



A Name Contributing to Turkish Vaccine History: Dr. Kemal Muhtar Özden (1874-1958)

Türk Aşı Tarihine Katkı Yapan Bir İsim: Doktor Kemal Muhtar Özden (1874-1958)

Erol Karcı (iD)

Çankırı Karatekin Üniversitesi Edebiyat Fakültesi, Tarih Bölümü, Çankırı, Türkiye

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Dr. Kemal Muhtar Bey, whose full name is Hüseyin Kemal Muhtar (Özden), hails from a prominent family who had made significant contributions to Turkish medicine and is the son of Mehmet Muhtar Bey, the Chief Secretary of the Imperial School of Medicine (Mekteb-i Tıbbiye-i Şahane) (1). His father, Mehmet Muhtar Bey, also served as the literature instructor at the Imperial School of Medicine (Tıbbiye) and the Imperial Military Academy (Harbiye Mektepleri) and was a founding member of the Ottoman Medical Society (Cemiyet-i Tıbbiye-i Osmaniye). His mother was Şerife Aliye Hanım. Mehmet Muhtar Bey, who held great respect for the medical profession and doctors (3), had three sons who became doctors, namely Celal Muhtar (4), Âkil Muhtar (5), and Kemal Muhtar. These individuals secured their places in the global medical literature through their contributions (3).

Dr. Kemal Muhtar Bey was born in İstanbul in 1874. He attended school in the following sequence: Mirâgür Primary School in Üsküdar, the Paşakapısı Military Middle School, the Medical Preparatory School, and the Imperial Military Medical School. He graduated from this school on January 11, 1900. On March 15, 1900, he was assigned to the Gülhane Hospital with the rank of captain. Then, on May 14, 1900, he became

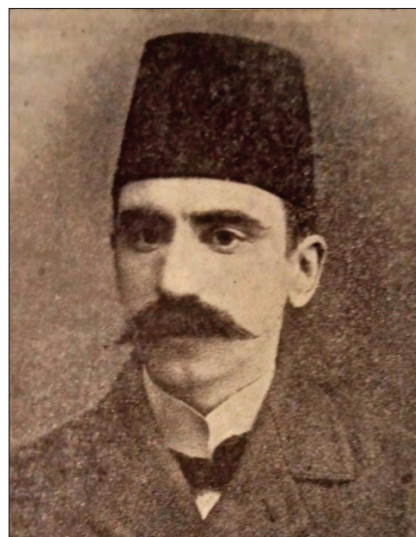


Figure 1. Dr. Kemal Muhtar (Özden) (1874-1958).

a resident at the Bacteriology Department, and on June 14, 1901, he was transferred to the Dâülkelp Treatment Hospital (Rabies Hospital) as a resident. He served as the physician of the Çatalca Battalion from 14 August 1901 to 15 April 1908.

¹ For picture see, (1).

² In an archival document examined, his name was given as both Hüseyin Kemal and Hüseyin Kemalettin (2).

Correspondence Address / Yazışma Adresi

Erol Karcı

Çankırı Karatekin Üniversitesi Edebiyat Fakültesi,
Tarih Bölümü,
Çankırı-Türkiye

E-mail: ekarci06@gmail.com

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On April 17, 1908, he was appointed as the deputy director of the Bacteriology Department (1). He served as an assistant to Dr. Nicole in this institution, and for a period, he worked alongside Dr. Remlinger at the Dâülkelp Treatment Hospital, obtaining certificates from both of his mentors (3).

On July 27, 1908, he was appointed as a lecturer in Bacteriology at the Imperial School of Medicine (Mekteb-i Tıbbiye) (1). In early December 1908, he was sent to the villages around Lake Terkos, along with Hüseyin Hüsnü Bey, to conduct research on the cholera outbreak in the region. According to a letter dated December 3, 1908, sent by the Ministry of Interior (Dâhiliye Nezareti) to the Council of Medical Faculty and the Directorate of Public Health (Meclis-i Tıbbiye-i Mülkiye and Sihiye-i Umumiye Riyaseti), it had been previously reported that the disease around Lake Terkos was not cholera, as communicated by the Çatalca district governorship. However, as a result of Dr. Kemal Muhtar Bey's investigations in the region, it was determined that cholera did indeed exist in the villages around the lake and that the lake itself was also at risk. At this point, an important letter written by Dr. Kemal Muhtar and sent to Dr. Akil Muhtar Bey, who subsequently forwarded it to the relevant authorities, is significant. In this letter, after reporting the occurrence of cholera in the villages around the lake and the need to protect the lake, he made certain requests. The first of these requests is for an adequate number of gendarmes and a few guards to be sent from either the Çatalca district governorship or İstanbul. Secondly, he requested that two more doctors be sent to the region. Thirdly, he asked for a sum of money, and fourthly, he requested that he be appointed as an inspector in the region. His fifth request was to issue the necessary orders to the telegraph office clerk in Karaburun, who was both a civil servant and a soldier and refused civil communication, or to send another civil servant in his place (6).

