

An average adult has about nine to eleven pints of blood. Blood is a red-colored liquid that helps our body fight diseases, block our wounds and helps in the transportation of nutrients to our trillions of cells. How often do we think about this force that helps us maintain our life? It is time we had blood on our brain.

The science of blood is incredible from specialized cells to specific blood types. Although, this is far from the whole story. Blood has a strong cultural resonance which motivates the creation of institutions that donate blood and expensive industries that produce blood-derived medicine. Blood history is completely human history.

It is about time we know the importance and the impact of blood. Blood flows through each and every one of us, therefore we can learn a lot about blood since we all have it.

Blood is useful; however, it is a complex compound.

There is a contradiction about blood. Although most of us are mostly concerned about the lungs and heart, the main function of both lungs and heart is to serve the blood. This means that the lungs help in the introduction of oxygen into the blood. On the other hand, the heart helps circulate blood to various parts of the body.

Blood is the Swiss Army knife of our bodies: it's an everyday instrument with various purposes.

We have up to 30 trillion red blood cells in our body which gives the blood its rich color. It also helps in the delivery of oxygen to the organs and tissues of our body. These red blood cells also serve as waste disposal that helps to carry used oxygen that has been changed into carbon dioxide back to the lungs for elimination. These cells travel a total of 12,000 miles daily.

The blood consists of other cells. One of them is Platelets which helps in the clotting of blood and stops the flow of blood during bleeding. For instance, when you have an injury and you see that the injury is not bleeding a lot anymore, you are experiencing the movement of millions of platelets and proteins to the injury site.

Another type of blood cell is the white blood cells which defend the immune system. When our bodies notice the invasion of foreign objects such as virus, bacteria or toxin; these white blood cells attach themselves to these foreign objects and swallow it.

In the medical setting, transfusions of blood are very crucial given all the important purpose of blood. Red blood cells can be transfused into another patient just to help the patient's body accept new organs. Also, cancer patients that have few platelets can be given millions of platelets more through transfusion. Worldwide, every three seconds, patients receive a stranger's blood.

However, a patient cannot be given any type of blood.

Blood has its own type too which is determined by the molecules that attach to the surface of red blood cells known as antigens. Antigens also come in different types too. All the blood cells have H antigens. Combination of A and B antigens is what determines the blood type. Type A blood it will have just A antigens and type B blood will have just B antigens. Type AB blood has both A antigens and B antigens. Type O blood does not have any antigen.

Type is further categorized according to the Rhesus factor, which is used to determine whether the blood is positive or negative depending on what is on the antigens. Our bodies can only accept the right type of blood type. If a patient has A-negative blood, such a patient will reject transfusion from a person with B positive. In critical cases, if such happens, the patient might go into hemolytic shock and die.

However, leeches can take all types of blood.

Leeches still remains an important tool in medicine

Do not shiver- we are going to discuss leeches. Leeches are mostly hated by humans who see them as slimy parasites. Although leeches might not have value among creatures in the animal kingdom, these creatures have played an important role in the medical field for centuries.

Throughout history, leeches have been known to be a bloodsucker.

Many illnesses have thought to be caused by an excess amount of blood in the body before modern medical science came into existence. Due to this, leeching which is the removal of blood through leech has been used in a lot of cultures to cure different illnesses such as headaches and fever. In ancient Egypt and Greece leeches has been used for medicinal purposes. Also, the god of medicine for the Hindus, Dhanvantari was known to be holding a jar of leeches all the time.

There was a common practice in the nineteenth century, that drawing blood from a patient can cure and prevent diseases. This led to leeching popularity and leeches became highly used even after they almost went into extinction in England. This period was called the “leech mania”.

In this modern-day, blood withdrawn through leech has been dismissed and seen as old fashioned. Although leeches now have another function to serve in medicine.

A leech produces a chemical called anticoagulants when it attaches itself to its host. These chemical consists of both proteins and peptides which makes the blood thin and as such it prevents clotting. When you have a deep cut and you want to prevent bleeding from occurring, blood clots are helpful. However, blood clotting is a problem when it wants to attach itself to the body tissue.

When a surgeon performs a transplant of the scalp or transfers muscle to the chest during breast reconstruction surgery, the surgeon would want the blood to keep flowing to the wound so it can heal faster.

