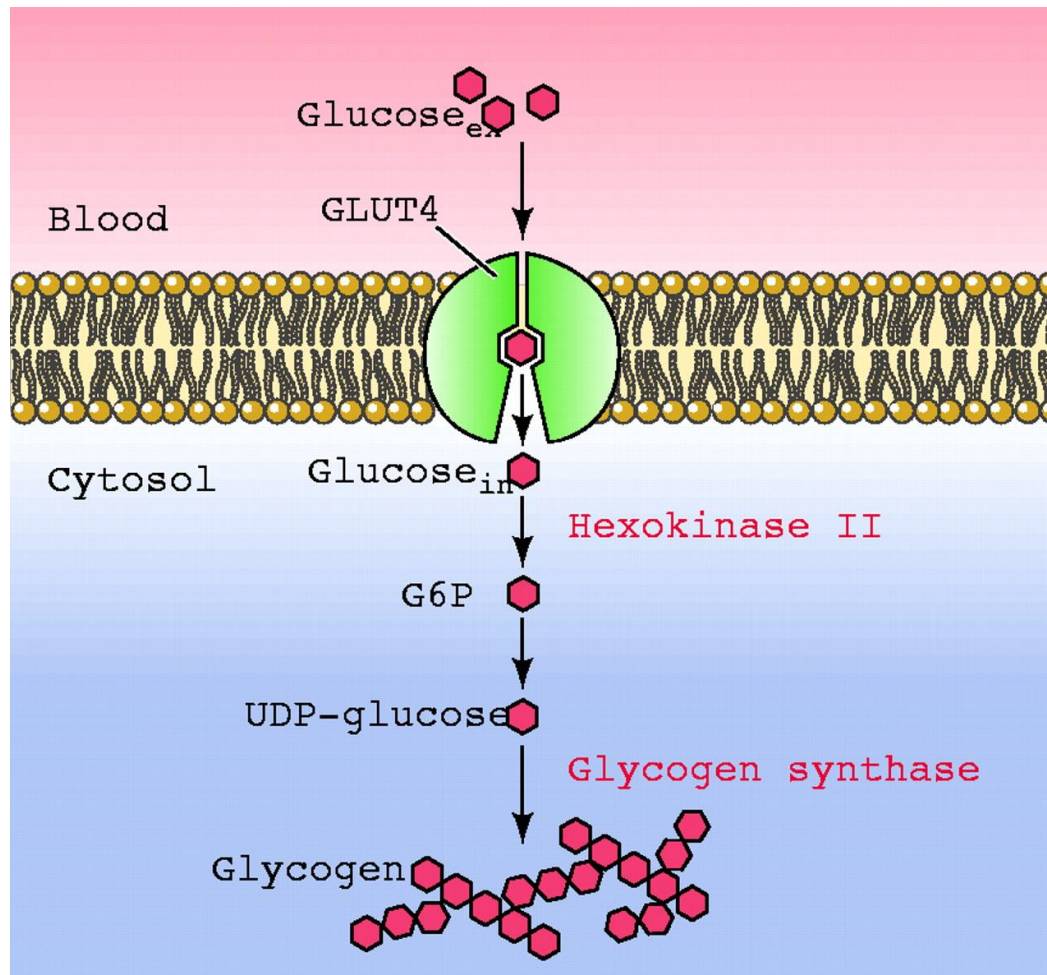