The archival documents we examined indicated that the Ottoman Health Administration took Dr. Kemal Muhtar Bey's requests into consideration and promptly took action to

meet them. At this point, it was decided to take measures to eliminate the disease without allowing the cholera microbe to contaminate Terkos Lake, which played a crucial role in supplying water to İstanbul. To this end, it was decided to burn the houses where cholera was detected, and the expenses for this would be covered from the Ministry of Interior's budget. Additionally, 30 gendarmes, some of them being cavalry, were dispatched to the region. Furthermore, it was deemed appropriate to appoint him as an inspector, and his requests for doctors, guards, and funds were also approved. In a document dated December 4, 1910, sent from the Ministry of War to the Ministry of the Interior, it was indicated that the necessary notifications had been made to the military telegraph office in Karaburun for the acceptance of telegrams to be sent to the Municipality by the health inspector. However, in the letter sent from the İstanbul Telegraph Directorate (Dersaadet Telgraf Müdüriyeti), it was stated that the military telegraph center in Karaburun had been closed due to the absence of military personnel in the area. Hence, the Ministry of the Interior submitted an application to the Ministry of Finance, requesting the deployment of an official and a telegraph machine to the region until the eradication of the disease. Additionally, in a letter dated December 8, 1910, sent to the Çatalca Mutasarrıf (District Governor), they requested the provision of necessary facilities for Dr. Kemal Muhtar Bey. On December 17, 1910, in response to the requested funds, 5.000 kuruş were sent (6).

In the letter dated December 18, sent by the Ministry of the Interior to the Çatalca Mutasarrıf (District Governor), it was reported that due to the outbreak of cholera in the Terkos region, there had been no cases of illness or fatalities due to cholera during the period mentioned in the report prepared by Dr. Kemal Muhtar Bey and Hüseyin Hüsnü Bey, who were sent to the region 15 days ago. However, it was also requested that immediate notification be provided if any suspicious illness was observed in Terkos and its surroundings (6).

According to the report dated January 23, 1911, by Dr. Kemal Muhtar Bey regarding Terkos Lake, there were 12 villages

³ Dr. Celal Muhtar Bey (Özden), also mentioned in some sources as "Djélaledin Moukhtar," was born in İstanbul in 1865. He commenced his education at the Military Medical School in 1881 and graduated in 1887. Until 1889, he served as an assistant to Dr. Zeoros Pasha. Dr. Celal Muhtar Bey, who was interested in Pasteur's findings, followed his publications. In 1889, he was sent to Paris to conduct research on skin and syphilitic diseases, and he remained there until the end of 1892. Celal Muhtar Bey, who had significant theoretical knowledge in the field of bacteriology, collaborated with renowned dermatologists at St. Louis Hospital in Paris during his stay, including Alfred Fournier (1832-1914), Emil Vidal (1825-1893), Jean Darier (1856-1938), Ernest Besnier (1831-1909), and Francois Henri Hallopeau (1842-1893). In addition to attending classes at the Pasteur Institute, he conducted research in the laboratories of Elie Metchnikoff (1845-1916) and the famous physician Emile Roux (1853-1933). Dr. Celal Muhtar participated in the First International Dermatology Congress held in Paris from August 5th to 10th, 1889. On March 10, 1892, he was appointed as a corresponding member of the "French Society of Dermatology and Syphilography". In 1892, he returned to İstanbul and began working with Dr. Duhring. In 1893, he played a significant role in combating the cholera epidemic in İstanbul. The work carried out by him was noticed by Sultan Abdulhamid II, and he was appointed as the palace physician. Following Dr. Duhring's return to Germany in 1902, he was appointed as the Chair of the Department of Skin Diseases and Syphilis in the Civilian and Military Medical School. Dr. Celal Muhtar Bey, who continued to work as a lecturer until 1925 trained many students. During these years, he published many articles, especially on syphilis, in Turkish and foreign journals. In 1901, he translated into Turkish the second edition of his lecturer Fournier's book, "Syphilis et Marriage". In addition to his work in science and education, Dr. Celal Muhtar Bey made important contributions to his country through other duties he undertook. He worked as a general inspector for the Turkish Red Crescent (Hilal-i Ahmer Cemiyeti) as well as serving as a member of the executive board of the same institution, and through such duties, carried out important services during the First World War and the War of Independence. He passed away in 1947 (4).

in direct contact with the lake. Furthermore, there were nine villages along Kanlıdere (Istranca Stream), which carried water into the lake. The water of the lake was polluted due to the waste from these villages, the formation of marshes resulting from the closure of the canal on the lake's shore, and the fishermen who were fishing in the lake. Therefore, during the summer months, the lake's surface was covered with a 1-centimeter-thick layer of algae (7). His findings revealed the reasons leading to the pollution of Terkos Lake and were important in showing that this pollution could potentially lead to significant health issues in the capital, Istanbul, and its surroundings.

Kemal Muhtar Bey, who served as the chief of the Analysis and Serum Sections at the Bacteriology Institute from March 15, 1910, to April 14, 1912 (1), during these years, prepared a new medium for the investigation and isolation of cholera vibrio and published it in Europe (Kemal Moukthar, Note sur un milieu nouveau pour la recherche et l'isolement du vibron cholérique-1912-C.R. Soc. Biol. 72, 1025-1028). His discovery became a classic and was well-documented in both domestic and international medical literature. The renowned French scientist Prof. Dr. A. Calmette included "Kemal Muhtar Medium" in his book "Microbiology and Serology," which is considered a classic in medicine (3).