Have scientists engineered a more effective anticoagulant by now?

No, they have not. The most effective blood-thinning agent that is still known is the leech anticoagulant. Great pharmaceutical companies even those with billion-dollar bank accounts are still unable to produce this powerful compound.

It is no surprise that leeches are still used today by plastic surgeons due to its ability to attach itself to tissue. In 2002, It was revealed by a surgeon Ian Whitaker in a telephone survey that 80% of UK plastic surgeries still use leeches as postoperative treatment.

Although leeches are blood-sucking animals, they are essential in the medicinal world.

Dame Janet Vaughan transformed both blood collection and delivery in Britain.

Few women have had more influence on British medical care than Dame Janet Vaughan.

Vaughan was born in 1899 and she fought to get educated because during those times women were not allowed to. She studied medical sciences at the University of Oxford in which she graduated with a distinction. Additionally, she first experienced her passion, the research of blood while studying at Oxford.

She was granted a Rockefeller Scholarship to further her study at Harvard after she graduated from Oxford. Because she was the only female student studying at the University then; she was not allowed to study with human patients blood. Rather, she was given pigeon blood to study on. Even at that, she was able to conduct the first-ever research on deficiencies of vitamin B12 in blood.

In England, Vaughan made herself an expert in the field of blood diseases. She published a textbook in 1934 titled *The Anaemias* in the field of hematology, which is the study of blood.

However, her most significant contribution to the medical field is covered below.

Vaughan read about the trailblazing Catalan doctor Frederic Durán-Jordà during the Spanish Civil War. During this war, Dr. Durán-Jordà established an effective system for the collection, storage, and transportation of blood. In this system that he set up, nurses were allowed to collect blood from patients before the patients actually see the doctors so it can reduce the doctor's time. This blood was transported in transformed fish vans. This shows how available resources can be used in an unplanned situation. This approach was later used by Vaughan.

Another war was coming up and Vaughan was aware that Britain would need a similar system that Duran had set up. About 10% of the people that were in the bombing raid of the Spanish

Civil War needed blood transfusions. As a result of this statistic, a bombed London could result in 6,500 transfusions daily.

Therefore, Vaughan established an Emergency Blood Transfusion Service (EBTS). Four EBTS depots were set up outside London which was collecting blood from donors and transporting it to the hospitals in the city. These blood were stored in milk bottles and it was delivered in transformed ice cream trucks that had the ability of refrigeration.

When the war began the EBTS was ready. During wartime, each of the EBTS depot distributed up to tens of thousands of bottles of blood and countless lives was saved. In 1946, two years before Britain's National Health Service (NHS) was founded, the EBTS became the Blood Transfusion Service which was serving and saving the people of Britain.

This would not have happened if the war did not foster the importance of collective sacrifice among the British population and it would not have happened if did not know that blood can be donated. Also, this would not have happened if Dame Janet Vaughan did come up with the EBTS.

In contrast to blood as a whole, plasma is a multibillion-dollar industry.

It is popularly assumed that plasma is a modern technology energy source in the science fiction universes. However, plasma is closer to us than we thought and it is actually flowing through our veins right now. Over half of the volume of our blood is made of plasma and it constitutes of fat, water, salt, proteins, antibodies and coagulants that helps blood clotting.

Plasma can be harvested in various ways for medical purposes. Firstly, plasma can be separated from blood after it is donated which leads to fresh frozen plasma (FFP). These FFP transfusions are usually used to help in blood clotting.

Plasma can also be separated from the blood using an apheresis machine. This machine helps to connect to a donor and it also helps process plasma as well as send back what is left to the donor's body. This process is called source plasma.

Source plasma is not used for transfusions, rather it is refined to increase the volume of specific ingredients which can be a critical life saving medical treatments. Source plasma is full of immunoglobulins which is a type of white blood cell that helps fight foreign substances in the immune system. A plasma that is refined is said to be rich in protein albumin which strengthens the blood's volume and pressure.

The demand for source plasma increased after Factor VIII was designed.

