HEART AND LUNG FUNCTIONS AND INTEGRAL PART OF THE AEROBIC ENERGY SUPPLY SYSTEM pdf

1: The Circulatory System

The integration of the heart, lungs and circulatory system to transport oxygen and remove carbon dioxide Training effect The physiological changes and improved fitness resulting from regular exercise.

It can get even worse when sifting through all the biochemical processes. However, knowing the basics of how we generate energy can be helpful in understanding how we fatigue and what training measures can be used to minimize it. When an ATP molecule is combined with water the last of three phosphate groups splits apart and produces energy. On one end would be a quick, explosive burst such as throwing a punch. On the other end would be an extended, lower-level event such as walking five miles. Between the two could be anything: As you can see, there are many expressions of energy output depending on the amount of force required and the length of the activity. What then, is the energy source for activities that fall on the continuum at various points? This is the essence of bioenergetics - so many possibilities and so many factors involved. What dictates which one or two is relied upon the most is the effort required. ATP must be present for muscles to contract. If depleted, it must be replenished if further muscle contraction is to continue. Perform an explosive, one-time movement such as a standing long jump or vertical jump and you exert maximal effort, but guess what? You will not become fatigued from this single exertion. However, jump multiple times and eventually you will become fatigued. Going all-out for as long as possible will deplete immediate ATP stores, then glycolytic stores. Continuing effort must be fueled by the oxidative system at a lower intensity, all other factors being equal. The most pure aerobic activity that exists is sleeping or lying comatose. It is immediate and functions without oxygen. During the first few seconds of any activity, stored ATP supplies the energy. For a few more seconds beyond that, PC cushions the decline of ATP until there is a shift to another energy system. Dietary carbohydrates supply glucose that circulates in the blood or is stored as glycogen in the muscles and the liver. Like the ATP-PC system, oxygen is not required for the actual process of glycolysis but it does play a role with the byproduct of glycolysis: It is estimated glycolysis can create energy at approximately 16 calories per minute. Here is where it gets interesting. After maximum power declines around 12 seconds, further intense activity up to approximately 30 seconds results in lactic acid accumulation, a decrease in power, and consequent muscle fatigue. Exerting further effort up to approximately 50 seconds results in another drop in power due to the shift in dependence on the oxidative system. That is the progression of the three energy systems when going all-out. Recall the byproduct of glycolysis is pyruvic acid. In fast glycolysis, more power can be generated, but pyruvic acid is converted to lactic acid and fatigue ensues quickly. Slow glycolysis is different. Relatively less power is generated, but pyruvic acid is converted to acetyl coenzyme A acA , fed through the oxidative Krebs cycle, more ATP is produced, and fatigued is delayed. Thus, extreme fatigue can be avoided but relatively less-intense effort can continue to be expressed in slow glycolysis as compared to fast glycolysis. Continued effort results in further decline, either via fast glycolysis quick decline or slow glycolysis slower decline. The effort demand is low, but ATP in this system can be produced three ways: Krebs cycle Beta Oxidation. The Krebs cycle is a sequence of chemical reactions that continues to oxidize the glucose that was initiated during glycolysis. Here is the problem: Through more chemical reactions in the electron transport chain, hydrogen combines with oxygen, water is produced, and acidity is prevented. Notice this takes time due to the need of oxygen, which is why the oxidative energy takes a while and intensity of effort declines i. The Krebs cycle and the electron transport chain metabolize triglycerides stored fat and carbohydrates to produce ATP. The breakdown of triglycerides is called lipolysis. The byproducts of lipolysis are glycerol and free fatty acids. However, before free fatty acids can enter the Krebs cycle they must enter the process of beta oxidation where a series of chemical reactions downgrades them to acA and hydrogen. The acA now enters the Krebs cycle and fat is metabolized just like carbohydrates. In Plain English Due to the time-line, the oxidative system provides energy much more slowly than the other two systems, but has an almost unlimited supply in your adipose sites - yeah, that stuff you can pinch! The oxidative system by itself is used primarily during complete rest and low-intensity activity. It can produce ATP through either fat fatty acids or carbohydrate glucose. Because fatty acids take more time to breakdown than glucose, more oxygen is needed for complete combustion. If efforts are intense and the cardiovascular system cannot supply oxygen quickly enough, carbohydrate must produce ATP. However, in very long duration activities i. The building blocks of protein - amino acids - can be either converted into glucose via gluconeogenisis or other sources used in the Krebs cycle, such as acA. Regardless, sport-specific conditioning plans and optimal nutritional intake need to be implemented. But be aware of the reality of genetics: If you possess predominately slow type I fibers endurance or fast type II fibers strength , you can only do so much. For me, this explains why I never got a sniff of any national-level competitions back in the early s.

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2: Homeostasis of the Body After Exercising | www.enganchecubano.com

The ability of the heart, lungs, circulatory system, and energy supply system to perform at optimum levels for extended period of time. Cardiovascular endurance The ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate to high levels of intensity.