He served as the Chief Physician at the Ioannina Sultaniye Hospital for a period during the Balkan Wars (3). During the battles on the Ioannina front that ended in defeat, in October 1912, when the city's fortress was besieged, the Independent Corps Chief Physician, Dr. Süleyman Numan Bey, and the Army Health Inspector Aristidi Pasha, along with his assistant, Dr. İhya Salih Bey, were in charge of health services. Dr. Süleyman Numan Bey worked tirelessly to ensure that health services continued to function smoothly in Ioannina, despite shortages of personnel and resources. However, despite these efforts, a significant amount of supplies was lost, and the sick and wounded remained hungry and in dire conditions. Every day, hundreds of soldiers lost their lives due to hunger, and diseases also increased. During the war, in addition to the



Figure 2. Document indicating that after the occupation of Ioannina by the Greek Army, Dr. Kemal Muhtar, Dr. Süleyman Numan, and Dr. Refik Münir were in good health and working in the military hospitals in Ioannina (10).

Ioannina Central Hospital, Papasoğlu, Adamidis, Elizabet, and Sultaniye Hospitals were also in operation. During this period, doctors struggled to find fuel for heating, and sometimes, the food sent by various aid organizations was withheld from the doctors. This situation was a source of great distress among them. About ten thousand people were lost as wounded, sick, and martyrs on this front. Even after the ceasefire was signed, Serbian and Greek attacks continued. On February 12, 1913, the total number of individuals in Ioannina Hospital was 5.666. With so many patients at the Ioannina Central Hospital, Dr. Arif, Dr.

⁴ Dr. Akil Muhtar (Özden) Bey was born in İstanbul on October 1, 1877. Akil Muhtar, the brother of Dr. Celal Muhtar, a dermatologist, and Dr. Kemal Muhtar, a bacteriologist, became a physician like his brothers. After completing his studies at the Paşakapısı Rüştiye (middle school), he entered the Imperial Military Medical High School (Mekteb-i Tibbiye-i Askeriye İdadisi). After graduating from that school, he transferred to the Imperial School of Medicine (Mekteb-i Tibbiye-i Şahane). During his time at the medical school, he became a member of the Committee of Union and Progress (İttihat ve Terakki Cemiyeti). Due to increasing pressures, he fled to Switzerland in 1896 to complete his education at a reputable medical faculty. He graduated in 1902. After his graduation, he stayed in Paris for a year to further enhance his knowledge. In 1903, he returned to Geneva and became an assistant to Prof. Dr. Louis Bard at the Internal Medicine Clinic of the Medical Faculty. With the thesis he prepared during this time, he earned the title of medical doctor on September 28, 1904. Subsequently, he became a resident in the outpatient clinic. In 1907, he became an associate professor and started teaching "Medical Curriculum and Practical Treatment" courses. During this period, he engaged in intensive scientific research and made significant publications. He returned to İstanbul in 1908. During the transformation of Mekteb-i Tibbiye-i Mülkiye into a Medical Faculty, he was appointed as the Health Instructor (Hifzissihha Muallimi) upon the recommendation of Dr. Cemil (Topuzlu) Pasha and Dr. Besim Ömer (Akalin) Pasha. Later, he was appointed as the professor of Experimental Treatment (Pharmacodynamics) and Therapeutic Clinics. In 1917 and 1919, he was elected as the Dean of the Medical Faculty on two occasions. During his deanship, which coincided with the Armistice and occupation period, he made significant contributions to helping the Medical Faculty navigate this challenging period with minimal damage. He provided significant support for conducting scientific research, publishing numerous textbooks, and ensuring the regular publication of the Darülfünun Medical Faculty Journal. In 1933, he was appointed as the head of the Pharmacodynamics Institute at İstanbul University. He retired in July 1943. He passed away on March 12, 1949 (5).

Reşat Rıza, Dr. Baha, Dr. Refik Münir, Surgeon Asım, Pharmacists Fuat, and Dikran attended to them. At Papasoğlu Hospital, Captain Ali and Surgeon Ata were responsible. As for Elizabeth and Sultaniye Hospitals, they were managed by Chief Physician Dr. Kemal Muhtar, Dr. Bahri, Dr. Haver, Dr. Mesih Sabih, Dr. Nefi, Dr. Tevfik Bey, and Operator Nevres Bey (8).

On February 21, 1913, Greek soldiers began to enter the city of Ioannina. On this date, a Greek military doctor and two civilian doctors visited the hospitals with Dr. Süleyman Numan Bey. As a result of this visit, the administration of Elizabeth and Adamidis hospitals was entrusted to Dr. Baha Bey. However, on February 23, an order was given to vacate the mansion where the hospital was located, and the patients were transferred to the Central Hospital. The Greek military authorities decided to use Sultaniye Hospital, under the management of Dr. Kemal Muhtar Bey, as a government building. After the occupation, the Greek Field Health Inspectorate allowed doctors to work in the hospitals to improve care and ensure better discipline in the hospitals. It was even mentioned that doctors could freely move with the Red Crescent emblem on their sleeves, and Greek officers would salute them (8).

