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Erich Wernicke — a Close Collaborator of Emil von Behring. His Life and Work in Posen (Poznan)

Erich Wernicke — bliski współpracownik Emila von Behringa. Życie i praca w Poznaniu

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Summary

Erich Wernicke was a close collaborator and friend of Emil von Behring. Their co-work is well described. The details of his 20 years stay in Poznan are, however, much less known. Wernicke was a famous hygienist and immunologist. His stay in Poznan was characterized by transferring hygienic basic science which developed in the beginnings of the 20th century in the daily life of people for example on the field of clean water and disinfection. From 1899 he was the chair of the Hygiene Institute of Posen (Poznan) and from 1905 until 1908 he was rector of the Royal Academy of Posen (Poznan). His expertise helped to establish in Poznan a modern water supply system and water hygiene.

Keywords: Erich Wernicke, history of immunology, history of hygiene, history of city Poznan, history of public health

Streszczenie

Erich Wernicke był bliskim współpracownikiem i przyjacielem Emila von Behringa. Ich współpraca jest dobrze znana. Jednak szczegóły jego dwudziestoletniego pobytu w Poznaniu nie zostały dotychczas dokładnie zbadane i przeanalizowane. Wernicke był słynnym znawcą higieny i immunologii. Podczas swojego pobytu w Poznaniu pomagał w stosowaniu zdobyczy nauk podstawowych z zakresu higieny i mikrobiologii w urządzeniach użyteczności publicznej, np. przy oczyszczaniu wody oraz jej dezynfekcji. Od 1899 roku był kierownikiem Instytutu Higieny w Poznaniu. W latach 1905–1908 pełnił funkcję rektora Akademii Królewskiej w Poznaniu. Jego doświadczenia pomogły wprowadzić w tym mieście nowoczesny system dostarczania wody i jej odkażania.

Słowa kluczowe: Erich Wernicke, historia immunologii, historia higieny, historia Poznania, historia zdrowia publicznego

1. Introduction / Method

Erich Wernicke may have deserved the Nobel Prize received by Behring and Kitasato, but certainly should not have been forgotten. His close collaboration with Emil von Behring in Koch's laboratory enabled the development of diphtheria antitoxin and brought Behring the Nobel Prize. The aim of this paper is to analyse the achievements

of Erich Wernicke while resident in the city of Poznan. Wernicke was a famous hygienist and immunologist and he published over twenty scientific papers and several articles as well as monographs during his life. However during his time in Poznan, Wernicke introduced basic hygiene, which developed in the beginning of the 20th century, into the daily lives of people in the areas of clean

water and disinfection, for example. The study presented here is based on primary sources from the Berlin State Library [1] and the State Archive in Poznan.

2. Wernicke's life and work before moving to Posen (Poznan) (1859–1899)

Erich Wernicke was born on the 20th April 1859 in Friedeberg/Neumark (Strzelce Krajeńskie), a small town near Landsberg/Warthe (Gorzów Wielkopolski) in the district of Lebus. He was the seventh child born to his parents Henriette Wernicke, née Benickendorf, and Julius Wernicke. Julius Wernicke was a secondary-school teacher, choirmaster and organist. The education of the children was heavily influenced by the family's strict protestantism [2].

After graduation Erich Wernicke started to study medicine at the University of Berlin as a member of the "Medizinisch-Chirurgischem Friedrich-Wilhelm-Institut" in 1879 [3]. The admission to this military institute represented Erich Wernicke's only way to study medicine for family pecuniary reasons. Among his teachers at the medical faculty, there were many whose reputations survive the centuries, for example von Helmholtz, du Bois-Reymond, Leyden, Bardeleben, von Langenbeck, von Bergmann, Virchow, Henoch, and Gusserow [4]. In April 1885, Wernicke passed the last of the medical state examinations [5]. One month later he successfully defended his doctoral thesis covering an obstetrical issue ('Hydrocephalus congenitus foetalis') with the highest grade 'summa cum laude' [6].

From 1885 until 1890, Wernicke gained practical experience as a military doctor in Mühlhausen/Elsaß and Karlsruhe particularly in the area of surgical medicine. It was during this time that Wernicke became very interested in hygiene: Together with H. Salzmann from the Technical University of Karlsruhe he investigated the antiseptic effects of mercury dichloride in wound dressings [7].

