

## Thoughts on the Human Body

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“One Sunday morning when both my dad and I were working in our offices, he walked into my office and gave me this manuscript. I read it, said I enjoyed it, and asked where he was going to publish it. He answered, ‘Nowhere. I just wrote it for you.’ I recently came across it while cleaning out some files. I thought others would like to read it since it was written in the 1960s.” – John Ochsner, MD

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When we arrive on this earth we are endowed with the most perfect, the most efficient, and the best constructed machine ever devised – our body. A machine beautifully engineered and constructed with the best materials with no planned obsolescence. Almost all bodies are constructed with material of superb quality destined with proper use to last long periods of time. However, a few – whose family history as regards longevity is not the best – are constructed of materials somewhat less than perfect. Osler once said that those who want to live to a ripe old age should choose the right grandparents. However, it is a little late for some of us to do that. Heredity does play a role in our longevity but we are responsible, as in the case of most machines, for the adequate care and maintenance is what determines whether the machine functions well and lasts a long time without excessive wear and early obsolescence.

Anyone who buys a machine, whether it be a washing machine or sewing machine, an automobile, or a power plant, knows that with proper care and supervision the machine will function well without difficulty for long periods of time even though it ultimately will wear out. The body’s computer, the brain, is by far the most sophisticated, the finest

constructed, the most efficient computer that has ever been or ever will be designed. No man-made computer can approach the efficiency of the computer each of us has. As in the man-made computer, the efficiency of the computer and its value depend largely upon the material fed into it (program). No computer is better than the material it receives. With proper programming, the recall value of the human computer is unexcelled. Conversely, with improper programming and improper input, the recall can be anything but desirable; as a matter of fact it can be detrimental. Our computer is housed in an area, the shell, which is well protected as it is necessary for the man-made computer in which it is housed to have not only a constant temperature but also constant humidity. The brain’s frontal lobes which contain higher centers form an extremely elaborate electrical system which monitors and operates the entire machine with an efficiency that is unknown in any other machine. Located in the brain is the center for the activation of the various motors (muscles that move our body, for monitoring the various activities which are essential for proper function, namely the pumping system, the waste disposal system, the heart-regulating system, the alarm system).

The thermostat which is located in the brain is adjusted to such a fine degree that the temperature remains constant almost at all times unless something interferes with the function of the machine. If the body generates more heat, the thermostat goes to work and opens up avenues for the dissipation of the heat, such as the dilatation of vessels on the surface of the body and outpouring of fluid on the surface to permit evaporation which tends to lower the surface temperature. An increase in the rate air is exchanged in the lungs also permits dissipation of heat. Conversely, when insufficient heat is generated or in cold areas, the valves controlling flow through the pipes (blood vessels) extending to the body surface are closed, shunting most of the fluid (blood) into the interiors and preventing the dissipation of the heat in the periphery. Also, more heat is generated by involuntary contraction of muscles, i.e. shivering. Under certain conditions such as infections associated with increased heat production, the heat-regulating center is affected so that the dissipation of heat is altered. This results in increased temperature within the machine which can at times become dangerous and require supplemental measures such as cooling the outside to control the

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excess temperature. This is seen in individuals with severe infection or in heat stroke in which the heat regulating center has lost its ability to effectively regulate the heat.

The pumping system of the body is the most efficient of all pumping systems. It begins working while the infant is still in utero and pumps day and night without cessation until the individual dies at the age of 50, 60, 70, 80, or even 100. With no rest, it is obvious that this machine is a very efficient one. It requires a great deal of energy – much more than is ordinarily thought. The amount of energy required by the human heart at rest, i.e. asleep, is 40-foot tons in 24 hours, which is the amount of energy necessary to elevate a ton 24 feet in 24 hours, a power far too great to be supplied by a battery. Additionally, of all machines the human heart is the most efficient, a two-cylinder pump which is most efficient at the time of its greatest stress. Most pumps when under increasing stress require increasing amounts of energy. The human heart, however, requires less energy at the time of its greatest stress than when subjected to less stress. At the beginning of contraction of the heart when the blood pressure is at the resting stage (diastole) more energy is required than at the completion of the contraction when the blood pressure is highest (systole). No other pump has this degree of efficiency. The heart requires no conscious action on our part to function, but it is under the control of the nervous system to a certain extent in that its rate is slowed by stimulation of the vagus nerves and increased by stimulation of the sympathetic nerves. Normally the heart assumes its own control and is automatic in this control unless there is some external stimulus that causes it either to be slowed or to be increased in rate. With increased exertion on the part of the individual, more blood is needed to be pumped to the various parts of the body to supply more food and oxygen, resulting in an increased heart rate and pumping efficiency of the heart. Normally, the heart contraction stimulation is initiated at the base of the heart in the pacemaker. First, the auricles which are the less muscular chambers at the base of the heart contract and then the electrical impulse is carried down through a cable, the bundle of His, to the ventricles which are the powerful muscular chambers. One of the ventricles drives the blood through the lungs and the other out through the body. If as the result of a heart attack the cable, the bundle of His, is injured preventing the electrical impulse transmission, the ventricles assume their own rhythm which usually is much slower than that produced by the normal pacemaker. If the rhythm by the ventricles is not sufficient to sustain the blood supply to the brain, the individual may faint. The