The situation of Kemal Muhtar Bey, who became a prisoner like other Ottoman doctors in the region after the occupation of Ioannina by the Greek army, was reflected in some

documents. A telegram sent from Belgrade on March 23, 1913, mentioned that Dr. Kemal Muhtar Bey was in Ioannina, and he was in good health (9). In a letter dated May 2, 1913, sent from the International Red Cross Agency in Belgrade to the Central Committee of the Red Crescent Society, it was stated that Dr. Kemal Muhtar, Dr. Süleyman Numan, and Dr. Refik Münir were in good health, and they were working in the military hospitals in Ioannina (10).

Kemal Muhtar Bey, who served as the Chief of the Serum Section from April 14, 1912, to July 29, 1913, was transferred to the Ottoman State Vaccine Directorate (Telkikhane-i Osmani Müdürlüğü) on July 30, 1913. After some time, on January 21, 1914, he was additionally assigned the role of Director of the Second Supply Branch of the Health Division of the Ministry of War (1). During this assignment, Kemal Muhtar Bey, who held the rank of Senior Captain (Kolağası), was promoted by one rank (2).

During Dr. Abdullah Cevdet's tenure as the General Director of Health, he left the Ottoman State Vaccine Directorate on August 9, 1920. The position, which became vacant after the death of Dr. Rifat Hüsamettin, was appointed to him for a second time on February 18, 1922 (11, 12). During this appointment, he was reluctantly convinced and worked as an honorary officer for six months. During the Turkish War of Independence, he prepared the smallpox vaccine needed in Anatolia, and after completing this task, he resigned on September 2, 1922 (11). Following his resignation, Dr. Şerafettin Mustafa Bey, who was the deputy director, was appointed to the position of Director of the Ottoman State Vaccine Directorate (13).

After the National Army entered İstanbul, he became the Director of Health and Social Welfare for İstanbul Province in 1923 (3). Furthermore, he was also appointed as the Director of the Public Health Department within the Ministry of Health and Social Welfare (1). He resigned from his official duties on 1 November 1924 due to his health (14). He was elected as "Sheikh'ul-Etibba" and honorary president by the Fellowship and Aid Society of Turkish Physicians (3). He passed away in 1958 (1).

Ottoman State Vaccine Directorate and the Work of Dr. Kemal Muhtar Bey

During the reign of Sultan Abdulhamid II, preventive health institutions were established within the Imperial School of Medicine. The first step taken in this direction was the opening of the "Rabies and Bacteriology Surgical Center". The rabies vaccine introduced by Dr. Pasteur to the scientific world on October 26, 1885, was received with great interest in İstanbul. Sultan Abdulhamid II sent a three-member delegation to Paris, consisting of Dr. Zeoros Pasha, Dr. Hüseyin Remzi Bey,

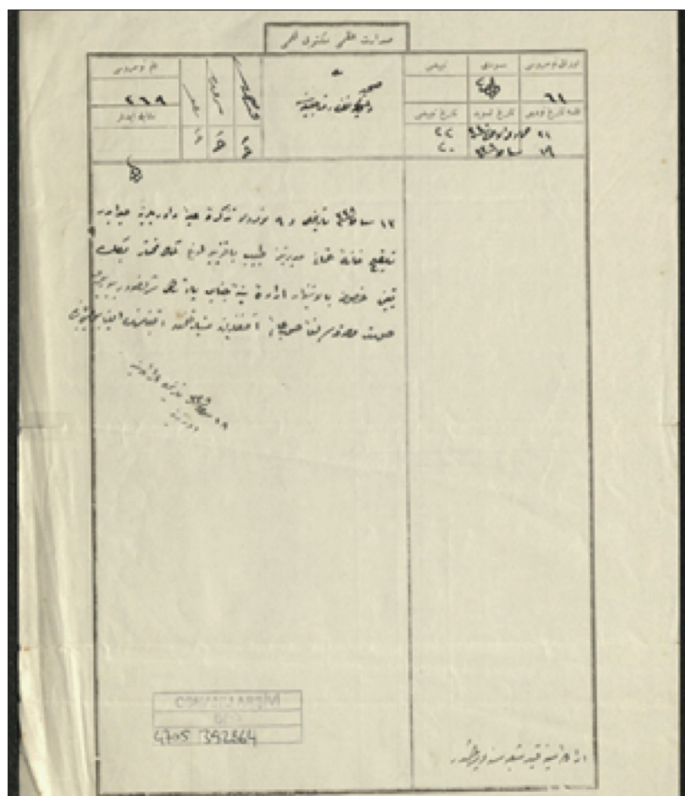


Figure 3. Document showing Kemal Muhtar Bey's appointment to the Ottoman State Vaccine Directorate in 1922 (12).

and Veterinarian Hüseyin Hüsnü Bey, with the purpose of learning about this new discovery (15). The delegation arrived in Paris on June 6, 1886, and they presented the Order of the Medjidie, first class, sent by Sultan Abdulhamid II to Pasteur. They also delivered a donation of 10.000 French Francs to the officials who were working to establish an institute (15). The delegation stayed in Paris for six months, took private lessons, and worked in laboratories to learn how to prepare and administer the rabies vaccine. In December 1886, following the report provided by the delegation upon their return to İstanbul, a rabies institution was established in 1887 under the name "Rabies and Bacteriology Surgical Center" (16).