Physical activity is any body movement that works your muscles and requires more energy than resting. Walking, running, dancing, swimming, yoga, and gardening are a few examples of physical activity. Lifting weights, taking an aerobics class, and playing on a sports team are examples of exercise. Physical activity is good for many parts of your body. This article focuses on the benefits of physical activity for your heart and lungs. The article also provides tips for getting started and staying active. Physical activity is one part of a heart-healthy lifestyle. Outlook Being physically active is one of the best ways to keep your heart and lungs healthy. Following a healthy diet and not smoking are other important ways to keep your heart and lungs healthy. Many Americans are not active enough. The good news, though, is that even modest amounts of physical activity are good for your health. The more active you are, the more you will benefit. Types of Physical Activity The four main types of physical activity are aerobic, muscle-strengthening, bone-strengthening, and stretching. Aerobic activity is the type that benefits your heart and lungs the most. Aerobic Activity Aerobic activity moves your large muscles, such as those in your arms and legs. Running, swimming, walking, bicycling, dancing, and doing jumping jacks are examples of aerobic activity. Aerobic activity also is called endurance activity. Aerobic activity makes your heart beat faster than usual. You also breathe harder during this type of activity. Over time, regular aerobic activity makes your heart and lungs stronger and able to work better. Other Types of Physical Activity The other types of physical activityâ€”muscle-strengthening, bone strengthening, and stretchingâ€”benefit your body in other ways. Muscle-strengthening activities improve the strength, power, and endurance of your muscles. Doing pushups and situps, lifting weights, climbing stairs, and digging in the garden are examples of muscle-strengthening activities. This helps make your bones strong. Running, walking, jumping rope, and lifting weights are examples of bone-strengthening activities. Muscle-strengthening and bone-strengthening activities also can be aerobic, depending on whether they make your heart and lungs work harder than usual. For example, running is both an aerobic activity and a bone-strengthening activity. Stretching helps improve your flexibility and your ability to fully move your joints. Touching your toes, doing side stretches, and doing yoga exercises are examples of stretching. Levels of Intensity in Aerobic Activity You can do aerobic activity with light, moderate, or vigorous intensity. Moderate- and vigorous-intensity aerobic activities are better for your heart than light-intensity activities. However, even light-intensity activities are better than no activity at all. The level of intensity depends on how hard you have to work to do the activity. To do the same activity, people who are less fit usually have to work harder than people who are more fit. So, for example, what is light-intensity activity for one person may be moderate-intensity for another. Moderate-intensity activities make your heart, lungs, and muscles work harder than light-intensity activities do. On a scale of 0 to 10, moderate-intensity activity is a 5 or 6 and produces noticeable increases in breathing and heart rate. A person doing moderate-intensity activity can talk but not sing. Vigorous-Intensity Activities Vigorous-intensity activities make your heart, lungs, and muscles work hard. On a scale of 0 to 10, vigorous-intensity activity is a 7 or 8. Examples of Aerobic Activities Below are examples of aerobic activities. Depending on your level of fitness, they can be light, moderate, or vigorous in intensity: Pushing a grocery cart around a store Gardening, such as digging or hoeing that causes your heart rate to go up Walking, hiking, jogging, running Water aerobics or swimming laps Bicycling, skateboarding, rollerblading, and jumping rope Ballroom dancing and aerobic dancing Tennis, soccer, hockey, and basketball Benefits of Physical Activity Physical activity has many health benefits. These benefits apply to people of all ages and races and both sexes. For example, physical activity helps you maintain a healthy weight and makes it easier to do daily tasks, such as climbing stairs and shopping. Physically active adults are at lower risk for depression and declines in cognitive function as they get older. Cognitive function includes thinking, learning, and judgment skills. Physically active children and teens may have fewer symptoms of depression than their peers. Many studies have shown the clear benefits of physical activity for your heart and lungs. Physical Activity Strengthens Your Heart and Improves Lung Function When done regularly, moderate- and vigorous-intensity physical activity strengthens your heart muscle. As a result, more blood flows to your muscles, and oxygen levels in your blood rise. This allows them to deliver more oxygen to your body and carry away waste products. CHD is a condition in which a waxy substance called plaque plak builds up inside your coronary arteries. These arteries supply your heart muscle with oxygen-rich blood. Plaque narrows the arteries and reduces blood flow to your heart muscle. Eventually, an area of plaque can rupture break open. This causes a blood clot to form on the surface of the plaque. If the clot becomes large enough, it can mostly or completely block blood flow through a coronary artery. Blocked blood flow to the heart muscle causes a heart attack. Certain traits, conditions, or habits may raise your risk for CHD. Physical activity can help control some of these risk factors because it: Can lower blood pressure and triglyceride. Triglycerides are a type of fat in the blood. Can raise HDL cholesterol levels. Helps your body manage blood sugar and insulin levels, which lowers your risk for type 2 diabetes. Reduces levels of C-reactive protein CRP in your body. This protein is a sign of inflammation. Physical activity also helps you maintain a healthy weight over time once you have lost weight. May help you quit smoking. Smoking is a major risk factor for CHD. Inactive people are more likely to develop CHD than people who are physically active. Studies suggest that inactivity is a major risk factor for CHD, just like high blood pressure, high blood cholesterol, and smoking. It also may reduce the risk of a second heart attack in people who already have had heart attacks. Vigorous aerobic activity may not be safe for people who have CHD. Ask your doctor what types of activity are safe for you. Risks of Physical Activity In general, the benefits of regular physical activity far outweigh risks to the heart and lungs. Rarely, heart problems occur as a result of physical activity. These events generally happen to people who already have heart conditions. The risk of heart problems due to physical activity is higher for youth and young adults who have congenital kon-JEN-ih-tal heart problems. People who have these conditions should ask their doctors what types of physical activity are safe for them. If you have a heart problem or chronic ongoing diseaseâ€”such as heart disease, diabetes, or high blood pressure â€”ask your doctor what types of physical activity are safe for you. You also should talk with your doctor about safe physical activities if you have symptoms such as chest pain or dizziness. Discuss ways that you can slowly and safely build physical activity into your daily routine. For more information, go to "Getting Started and Staying Active. The " Physical Activity Guidelines for Americans" explain that regular physical activity improves health. They encourage people to be as active as possible. The guidelines recommend the types and amounts of physical activity that children, adults, older adults, and other groups should do. The guidelines also provide tips for how to fit physical activity into your daily life. The information below is based on the HHS guidelines. Guidelines for Children and Youth The guidelines advise that: Children and youth do 60 minutes or more of physical activity every day. Activities should vary and be a good fit for their age and physical development. Any type of activity counts toward the advised 60 minutes or more. Most physical activity should be moderate-intensity aerobic activity. Examples include walking, running, skipping, playing on the playground, playing basketball, and biking. Vigorous-intensity aerobic activity should be included at least 3 days a week. Examples include running, doing jumping jacks, and fast swimming. Muscle-strengthening activities should be included at least 3 days a week. Examples include playing on playground equipment, playing tug-of-war, and doing pushups and pullups.

HEART AND LUNG FUNCTIONS AND INTEGRAL PART OF THE AEROBIC ENERGY SUPPLY SYSTEM pdf

3: Aerobic exercise - Wikipedia

Contents: Without pity -- Social psychology without pity -- The body as a machine -- Anaerobic and the role of aerobic -- Heart and lung functions and integral part of the aerobic energy supply system -- Paradigm: pain is a guardian of good health!

Oxygen is required for cellular functions. The air breathed in and held in the lungs is transferred to the blood. The blood is circulated by the heart, which pumps the oxygenated blood from the lungs to the body. Additionally, the two body systems work together to remove carbon dioxide, which is a metabolic waste product. The Heart How do the cardiovascular and respiratory systems work together? The heart is where circulation and cooperation between the respiratory and the cardiovascular systems begin. The heart has two ventricles and two atria. The right ventricle and atrium are where blood is received from the veins. Deoxygenated blood flows into the right atrium of the heart. When the heart muscle relaxes, the blood is released from the atrium and into the right ventricle. The right ventricle then pushes the blood through the pulmonary valve and into the pulmonary artery, where the blood is delivered to the lungs for retrieval of oxygen. The blood is then returned to the left side of the heart. As on the right side, the left atrium receives the blood and sends it to the ventricle when the heart muscle relaxes. Finally, the blood is pushed to the aorta and delivered to the rest of the body. The Lungs The lungs are where carbon dioxide and oxygen are exchanged. Lungs are the primary organ in the respiratory system. The process is called gas exchange. When you inhale, the alveoli in the lungs fill with oxygen. The oxygen is sent to blood cells in the capillaries that surround the alveoli. When you exhale, the carbon dioxide in the blood is sent to the alveoli, where it is expelled from the body. At this point, the blood is now filled with oxygen and returns to the heart. The valve to the aorta opens, and the blood is pumped into the artery. The aorta is the major artery of the body that delivers large amounts of blood to the different parts of the body, including the legs, the arms and the brain. Arteries Arteries are the main sources that deliver oxygenated blood to the body, and they are dependent on the lungs for the oxygen. The aorta branches into arterioles, which branch into even smaller vessels called capillaries. These capillaries have very small membranes that allow the oxygen to move across them and into the cells. Bronchioles and Alveoli The bronchioles and alveoli are the main parts of the lungs that deliver oxygen to the blood. The bronchioles are branches off the trachea that span the lobes of the lungs in the respiratory system. They terminate in alveoli, the site for gas exchange, which are tiny sacs surrounded by capillaries. When understanding how the cardiovascular system works with the respiratory system, these parts of the lungs are the main site for cardiovascular and respiratory interaction. Bronchioles and Alveoli in the Lungs About the Author Lysis is the pen name for a former computer programmer and network administrator who now studies biochemistry and biology while ghostwriting for clients. She currently studies health, medicine and autoimmune disorders. Lysis is currently pursuing a Ph.