In the 1980s Factor VIII was defined as the name of a protein that is found in plasma and a concentrated product of the thing developed in that year. This product can be used to cure hemophilia a disease caused by the shortage of Factor VIII which hinders blood clot and hence causes serious internal bleeding. Before the introduction of Factor VIII, people suffering from hemophilia were living short and painful lives. But now due to treatments of Factor VIII, the blood of a hemophilia person can now clot normally

There is a problem though, source plasma only contains a few amounts of Factor VIII and a lot of quantity is needed for concentration. Recently, a lot of countries realized they had plasma supply problems. There is no country that has been able to meet the demand for source plasma from donations only.

Is the solution to pay people for source plasma?

A lot of countries do not pay people for source plasma because of ethical issues. However, they import plasma from countries that allow such. The United State is known to be the largest exporter of plasma today in which they supply half of it to Europe.

However, there is a huge problem with this method.

Most of US plasma sellers are people that are poor or vulnerable in the society. Hence, these group of people is more likely to have poor health such as bloodborne diseases like hepatitis. It is not just the patients that can suffer from this, some sellers give their plasma twice in one week which can have a side effect on their body. Some may experience nausea, fainting, and some

experience fatigue. Although people still consider these effect best option instead of going hungry.

The plasma industry is in a dilemma with no easy solution. It is not only blood-related issues that the society struggle with. There are others which will be discussed in the next chapter.

Menstruation is still not completely understood and remains an abomination in some specific countries.

The process of menstruation is natural, it is quite unbelievable that matters regarding menstruation still create embarrassment, silence or complete disgust. This also extends to UK politics where different activists have held campaigns for many years in order to consider female sanitary products as a necessity that should be excluded from tax. These issues are more complicated and deeply rooted in many developing countries.

For example, in Nepal, they have this practice of chaupadi. Chaupadi is a practice that involves physically separating women that are menstruating from their families and close ones, forcing them to live in tiny and dirty houses during their menstruation.

This Chaupadi culture originated from the belief that females experiencing their menstruation are polluting other people and all sort of bad things happens to people who come in contact with them. For instance, if a man touches them, the man can shiver and fall sick. Having contact with a woman that is menstruating can even attract snakes according to their culture.

Women are not allowed to enter their houses, touch the water or prepare any food once they start their menstrual period until their last period. These women are treated as an outcast. This is an ancient tradition in its death torment. A government study that was conducted in 2010 revealed that up to 58% of the Nepalese women in the far west regions are forced to practice chaupadi against their wish.

The Nepalese that is lucky enough to get educated know that the chaupadi tradition is rubbish and that menstruation is based on biology which is natural.

No one actually knows why women experience menstruation, women lose up to 30 to 50 millimeters of blood and tissue every month and gain nothing in return aside from pain and bloating. During menstruation, women release endometrium which is the lining of their womb. Most animals do not menstruate because they preserve their endometrium and the ones that discharge it does not bleed frequently or extremely.

The conflict hypothesis is one of the fascinating theories of human menstruation.

This argument was based on the fact that human embryos are specifically invading and parasitical. For other species, the embryos gently attach itself to the mother's endometrium. However, the human embryos dig through it and tear the arterial walls leading to the flow of blood towards the embryos. Through direct means to the mother's blood, embryos are able to produce hormones that influence the mother's body into producing more insulin which is a hormone that is essential for the embryo's development.

Due to the strain on a lady's body during pregnancy, the conflict hypothesis argues that menstruation is an evolutionary attribute for removing inadequate eggs. To put it plainly, the body cautiously chooses which embryos are permitted to develop and tax the mother so vigorously.

Menstruation is unavoidable for most women, thereby making our culture causing confusion with this natural biological function.

HIV and AIDS are exceptionally complicated, but treatments have improved greatly

AIDS is a syndrome that causes the immune system to malfunction which reduces the body's defense mechanism and AIDS is caused by the HIV virus. In order to understand HIV and AIDS it is important we understand the blood as well especially the CD4 white blood cells.

These cells are very essential to our immune system because these cells recognize threats in our body and they produce chemicals that attract other white blood cells to the threat zone. The CD4 acts like air traffic controllers that direct the destination of the white blood cells.

However, HIV attacks these CD4 cells by attaching to them and penetrating it. Once the virus gets inside the cell, it steals the DNA of a CD4 cell and combines it with its own genetic makeup. Hence, this virus can now copy thousands of new copies which allows the CD4 cell to infect others.