In the spring of 1890 Wernicke returned to Berlin as a scientific assistant to Robert Koch at the Hygiene Institute of Berlin. A very productive collaboration with Emil von Behring, who was well known by Wernicke from his years as a student, began [FIG. 1]. Their field of activity was the development of antitoxic sera and both scientists worked day and night to develop a diphtheria vaccine [8]. Over the following years Behring and Wernicke succeeded in immunising guinea pigs against diphtheria. This was a difficult procedure requiring a high degree of endurance, diligence and skilfulness [8]. Wernicke managed the practical experiments and wrote them down meticulously in a minute book [9]. Behring however directed the experiments and decided



FIG. 1. Erich Wernicke, Robert Koch and Emil Behring (from left to right), Berlin, 1891, archives of the 'Behringwerke', Marburg, Germany, archive no 1396



FIG. 2. Old building of the Hygiene Institute in Posen (Poznan), Breslauerstrasse no 16, around 1907. Source: Adam Mickiewicz University Library, Poznan, Poland



FIG. 3. New building of the Hygiene Institute of Posen (Poznan), 1913, Königsring, archives of the 'Behringwerke', Marburg, Germany, archive no 1396

the next steps as he was unable to do the experiments himself due to bad health [10]. In 1892 they reported and published together the first successful cure for diphtheria using sera from guinea pigs [11]. Later Behring admitted that the development of the diphtheria antitoxin probably would have come from the Pasteur Institute in France if Wernicke hadn't done the crucial series of tests [10]. In 1901, Behring received the Nobel Prize for the serum therapy, whereas Wernicke's contributions to the development of the diphtheria antitoxin were largely forgotten.

Wernicke received his habilitation in 1894 for hygiene and bacteriology from the University of Berlin [9]. In 1895 he took over the directorship of the hygiene and chemical laboratory of the 'Medizinisch-Chirurgische Friedrich-Wilhelm-Institut'. From 1897 until 1898 Wernicke was initially an honorary and later a full professor at the University of Marburg [9].

3. Wernicke's life and work in Posen (Poznan) (1899–1914)

3.1. Wernicke and the Hygiene Institute of Posen (Poznan)

On the 5th April 1899 Wernicke accepted a chair at the planned Hygiene Institute of Posen (Poznan) [12] and his task was to build-up this institute. He did this with great enthusiasm. Under the direction of Wernicke, the Hygiene Institute of Posen (Poznan) became scientifically very vibrant [12]. The Hygiene Institute was subdivided into three departments: 1. the department of hygiene and bacteriology, 2. the department of pathology and anatomy, and 3. the department of chemical analyses and hygiene of food products. Wernicke headed the whole institute and in particular the department of hygiene and bacteriology. The two other departments were the responsibility of two additional leading scientists [13].



FIG. 4. Hygiene Institute of Posen (Poznan), around 1913 (left-most position), Source: Adam Mickiewicz University Library, Poznan, Poland



FIG. 5. Professor Erich Wernicke and his assistants in one of the laboratories of the new Hygiene Institute in Posen (Poznan), 1913, archive collection of Wernicke in the National Library of Germany, Berlin, archive no 156/5, photo no 21



FIG. 6. Professor Erich Wernicke, Posen 1910, archives of the 'Behringwerke', Marburg, Germany, archive no 1396

Initially the Hygiene Institute was accommodated in an old building [FIG. 2] located in Breslauerstr. 16. [14] A highlight in Wernicke's scientific life was undoubtedly the inauguration of the new building housing the Hygiene Institute in April 1913 [FIG 3, 4]. This new building included an auditorium with projector and capacity for seventy people, modern laboratories [FIG. 5], central heating and windows 'so big and well-placed that all rooms of the institute were truly flushed with light' [14]. One laboratory was totally isolated from the others to allow studies on plague and cholera. After working in this high security laboratory everyone had to take a bath before leaving [14].

The main task of the hygiene department was to prevent and combat the infection of diseases such as cholera, typhus, recurrent fever, pox, plague, rabies and others [13]. However, the questions of water supply, water hygiene and effluent disposal were also important fields of activity. Further areas of interest included soil investigations, hygiene assessments of habitations, hygienic surveillance of commercial undertakings, inspection of disinfection apparatus, education of staff amongst others. While the Hygiene Institute supported routine work, much scientific research was also conducted under its auspices as evidenced by the numerous scientific papers published and the graduation of many young scientists [13].

