

Good essay on tissue and cellular organization

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Tissue and Cellular Organization

The circle of life on the earth is very complicated, though sometimes it seems to be rather easy. People see plants, insects, various fluids, surface and soil, but they often do not think of all the complexity of the constitution of bodies that fill up the world. In other words, everything consists of cells and tissues, and in order to understand the essence of every matter it is important to investigate their structure.

There are some organisms, such as bacteria, that are unicellular or they are made up of only a “ single cell” (Science Daily, 2014). These one-celled organisms can live in the hair, skin and various parts of the human body. They can perform activities that a human body can do such as making and catching food, eliminate wastes, grow and even reproduce (George, 2002). Nevertheless, other organisms are known to be multicellular. For instance, human bodies consist of about 100 trillion cells, and the average mass of a cell reaches 1 nanogram (Science Daily, 2014). Cells perform different functions that are very important for the life of an organism. Thus, cells make up the structure of the body, absorb nutrients from food and convert them into energy which helps the organism to function properly (George, 2002). Moreover, cells are known to perform various specialized functions, such as hereditary and reproductive. It is important to note that the structure of cells is rather complicated. Cells consist of a nucleolus that is considered as the cells’ command center; the plasma membrane or the outer lining; cytoplasm or the nucleus surround; and others (Science Daily, 2002). All in all, cells are considered to be the basic units of life notwithstanding the fact that they are small in size and can be recognized only by means of a

microscope (George, 2002).

A tissue is a collection of cells that perform specific functions (Premkumar, 2004). The tissues are the results of cells connections that are composed of a group of cells that have a similar shape and function (Premkumar, 2004). The different types of tissues can be found in different organs and exist in four types of tissue in the human body which are: epithelial, connective, nervous, and muscular tissue (Msnucleus. org, 2014). The functions of these various types of tissues differ from each other. For example, the epithelial tissue lines and covers surfaces on the body that are exposed to the environment (Premkumar, 2004). Then, the function of connective tissue is to protect the organism and to support the connections between other tissues. On the other hand, the muscular tissue is aimed at producing movement, and the function of nervous tissue is to conduct impulses and receive various stimuli. Thus, the investigation will further concentrate on the functions and importance of the epithelial tissues, namely on the ciliated epithelial tissue.

Ciliated epithelial tissue is a kind of epithelium which is covered with ciliated cells (Premkumar, 2004). These cells have small hair-like protrusions, called “ cilia”. Ciliated epithelium is present in human body in the nasal and respiratory organs, brains, digestive tract and female reproductive organs (fallopian tubes). Besides, the functions of the ciliated epithelium are very important for the human body to function properly. The main function is to “ help the cells move along the tissue, help debris and waste move along the surface of the cells” (Wise Geek 2014). In other words, cilia move in one direction in a wavelike pattern, thus sweeping away debris and mucus that

prevents various microbes from penetrating human organism through nasal cavity and other respiratory organs such as trachea and bronchus. Ciliated epithelium keeps dust and debris out of the lungs, filters the air a person breathes and controls the flow of mucus (Premkumar, 2004) Especially, it is essential in the period of disease, when cilia move mucus out of respiratory passages, which in its turn traps unnecessary and harmful particles in order to purge an organism.

In addition, one more function of the ciliated epithelium in brains is to provide brain tissues with air and protect from the oxygen debt. Moreover, it helps cerebral fluids to circulate in the brain, thus providing its healthy functioning. In reproductive system ciliated epithelium performs a vital role: it moves unfertilized eggs from fallopian tubes to the uterus helping them to become fertilized. As far as digestive system is concerned, ciliated epithelium assists in absorbing nutritious substances by the organism thus providing it with all necessary elements.

It goes without saying that ciliated epithelium damage can lead to various pathologies in human organism. Moreover, taking part in the functioning of other systems, ciliated epithelium damage influences the general state of health of a person.

The first ciliary disease is found in men from Denmark and Sweden, who produced spermatozoa that does not have dynein arms, and were considered as immotile (Afzelius, 2004). The disease was later called the “immotile-cilia syndrome” (Afzelius, 2004). It was discovered that the patients suffered from chronic or recurrent rhinitis, sinusitis, bronchitis, and “otitis”, resulting to having the illness in organs with mucus-transporting, ciliated

epithelia (Afzelius, 2004). Reports show that these men were not seriously handicapped by their disease, but only went to the hospital due to fertility crisis. At present, more people bearing the same clinical symptoms have undergone examination of the motility or immotility of their nasal or bronchial cilia. Afzelius (2004) explained that there are some people who have immotile cilia. On the other hand, some had motile cilia, but the motility does not have insufficient strength or co-ordination to transport the mucus blanket in the normal manner. Such syndrome was later called the “ primary ciliary dyskinesia”, or abbreviated PCD (Afzelius, 2004).

The most dangerous conditions of epithelium damage occur within the respiratory organs. In most cases ciliated epithelial damage is caused by smoking. As a result, a person encounters problems with mucociliary clearance and respiratory health in general (Educational Portal, 2014).