HEART AND LUNG FUNCTIONS AND INTEGRAL PART OF THE AEROBIC ENERGY SUPPLY SYSTEM pdf

4: Physical Activity and Your Heart | National Heart, Lung, and Blood Institute (NHLBI)

Aerobic capacity is used to measure the health and capabilities of the entire cardio-respiratory system, including the blood vessels, heart and lungs. Your aerobic capacity is the amount of oxygen used by the muscles during exercise.

Muscles involved in exercise produce a significant amount of energy by combining foodstuffs with oxygen. The heart, in turn, pumps more oxygenated blood to the working muscles. If a steady supply of oxygen is not produced to meet the energy demands of an activity, then an energy imbalance develops, blood lactate LA levels rise, blood pH levels decrease and fatigue occurs. A fundamental knowledge of how the body works during different types of exercise is necessary for understanding both the basic concepts of energy production and the physiological adjustments made by the body to meet the energy requirements of exercising skeletal muscles. Basic concepts of energy and its sources The energy that is required for the normal functioning muscle contraction, conduction of nervous impulses, hormone synthesis, etc. These chemical reactions are either aerobic occurring in the presence of oxygen or anaerobic without oxygen. An individual must continually produce energy or the various tissues and organs in the body will cease to function. It would be akin to pulling the plug of an appliance from the electrical outlet. To clarify the relationship between food consumption and energy production, individuals should think of the human body as a factory. The body must process different raw materials to make its final product â€" energy. This energy is used by every cell of the body. The three basic raw materials the body uses to produce energy are oxygen, carbohydrates sugar and starches and fat. These materials essentially are available in an unlimited supply. Since humans live in a veritable sea of oxygen, an adequate supply is generally not a problem. When individuals eat food, carbohydrates and fat are replenished. It is important to note that of the three calorie-providing nutrients, protein is the only one that the body does not usually use to produce energy under normal circumstances. Proteins provide much of the structural basis for cells and are a major component of enzymes substances responsible for controlling various chemical reactions at the cellular level. If more protein is consumed than the body needs, the excess will be converted into either fat or carbohydrate. Since the amount of energy required at rest is so small, the human body does not consume much oxygen. Accordingly, the resting energy needs are easily met by the aerobic system. During the initial stages of exercise, however, the situation changes. Unfortunately, the rate of aerobic energy production is sluggish i. Thus, a delay exists in the delivery of oxygen from the outside. The anaerobic energy system serves this function. Since a specific amount of work requires a given amount of energy, the body must always have an appropriate level of energy available to meet the demands placed on it. The following descriptive timetable illustrates how energy is produced during the initial stages of exercise and during moderate intensity exercise: During this phase, oxygen is not required. Lactic acid is the by-product of this anaerobic reaction. After a few minutes, the aerobic system is able to supply all the energy needed for relatively mild exercise. If the exercise bout is relatively intense, other events take place to ensure that adequate amounts of energy are provided for the working skeletal muscles. The production of energy during exercise at relatively high levels of intensity occurs as follows: More carbon dioxide is also produced. The intensity of the muscle contractions causes a compression of the small arteries and, in effect, prevents oxygen, glucose or fat from entering the muscle cell. Thus, the majority of the carbohydrate needed comes from that which is already stored within the muscle itself. As lactic acid levels within the muscles increase, the efficiency of the aerobic chemical reactions are inhibited. When this occurs, inadequate amounts of energy can be produced aerobically. Accordingly, an individual has to either decrease the intensity level of the exercise bout thereby reducing the amount of energy needed or rely more heavily on the anaerobic system. In all likelihood, it is the presence of lactic acid that causes excessive breathing while exercising, and causes feelings of fatigue and heaviness in the muscles, eventually forcing an individual to stop exercising. To better comprehend how the body works during different types of exercising, an individual should understand the relative importance of the anaerobic and aerobic systems for energy production. Figure

1 provides an approximate idea of the maximal amount of energy a well-trained individual can produce over time, and how that energy is produced. For comparison purposes, the energy required at rest is given a value of one. Although the stored energy can be used to perform a lot of work very rapidly, these stockpiles are essentially exhausted after 10 to 20 seconds. This factor partially explains why individuals cannot run meters as fast as they can run meters, or why weightlifters can lift more in one lift than they can in three lifts without a pause. After 10 minutes, the amount of energy produced is very small. After five to six minutes of continuous exercise, the majority of energy the body requires has to be produced aerobically. The longer the duration of exercise, the greater the importance of the aerobic system. Anything over 10 minutes has to be performed aerobically, except for the occasional and brief increases in work output. If an individual increases the intensity level of exercise, a number of things will happen. Increases occur in heart rate, respiration and oxygen intake, as well as in the activity levels of other parts of the aerobic systems. A point occurs, however, beyond which oxygen intake cannot increase even though more work is being performed. At this point, the individual has reached a level that is commonly referred to as maximal oxygen uptake VO2 max. This measure is considered to be the best single indicator of aerobic fitness, since it involves the optimal ability of three major systems of the body pulmonary, cardiovascular and muscular to take in, transport and utilize oxygen. Energy production and exercise intensity. If the amount of work being performed is progressively increased along the continuum to levels of maximum capacity, the ability to produce energy aerobically will not be able to completely match the energy demands. For most sedentary individuals, this point occurs at a work output requiring approximately half of their VO2 max. Of course, the human body does not switch over to the anaerobic system all at once, but gradually shifts gears to produce energy at a faster rate. A level between 50 and 70 percent of VO2 max represents a transition phase for most people. Above 70 percent of VO2 max, the aerobic system does not produce energy fast enough, thereby causing individuals to rely more and more on their anaerobic systems. Another important factor that must be considered when examining the relationship between the production of energy and exercise intensity is lactic acid. Figure 2 presents a schematic diagram of the level of lactic acid in the blood relative to the intensity of exercise. The level of lactic acid is a rough indictor of the degree to which the anaerobic mechanism is being used. As Figure 2 illustrates, lactic acid will begin to rise slowly around 50 percent of VO2 max. Depending on the intensity and duration levels of the activity, it is important to note that many physical activities require both aerobic and anaerobic production of energy. For example, soccer players who often are required to run for extended periods i. Obviously, if the activity did not depend on the aerobic system for energy, they would not be able to run for nearly as long. However, when a game situation requires players to sprint after the ball high-intensity intervals which exceed 70 percent of VO2 max , these athletes are forced to draw upon their emergency anaerobic sources. Anaerobic chemical reactions are primarily used in high-intensity exercise of relatively brief duration e. Physiological adjustments to exercise The aerobic metabolism of fats and carbohydrates is the preferred and more efficient mode of energy production. Several physiological adjustments are made during exercise. The primary objective of these adjustments is to provide an exercising muscle with oxygenated blood that can be used for the production of energy. Academy Of Art University. The amount of blood pumped per minute by the heart is explained by the term cardiac output Q. This measure is indicative of the rate of oxygen delivery to the peripheral tissues e. Cardiac output, which is the product of heart rate HR and stroke volume SV , increases linearly as a function of work rate. At rest, Q is roughly four to five liters per minute, but can rise to 20 to 25 liters per minute during exercise in young, healthy adults. Heart rate, one of the two primary determinants of Q, also rises linearly with work rate. The gradual withdrawal of vagal parasympathetic nervous system influences and the progressive increases in sympathetic nerve activity which occur during exercise, are largely responsible for the observed increases in HR. At or near VO2 max, HR begins to level off and is referred to as maximal heart rate. Stroke volume SV is the other primary determinant of Q, and represents the amount of blood ejected from the heart during each beat. Unlike HR, SV does not increase linearly with work rate. SV increases progressively until a work rate equivalent to approximately 50 to 75