individual is likely to be incapacitated and can exert very little, if at all. In such instances an artificial pacemaker is used. The electrodes are implanted in the muscles of the ventricles so that the artificial pacemaker stimulates the ventricles with a small electrical impulse producing the desired heart rate.

A great deal of energy is required by the body. Contraction of muscles including the heart, as for every motor, requires energy. In all these activities a great deal of oxygen is required to permit the combustion of the fuel utilized. Oxygen enters the body through the respiratory tract, the nose, mouth, trachea, and lungs, is absorbed in the lungs by the hemoglobin in the red blood cells, and is delivered to all the cells of the body. In the cells oxygen is exchanged for the carbon dioxide which is the waste product of the cell resulting from the energy generated within the cell. The carbon dioxide in turn is transported by the blood back to the lungs where it is given up and discharged from the body in the exhaled air. In this way, the marvelous transport system of carrying oxygen to the tissues for their vital uses and the transportation of the noxious carbon dioxide back to the lungs to be exhaled is almost an automatic process. If exertion is increased, more energy is required, necessitating a greater oxygen supply to burn the fuel needed to supply the increased energy need. This requires not only an increase in the pumping rate of the blood but also an increase in the rate of breathing so that there is a more rapid discharge of noxious carbon dioxide out of the body and absorption of oxygen into the blood. Fuel supplies and waste products are transported in the blood throughout the body through an intricate tubular system equipped with a valvular-like mechanism which regulates the blood to different parts of the body. Since the body motors (muscles, glands, nerves, etc.) vary in their requirement needs from time to time, this selective supply is particularly efficient. By this mechanism blood and its necessary constituents can be shunted from one part of the body to others when the need arises. For instance, during digestion when more blood is needed in the stomach and intestine after a meal, blood is shunted from the rest of the body to the digestive tract and there is a relative depletion of the blood to the muscles. For this reason it may be hazardous to swim immediately after eating because of the relative lack of blood and its constituents in the muscles. Because fuel and oxygen are essential for muscular contraction, the swimmer may develop cramps in the extremities that interfere with his swimming and may result in his drowning.

The system of borrowing and lending of blood whenever it is necessary is entirely automatic and

goes on without the consciousness of the individual. Those portions of the machine that require the greatest amount of blood, oxygen, and food – the brain and the kidneys – are supplied with enormous amounts of blood, relatively much more than other portions of the body. The nitrogenous waste products of the body as the result of energy production are almost entirely removed from the body by the kidneys, so that enormous amounts of blood necessarily flow through the kidneys. The kidney removes from the blood the nitrogenous wastes in solution, and because water is so essential to the body, most of the water is separated from the wastes and retained in the body. The nitrogenous wastes are thus concentrated and excreted in the urine. If, however, there has been kidney damage in which this selective process of excreting the noxious substances and retaining the waters is lost, the individual loses the ability to excrete the poisons, resulting in their retention in the body and accumulation.

For any pump to operate it is necessary to supply it with energy. The human body is supplied with energy by the food that is taken in and is consumed more efficiently than in other machines. The food is masticated, swallowed, and acted upon by digestive juices in the stomach and in the intestines. As the result of chemical alterations it is absorbed into the blood streams and carried to the liver. Because toxic products and bacteria are absorbed into the blood, they must be removed, which is done very efficiently by the liver. After the food substances have been purified by the liver, they are carried in the veins back to the heart and lungs to be transported throughout the body where they can be utilized. The liver also serves as a filter to remove bacteria absorbed from the intestinal tract and also debris. In certain forms of anemia in which the red blood cells are destroyed, the liver filters out the cell debris and excretes it in the bile.