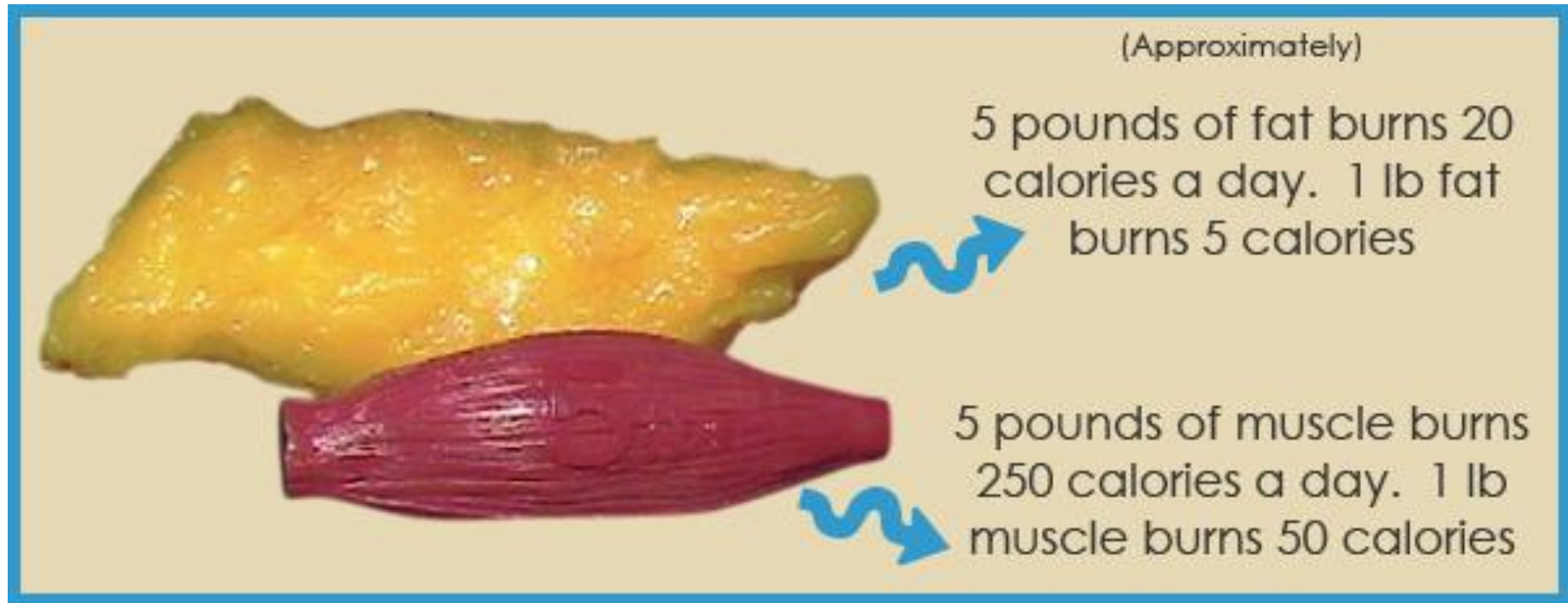