percent VO2 max is reached. Thereafter, continued increases in work rate cause little or no increase in SV. Exercise-induced increases in SV are believed to be the result of factors that are both intrinsic and extrinsic to the heart. According to the Frank-Starling law, a greater stretch is placed on the muscle fibers of the heart due to a greater venous return of blood to the heart during physical activity or exercise , resulting in a more forceful contraction of those fibers and, consequently, a greater SV. Extrinsic factors such as increased nervous sympathetic or endocrine release of adrenal hormones epinephrine and norepinephrine stimulation to the myocardium can also contribute to the increased SV that occurs during exercise. Systolic blood pressure SBP represents the force developed by the heart during ventricular contraction. SBP increases linearly with work rate. In healthy adults, SBP tends not to exceed mm Hg at maximal exercise levels. Diastolic blood pressure DBP , on the other hand, is indicative of the pressure in the arterial system during ventricular relaxation and reflects peripheral resistance to blood flow. DBP changes little from rest to maximal levels of exercise. Pulse pressure is important because it reflects the driving force for blood flow in the arteries. The sum of all the forces that oppose blood flow in the systemic circulation is expressed by the term total peripheral resistance TPR. Numerous factors can affect TPR, including blood viscosity, vessel length, hydrostatic pressure and vessel diameter. Vessel diameter is by far the most important of these factors, since TPR is inversely proportional to the fourth power of the radius of the vessel. If one vessel has half the radius of another, and if all other factors are equal, the larger vessel would have 16 times 24 less resistance than the smaller vessel. As a result, 16 times more blood would flow through the larger vessel at the same pressure. This factor has important implications for exercise, since certain organs require more blood flow than others during physical activity. During exercise, resistance in the vessels supplying the muscles and skin is decreased. As a result, blood flow to these parts of the body is enhanced.

HEART AND LUNG FUNCTIONS AND INTEGRAL PART OF THE AEROBIC ENERGY SUPPLY SYSTEM pdf

5: How Do the Respiratory & Cardiovascular System Work Together? | Sciencing

-- Vegetarian or mixed diet and pollution -- Whirlpool at F a requirement, virus, bacteria, cancer, benefits of warm water -- Speech, stroke and gastric tube -- Aphasia, dysphagia, speech recovery -- Speech rehabilitation to functional, instructions -- Muscle functions are not governed by the brain?

In humans the lungs take up a lot of the chest cavity. They are located just behind, and to either side of, the heart. They extend down from the collarbone to the diaphragm the muscular wall between the chest cavity and the abdominal cavity. In adult humans each lung is 25 to 30 cm. The right lung is somewhat larger than the left lung because it has three lobes, or sections, whereas the left lung has only two. When we breathe, the air travels to the lungs through a series of tubes and passages. The air enters the body through the nostrils or the mouth. It travels down the throat to the windpipe. Inside the chest cavity the windpipe divides into two branches, called the right and left bronchial tubes that enter the lungs. The large bronchial tubes branch into ever smaller tubes, called bronchioles. These in turn divide into even narrower tubes. Each small tube ends in clusters of thin-walled air sacs, called alveoli. It is the alveoli that receive the oxygen and pass it on to the blood. The alveoli are surrounded by tiny blood vessels, called capillaries. The alveoli and capillaries both have very thin walls, which allow the oxygen to pass from the alveoli to the blood. The capillaries then connect to larger blood vessels, called veins, which bring the oxygenated blood from the lungs to the heart. The largest veins that do this work are called the pulmonary veins, and they connect directly to the heart. Breathing and Respiration Sometimes we use the terms breathing and respiration to mean the same thing, but they actually are distinct processes. Breathing is the process of moving oxygen-rich air into and out of the lungs. Respiration refers to how the cells of the body use oxygen to create energy and how they exhale carbon dioxide that is a waste product of this process. The lungs have to work continuously because the body cells are constantly using up oxygen and producing carbon dioxide. Unlike the heart, the lungs have no muscle tissue. Instead, muscles in the rib cage and the diaphragm do all the work of lifting the ribs upward and outward to let the air in, and then relaxing to force the air out. Gas Exchange Why are oxygen and carbon dioxide such important gasses? All cells of the body need energy to do their work. They get energy by combining sugars or other food materials with oxygen. This chemical reaction is something like burning. Inside the body cells the chemical reaction gives off heat and other forms of energy. This energy provides the power we need to talk and move and think. When a fire burns, carbon dioxide is formed. When a body cell combines sugar with oxygen to get energy, carbon dioxide is formed there, too. But too much carbon dioxide could poison a cell. They need some way to get rid of carbon dioxide. The blood brings oxygen to the body cells and takes away their carbon dioxide. The blood that travels back to the heart and lungs is dark red. It has picked up carbon dioxide from the body cells, and it has left most of its oxygen with the cells. This is the blood that the heart pumps into the lungs. The carbon dioxide in the blood is exchanged for oxygen in the alveoli. These tiny air sacs in the lungs are only one cell thick and they are surrounded by capillaries that are also only one cell thick. Blood from the heart flows through these capillaries and collects oxygen from the alveoli. At the same time, carbon dioxide passes out of the capillaries and into the alveoli. When you breathe out, you get rid of this carbon dioxide. The bright red, oxygen-rich blood is returned to the heart and pumped out to the body.

HEART AND LUNG FUNCTIONS AND INTEGRAL PART OF THE AEROBIC ENERGY SUPPLY SYSTEM pdf

6: Bloodâ€™s Function in the Body and in Metabolism Support

Unfortunately, the rate of aerobic energy production is sluggish (i.e., oxygen must be breathed in, transferred from the lungs to the blood, carried to the heart and then pumped to the muscles where it actually is needed).

