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Epidemic typhus in the Lithuanian army from 1919 to 1923

Epidemijski pegavac u litvanskoj vojsci od 1919. do 1923.

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Introduction

Population movements, particularly those connected with war, spawn infectious diseases. These were noted in the Peloponnesian War between Sparta and Athens in 430 BC. In "Rats, Lice, and History", Hans Zinsser emphasized: "And typhus, with his brothers and sisters – plague, cholera, typhoid, dysentery – has decided more campaigns than Caesar, Hannibal, Napoleon, and all the inspector generals of history" [1]. Biblical writers depicted these diseases as one of the four apocalyptic horsemen that resulted in more soldiers being killed than by weapons. The First World War was the first military conflict in which this rule no longer applied [2]. However, despite the progress in military medicine, during the Great War, the armies in Eastern Europe faced major epidemics of typhus.

Typhus, in particular, was a tremendous scourge. Also known as "war typhus", the disease appears to have first surfaced in Serbia in 1914. Because of malnourishment, unsanitary conditions, and disruption of supplies, armies were decimated by epidemic typhus. The migration of soldiers and refugees accelerated the contagion. Death rates ranged from 20% to 80%, with the highest percentage occurring in 1918 [3]. Typhus exploded in Russia during the Civil War (1917–1922). The Red Army alone lost 100,000 men from 1918 to 1920 [4]. Typhus also felled armies in neighboring Poland, Ukraine, Romania, and the Baltic States. These countries tried to take preventive measures but found it difficult to stop the disease.

The newly created Lithuanian army was plagued by epidemic typhus from the very first days of its formation at the end of 1918. Troops suffered from typhus throughout the Lithuanian War for Independence (1918–1920)* with the highest incidence rates, compared to all other infectious diseases, occurring in 1919 [5]. Because of severe shortages in the Lithuanian army, it seemed impossible to combat typhus. Everything was missing, from clean clothes to disinfectants. However, the Sanitation Department of the Lithuanian Ministry of National Defense used all, albeit minimal, resources to carry out the prevention of epidemic typhus, and gradually the situation improved.

The history of epidemic typhus

Epidemic, or exanthematic typhus, is an infectious disease caused by a small bacteria *Rickettsia prowazekii* which spreads through the body louse *Pediculus humanus humanus*. The name "typhus" (derived from the Greek word "typhus", meaning smoke or haze) was first introduced by Hippocrate, who used it to describe the state of a sick person's stupor rather than a specific disease [6]. The first record of the disease was *Cronica cavense* – an Italian manuscript about "severe fever with peticuli" composed in the monastery near Salerno in 1083 [1]. Due to the similarity of symptoms, epidemic typhus was confused with other diseases for a very long time. It was separated from the plague by Girolamo Fracastoro in 1546 and from typhoid – by John Huxham in 1739. These perceptions were confirmed by Francois Boissier de la Croix

* Lithuanian Wars of Independence – the fights against Bolshevik, Bermontians, and Poland in order to defend the restored independence of Lithuania. The battles began in the late 1918 and ended in the late 1920s. However, sometimes the end of these battles is considered to be the year 1923 when the Klaipėda region was regained. As the activities of the Sanitation Department narrowed down in the same year, 1923 will be considered the end of the Wars of Independence in this article.

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de Sauvage, who introduced the term "exanthematic typhus" in 1760 and applied it to the disease, which we still call by the same name today [7]. Although, at that moment, it seemed that the disease had become quite well known, two essential things were still unclear: the pathogen and the transmission pathways. This was clarified in the twentieth century. The louse as the vector of epidemic typhus was discovered by Charles Nicolle in 1909. Soon after, the causative agent *Rickettsia prowazekii* was revealed by H. T. Ricketts and J. M. Prowazek. It was one of the most important discoveries in history as it fostered the development of preventive measures against the pathways of the disease. The main prevention measure – vaccine, was discovered by prof. Rudolf Stefan Weigl in the 1930s [8].