Dr. Hüseyin Remzi Bey, who was part of this delegation, prepared a report upon his return from Paris, proposing the establishment of a vaccination center (telkikhane) just like in other countries, for the production of smallpox vaccine and its distribution to necessary locations (17). With the approval of this plan by the Council of State, a smallpox vaccine center was established in İstanbul on July 23, 1892. Initially, it was called the "Telkikhane-i Cüderî Ameliyathanesi," and later it was known as "Telkikhane-i Şahâne" and "Telkikhane-i Osmani" (15).

Telkikhane commenced its activities under the oversight of the Meclis-i Tıbbiye-i Mülkiye and Sıhhiye-i Umumiye, which were responsible for the civil health matters of the country and affiliated with the Imperial School of Medicine. The laboratory where it was located consisted of a hall, an inspector's room, a chemistry lab, and a vaccination hall. It also had a three-bay barn in its yard. The calves, aged two to three months, intended for vaccination underwent an initial veterinary inspection to ensure their health. Once they were confirmed to be in good health, they were laid on a table, and their legs, heads, and the area from their udders to their armpits were gently secured with a soft strap before shaving the fur. This area was washed with soap and then dried with a sterile cloth. Imported vaccine cultures were placed on the parallel incisions made in the shaved area. After drying, the incisions were bandaged, and the animals were taken to the stable. Seven days later, the animal would be laid back on the operating table, the pustules would be washed, and the vaccine yeast that had accumulated inside would be removed. The calves were kept for a month and then sold. At Telkikhane, everyone who applied was vaccinated free of charge, except on Fridays and Sundays (25).

Dr. Hüseyin Remzi Bey, who played a significant role in the establishment of Telkikhane-i Şahane (25), continued his work there until his passing on December 18, 1896 (17). After his passing, Dr. Hasan Zühtü Nazif Bey was appointed to replace

him (18). Nazif Bey was sent to France in 1890 for bacteriology training and attended courses at the Val-de-Grâce Military Medical School and the Pasteur Institute (18). However, just one year later, in 1897, during the Ottoman-Greek War, he passed away due to typhus in Thessaly (25). As a result, Dr. Rifat Hüsamettin Bey, who was the instructor of Pathological Anatomy at the Imperial School of Medicine and the professor of Bacteriology at the Veterinary School, was appointed as the director (18, 25).

After the proclamation of the Second Constitutional Monarchy in 1908, the name of Telkikhane and the authority to which it was affiliated frequently changed. The Committee of Union and Progress (İttihat ve Terakki) government changed the word "Şahane" in the names of all official institutions to "Osmani." Accordingly, the name of the vaccination institute was changed to "Telkikhane-i Osmani." While Telkikhane-i Osmani continued to operate within Mekteb-i Tıbbiye-i Şahane, affiliated with Meclis-i Tıbbiye-i Mülkiye and Sıhhiye-i Umumiye, as it did during the Telkikhane-i Şahane era, it came under the administration of the Ministry of Interior in 1911. During the Balkan Wars, on March 1, 1913, the "Law on the Organization of the General Directorate of Health" was enacted, which led to the dissolution of Meclis-i Umur-ı Tıbbiye-i Mülkiye and Sıhhiye-i Umumiye (Cemiyet-i Tıbbiye-i Mülkiye), and the establishment of the General Directorate of Health in its place. Telkikhane-i Osmani was then affiliated to the General Directorate of Health (25).

During this time, Dr. Rifat Hüsamettin Paşa, due to not being included in the newly established Medical Faculty's staff and a reduction in his military rank, requested retirement from the university. Afterward, he went to Paris for some time to conduct professional research, and in 1910, he returned to his home country. In the same year, he became a member of the Supreme Council of Health (Meclis-i Âli-i Sıhhi) and was appointed as the director of Telkikhane-i Şahane for the second time. However, he was dismissed from this position in 1913, and Dr. Kemal Muhtar Bey was appointed as his successor (19).

During Dr. Kemal Muhtar Bey's tenure, Telkikhane was operating in a building next to the Demirkapı Medical School. During this period, the Telkikhane staff consisted of two assistants, three doctors, six preparers, and six service personnel. Dr. Kemal Muhtar Bey, who started his duty with a salary of 2.500 kuruş (11), began to make some changes in the practices after assuming his position. First, he had the vaccine cultures placed in covered Petri dishes. He had all the equipment used in vaccine production sterilized with

⁵ For the efforts made in our country for vaccine production before the opening of Telkikhane-i Şahane, please refer to (25).

hot air in a Pasteur oven. Until this period, vaccines prepared were drawn orally into tubes. While Dr. Kemal Muhtar Bey was attempting to procure equipment from Paris for filling vaccines into tubes, he discovered two Felix devices in Telkikhane's warehouse. He tested these devices with Dr. İzzet Bey and confirmed that they were in working condition. As a result, the method of drawing the vaccine orally was banned, and vaccines began to be drawn using the felix device. This practice was very beneficial both in terms of hygiene and speed (11,25).