If HIV is left untreated it will empty your body's CD4 cells until you acquire AIDS. AIDS makes the body's immune system very weak that you become at risk of getting numerous diseases such as infectious diseases or cancerous tumors.

HIV can get into the bloodstream through having unprotected sex or sharing of needles. Although you can contract HIV and not become infected, that is if your immune system recognizes it and eliminates it. However, if one CD4 cell is infected, other cells of the CD4 will become infected and infection will happen.

When one gets infected the HIV virus; during the first two weeks, the virus introduces billions of HIV particles into your bloodstream. After, a process called seroconversion happens which is when your body starts to produce antibodies just to fight this virus. The side effects that happen during this process is similar to that of flu: fever, diarrhea, and joint aches. After these symptoms, you will not experience any other symptoms for years even though your CD4 cell count is low. Sometimes later, you will eventually develop AIDS.

Fortunately, HIV and AIDS can be treated now.

Before the mid-1990s, it was assumed by everyone that HIV was an unconquerable and fearful public health crisis. This notion was changed after the introduction of antiretroviral therapy (ART).

ART requires using different types of drugs to accomplish different things. For instance, nucleotide reverse transcriptase inhibitors prevent infected cells from replicating the HIV virus.

Fusion inhibitors stop the virus from affecting healthy cells. HIV treatment is really effective now, even if a person has HIV and he or she is on ART treatment, the person will not become infectious and can live well till old age.

Definitely, the best treatment is prevention. By educating people on the significance of practicing safe sex and needle hygiene, one day we might eventually eradicate HIV/AIDS completely.

Blood transfusions are an important approach for treating severe trauma patients.

The short form of traumatic injury is trauma which is a sudden and serious physical injury that requires treatment immediately. Even though trauma is mentioned less frequently than cancer or HIV, trauma is responsible for 10% of deaths globally. 40% of trauma deaths occur from severe bleeding.

How does this occur, if the blood is meant to clot?

When we experience severe trauma, we lose blood and our body refrains the blood's ability to clot. The goal is to stop blood clot in the organ and arteries from happening. This is a big risk that happens after we have lost a lot of blood as the remaining blood flows very slow.

This method also stops wounds from clotting and the body can bleed until death happens. The heart cannot pump enough blood to the various part of the body if there are less blood volume and pressure. Therefore, the organs of the body are starved of oxygen.

Furthermore, when internal bleeding happens, the cells of the blood will generate lactic acid that makes the body become acidic and produce potassium that can stop the heart. Reduced blood flow can also mean that the blood is transferring lesser heat. This means that the colder the body gets, the worse the platelets perform which is a major challenge when clotting is needed.

All these elements lead to a destructive feedback loop which makes it difficult for patients with trauma to survive. Over the last decade, there has been remarkable progress in trauma

treatment all thanks to medical science. The huge and the most surprising advancement is the readoption of the previous transfusion methods.

The blood fractionation became very known in the 1970s. New technology has made it possible for blood to be divided into different parts such as red blood cells, white blood cells, plasma, and platelets. This was an important advancement for cancer patients that desperately needed only white blood cells and platelets. Separating blood's components and transfusing them as needed was called component therapy (CT). The change to CT was immediate and accepted. Ten years after, people stopped using the whole blood component to treat trauma patients.

But there's new evidence that whole blood is more effective than CT.

This is partly true because fractionating of blood takes time and the components must be stored after. Components of blood contain added chemicals such as preservatives as well as anticoagulants which over time it can lose its effectiveness. There is still ongoing research on how long blood can stay fresh for. However, there is a growing notion in medical science about the use of whole fresh blood to treat trauma patients.

Today, we're at the most advanced progress and possibility in medical science. Let's hope medical science keeps improving our treatments and broaden our knowledge of the most important bodily fluid.

Nine Pints: A Journey Through the Money, Medicine, and Mysteries of Blood by Rose George Book Review

For such an important part of human physiology, blood is greatly ignored in favor of better and more specialized organs such as the brain and heart. Mostly, the only type of blood that is not usually ignored is the menstrual blood with discrimination, cultures, and abominations that are there to maltreat women. The industry for blood-related treatments is growing from medicinal

leeches to source plasma to Factor VIII. It is no surprise when you think of how important and the number of things our body used blood for.

<https://goodbooksummary.com/nine-pints-by-rose-george-book-summary/>