Fig. 1 Muscle glycogen concentration in trained and untrained individuals immediately after exercise, 6 hrs postexercise, and either 48 or 72 hrs postexercise.

Uptake of glucose by contracting muscle does not need insulin

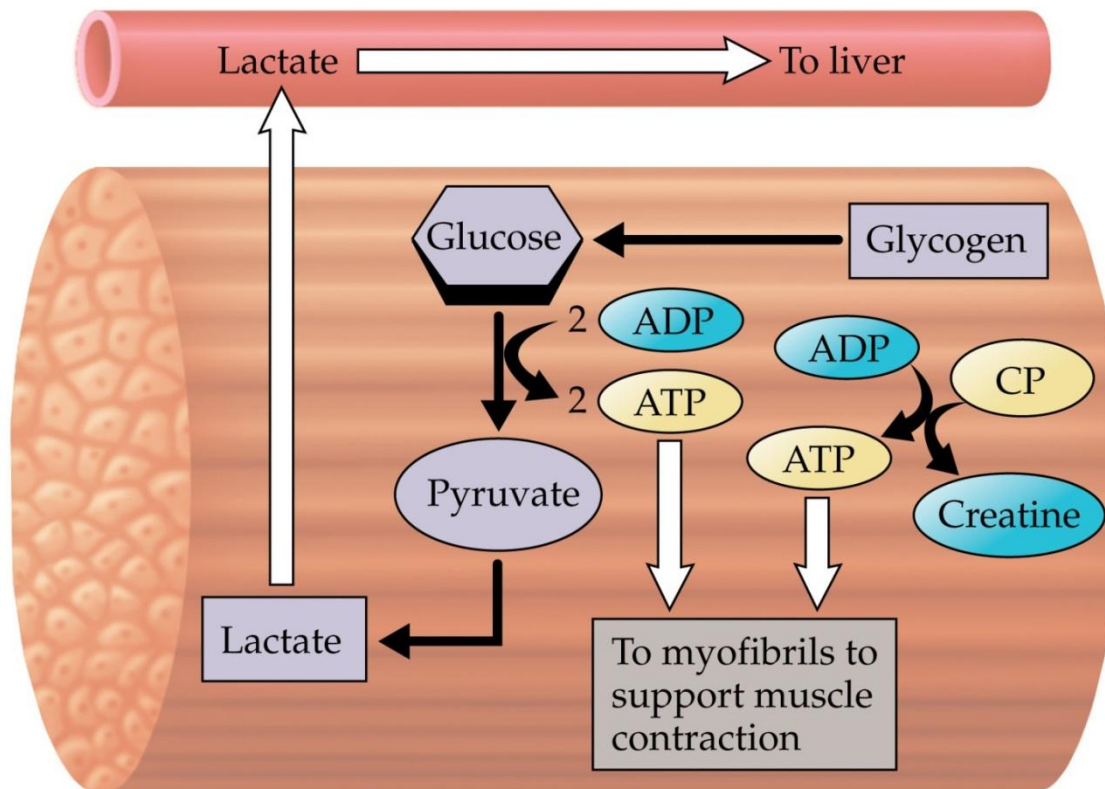


Muscles burns up to 50 fold calories than fat



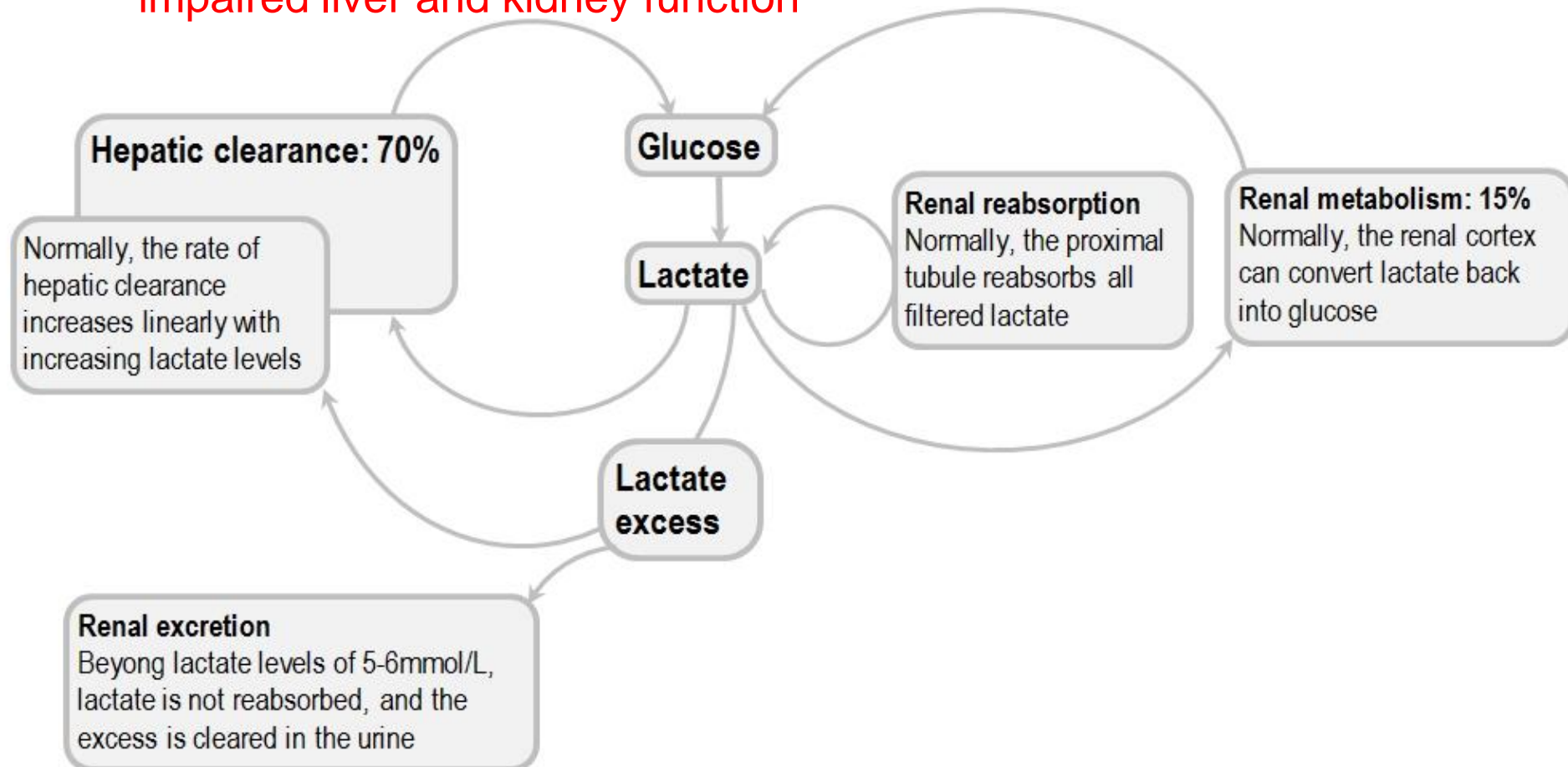