Dr. Kemal Muhtar Bey arranged for his assistant, Dr. Şerafettin Mustafa Bey, to be sent to Paris. The aim was to ensure that he received theoretical and practical bacteriology training and learned about the innovations in smallpox vaccine. Dr. Şerafettin Mustafa attended courses at the Pasteur Institute in 1913-1914. He worked in Dr. L. Camus's laboratory, which was equipped with modern instruments. He observed that the instruments used in vaccine production were sterilized, and the passage rooms, vaccinated animal stables, and emulsion rooms were disinfected daily. The vaccine yield was stored in special sealed bottles without glycerin in an electric freezer at temperatures between -15 and -18 degrees. Dr. Şerafettin Mustafa would write to Kemal Muhtar Bey about every innovation he observed during his time there. He especially emphasized the benefits of freezers (25).

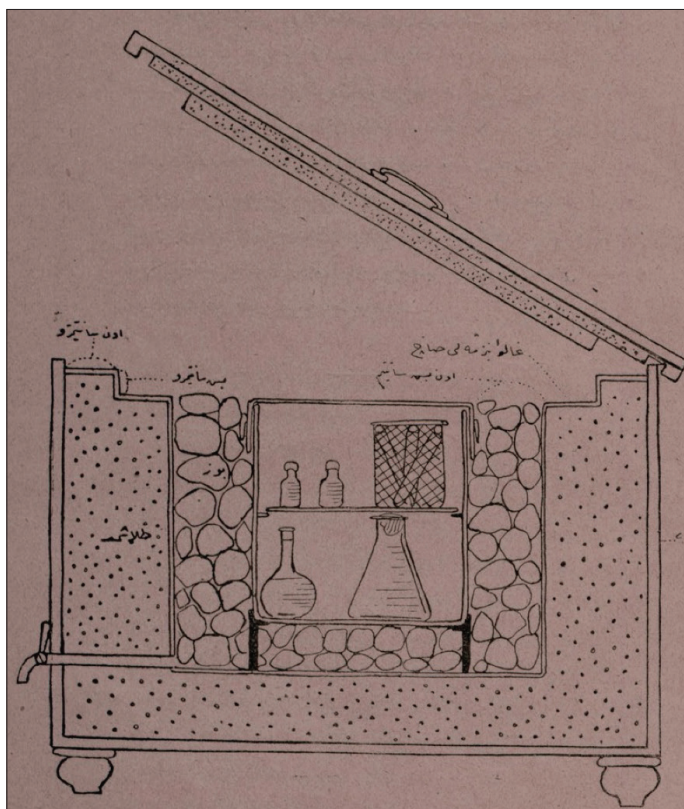


Figure 4. Kemal Muhtar Freezer, which cools to -14 degrees Celsius (24).

Dr. Kemal Muhtar Bey began using buffalo calves, which he found more suitable, in place of Crimean and local calves at Telkikhane. The vaccine material, derived from the pustules of vaccinated animals, underwent testing on rabbits to assess its effectiveness. Upon achieving positive results, it was subjected to a 15-30-day period of contact with glycerin, followed by storage in cold conditions. Once this process was complete, control numbers were assigned, and the vaccine was made available for distribution. Glycerin was preferred due to its ability to maintain the virus at a high titer, ensuring effective storage. The ideal storage temperature for the vaccines was between -5 and -15 degrees Celsius. Such low temperatures could only be achieved using electricity, which was not possible during those years. Dr. Kemal Muhtar Bey, most likely influenced by the reports from Dr. Şerafettin Mustafa in Paris, designed a freezer (25).

This freezer was named "Kemal Muhtar Freezer" by his friends. Thanks to the freezer, vaccine cultures were perfectly preserved for a year (11). When vaccines and serums were stored in this freezer, smallpox vaccines could be used for one year, and other vaccines for five months without spoiling (24). The "Kemal Muhtar Freezer" was a rectangular metal container with a lid. Ice cubes were placed in the 15 cm-wide gap surrounding it, and the 20 cm-wide area around it was filled with a preservative substance to prevent the ice from being affected by the ambient temperature. Thanks to the lids covering the container and the surrounding ice and additives, the melting time of the ice was extended (25). In this freezer, a temperature of -14 degrees Celsius was achieved using 10 okka of ice in 24 hours, and it maintained this temperature during that period (24).

During the tenure of Dr. Kemal Muhtar Bey, fresh and potent yeast was imported from Paris to reinforce the existing yeasts at Telkikhane. This practice was repeated from time to time. Before his directorship, approximately 500.000 vaccines were prepared annually. However, in 1914, in response to the General Health Directorate's ambition to vaccinate the entire population, over 3.5 million vaccines were prepared and distributed to the required locations under Dr. Kemal Muhtar Bey's leadership (11). Due to this achievement, on October 25, 1915, he was awarded the Order of the Osmanieh, third class (20).

During this period, graduates of the Junior Health Officers School were recruited in Telkikhane, leading to a more scientific approach to vaccine preparation. Experiments conducted on buffalo calves yielded positive results. For this reason, in 1916, buffalo calves were brought in. Due to the increase in the price of cattle during World War I, Dr. Kemal Muhtar Bey began leasing the cattle. After the vaccines were

Year	Number of vaccinations
1892	428
1893	5.597
1894	12.711
1895	48.356
1896	54.183
1897	76.458
1898	144.927
1899	127.682
1900	137.046
1901	147.770
1902	195.373
1903	139.179
1904	265.048
1905	223.884
1906	254.344
1907	233.135
1908	233.335
1909	275.966
1910	332.454
1911	631.816
1912	666.885
1913	1.427.059
Total	7.260.784

Figure 5. Vaccine production from the establishment of Telkikhane to the end of 1913 (23).

administered, the animals were sent to the slaughterhouse and examined by the assistants after being slaughtered. Additionally, after administering the vaccines, cultures were conducted, and great care was taken to ensure the absence of microbes. Vaccines were tested on children, and in addition, rabbits were also vaccinated to study their reactions (11).

