Історія медицини

History of medicine

ISSN: 2411-6181(on-line); ISSN: 2311-9896 (print)
Current issues of social studies and history of medicine. Joint Ukrainian -Romanian scientific journal, 2021, №:2(30), P. 91-93
***UDK** 612.118.221.2*
***DOI** 10.24061/2411-6181.2.2021.276*

ТАЄМНИЦЯ ГРУПИ КРОВІ

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BLOOD TYPE MYSTERY

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Тимофийчук Инга, Семененко Светлана. Тайна группы крови. Еще в древние времена кровь была символом жизненного потока и энергии. Считалось, что она дает силы. Красная краска и вино использовались в традиционных обрядах. Группа крови способна поведать о своем "владельце" немало любопытных фактов. Имея информацию о собственной группе крови можно лучше разобраться в себе и своем организме. **Цель статьи.** В статье рассматриваются исследования по истории медицины, которые формируют новые представления о формировании групп крови. **Новизна исследования** обусловлена тем, что представления о группах крови из года в год пополняются новыми данными, что и побуждает провести исторический очерк, принимая во внимание новейшие данные. **Выводы.** Эволюция человека невозможна без систематического изменения частот генов в популяции. Продолжается ли эволюция в настоящее время? Мнения порой противоречивы. Одни считают, что человек достиг вершины эволюционного древа, другие не соглашаются с такими выводами.

Ключевые слова: группа крови, физиология человека, история медицины.

Introduction. Even in ancient times, blood was a symbol of the flow of life and energy. It was believed that it gives strength. Red paint and wine were used in traditional rituals.

The blood group represents a certain stage in the millennial evolution of the digestive and immune systems, the result of the adaptation of our ancestors to changing natural conditions. The blood group is able to tell a lot of interesting facts about its "owner". Having information about your own blood group you can better understand yourself and your body.

Problem statement. According to one of the theories put forward by the Polish scientist Ludwig Hirszfeld, ancient people of all races had the same blood group - the first O. Their digestive tract was best adapted for digesting meat food. That is why even a modern person with the first blood group has a higher gastric acidity than others. For the same reason, peptic ulcer disease occurs most often in people with the first group. The rest of the blood groups were isolated through mutation from the "primal blood" of our primitive ancestors.

With the increase in population and changes in the environment, the ability to obtain meat food decreases. Gradually, vegetable protein becomes the main source of energy for humans. As a result, this led to the emergence of the "vegetarian" second blood group A. The resettlement of peoples to Europe is the reason for the prevalence of people with the second blood group there at the present time. Its owners are more adapted to survive in densely populated areas. Gene A is a characteristic of a typical urban dweller[1].

It is believed that the birthplace of the third group B gene is in the foothills of the Himalayas, in what is now India and Pakistan. Cattle-breeding with the use of dairy products for food predetermined the next evolution of the digestive system. Harsh climatic conditions contributed to the emergence of character traits such as patience, determination and equanimity[2].

The fourth blood group AB arose as a result of the mixing of the owners of the gene A and carriers of the gene B. Today, only 6% of Europeans have the fourth blood group, which is the youngest in the AVO system. The uniqueness of this group is in the inheritance of high immunological protection, which manifests itself in resistance to autoimmune and allergic diseases. It is quite probable that food and environmental antigens (antigens of bacteria, viruses or plants) have epitopes similar to glycoproteins of antigens A and B.

Arab and European medical treatises have preserved diagrams of the human body with detailed instructions from where to bleed for various diseases. With the help of lancets, leeches and cans, surgeons and barbers (it was they who occupied a lower place in the hierarchy of medical professions who directly followed medical recommendations) extracted blood from the hands, feet and the back of the head with cups and plates. Since the middle of the 17th century, venous cutting has periodically raised doubts and criticism, but it did not completely disappear even after the spread of biomedicine and its official recognition. Other practices related to humoral ideas about blood are still in use today – from "warming up" mustard

[1] Mykhel D. V. "Perelyvanye krovy: Sovetskaia Rossyia i Zapad (1918–1941)**"** [Blood transfusion: Soviet Russia and the West (1918–1941)], *Otechestvennye zapysky* [Domestic notes], Vol. 1, 2006, URL: https://strana-oz.ru/2006/1/perelivanie-krovi-sovetskaya-rossiya-i-zapad-1918-1941 [in Russian].
[2] Boaz R. E. The Search for "Aryan Blood": Seroanthropology in Weimar and National Socialist Germany, *Kent State University*, 2009, URL: https://www.jstor.org/stable/10.7829/j.ctt1282zr [in English].

plasters or goose fat for colds to cans, which were widely used in Soviet medicine and Soviet self-medication practices. In modern biomedicine, cupping is considered either a placebo or an alternative technique, but in China and Finland they still maintain a reputation for strengthening, relaxing, and pain relieving. It was proposed to fill the lack of blood by drinking fresh blood of animals and people and bathing from it. For example, in 1492 Vatican doctors tried in vain to cure Pope Innocent VIII by giving him a drink from the venous blood of three healthy youths[3].