Lactate is recycled in liver to glucose

Implication: people with impaired liver function cannot do vigorous works due to liver's limited capacity to recycle lactates



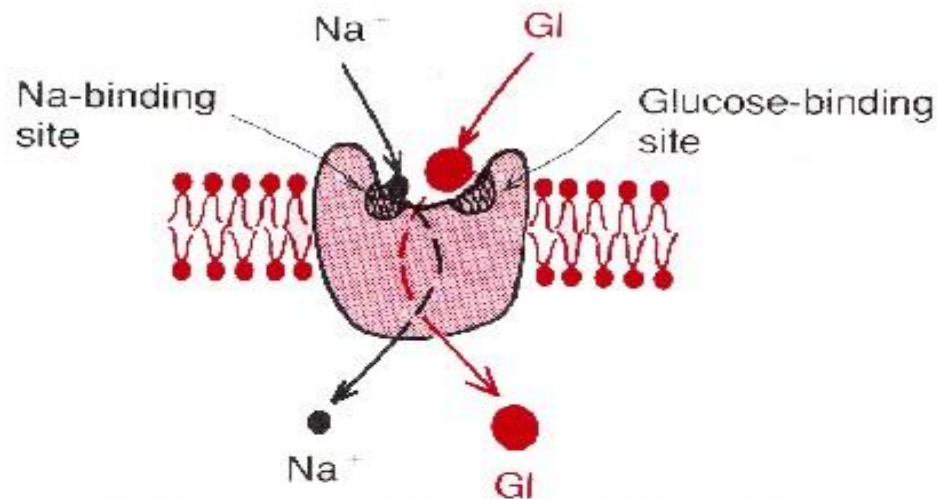
Liver and kidneys are organs that recycle or remove lactates

- Lactate acidosis can be caused by vigorous exercises in people with impaired liver and kidney function