D and Lance C. Introduction What are the physiological limitations of the human body? How much more are you capable of doing? The curiosity and complexity of solving these questions have led to a plethora of research investigations on human potential. Much about the mystery of muscular strength is just now being unraveled with the advances in genetics research and will be the topic of a future article. Whether you are a world-class athlete or a recreational runner, your capacity for endurance exercise has similar physiological limitations. One is limited in this pursuit by a complex integration of multiple physiological functions. The capacity for oxygen consumption is reliant upon the physiological parameters of maximal oxygen uptake, lactate threshold, and economy of movement in the given activity. Fuel, or food substrate, is supplied mostly through carbohydrates and fats. Hydration levels and genetic factors also play influential roles in the capacity for endurance exercise. This article will review the main physiological mechanisms limiting endurance exercise and performance. Prolonged exercise requires sustained energy provision to maintain muscle contraction and is accomplished through the continual production of ATP adenosine triphosphate , the universal energy molecule. The production of ATP is accomplished through three metabolic pathways breakdown of a fuel to release energy , which include the phosphagen system the production of ATP from creatine phosphate , glycolysis glucose breakdown , and mitochondrial respiration aerobic metabolism within the mitochondrion of the cell. The first two pathways are only capable of energy production for short durations; consequently, ATP regeneration for extended exercise is accomplished predominantly through mitochondrial respiration. The biochemical reactions involved in mitochondrial respiration depend on continuous oxygen availability for proper functioning. Enhanced oxygen delivery and utilization during exercise will improve mitochondrial respiration and subsequently the capacity for endurance exercise. Both central heart, lungs, blood vessels and peripheral tissue extraction of oxygen physiological functions can limit VO2max. The relative importance of each function in limiting endurance performance has been discussed, researched and debated by exercise physiologists for decades. The role of the central component is for oxygen to be transported from the atmosphere and delivered to the muscles where it is utilized during mitochondrial respiration to produce ATP. Pulmonary diffusion The lungs serve a primary function of transferring oxygen from the atmosphere to the blood, and for the removal of carbon dioxide from the body. Pulmonary ventilation, or breathing, is the movement of air into and out of the lungs. Pulmonary diffusion is the exchange of oxygen and carbon dioxide between the lungs and the blood. In normal individuals, pulmonary diffusion is not a limiting factor to VO2max. However, in well-trained endurance athletes, with much higher cardiac outputs which is the product of heart rate and stroke volume , pulmonary diffusion may become a limiting factor to VO2max. Despite this possibility, pulmonary diffusion is thought to play a minor role in the overall limitation of oxygen delivery for endurance performance. Contrariwise, stroke volume the amount of blood pumped per heart beat increases substantially from endurance training. However, from endurance training, both the left and right ventricles have expanded capacity to fill with blood. The heart, being a muscle with the ability to extend, also attains a greater stretch from the increased blood volume, which results in a stronger elastic recoil for ejecting the blood to the body tissues. The variation in individual maximal stroke volume explains most of the range observed in VO2max in trained and untrained individuals. This allows for further increases in cardiac output and improved endurance performance. Blood Volume and Flow Working muscles demand considerably more oxygen and nutrients. To meet these needs, more blood must be allocated to the muscles during endurance exercise. The final link in the oxygen delivery chain from the lungs and heart is the oxygen carrying capacity of the blood. Oxygen is transported in the blood bound to a molecule called hemoglobin located within red blood cells. Regular, intense endurance training will increase blood volume via two mechanisms: It is important to add that during intense endurance exercise the body redistributes blood flow to the metabolically active skeletal muscles, readying the tissues for extraction of the needed oxygen. To briefly recap all of the above, oxygen delivery to muscles during endurance exercise may be limited by central factors including pulmonary diffusion, maximal cardiac output, and blood oxygen carrying capacity volume and flow. Despite the apparent central limiting factors to VO2max and endurance exercise, research has also suggested the influence of peripheral limiting factors, which is where we now shift our focus. A pressure gradient difference existing between the blood and muscle cells allows for the transportation of oxygen from the red blood cells into the mitochondria. Oxygen utilization and continued mitochondrial respiration rely on the maintenance of this gradient. Which is More Crucial to VO2max: The Central or Peripheral Component? Although most current research supports the central component to be the main limitation to VO2max Wilmore and Costill , the importance of peripheral components to VO2max should not be minimized. However, due to the logistical constraints of studying the consumption of oxygen at the cellular level, at highly intense levels, the entire picture of oxygen utilization is still developing Robergs Exercise Economy The term economy is used to express the oxygen consumption required to perform a given exercise workload, whether it be spinning, running, or any other endurance activity Daniels Differences in oxygen consumption between individuals at similar exercise workloads illustrate the individual variation found in exercise economy. Consequently, individuals with similar VO2max values can have much different endurance performances depending on their economy of movement. The performance benefit of this training adaptation is that an individual is capable of maintaining a higher steady state exercise intensity below the lactate threshold during the endurance exercise. This allows the endurance exerciser to maintain faster steady state tempos during training or racing, leading to improved endurance performance. It has been proposed that the best predictor of endurance performance is the maximal steady state workload achieved near VO2max Weltman To better understand and appreciate the lactate threshold, a physiological explanation describing its mechanism is warranted. The primary pathway for ATP regeneration during endurance exercise is mitochondrial respiration, which initially shares the same metabolic pathway as glycolysis, where muscle glycogen glycogen is the store form of glucose in muscle or the liver or blood glucose is converted into another chemical molecule called pyruvate. Depending on exercise intensity, pyruvate will either enter the mitochondria or be converted to lactate. At exercise intensity levels below the lactate threshold, pyruvate enters the mitochondria and muscle contraction continues through oxidative ATP production. However, at exercise intensity levels above the lactate threshold, the capacity to produce ATP through mitochondrial respiration is compromised, and pyruvate is converted to lactate. The physiological explanations for lactate threshold improvements following endurance training are related to increased mitochondria size, numbers, and enzyme levels. Additionally, the previously mentioned 2-fold increase in mitochondrial enzymes will also enhance mitochondrial respiration capacity. The combined result of these adaptations is a delayed timeline to lactate threshold and greater capacity to perform endurance exercise. Maximizing Endurance Performance The potential for endurance performance according to the physiological parameters we have examined thus far is limited by the complex interaction of VO2max, economy, and lactate threshold. An individual would achieve their endurance potential by maximizing their physiological capacities in each of these components. In an effort to investigate the endurance potential of humans, researchers have input VO2max, economy, and lactate threshold levels into theoretical models to predict the ideal performance for a marathon Joyner These optimal performances in each physiological component would result in an amazing time of 1: Substrate Availability and Utilization Thus far, we have focused on the metabolic machinery VO2max, economy, and lactate threshold necessary for endurance exercise and performance. However, the ability to exercise for extended periods requires not only adequate metabolic machinery but also fuel food substrates for continual muscle contraction. Availability and utilization of these substrates plays a significant role in the limitations to endurance exercise. The intensity of endurance exercise regulates the substrate utilized for the provision of energy. While carbohydrate substrate supply is limited, lipid supply in most individuals is unlimited. After approximately 2 hours of intense steady state exercise, muscle glycogen stores become significantly depleted resulting in fatigue, regardless of the presence of an adequate oxygen supply. When muscle glycogen stores are exhausted, individuals experience fatigue and muscular pain. One of the most noted physiological adaptations to endurance training is an increased reliance on fats at the same relative intensity workload. Most endurance competitions are performed at intensities near the lactate threshold in which substrate utilization relies almost entirely on blood glucose and muscle glycogen. This training adaptation extends the duration and intensity of the endurance exercise prior to muscle glycogen depletion, and subsequent fatigue becomes prolonged. The approach calls for the individual to train intensely while maintaining a low-carbohydrate diet early in the week, thus depleting muscle glycogen stores. Unfortunately, this practice, though effective, is also mentally and physically demanding for the individual. During these activities, the energy supply provided by lipids is virtually inexhaustible in most individuals. Consequently, the limitation to performance in these longer, lower intensity events is the result of physiological mechanisms other than substrate supply and oxygen availability, and may be the product of muscle damage. Hydration and Endurance Exercise Sweating is a normal physiological response to prolonged exercise, required for the dissipation of heat produced during energy metabolism. Unfortunately, this natural occurring response can also result in substantial fluid loss and impaired endurance performance. Inadequate fluid balance throughout prolonged bouts of exercise or training sessions results in several deleterious physiological events including increased heart rates and temperatures. Research has suggested that rising body core temperatures may cause fatigue in the muscles by impairing mitochondrial respiration and central nervous system Fitts Dehydration also results in higher heart rate values for the same submaximal intensity due to decreased stroke volumes, resulting from the lower blood plasma volumes. Although dehydration is a naturally occurring physiological limitation to endurance exercise, it can be countered to a certain degree by adequate hydration practices both prior to and during endurance exercise. Currently, there are many different approaches and products used by endurance enthusiasts for pre-exercise and exercise hydration, including the ingestion of solutions comprised of water, salt, simple carbohydrates, electrolytes and glycerol. Various researchers have reported a genetically regulated upper limit to individual VO2max values Bouchard et al Similarly, training improvements in economy and lactate threshold are parameters that are also genetically regulated. Genetic differences in muscle fiber type proportion slow-twitch and fast-twitch are also commonly found in individuals. Slow-twitch muscle fibers, characterized by more mitochondrial mass and enzyme levels than fast-twitch muscle fibers, have an increased capacity for mitochondrial respiration. Elite endurance athletes generally possess high percentages of slow-twitch muscle fibers in muscles contributing to their respective endurance exercise. The advantage of more slow-twitch muscle fibers includes greater mitochondrial capacity, increased oxygen consumption, and increased performance in endurance exercise. Conclusion The purpose of our article was to review the major physiological limitations to endurance exercise. Though the physiological mechanisms regulating endurance performance are quite complex, the main factors limiting prolonged exercise have a straightforward interpretation. To continue exercise for extended durations, sustained muscle contraction must be maintained and is dependent on the continuous provision of both oxygen and fuel. Although each of the physiological limitations is modifiable through endurance training, it is important to recognize that genetic factors play a tremendous role in the trainability of these limitations and their capacity. It is therefore critical for coaches, fitness instructors, and personal trainers to recognize the all of the physiological components limiting endurance performance as they design exercise programs to improve endurance capacity. Limiting factors for maximum oxygen uptake and determinants of endurance performance. Medicine and Science in Sport and Exercise, 32 1 , Familial aggregation for VO2max response to exercise training: Journal of Applied Physiology, 87, Gas exchange in exercise.