The human body is one of the most efficient chemical factories in the world. It can produce chemicals of very complex nature which are required for body functions by using the raw chemicals and building them into the complex chemical structures which are needed for the proper functioning of the machine. This is done in various portions of the body, in the liver, the glands of internal secretion, the pituitary, the adrenal, the prostate, the thyroid, and the pancreas.

Another part of the waste disposal plant is disposal of wastes through the gastrointestinal tract. After the food has been utilized and most of the essential elements have been extracted normally from them, including the water in order to conserve water, the residue is excreted from the lower intestinal tract.

A very important part of the disposal system is the action of bacteria on waste products which is necessary particularly in the large intestine or colon to make a normal function of the intestinal process. These bacteria help in the chemical breakdown of the food elements that the body needs.

The body is endowed with a very good protective system which alerts one if there is danger. Largely as the result of the programming of the computer, the individual learns which conditions are hazardous. When these present themselves, the immediate reaction is an increase in the production of adrenalin which activates the heart to pump more blood and the body to respond more quickly. One is able to respond to stress more effectively than would be possible without this stimulus. As the result of programming, one learns which things are harmful and avoids them. For instance, it does not take long for children to realize that when they touch something hot and feel the sensation of heat on the skin that this is harmful. The immediate application of the heat means a recoil to protect the individual from further damage.

The body also has a tremendous back-up system that is endowed with a great deal more capability than is ordinarily used. There are a good many paired organs, two lungs, two eyes, two kidneys – each of these has a tremendous reserve far beyond what is ordinarily needed, so that a tremendous reserve is present. Also in many parts of the body there is regeneration. The cells of the body are continually being destroyed as a result of the wearing out process but are being regenerated. This is true of most of the body but not all, and this is a part of the back-up system which is essential for the proper functioning of the body.

From the above it is obvious that the human body is the most efficient and best designed system that has even been designed, but like all systems, it is subject to wear. The human body has a longevity far greater than most machines. However, it, as all machines, should not be abused but given good care and maintenance. For some reason or other we have come to believe that the human body can stand any amount of abuse and that it is not necessary for it to have care. As do all machines, the body does experience wear, although its rate of wear and deterioration depends largely upon the care it receives. If it is neglected and abused, rapid deterioration and early obsolescence and failure result. It is astounding to me how the public generally completely disregards their bodies at the same time that they take meticulous care of their automobiles, their watches, their home appliances, etc. With proper care and lack of abuse, this beautifully machined mechanism will last for a long time and function

perfectly. One must avoid all factors which produce an increase in the wearing out process and do everything to ameliorate deterioration.

After considerable experience, I am convinced that the use of tobacco is the most important factor in the acceleration of aging and the production of premature senescence and disability. The use of tobacco allows noxious agents such as carbon monoxide, tar, and cancer-producing agents to be introduced into the body causing changes in the cardiovascular system that lead to the premature hardening of the arteries (arteriosclerosis), heart disease, stroke, and death. It is responsible for the loss of limbs and extreme pain on exercise in the extremities. Tobacco also contains cancer-producing agents and is a principal cause of cancer of the lung, lips, tongue and larynx and also the bladder. It is the cause of the extremely disabling condition, emphysema, in which there is destruction of the lungs, making it extremely difficult for one to get sufficient oxygen to breathe satisfactorily.

In the human body as in any machine, use and proper use are necessary. Too frequently we do not get exercise; we have become a sedentary people. Exercise is important daily, and it should be strenuous

enough whenever possible to require rapid deep breathing and to cause an increase in the heart rate.

This should be done only under the supervision of the physician because a damaged heart will not allow one to stand such exercise. The exercise should be taken every day, however, and should not be limited to the weekends at which time strenuous exercise is used. Golf, which is frequently used as a form of exercise, is fine and is an excellent form of relaxation, but as a form of exercise it has been completely over-emphasized. Although walking is important, too many people ride a cart, which of course vitiates the value of the walking. If one took the same amount of time and walked instead of playing golf, they would get more exercise.

Another factor which accelerates the aging and wearing out process is obesity. This is largely dependent upon the amount that one eats and the amount that one exercises. Diet is important primarily in that it affects the weight – whether one gains weight or not is dependent upon the amount taken in as contrasted to the amount burned up. It is important that one stay on the thin side.

Worry is another factor which accelerates aging. I am convinced that hard work does not increase aging if one does not worry, but worry is a real factor.