Attempts at blood transfusions begin in the Empire era, after the discovery of oxygen and its presence in arterial blood. In 1818, the British obstetrician James Blundell, who by this time had published several experiments on blood transfusion, injected a woman in labor who was dying of postpartum hemorrhage with her husband's blood – and the woman survived. During his professional career, Blundell undertook intravenous blood injections as a last resort in ten more cases, and in half of them patients recovered: blood became the resource that could save the life of another person and which could be shared.

As a rule, people know about eight types of blood: blood can belong to group 0, A, B or AB and have positive or negative rhesus (Rh + and Rh-), which gives eight options. Four groups, discovered by Karl Landsteiner and his students in the 1900s, form the so-called AB0 system.

Independently of Landsteiner's team, four blood groups were identified in 1907 by Czech psychiatrist Jan Jansky, who was looking for a connection between blood and mental diseases – but did not find it and honestly published an article about it. The Rh factor is another system discovered by Landsteiner and Alexander Wiener in 1937 and empirically confirmed by physicians Philip Levin and Rufus Stetson two years later; it got its name because of the similarity of antigens of humans and rhesus monkeys. Since then, however, it turned out that the antigens are not identical, but they did not change the established name. Blood systems are not limited to the Rh factor and ABo: 36 have been opened for 2018.

The novelty of the article. Consists in the analysis of ideas about blood groups. The old ideas that blood and other bodily fluids taken from young people are able to heal and restore youth have not disappeared.

The relevance of the study is due to the fact that ideas about blood groups are replenished from year to year with new ones data, which prompts a historical sketch.

Main part. At the turn of the 19th and 20th centuries, the greatest achievement of biology and medicine took place: the Austrian immunologist Karl Landsteiner discovered blood groups. Until this time, it was not possible to avoid complications of blood transfusion from person to person. Almost all attempts to replace blood in humans ended tragically.

The first human blood transfusion from a person was carried out by the English professor of obstetrics and gynecology J. Blundell (1819). He made a blood transfusion to a woman in labor who was dying of blood loss. In 1830 and 1832. similar operations were carried out in Russia by obstetrician-pediatrician S.F. Khotovitsky and obstetrician G.S. Wolf.

Landsteiner's discovery explained the reasons for the failure. Seemingly the same blood was different in the properties of red blood cells, the so-called “red blood cells”. Landsteiner divided the blood of all people into three groups: O, A and B. Somewhat later, the presence of the fourth blood group was established – AB. Blood transfusion has become an effective therapeutic agent that is used in the treatment of many diseases[4].

In 1930, Karl Landsteiner was awarded the Nobel Prize in Physiology or Medicine “for his discovery of human blood groups”. The genotype of each a person is unique. The frequent incompatibility of blood during transfusion confirms the fact of human biological diversity. In 1940, Landsteiner and Wiener discovered erythrocyte antigens in the blood of experimental monkeys (rhesus monkeys), which were given the name “rhesus”. Antigens have a protective function. The more Rh-negative individuals in the population, the more often conflict pregnancies occur. In Japanese, hemolytic disease of the newborn, which is caused by Rh antibodies, is quite rare – only 1% of Japanese people have Rh negative blood group. Rh-negative persons are almost fifteen times more common among the population of most European countries. Accordingly, the incidence of diseases associated with incompatibility is higher[5].

Modern medicine is actively studying the distribution of genetic blood markers for each population, including by geography – throughout the globe. The study of the geographical distribution of blood groups among different peoples was initiated by German doctors – the spouses Hirschfeld. During the First World War, they worked in a field hospital in Macedonia. Blood transfusion to the wounded was accompanied not only by the determination of the group affiliation, but also by the fixation of the accompanying statistical data. By the end of the war, doctors had collected significant material on the frequency of certain blood groups among representatives of different peoples and nationalities. The differences were found to be significant.

Most of the information was collected regarding the ABO system, on which the success of blood transfusion primarily depends.

Subsequently, the English geneticist-hematologist Murant, who worked with the material on the distribution of blood groups around the world, created an atlas of blood groups. O-blood group is most often called the first. It occurs with significant frequency in almost all peoples, but its distribution is uneven. The highest frequency of this blood group (more than 40%) is observed in Europe: Ireland, Iceland, England, Scandinavian countries. A decrease in the frequency of the O-group is observed as we move to the south and southeast. In Asian countries – China, Mongolia, India, Turkey – the O-group among residents is two times less common than in Europe. But

[3] Hudson N. “From “Nation” to “Race”: The Origin of Racial Classification in Eighteenth-Century Thought”, *Eighteenth-Century Studies,* Vol. 29, N. 3, 1996, URL: https://muse.jhu.edu/article/10677 [in English].

[4] Mazumdar P. M. H. “Blood and Soil: The Serology of the Aryan Racial State”, *Bulletin of the History of Medicin,* Vol. 64, N. 2, 1990, P. 187–219 [in English].