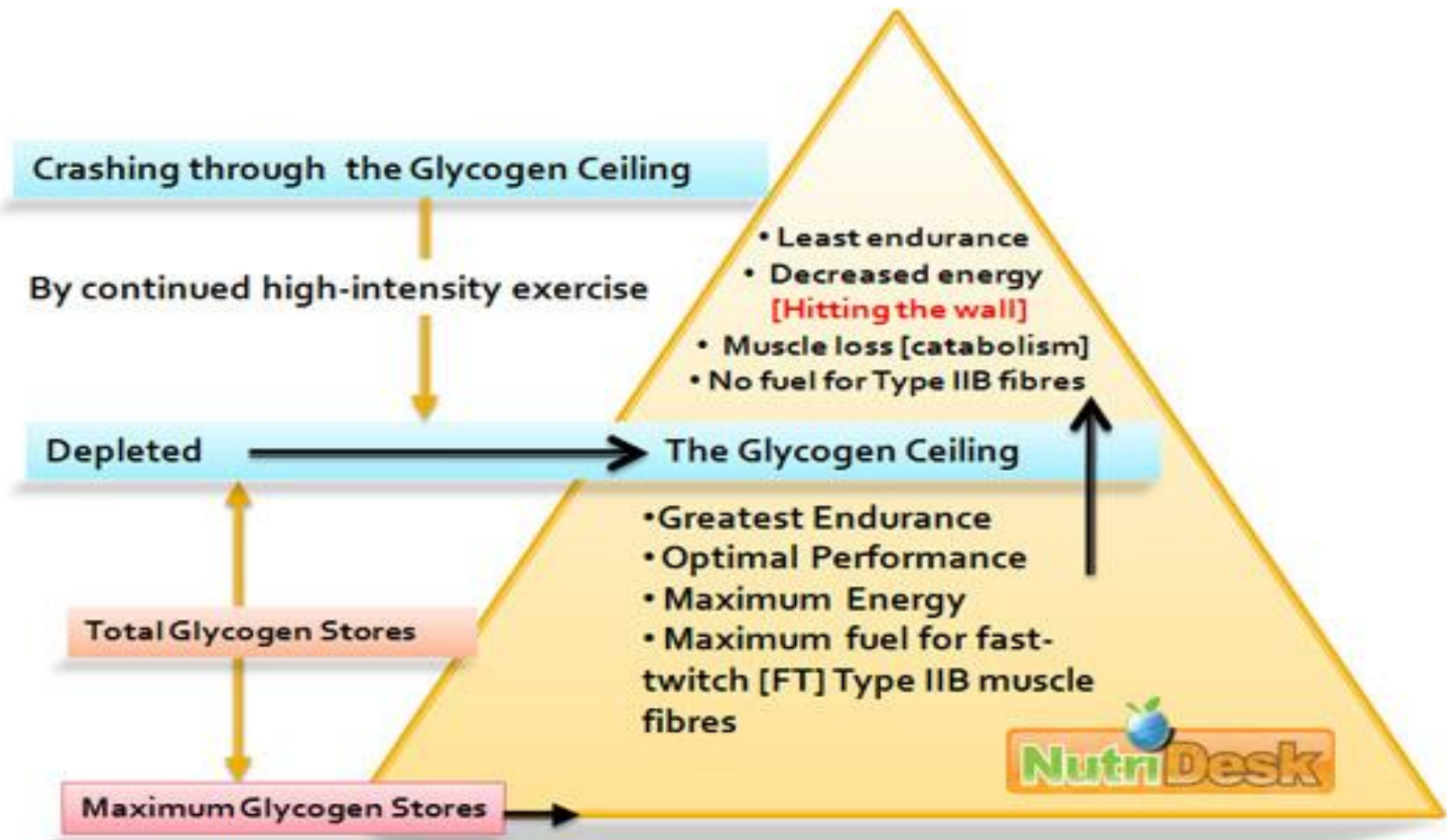
Sodium is needed for glucose transport

Postulated Mechanism for Sodium