Relationship between epidemic typhus and military

Historically, epidemic typhus was one of the most terrible diseases connected with military conflicts. It followed the soldiers during the Granada War (1482–1491), the Thirty Years War (1618–1648), and the War of the Austrian Succession (1741) [9]. The classical example of the relationship between epidemic typhus and the army is the effect on Napoleon's Grande Armée during the invasion of Russia in 1812. Since the etiology of typhus was not well-known at that time, soldiers did not take any preventive measures to defeat these parasites. As a result, 80,000 French soldiers had died or contracted epidemic typhus by July 1812. Even the best sanitation in the world at the time could not help stop the rise in these numbers [10].

Nicolle's discovery in 1909 was a real revolution in the history of epidemic typhus. From the start of the First World War, armies knew that the disease could be overcome by fighting lice. Delousing stations were installed on both the Eastern and the Western fronts. Disinfection with steam, dry heat, benzene fumes, sulfur and carbolic acid, or hydrogen cyanide played an important role [4]. The soldiers also used a wide variety of insecticides: N.C.I. (naphthalene 96%, creosote 2%, iodoform 2%), Vermijelli, Crude Oil Ointment, Mercury Ointment, White Mercury Powder, etc. [11]. Much attention was paid to general sanitary conditions, particularly the cleanliness of the body and clothes. Baths were built near the barracks. Education of soldiers about the disease was also a particularly important preventive measure.

On the Western Front, since multiple preventive measures were taken, curtailing epidemic typhus was fairly successful [1]. The situation on the Eastern Front was much worse. After the end of the First World War, local wars continued. Revolutions, famine, and other communicable diseases exacerbated the spread of lice. Most of the soldiers were uneducated and tired after four years of war. During the Russian Civil War, not only were disinfection devices lacking, but clean clothes, warm water, and soap were scarce as well [4]. Hans Zinsser wrote: "As everyone who has really been to war knows, let the water supply fail, or soap become scarce, or a change of clothing be delayed, it takes no time at all before the louse comes back to its own" [1]. The situation was similar in all the neighboring states that continued their struggles for independence, including Lithuania.

Epidemic typhus in the Lithuanian Armed Forces

The Lithuanian Army was formed on November 23 in 1918 – nine months after the proclamation of Lithuania's independence. The first two years were particularly difficult. This period was referred to as the "period of extreme illness and severe loss" in the Lithuanian Armed Forces [5]. As noted, epidemic typhus had the highest incidence rate in 1919 – the first year of the army's existence. In that year alone, 1,559 soldiers fell ill with the disease. Inpatient morbidity was more than 15% and accounted for 12% of the overall morbidity (Figures 1 and 2) [5]. Mortality rates were also very high (Figure 3).

The main cause was poor sanitation. German troops had occupied the western Russian provinces and Lithuania, in particular, during the Great War. Thus, there was a lack of clean barracks, clothing, footwear, disinfection chambers, saunas, and disinfectants available to the new Lithuanian army. The first Lithuanian military units settled in the barns, abandoned houses, or barracks that were taken over by the German occupying army. Usually, these were simple wooden buildings damaged or left in ruins by the retreating German soldiers. There was a shortage of mattresses. On August 13, 1919, during the sanitary inspection of the Kaunas

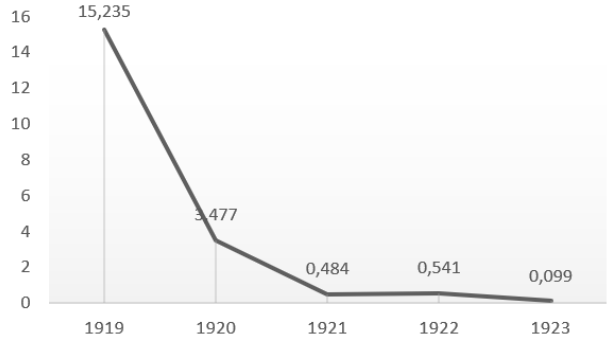

Fig. 1 – Morbidity (%) of epidemic typhus (numbers of sick per every 100 soldiers). (Made based on "Morbidity and Mortality in the Lithuanian army" by S. Barkauskas [5]).