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7: How Does Running Help Your Respiratory System? | Healthy Living

The other part of the respiratory system is the muscles, such as the intercostals (muscles between the ribs) and the diaphragm, which cause the lungs to expand and contract. When the size of the lungs changes, so does the pressure inside, leading to air either coming in (inhalation) or being forced out (exhalation).

Kenneth Cooper and Col. Pauline Potts, a physical therapist, both of the United States Air Force advocated the concept of aerobic exercise. In the s, Cooper started research into preventive medicine. He conducted the first extensive research on aerobic exercise on over 5, U. Cooper published his ideas in a book "Aerobics". In he created his own institute the Cooper Institute for non-profit research and education devoted to preventive medicine and published a mass-market version of his book "The New Aerobics" in Cooper encouraged millions into becoming active and is now known as the "father of aerobics". Bioenergetic systems This section needs additional citations for verification. Relevant discussion may be found on the talk page. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. October Learn how and when to remove this template message Fox and Haskell formula showing the split between aerobic light orange and anaerobic dark orange exercise and heart rate Aerobic exercise and fitness can be contrasted with anaerobic exercise , of which strength training and short-distance running are the most salient examples. The two types of exercise differ by the duration and intensity of muscular contractions involved, as well as by how energy is generated within the muscle. Myokine secretion in turn is dependent on the amount of muscle contracted, and the duration and intensity of contraction. As such, both types of exercise produce endocrine benefits. What is generally called aerobic exercise might be better termed "solely aerobic", because it is designed to be low-intensity enough not to generate lactate via pyruvate fermentation , so that all carbohydrate is aerobically turned into energy. Initially during increased exertion, muscle glycogen is broken down to produce glucose, which undergoes glycolysis producing pyruvate which then reacts with oxygen Krebs cycle , Chemiosmosis to produce carbon dioxide and water and releases energy. If there is a shortage of oxygen anaerobic exercise, explosive movements , carbohydrate is consumed more rapidly because the pyruvate ferments into lactate. If the intensity of the exercise exceeds the rate with which the cardiovascular system can supply muscles with oxygen, it results in buildup of lactate and quickly makes it impossible to continue the exercise. Unpleasant effects of lactate buildup initially include the burning sensation in the muscles, and may eventually include nausea and even vomiting if the exercise is continued without allowing lactate to clear from the bloodstream. As glycogen levels in the muscle begin to fall, glucose is released into the bloodstream by the liver, and fat metabolism is increased so that it can fuel the aerobic pathways. Aerobic exercise may be fueled by glycogen reserves, fat reserves, or a combination of both, depending on the intensity. Exhaustion of glycogen is a major cause of what marathon runners call " hitting the wall ". Training, lower intensity levels, and carbohydrate loading may allow postponement of the onset of exhaustion beyond 4 hours. In general, it is performed at a moderate level of intensity over a relatively long period of time. For example, running a long distance at a moderate pace is an aerobic exercise, but sprinting is not. Playing singles tennis, with near-continuous motion, is generally considered aerobic activity, while golf or two person team tennis, with brief bursts of activity punctuated by more frequent breaks, may not be predominantly aerobic. Some sports are thus inherently "aerobic", while other aerobic exercises, such as fartlek training or aerobic dance classes, are designed specifically to improve aerobic capacity and fitness. It is most common for aerobic exercises to involve the leg muscles, primarily or exclusively. There are some exceptions. Common kettlebell exercises combine aerobic and anaerobic aspects. Benefits[edit] Among the recognized benefits of doing regular aerobic exercise are: One meta-analysis has shown, from multiple conducted studies, that aerobic exercise does help lower Hb A1Clevels for type 2 diabetics. In addition, high-impact aerobic activities such as jogging or using a skipping rope can stimulate bone growth, as well as reduce the risk of osteoporosis for both men and women. In addition to the health benefits of aerobic exercise, there are numerous performance benefits: Increased storage of energy molecules such as fats and carbohydrates within the muscles, allowing for increased endurance Neovascularization of the muscle sarcomeres to increase blood flow through the muscles Increasing speed at which aerobic metabolism is activated within muscles, allowing a greater portion of energy for intense exercise to be generated aerobically Improving the ability of muscles to use fats during exercise, preserving intramuscular glycogen Enhancing the speed at which muscles recover from high intensity exercise Neurobiological effects: Overuse injuries because of repetitive, high-impact exercise such as distance running Is not an effective approach to building muscle Only effective for fat loss when used consistently Both the health benefits and the performance benefits, or "training effect", require a minimum duration and frequency of exercise. Most authorities suggest at least twenty minutes performed at least three times per week. Cooper describes some of the major health benefits of aerobic exercise, such as gaining more efficient lungs by maximising breathing capacity, thereby increasing ability to ventilate more air in a shorter period of time. As breathing capacity increases, one is able to extract oxygen more quickly into the blood stream, increasing elimination of carbon dioxide. With aerobic exercise the heart becomes more efficient at functioning, and blood volume, hemoglobin and red blood cells increase, enhancing the ability of the body to transport oxygen from the lungs into the blood and muscles. Metabolism will change and enable consumption of more calories without putting on weight. Aerobic exercise can delay osteoporosis as there is an increase in muscle mass, a loss of fat and an increase in bone density. With these variables increasing, there is a decrease in likelihood of diabetes as muscles use sugars better than fat. One of the major benefits of aerobic exercise is that body weight may decrease slowly; it will only decrease at a rapid pace if there is a calorie restriction, therefore reducing obesity rates. VO2 max Aerobic capacity describes the functional capacity of the cardiorespiratory system, the heart, lungs and blood vessels. Aerobic capacity refers to the maximum amount of oxygen consumed by the body during intense exercises, in a given time frame. To measure maximal aerobic capacity, an exercise physiologist or physician will perform a VO2 max test, in which a subject will undergo progressively more strenuous exercise on a treadmill, from an easy walk through to exhaustion. The individual is typically connected to a respirometer to measure oxygen consumption, and the speed is increased incrementally over a fixed duration of time. The higher the measured cardiorespiratory endurance level, the more oxygen has been transported to and used by exercising muscles, and the higher the level of intensity at which the individual can exercise. More simply put, the higher the aerobic capacity, the higher the level of aerobic fitness. The Cooper and multi-stage fitness tests can also be used to assess functional aerobic capacity for particular jobs or activities. The degree to which aerobic capacity can be improved by exercise varies very widely in the human population: Commercial success[edit] Aerobic exercise has long been a popular approach to achieving weight loss and physical fitness, often taking a commercial form.