Co-transport of Glucose

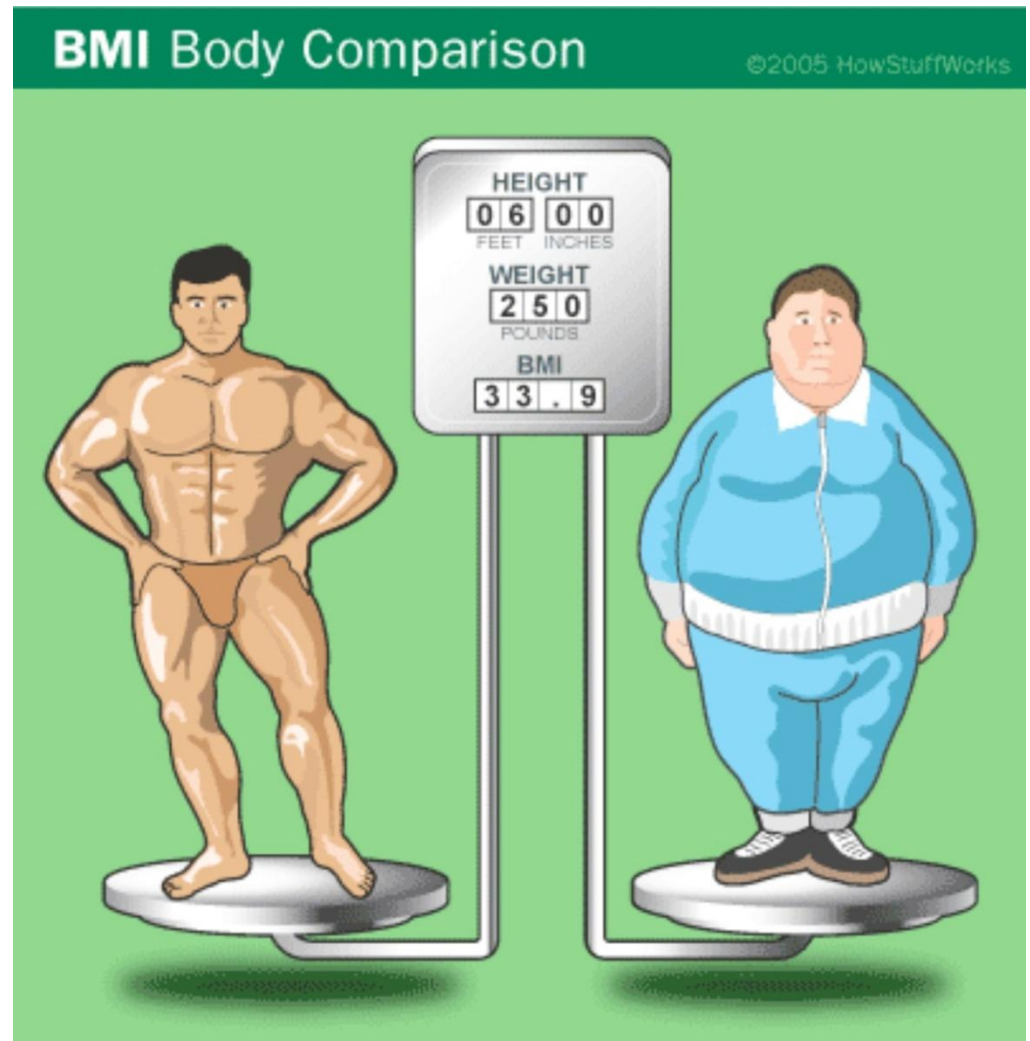
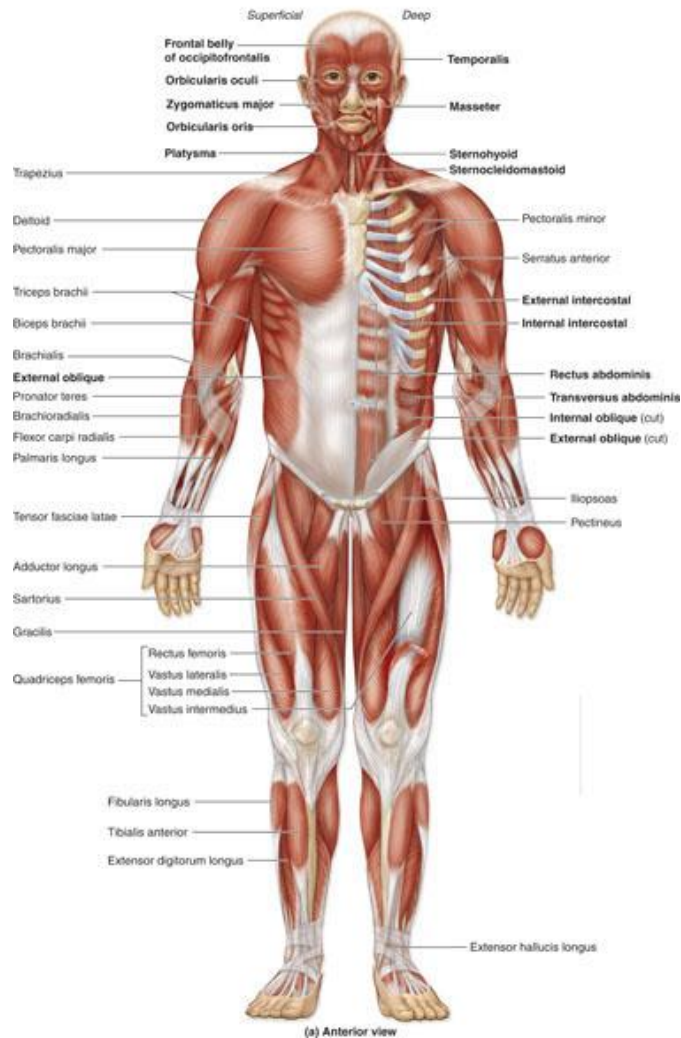