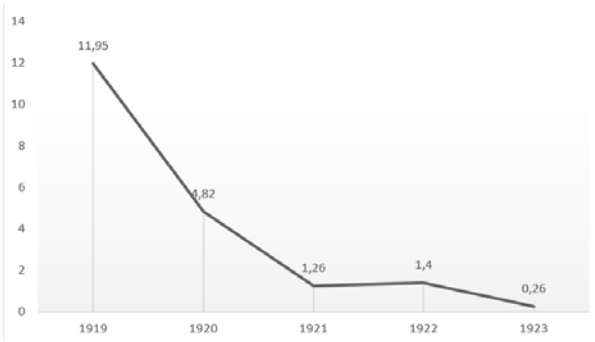

Fig. 2 – Proportion (%) of epidemic typhus in whole inpatient morbidity. (Made based on "Morbidity and Mortality in the Lithuanian army" by S. Barkauskas [5]).

Fig. 3 – Mortality (%) of epidemic typhus (deaths per every 100 sick soldiers). (Made based on "Morbidity and Mortality in the Lithuanian army" by S. Barkauskas [5]).

Battalion, it was found that 25% of soldiers did not have them. In addition, 20% of soldiers did not have blankets [12]. Basic clothing was lacking. In July and August 1919, sanitary inspections revealed that most battalion soldiers had only one pair of clothes (although it was required to have at least two), and pants and shoes particularly were in poor condition. For example, in the Panevėžys battalion, 30% of the soldiers did not have shoes or were badly worn. In the Marijampolė Battalion, 90% of soldiers had only one set of clothes [12].

The shortage of disinfection chambers was a huge problem. This was especially felt in hospitals. At the beginning of 1919, when the epidemic of typhus was raging in Telšiai, the military doctors working here faced a serious problem – there was not a single disinfection chamber in the whole district [13]. Moreover, the Lithuanian army lacked specialists called "disinfectors" who knew how to use disinfecting equipment. In July 1919, there was only one such qualified person capable of disinfecting, and 6,934 soldiers in the Lithuanian army [14]. In addition to these shortages, the soldiers' poor understanding of hygiene helped spread typhus. The first soldiers came mainly from the villages and were not highly literate. They had a poor understanding of cleanliness and its importance in the prevention of epidemic typhus. One military doctor I. M. noted in the newspaper "Military word": "There is no clear understanding of this in the vast crowds of our army. If the soldiers talk among themselves about the danger to them, it is about the danger of a bayonet or a bullet. But it is forgotten that while in the army, they are also at risk from invisible enemies – carriers of various infectious diseases" [15]. Sanitary inspections revealed numerous examples of poor hygiene. For example, during the sanitary inspection of the Panevėžys Battalion on July 25–26 in 1919, it was observed that even when baths were available, soldiers visited them irregularly or infrequently [12].

Prevention of epidemic typhus in the Lithuanian Army

Despite the shortages and intense fighting in 1919, the Sanitation Department of the Ministry of National Defence used all, albeit minimal, resources to improve the situation ever since. This body, in collaboration with the Supply Division, struggled to increase preventive. The head of the Sanitation Department, General Vladas Nagevičius, played a major role in this effort. In the almanac "Shield", the general was described as follows: "With General Nagevičius at the forefront, everything began to grow and develop rapidly. His tremendous efforts, inexhaustible energy, rigor, extraordinary talent of the organizer, ability to orientate quickly..., ability to choose doctors for responsible positions quickly rectified the military sanitation" (Figure 4) [16].

Fig. 4 – Vladas Nagevičius, the head of military sanitation, inspects sanitary units (1921) [16]. (The archive of the Museum of the History of Lithuanian Medicine and Pharmacy).