From its establishment until the end of 1913, a total of 7.260.784 doses of vaccine were produced at Telkikhane. During Dr. Kemal Muhtar Bey's tenure as director from 1914 to 1919, 27.688.449 doses of vaccine were produced. Since mail was cut off to Anatolia during the War of Independence, vaccines for 655.000 people in 1920, 1.770.000 in 1921, and 1.283.000 in 1922 were shipped through the Red Crescent Society. During the Armistice period, the Allied Powers, who occupied İstanbul, sent a medical commission to inspect Telkikhane. As a result of this inspection, in 1920, they received 181.220 doses of vaccines for the soldiers and migrants, and in 1921, 29.800 doses (11).

Dr. Şerafettin Mustafa Bey described Dr. Kemal Muhtar Bey as a "valuable and active bacteriologist" and attributed the increase in the activities of Telkikhane to him (11). Some of the documents we examined also praised Dr. Kemal Muhtar Bey's work. For example, in a document dated March 29, 1917, it was noted that he brought about many innovations and advancements at Telkikhane, and his expertise and success in vaccine preparation were also emphasized (21). His donation of a significant amount, such as 8.850 kuruş, for the renovation of the Meclis-i Âli-i Sıhhi (Supreme Council of Health) room in April 1917, demonstrates his commitment to the community and his generous personality (22).

Dr. Kemal Muhtar Bey's Views on Smallpox and Smallpox Vaccine

Dr. Kemal Muhtar's article titled "Why Doesn't Smallpox End?" in the 7th issue of Sıhhiye Mecmuası (Journal of Health) is important for understanding his views on this disease and vaccination. According to Dr. Kemal Muhtar Bey, almost all the infectious diseases observed in the Ottoman Empire had been consistently occurring for years. Regarding why the smallpox disease did not end, he pointed out two main factors. The first of these factors was the insufficient interest shown by the public in vaccination, and the second was the inadequate production of vaccines. According to him, smallpox had been eradicated in civilized countries. The reason for this was that everyone had been vaccinated against this disease (23).

Dr. Kemal Muhtar Bey, in his article, also pondered the question "Why aren't we doing this?" and examined the subject with a critical perspective. According to him, in our country, the value of life was not appreciated. One of the allies of the Ottoman Empire in World War I, Germany, had not lost a single person to smallpox in forty years, according to Dr. Kemal Muhtar Bey. However, during this period, the Ottoman Empire lost forty thousand people to this disease. After this information, Kemal Muhtar Bey, saying "Why don't we get vaccinated?" expressed that taking advantage of the government's facilities would be a reasonable response. He then provided the following table (23).

According to the table provided by Dr. Kemal Muhtar Bey, during the 22 years from the opening of Telkikhane-i Osmani in 1892 until the end of 1913, enough vaccines were produced to immunize 7.260.784 people. When you add the one million vaccine vials imported from Europe and produced in Telkikhane in Damascus and Baghdad to this number, the total amounts to eight million doses of vaccines. Even if all of these vaccines were used and all were effective, only eight million people would have been immunized. When we account for those who passed away for various reasons after being vaccinated over the course of 22 years, individuals who

relocated to different regions, those who remained in areas separated from Ottoman territories, and those who received multiple vaccinations, it can be estimated that one in every twenty-five individuals in the Ottoman Empire had not been vaccinated. At this point, Mr. Kemal Muhtar continued his article with another question. "Can a country where one in twenty-five people have not yet been vaccinated eliminate the disease?" Following this question, he provided information that highlighted the importance given to the issue by the health administration. Accordingly, the General Directorate of Health, taking the vaccine issue into consideration, ordered the preparation of vaccines for 3.500.000 people in 1914. It was reported to Telkikhane-i Osmaniye that this figure would be increased to five million for 1915. This would ensure that the entire Ottoman population would be vaccinated within five years. According to Dr. Kemal Muhtar Bey, it would have been possible to eradicate the smallpox disease at the end of those five years. However, at this point, doctors, vaccination officers, and all other government officials should have regarded the execution of vaccination not as an official duty but as a patriotic duty. Furthermore, the public should have shared the same sentiments. Kemal Muhtar Bey also mentioned that the law of supply and demand applied in Telkikhane, emphasizing that as much vaccine as demanded would be prepared and sent out. Addressing the entire Ottoman population, he demonstrated the importance he placed on both vaccine production and vaccination by saying, "Whoever loves his country should get vaccinated" (23).