- Sodium concentration outside the cell is very high compared to inside the cell, due to Na-K pump. This provides the energy for transport.
- When both sodium and glucose are attached, the conformational change of the protein molecule automatically takes place and both are transported to the inside of cell.

Endurance=High glycogen storage & high fat burning efficacy



Weight can be misleading- muscle cells burn more calorie; while fat cells tend to store calorie



Study: aerobic and resistance exercises, alone is good, But Best together

- A study comparing the benefits of aerobic versus resistance training has found that either is good, but both are better, when it comes to lowering [A1c](#)'s in people with [diabetes](#).
- The study examined 251 sedentary adults with [type 2 diabetes](#) and assigned them either 45 minutes of aerobic [exercise](#), 45 minutes of resistance training, or 45 minutes of a combination of both, all performed three times a week. A fourth group did nothing at all.

Study: aerobic and resistance exercise, alone is good, But Best together

- After **twenty-six weeks** of this, the do-nothing group saw no change at all, of course. Both the aerobic and the resistance training groups saw a half percentage point drop in their A1c's. But the group that did both saw nearly a full-point drop in their A1c's.
- In light of the fact that a one-point drop in A1c is associated with a 15 to 20 percent drop in risk of heart attack and a 25 to 40 percent drop in risk of diabetic eye or kidney disease, it might be wise to get that gym bag out again.
- Source: EurekAlert; *Annals of Internal Medicine*, September 2007
- <http://diabeteshealth.com/read/2007/10/04/5462/aerobic-and-resistance-exercise-good-alone--but-best-together/>

You can do it take action today



Resistance training builds strength of muscles, bones, and surrounding soft tissue; burns calories; and may lower cholesterol

 ADAM.



Our body is gifted with self-healing power,
Good Health to You!



Designed by Lanson Lan
TCM, Nutrition, Sports Medicine
Email: 715515212@qq.com, skype: Nutriforce