Nagevičius was an indefatigable warrior in the fight against infectious diseases in the Lithuanian army. By establishing many contacts with foreign countries, the international Red Cross, and promoting contributions from Lithuanian civilians to the well-being of the army, he succeeded in increasing the most important preventive measures for the troops. His work enabled the Sanitation Department to control epidemic typhus. The main focus was on living conditions, disinfection, cleanliness, and education.

Living conditions

The Sanitation Department carried out regular sanitary inspections in the army and reported the deficiencies to the Supply Department. These sanitary inspections covered five broad areas: condition of barracks, food and water, clothing, shoes, and saunas [14]. Usually, the Sanitation Department asked the Supply Department to repair the barracks and temporary apartments. The Sanitation Department emphasized that soldiers could not sleep on the ground and requested straw, mattresses, and bedding. Linen mattresses that could be washed were to replace the paper mattresses formerly used [17]. The sanitation staff asked for laundries and driers to wash clothing. They emphasized the need for clean water, sufficient food, and building as many baths as possible. They made efforts to ensure that soldiers did not live in cramped conditions. Each soldier had to have at least 16 cubic meters of air space in the barracks; distances needed to be maintained between the beds [18]. Although these goals were not achieved in all units, general living conditions in the army began to improve significantly.

Disinfection

For the disinfection process, the Lithuanian Armed Forces used disinfection chambers. These were metal or wooden boxes containing steam (Figure 5).

Some disinfection chambers were stationary, but most were portable. The latter were more practical because, in the event of outbreaks of epidemic typhus, they could be easily transported from one place to another. Disinfection chambers were used to disinfect clothes, bedding, and upholstered furniture. This was a demanding process. People performing it had to be well prepared, strong, and healthy. Individuals with ulcers or sores on their hands could not use chemicals for disinfection. Those performing disinfection also needed special clothing and good knowledge of the process [19]. Professionals, called "disinfectors", had to undergo special training conducted by disinfection instructors. Those without the special education required to work with disinfection chambers were generally not accepted. For example, civilian Juozas Jaras knew how to use a disinfection camera because he took part in the fight against epidemic typhus in the vicinity of Skuodas. He was drafted into the army for the same purpose. However, when it became clear that he had not completed any special disinfection courses, Juozas Jaras was not accepted because he did not meet the disinfector qualifications [20, 21]. As a result of these strict requirements, there were relatively few disinfectors. To fill this gap, doctor's assistants were sent to be trained in the process.

Because of the scarcity of both disinfection chambers and professionals who could use them, other disinfection methods were also used. In addition to heat, disinfection with chemicals was performed. Soap and carbolic acid solution, purified carbolic acid, sulfur and carbolic acid solution, sublimate, lime milk, chlorinated lime, tree tar, formalin, and sulfur gas were used [19]. The choice of type of disinfection depended on the object that would be disinfected (Table 1).

These disinfection techniques were applied by trained military doctors and sanitary personnel. The textbook "Igiena" described detailed disinfection processes for sanitary lieutenants. Military periodicals also described some disinfecting methods that soldiers themselves could apply.

Cleanliness

Maintaining cleanliness was one of the most important ways to fight epidemic typhus. The Lithuanian army tried to install as many saunas as possible and provide soldiers with soap and clean clothes. In the Congress of Military Doctors on January 21–25, 1921, further increases in soap rates,

Fig. 5 – Staff of the disinfection service of the First Separate Infirmary (1923) [19]. (The archive of the Museum of the History of Lithuanian Medicine and Pharmacy).

Table 1

Methods of disinfecting certain objects
(Made based on "Handbook for Sanitary Lieutenants, Hygiene" by Baranov, 1921 [19])

Object to be disinfected	Type of disinfection
Body	1% / 2% carbolic acid solution or 0.1% sublimate.
Premises	Soap and carbolic acid solution, 2% carbolic acid solution, 1% soda solution with water, sublimate solution, and 20% lime milk.
Doors, windows, and wooden furniture	Sublimate solution, soda, and green soap solution.
Upholstered furniture	Water vapor, formalin vapor, carbolic acid solution, soap and carbolic acid solution.
Metal and leather goods	5% solution of carbolic acid or soap and carbolic acid. Fur – formiline or sulfur gas.
Blankets, mattresses, and clothing	Water vapor, formalin vapor, boiling water, straw-burned.
Clothes	Water vapor, soap and carbolic acid solution, boiling water and soda solution, 0.1% sublimate solution.