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8: Physical Activity/Aerobic Exercise - Wikibooks, open books for an open world

When you exercise, the wide effects of exercise on the heart, lungs, and other major body systems provides a challenge to maintaining homeostasis both during and after exercise. After a workout, your body's main goal is to return to normal function.

Using heart rate as guide[edit] Use at your own discretion. This is NOT medical advice. Any change in lifestyle involving massive change in physical activity should be under doctors supervision. When we start conditioning, at first, our heart beat goes up to high levels even with very moderate forms of exercise. The reason for this is that our cardiovascular system and our respiratory system are not conditioned. In other words, they are not very effective for a person who has not exercised for years. But once we start exercising, these systems keep on becoming more and more effective and conditioned. Our heart becomes stronger and our lungs become stronger. Our body is able to supply more oxygen to the muscles in an easier fashion. Similary, the muscular system becomes more efficient. Our muscles are able to produce more work by using more energy. A fit and conditioned individual can work more through his muscles than a deconditioned person. His muscles are stronger and better adapt at working. So, as we train, our body can supply more oxygen, more easily, and the muscles can use that extra oxygen to do more work more easily. Therefore, no matter if you are a fit individual or some one who has been living a sedentary lifestyle for the past many years, you can use heart rate as an effective guide line for your exercise intensity. Your heart rate will tell you how comfortable your body is while exercising. Other methods like your speed or inclination or resistance etc. An unconditioned individual might be struggling at a speed, at which a trained individual is barely breaking a sweat. However, the heartbeat will tell a different story. Here is the theory behind using heart beat as a guide: It declines with age variably and there is an interindividual variability as well. Here is a rough approximation for the maximum heart rate for an individual: There is no need to push too much. For example, I am These are all approximations. As an alternative to measure the heart rate run and try to talk at the same time. That means that they can easily remain very comfortable and get significant health improvements. Very soon they will find that their heart beat does not rise that sharply. Invest in a good heart rate monitor. I think, polar makes excellent heart rate monitors. Buy the ones that have a chest strap. I found the chest strap heart rate monitors to be much more accurate. Do you have any idea how much difference these calories can make! Base line - become fit. Aerobic exercise, Running for example, is a pleasure and it gives the best feeling in the world to run. The whole body becomes more powerful and stronger. Warming up and cooling down[edit] It is very important to warm up before suddenly increasing the intensity of your exercise. It is equally if not more important to slowly cool off. These two things prevent injury. The cool down is important for recuperation of your body. This acid slows down the healing process and makes you sore. Generally, 5â€”10 minutes to warm up and about 5 minutes to cool down is sufficient. During the cool down, it is a good idea to write down your daily exercises. After both the cool down and warm up phase, 5â€”10 minutes of stretching should follow. This also prevents injury, helps in recuperation, and helps to alleviate lactic acid buildup. Specific exercise tips[edit] Treadmill[edit] I found treadmill to be an excellent machine for aerobic exercise. I have always loved running and treadmill makes it so easy. Running on a treadmill, lessens chances of injury. No problems with weather. Also, most good treadmills absorb the shock, making the running more comfortable for your legs. Also, most treadmills have excellent programs built into them. These programs have been designed by experts and use contemporary exercise theories. Programs like heart rate based programs, can use your heart rate monitors to adjust the inclination etc. With the higher grade, you will be pushing more against the treadmill than the treadmill will be pushing your feet along. You never know when you might lose a step or something and end up falling. The last thing you want is the belt burning your back or increasing your injury by throwing you around. Always, clip that stop button to your clothes. This is extremely important if you are going to run at a fast pace. Heart Rate Monitor Guide: I think most treadmill heart rate monitors lack precision. A good heart rate monitor would be a good investment if you plan on exercising seriously. Biking is another excellent aerobic exercise, besides being immensely entertaining. Tips about buying a bike and accessories[edit] Shoes Get special biking shoes. If your pedals have the lock-in mechanism, get matching shoes. The shoes can be "clipped" into the pedals. Pedals without this system but that offer the possibility to lock your foot are called clipless. That allows you to pull the pedals up in addition to the usual push down. That allows you to complete a full rotation instead of each leg just completing a partial rotation. In addition to using more muscle groups you can, with practice, develop a smoother pedal cycle with greater stability and thus allowing higher cadence. Higher cadence is essential for cardiovascular stress and training. Note that, some basic practice is needed to be able to easily unlock and lock your feet and to immediately unlock your feet in case of emergency. It does not matter that you bike is 1 lb. It will pinch you for long if you belong to the category that most of us belong to. Pump Tire pressure is essential for optimum performance. Correct tire pressure will yield a sufficiently low rolling resistance of the tire and a minimal risk of flats. Also, rolling resistance is significantly increased resulting in less than optimal speeds. Over-inflation only reduces the rolling resistance marginally but creates some other issues such as easy puncture flats and bouncing behavior, compromising bike stability. The pressure required is a variable depending on driver weight, the kind of tire and ride circumstances. Tires The choice depends on the kind of bike. There are specific tires for each kind of bike. The difference is in tire width and profile. The wider the tire, the higher the rolling resistance because of larger contact area, but also the higher the grip on the surface. Profile refers to the tire surface, this can be smooth slicks or heavy profile like on mountain bikes. The heavier the profile the more drag and grip it has on loose surfaces such as mud and sand. There is absolutely no point in any profile when the only surface you ride on is asphalt road. With this in mind, a road bike has a thin smooth tire with the lowest rolling resistance and a mountain bike will have a wide tire with heavy profile for optimum grip on rough surfaces. City bikes, cyclo-cross bikes or other models may choose for something intermediate. Other Accessories Accessories are optional but can be useful. The use of a helmet is heavily debated and a little out of the scope of this article. Cycling gloves may offer protection against RSI repetitive stress injuries from leaning on the handlebars by means of the padding in them. They can also offer extra comfort when riding rough surfaces. Most professional cyclists wear them but the choice remains yours. Glasses provide you with cover for dust and bugs but may also provide a hinder during heavy weather. Cycle clothing has several uses but may dramatically improve riding comfort, especially when riding for greater distances. Cycling shorts are essential in preventing shearing injuries from leg action under sweaty circumstances. The jerseys are in a fabric that allows sweating while still keeping warm. Basically the lycra allows for a more optimal thermoregulation, in addition they provide back pockets. Another good accessory - heart rate monitor. Its fun to see your heart rate once in a while.