Dr. Kemal Muhtar Bey's article titled "Why Vaccination Against Smallpox May Fail," published in *Sihhiye Journal*, is also of great significance. In this article, which is almost like a lesson for those interested in the subject, he attributed the failure of smallpox vaccination to three reasons. The first of these reasons was the vaccine being defective. The second reason was improper vaccination by the vaccinator, and the third was the lack of susceptibility in the vaccinated individual. In the continuation of his article, he also provided the answer to the question "How can a vaccine become defective?". According to this, some cows provided high-quality vaccines, while the vaccine produced by others was weak. Such a vaccine could not be effective. Vaccines prepared at Telkikhane-i Osmani underwent various examinations before being used. Vaccines that elicited a weak response in cows and had a low likelihood of success in humans were discarded. Those that elicited a strong response were then tested on rabbits. Subsequently, humans were vaccinated, and if positive results were achieved, the vaccines were distributed with a control number. The vaccine culture was stored at temperatures below freezing for three weeks to protect it from various microbes. Other microbes could not develop in cold temperatures. This was

done to ensure the strength and long-term preservation of the vaccine culture (24).

Vaccines produced at Telkikhane-i Osmani were always strong and effective as soon as they were manufactured. However, failing to store the vaccine culture at temperatures below freezing after it left Telkikhane would cause it to lose its potency. Because the first enemy of the smallpox vaccine was heat. Warm weather would encourage the growth of microbes, and it would also damage the vaccine's own virus. Hence, it was necessary to store the vaccine in a freezer or a cold place without exception. Otherwise, the vaccine would lose its potency. Dr. Kemal Muhtar Bey warned the relevant authorities about this matter. He requested doctors and vaccinators to demand only the required number of vaccines, noting that vaccines were exposed to sunlight, left near stoves, and even carried in clothing pockets (24).

At this point, he also provided information on how vaccines could be requested from Telkikhane. According to him, there was no need for continuous letter and telegram communication. All that was necessary was to submit the request once, indicating the demand for one hundred or five hundred tubes to be sent weekly. This request was recorded in the weekly log, and the dispatch would commence accordingly. Once the demand was satisfied, a request to cease sending vaccines would be adequate. However, it was important that telegrams were concise. There was no need for sentences indicating that the vaccination officer would be dispatched, that the vaccination season began, or that a sufficient quantity of vaccine vials should be sent. However, he insisted on a clear and specific mention of the quantity of each vaccine requested (smallpox, cholera, typhoid, dysentery). He also included a sample telegram text in his article. In a way, he was attempting to create a common document type and language between Telkikhane, regional institutions, and healthcare personnel. Sample telegram text:

To Telkikhane-i Osmani Directorate

Smallpox vaccination consignment (sending) for one thousand five hundred people (24).

Dr. Kemal Muhtar Bey pointed out four key factors regarding the second reason for the failure of smallpox vaccination, which is the inadequacy of the vaccinator in administering the vaccine. Firstly, if the person administering the vaccine did not cool the vaccination knife after heating it in a flame and placed the vaccine on a hot knife, the heat would cause the vaccine to spoil. Secondly, using substances like sublimate, phenol, and alcohol to clean the skin during vaccination could also lead to vaccine spoilage due to contact with these substances. Hence, he stated that alcohol should only be used after the applied alcohol has evaporated, and then the

vaccination should be administered. Thirdly, he pointed out the potential disadvantages of excessive bleeding during the vaccination. In this case, the potency of the vaccine would be diminished, and excessive bleeding would carry away the vaccine. Fourthly, he mentioned that if the vaccination is done too superficially, without going deep enough to reach the white blood, the vaccine would not take effect (24).

Dr. Kemal Muhtar Bey also provided a detailed explanation for the third reason for the failure of smallpox vaccination, which is the lack of susceptibility in the vaccinated individual. According to him, those who had been previously vaccinated and had a successful vaccination were exempt from smallpox vaccination. He noted that the vaccine would not take effect in individuals who had experienced smallpox, in those who inherited resistance from their parents (very rarely), in children who were breastfeeding from a mother who had contracted smallpox, and in babies drinking her milk (commonly observed), and in those who were naturally immune. Furthermore, he emphasized that the vaccine would be ruined if it were wiped off or had an antiseptic substance applied to it immediately after vaccination. He also reminded that the same vaccine culture was sent to various places and attributed the inconsistency in the vaccine's effectiveness between different locations to errors in its storage or administration. Hence, he recommended that vaccines should be requested in sufficient quantities from Telkikhane and stored in cold conditions (24).

Conclusion

Dr. Kemal Muhtar Bey is one of the most prominent bacteriologists to emerge in the late period of the Ottoman Empire. He, along with his siblings, made significant contributions to Turkish medicine. The innovations he introduced at Telkikhane where he was appointed on July 30, 1913, enabled the institution's development, an increase in its activities, and its transformation into a modern structure. In fact, from the establishment of Telkikhane in 1892 until the end of 1913 when he became its director, a total of 7.260.784 vaccinations were produced. However, from 1914 to 1919, a total of 27.688.449 vaccinations were produced. Even this figure alone is highly significant in demonstrating the service he provided in the field of vaccine production. The fact that he ensured the delivery of vaccines to Anatolia through the Red Crescent Society in 1920 (655.000 doses), 1921 (1.770.000 doses), and 1922 (1.283.000 doses) during the Turkish War of Independence, amid the country's occupation and dire shortages, is a remarkable service that deserves greater recognition.

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