amount of baths, and washrooms were required [17]. Various orders and statutes defined the importance of cleanliness in the military. The Statute of the Internal Service stated that it was the duty of every soldier to be clean and negligent. Soldiers were required to wash their faces, necks, and hands every morning. Visiting the baths was the primary mean of keeping the body clean overall, and the first step for new recruits was a visit to the sauna. Service soldiers were required to visit the sauna as often as possible, at least twice a month. It was obligatory to go to the sauna in groups with sanitation staff. Before going to the sauna, the soldiers had to leave all of their clothes in the disinfection chambers. The same statute specified hygienic measures in the barracks. Clean clothes were to be kept separate from dirty clothes. It was recommended that dirty clothing be kept in separate rooms where soldiers did not live or in warehouses [18]. Failure to maintain the cleanliness of clothing was punishable. For example, the Statute of Discipline reported that one soldier was arrested for three days because he did not clean his clothes for the next shift [22].

Education

The statutes and orders specified strict requirements for soldiers. However, soldiers also needed concrete examples of good hygiene. Here periodicals played a major role. The journal "Soldier" wrote that "the most important law of health science is cleanliness, which is achieved with water and soap" [23]. In the journal "Word of Soldiers" soldiers were taught: "Do not be lazy to go to the sauna and wash yourself; the more often you go to the sauna – the healthier your body will be, the spirit will be stronger and more alert, the more useful you will be to your homeland". Newspapers stressed the importance of using soap on a daily basis, washing hands and feet and cutting nails frequently, and using only one's own towels [24]. Educating soldiers about hygiene was a very important part of prevention because most of them were from poor families and had little understanding of the importance of cleanliness. With a limited amount of supplies, the formation of soldiers' knowledge of proper use of those available was important.

Treatment of epidemic typhus

Soldiers with epidemic typhus were mostly treated in the First Separate Infirmary (Figure 6).

Fig. 6 – Outpatient Clinic of the First Separate Infirmary in Šančiai, Kaunas (1923). (The archive of the Museum of the History of Lithuanian Medicine and Pharmacy).

The treatment consisted of good nursing to strengthen the patients and relieve symptoms. The main treatment was directed to the cardiovascular system. Soldiers' medical histories show that treatment began with an application of camphor. In patients whose blood pressure was low and who were in a weakened condition, camphor stimulated heart and blood circulation. Camphor was administered in the form of tablets or injections. Caffeine and red wine were given for the same purposes. In addition, potassium chloride, digoxin, and strophanthus tincture were used to regulate heart function in case of arrhythmias. Antipyretics and analgesics (e.g., codeine phosphate, antipyrine, aspirin) were used for

high temperatures (up to 40 degrees Celsius) and for pain relief. Sodium chloride infusions, usually 500 mL in volume, were used to restore body fluids. Castor oil, calomel, or enema were prescribed for constipation [25].

Besides treatment with drugs, good nursing was particularly important. The room where the patient was being treated was well ventilated, and bedding and clothes were disinfected and frequently changed. Patients were washed frequently (Figure 7).

the retreating German army only: the first medicines and sanitation measures were supplied by the sanitary depot of the German army in Šančiai [27]. Lithuanian industry was just beginning to develop, so foreign aid was necessary. First foreign help was received from Germany, France, Great Britain, and the United States. In 1919, a consignment was received from France that provided Lithuanian soldiers with medicine and clothing for as many as 40,000 soldiers [28]. A lot of medicines, disinfection chambers, and disinfectant

Fig. 7 – Patient bathing in Kaunas Military Hospital (1921) [26].
(The archive of the Museum of the History of Lithuanian Medicine and Pharmacy).