[5] McMullen E. T. “Anatomy of a Physiological Discovery: William Harvey and the Circulation of the Blood”, *Journal of the Royal Society of Medicine,* Vol. 88, N. 9, 1995, P. 491–498 [in English].

there is an increase in the frequency of blood group B. Indians of South and North America in all tribes have only one blood group – O. These distribution patterns have their own explanations[6].

German scientists Vogel and Pettenkofer in 1962 expressed an interesting hypothesis that that the patterns in the geographical distribution of blood groups of the ABO system are the result of extensive epidemics that raged in the past in these territories.

The antigen B of E. coli is similar to the group antigen of B-human blood. Many strains of viruses that cause influenza, parainfluenza, pneumonia and other infectious diseases contain antigens that resemble the A antigen of the human blood group. Viruses and microbes begin to interact with antigens of the human body and, above all, with antigens of blood groups. This relationship often leads to sad consequences when an infectious pathogen comes into contact with the human body.

The progress of medicine contributes to decrease in mortality from infectious diseases, but they still constitute a significant part of all human diseases. Not so long ago, epidemics of smallpox, plague, cholera, all kinds of fevers swept across the Earth in hurricanes, devastating cities and villages, destroying tribes. However, not all countries were affected by epidemics equally. The centers of plague and smallpox epidemics were Central Asia, India, China, part of North Africa[7].

Blood group O turned out to be the most resistant to smallpox. It became the only one in all tribes that retained an isolated lifestyle and did not enter no contact with other people in America. The work of archaeologists subsequently confirmed these findings. A and B antigens were identified in the bones of Indians who lived many centuries ago, which directly indicates the existence of these blood groups. The selection was very tough if none of these groups were preserved.

The Vogel-Pettenkofer hypothesis ceased to be a hypothesis after an unexpected outbreak of smallpox epidemic in West Bengal (India). Of 200 people with smallpox, 106 (50%) had an A-blood group. Among the non-ill, the frequency of this group was only 25%. The hypothesis has become a proven fact.

A positive reaction to the vaccination most often occurs in children with A – and AB blood groups. The immunity created after the first vaccination is almost completely absent. It turns out that too many still unexplored points remain in the relationship between human blood antigens and the pathogen[8].

In addition to the ABO system, only Rh antigens have been geographically studied. This knowledge is very important. There is a relationship between the incidence of immuno-incompatible marriages and the proportion in the population of Rh-positive and Rh-negative individuals.

As in Japan, hemolytic disease of the newborn, which is caused by Rh antibodies, is extremely rare among Chinese, Koreans, Indians and residents of other Asian countries. The reason for this is the insignificant frequency among individuals of Rh-negative blood: from 0 to 1.5%.

Conclusions. Other blood markers and their geographic distribution are not yet fully understood. However, anthropologists and historians who study the origin of individual peoples, the degree of kinship between them, the paths along which their resettlement once went, are becoming more and more interested in this issue. Human evolution is impossible without a systematic change in the frequencies of genes in the population. Is evolution still ongoing? Opinions are sometimes contradictory. Some believe that man has reached the top of the evolutionary tree and his biological improvement is no longer possible. Others disagree with these findings.

Інга Тимофійчук, Світлана Семененко. Таємниця групи крові. Таємниця групи крові. Ще в давні часи кров була символом життєвого потоку і енергії. Вважалося, що вона дає сили. Червона фарба і вино використовувалися в традиційних обрядах. Група крові здатна розповісти про своє "власника" чимало цікавих фактів. Маючи інформацію про власну групу крові, можна краще розібратися в собі і своєму організмі. **Мета статті.** У статті розглядаються дослідження з історії медицини, які формують нові уявлення про формування груп крові. **Новизна** дослідження обумовлена тим, що уявлення про групи крові з року в рік поповнюються новими даними, що і спонукає провести історичний нарис. **Основна частина**. Зі збільшенням кількості населення і зміною навколишнього середовища зменшується можливість добувати м'ясну їжу. У підсумку це і призвело до виникнення "вегетаріанської" другої групи крові А. Переселення народів в Європу є причиною переважання там людей з другою групою крові в цей час. Вважається, що батьківщина гена третьої групи В знаходиться в передгір'ях Гімалаїв, на території нинішніх Індії та Пакистану. Четверта група крові АВ виникла в результаті змішання володарів гена А і носіїв гена В. На сьогодні всього лише 6% європейців мають четверту групу крові, яка є наймолодшою в системі АВО. Унікальність цієї групи в успадкуванні високого імунологічного захисту, яка проявляється в стійкості до аутоімунних і алергічних захворювань. **Висновки.** Еволюція людини неможлива без систематичної зміни частот генів в популяції. Чи продовжується еволюція зараз? Думки часом суперечливі. Одні вважають, що людина досягла вершини еволюційного древа, інші не погоджуються з такими висновками.

Ключові слова: група крови, фізіологія людини, історія медицини.

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Received: *06.05.2021*
Advance Access Published: *June, 2021*

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