Ciliated epithelium contains the so-called goblet cells. Laura Enzor speaks about the purpose of these cells which is to “ create mucous. The mucous surrounds particles that should not be present in the human body, and the cilia move them out. Without these cells and tissue, a lot of harmful bacteria would remain in our lungs” (Educational Portal, 2014). That is why smokers are often recognized by heavy cough, accompanied with crepitation. Taking into consideration the fact that smokers breathe in about 4, 000 toxic chemicals daily, it is easy to predict, that ciliated epithelium in their respiratory organs is subject to constant irritation and serious damage of the cells (Education Portal, 2004). This continuous influence of chemicals results into excessive production of mucus. Besides, due to ciliated cells’

dysfunctions the organism is not able to get rid of the harmful chemicals, for the mucus cannot move out of the lungs. Thus, a person suffers from an unproductive cough, for the ciliated cells do not carry out their functions properly.

It is worth considering the fact, that as the result of damage of the ciliated epithelium, numerous pathologies occur in human organism. Many of them, of course, are caused by smoking. Some of the pathologies are: frequent respiratory infections predisposition, chronic bronchitis, chronic obstructive pulmonary disease (COPD), emphysema and even lung cancer. Smoking destroys cilia cells and with time such cells are prone to becoming cancerous (Educational Portal, 2014).

One more dangerous pathology that occurs as a result of ciliated cells' damage is the so-called "immotile cilia syndrome". This is a process of "congenital impairment of mucociliary clearance" (Uptodate, 2014). Being a hereditary disease, this syndrome is very dangerous for human life, for it presupposes ciliary immotility that is cilia disability to beat. To add more, woman with immotile cilia syndrome have a tendency for subfertility. This means, that when the cilia cells are unable to move properly, the process of fertilization is almost impossible. This concerns cilia cells in fallopian tubes that are responsible for tubal transportation. As a result of cilia cells' damage, the process of "propulsion of sperm in the opposite direction to ova and embryos, and supporting fertilization and early embryogenesis within the tubal lumen" is impossible (Oxford Journals, 2014). According to Baillie, "motile human sperm had been shown to bind by their heads to the ciliated apical areas of the tubal epithelium in vitro; While the density of sperm is

greater in the isthmus than the ampulla” (Oxford Journals, 2014). Thus, without cilia epithelium performance it is difficult to become pregnant, for sperm is unable to reach the eggs. It is also interesting to note, that smoking has a great impact on the female fertility. As well as with lungs, smoking damages cilia cells within the tubes, and a woman has difficulties with having a child. Such women also face risks of ectopic pregnancy that occurs due to reduction of the number of ciliated cells in the fallopian tubes. It has been proved that a woman that smokes more than 20 cigarettes a day will probably have problems with infertility and encounter ectopic pregnancy risks. Thus, these are pathologies caused by cilia epithelium damage. Nevertheless, not only women face fertility problems, but men, as well. The thing is that due to the immotile cilia syndrome men have immotile spermatozoa. It must be noted, that “ because spermatozoa with poor or no motility are unable to penetrate the isthmus border of the oviduct and the zona pellucida of the egg, the spermatozoa will not reach the egg cytoplasm” (Afzelius, 2004). Thus, male infertility is directly connected to the ciliated cells damage. Reports showed that an endometrial biopsy had been taken, and it was discovered that its cilia did not have the inner and outer dynein arms; while the nasal cilia were completely immotile (Afzelius, 2004). Another form of cilia-related disease is hydrocephalus. In this condition, the ependyma of the brain ventricles is a ciliated epithelium and its cilia created a low of cerebrospinal fluid in certain well-defined directions (Afzelius, 2004). With this condition, the fourth ventricle proper cerebrospinal fluid from the aqueduct, and from the plexus choroideus posteriorly and moves toward the central canal, and laterally towards the direction of the lateral apertures of

the ventricle (Afzelius, 2004). The hydrocephalus condition takes place when there is a slightly enlarged brain ventricles which can be used as a prenatal sonographic marker of the immotile-cilia syndrome. This is recommended in the case of the fetus, who possesses situs inversus or a sibling having the disease (Afzelius, 2004).

In addition, the disease called “ anosmia” is also related to cilia. These are the patients having the immotile-cilia syndrome that is characterized by having a poor sense of smell due to stuffed nose or heavy nasal secretion (Afzelius, 2004). The olfactory epithelium and its disorders also include the congenital anosmia. This is the condition when the receptor olfactory knobs of a patient completely lacked cilia, even if they contain several centrioles and mitochondria (Afzelius, 2004).

One more dangerous condition that appears with defective ciliated cells in kidneys is the polycystic kidney disease. Disease produces growing cysts in kidneys, and these cysts are filled with fluid. The disease occurs due to “ abnormalities in the proteins involved in the development of functional, sensory cilia in the kidneys” (Clinical Key, 2014). Such abnormalities lead to abnormal proliferation of tubular epithelial cells and cause formation of cysts. Polycystic kidney disease is considered to have a hereditary character, and appears among both, children and adults. When normal functioning of the cilia on the surface of cells that are responsible for receiving signals is disrupted, sensitivity to urine current is suppressed (Clinical Key, 2014).

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