9: - NLM Catalog Result

systemic circulation The part of the circulatory system that moves blood between the heart and the rest of the body; controlled by the left side of the heart.

Watch this brief animation on the importance of blood components. Nutrients In Once absorbed from the small intestine, all nutrients require transport to cells in need of their support. Additionally, molecules manufactured in other cells sometimes require delivery to other organ systems. Blood is the conduit and blood vessels are the highway that support nutrient and molecule transport to all cells. Water-soluble molecules, such as some vitamins, minerals, sugars, and many proteins, move independently in blood. Fat-soluble vitamins, triglycerides, cholesterol, and other lipids are packaged into lipoproteins that allow for transport in the watery milieu of blood. Many proteins, drugs, and hormones are dependent on transport carriers, primarily albumin. In addition to transporting all of these molecules, blood must transfer the oxygen breathed in by the lungs to all cells in the body. As discussed, the iron-containing hemoglobin molecule in red blood cells accomplishes this. Wastes Out Figure Nutrients In and Wastes Out In the metabolism of macronutrients to energy, cells produce the waste products carbon dioxide and water. As blood travels through smaller and smaller vessels, the rate of blood flow is dramatically reduced allowing for efficient exchange of nutrients and oxygen for cellular waste products. The kidneys remove any excess water in the blood, and blood delivers the carbon dioxide to the lungs where it is exhaled. Also, the liver produces the waste product urea from the breakdown of amino acids, and detoxifies many harmful substances, all of which require transport in the blood to the kidneys for excretion. All for One, One for All We are not going to talk about the three musketeers, but we will talk about the way our bodies function and work harmoniously to sustain life. The eleven organ systems in the body completely depend on each other for continued survival as a complex organism. Blood allows for transport of nutrients, wastes, water, and heat, and is also a conduit of communication between organ systems. The brain metabolizes, on average, 6 grams of glucose per hour. In order to avert confusion, coma, and death, glucose must be readily available to the brain at all times. To accomplish this task, cells in the pancreas sense glucose levels in the blood. If glucose levels are low, the hormone glucagon is released into the blood and is transported to the liver where it communicates the signal to ramp-up glycogen breakdown and glucose synthesis. The liver does just that, and glucose is released into the blood, which transports it to the brain. Concurrently, blood transports oxygen to support the metabolism of glucose to energy in the brain. Healthy blood conducts its duties rapidly, avoiding hypoglycemic coma and death. Maintaining healthy blood, including its continuous renewal, is essential to support its vast array of vital functions. Blood is healthy when it contains the appropriate amount of water and cellular components, and proper concentrations of dissolved substances, such as albumin and electrolytes. As with all other tissues, blood needs macro- and micronutrients to optimally function. In the bone marrow, where blood cells are made, amino acids are required to build the massive amount of hemoglobin packed within every red blood cell, along with all other enzymes and cellular organelles contained in each blood cell. Red blood cells, similar to the brain, use only glucose as fuel, and it must be in constant supply to support red-blood-cell metabolism. As with all other cells, the cells in the blood are surrounded by a plasma membrane, which is composed of mainly lipids. Blood health is also acutely sensitive to deficiencies in some vitamins and minerals more than others, a topic that will be explored in this chapter. Blood tests are helpful tools in diagnosing disease and provide much information on overall health. In standard blood tests performed during an annual physical, the typical blood tests conducted can tell your physician about the functioning of a particular organ or about disease risk. A biomarker A measurable molecule or trait that is connected with a specific disease or health condition. The concentrations of biomarkers in blood are indicative of disease risk. Some biomarkers are cholesterol, triglycerides, glucose, and prostate-specific antigen. The assessment of multiple blood parameters aid in the diagnosis of disease risk and are indicative of overall health status. This table notes only a few of the things that their levels tell us about health.

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Brand Stretch: Why 1 in 2 extensions fail, and how to beat the odds Teach yourself visual basic 6 in 21 days Mediterranean specialties for the modern cook. Faust and the sin of sloth, by L. W. Forster. Nikon d7000 user manual in hindi Alzheimers disease, primary hypertension and constipation William golding the inheritors Conscience and power Why Werent We Told? Religious Secrets and Deceptions Revealed Just me and my mom Developing Basic Skills Programs in Secondary Schools (ASCD Publications) Classified Information Leo Prokine Benedict XVI on the Eucharist Katawan Ana P. Ebo Journey Between Worlds Federal aid for the Mississippi and Sacramento Rivers 52 Dates for You and Your Mate Guide to the manufactures of Ontario and Quebec Pottery, porcelain, and glass. In memoriam Laszlo Moholy-Nagy Culmination of the tax research process and legal and ethical considerations Terms, concepts, and definitions The Editor of Love and Other Stories Diego Rivera: Artist and Muralist (Fact Finders Biographies: Great Hispanics) A passion for specialty paper Thoughts for the occasion, fraternal and benevolent The agony and the ecstasy irving stone Re-invigorating the nation: popular films and American national identity Feliciana meets dLoup Garou I spy a Christmas tree Woods Two years residence in the settlement on the English Prairie-June 25, 1820-July 3, 1821 . Knowledge to Support the Teaching of Reading Consensus processes K. Armon Bridge across the Osage River, in Benton County, Mo. Sacred geography of Puri The Mark of the Wolf Green leaves of summer sheet music Ocean in human affairs Canonical analysis and factor comparison Primary biliary cirrhosis and primary sclerosing cholangitis Mical S. Campbell and Thomas Faust