For patients with a high temperature, the body was cooled by immersing them in cool baths and placing a piece of ice on their heads. Sometimes they were wrapped in wet sheets. Doctors examined the patients' mouths and tongues regularly, washing them with water or lubricating them with glycerin. Patients were given only drinking water and easily digestible food [26]. In general, caring for a patient with epidemic typhus was difficult because the symptoms were very severe, and the disease lasted for a long time without effective treatment.

The sources of materials

The Supply Department and the pharmaceutical part of the Sanitation Department were two main institutions that took care of the entire supply of sanitary property to the Lithuanian army. In the early days, the help was sought from

fluids were obtained from Germany. American Red Cross provided the largest consignments of clothes, bedding, mattresses, footwear, "American soap", and medicines to the Lithuanian army [29]. On each month of January, February, and March 1921, this organization donated 240 kg of cresol for disinfection [30]. Significant help from American Red Cross came because of Vladas Nagevičius's connections with Edward Ryan, the head of the American Red Cross headquarters in Riga. Moreover, small organizations in Lithuania had been established thanks to the head of the Sanitation Department.

Over time, the Lithuanian industry also recovered. The first factories of slippers, leather, and footwear opened. Soap factories in Kaunas were of very great importance. The Lithuanian army received soaps from Vislickis, "Florance", and other soap factories [31]. The "Florance" soap was especially advertised in military periodicals (Figure 8).

Fig. 8 – An advertisement for soap "Florance 503" in the military periodical "Soldier". The advertisement says soap eliminates pimples and makes skin whiter and softer [31].

In 1921, the army took over the soap workshop in Aleksotas from the Lithuanian Ministry of Supply and Nutrition, and soap production was introduced in the army itself. Four soldiers worked in this workshop [31]. This recovery in production in Lithuania meant that fewer resources had to be sought abroad. In addition, the requisitions that tortured the Lithuanian people could be reduced.

Conclusion

The epidemic of typhus affected not only the Lithuanian army but also armies in neighboring countries. Fortunately, the disease was controlled quickly enough in the Lithuanian army: in the second year of the army's existence, the incidence of epidemic typhus was almost five times lower than in the first year (Figures 1 and 2). The successful fight against epidemic typhus depended solely on proper prevention. It was not possible to take other measures at that time. In the pre-antibiotic era, treatment was more harmful than beneficial. Soldiers sick with typhus needed many different drugs. Many of these, in turn, were poisonous and thus did not reduce mortality (Figure 3). This prevented proper disease management and did not let reduce the mortality. Mortality rates in the Lithuanian army were high throughout the whole period from 1919–1923. As a result, it seemed better to prevent the spread of the disease rather than treat the sick soldiers with ineffective measures.

The measures against epidemic typhus used in the Lithuanian army were not as diverse as in the Western countries, but they were innovative and effective. The main focus was on disinfection, cleanliness of person and living conditions, and education. Every effort was made to control the disease as much as possible within the army and prevent the admission of sick people from the outside. Strict requirements defined in statutes and other documents forced soldiers to follow all instructions. Military doctors greatly contributed to the eradication of typhus. Treating diseases was no longer their only task. They became disinfection specialists, providers of sanitation norms, and teachers.

The achievements in preventing contagious diseases, especially typhus, were due to unstinting activities of the Sanitation Department and, in particular, an increased supply of preventive materials. Increased production and acquisition of food, clothing, sanitation equipment, and medicines, as well as armaments, was crucial to the success of the Lithuanian army. More than half the territory of Lithuania was occupied in 1919. This impacted the number of materials available and disrupted supplies from abroad. When the strongest battles ended at the close of 1920, the situation was more stable, and both local people and foreign countries were able to deliver more supplies. Moreover, when the military conflict subsided, officers and doctors could shift their focus from fighting armed enemies and treating war wounds to fighting disease. As a result, the incidence of epidemic typhus and other communicable diseases greatly decreased. Having carried out its main work, the Sanitation Department reduced its activities to the minimum in 1923, leaving only a few facilities for treating soldiers.

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