3.2. Wernicke and the Royal Academy of Posen (Poznan)

The Academy was inaugurated on the 5th November 1903 in Posen (Poznan). It was expected to bridge the gap between the Universities of Königsberg (Kaliningrad) and Breslau (Wrocław). But in contrast to these universities, the Royal Academy of Posen (Poznan) was prescriptive with regard to the age of students nor their educational background. It served in essence as a community college. In 1903, immediately after the foundation of the Academy, Wernicke received a teaching assignment for hygiene and bacteriology there [15]. From 1905 until 1908 Erich Wernicke was rector of the Academy [16] and from 1903–1905 and again from 1908–1911, its vice-rector [FIG. 6] [17]. Wernicke was also a temporary member of the Academy administrative commission [18]. In 1910 the Academy was housed in its own building [19]. As an example of the kind of courses and seminars offered by Wernicke at the Academy, an excerpt of the lecture schedule for 1909/10 is shown in table 1.

3.3. The situation regarding the water supply in the 19th century in Posen (Poznan)

The situation regarding the water supply and hygiene in the 1860s and 1870s was described by an expert com-

missioned by the local government [20]: everyone was disturbed by the 'pungent odour' walking through the city of Poznan. In contrast to some European cities there was no form of canalisation. Hygiene analysis of the water from different wells in Poznan showed that the quality of the water was terrible. In addition to organic substances and nitric acid, ammoniac was also found in the groundwater. The presence of ammoniac indicated the contamination of the groundwater by excrement from people and animals. Excrement was collected in cesspools, which often leaked and were seldom emptied, so groundwater and the water wells became contaminated. As a consequence of the dirty water, the rate of infection and disease, and consequently, mortality was very high at 37 people per 1000 per year. More than half of the children did not reach the age of five [21]. In addition to the typical infections such as diphtheria, cholera, typhus and tuberculosis, malaria was also endemic in Posen (Poznan) at this time [21].

The first step towards improving the water supply was the replacement of the wooden water conduits with iron ones in 1862 [22]. But the main problem was to source sufficient clean water. The water obtained from springs of groundwater wasn't enough for the inhabitants of Posen (Poznan), therefore the water supply was supplemented with filtered water from the river Warthe. For this purpose a steam-powered pumping station including a filtration facility was built in 1866 [22]. This had to be augmented in the 1870s. But the main problem associated with this water was that pathogenic agents were not removed or destroyed by the filtration process and the search for new groundwater sources continued. In 1874, exploratory drilling and pumping of groundwater was conducted on the meadows of Bocianka and Eichwald in the south of Posen (Poznan) [22]. Although these attempts were very successful, the water obtained had a strange smell and after a short period of time it became darkly discoloured [22]. The problem could not be solved and the project was put on hold.

In response to the large epidemics caused by using filtered, but unhygienic river water and the city's growing water requirements (Posen grew from 67,000 to 117,000 inhabitants in 1900) the search for additional groundwater sources resumed at the beginning of the 20th century, when Erich Wernicke was already living and working in Posen (Poznan). The director of the waterworks, Mertens, and the director of the Hygiene Institute, Wernicke, recommended that groundwater also from the meadows of Bocianka and Eichwald should be mined from a depth of 120m to 150m [23].

The deep groundwater found with this technique was available in abundance and of good hygienic quality but

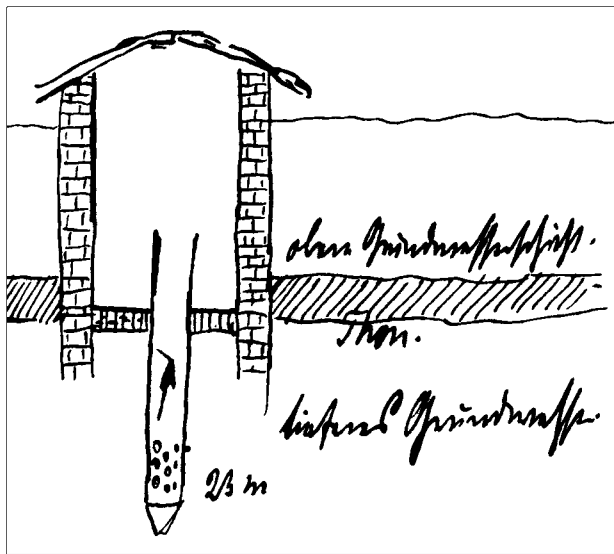


FIG. 7. Diagram of a groundwater well: hatching — the clay layer located above the upper groundwater layer and below the deeper groundwater layer; depth of groundwater well 23 metres, outlined by Wernicke himself [59]

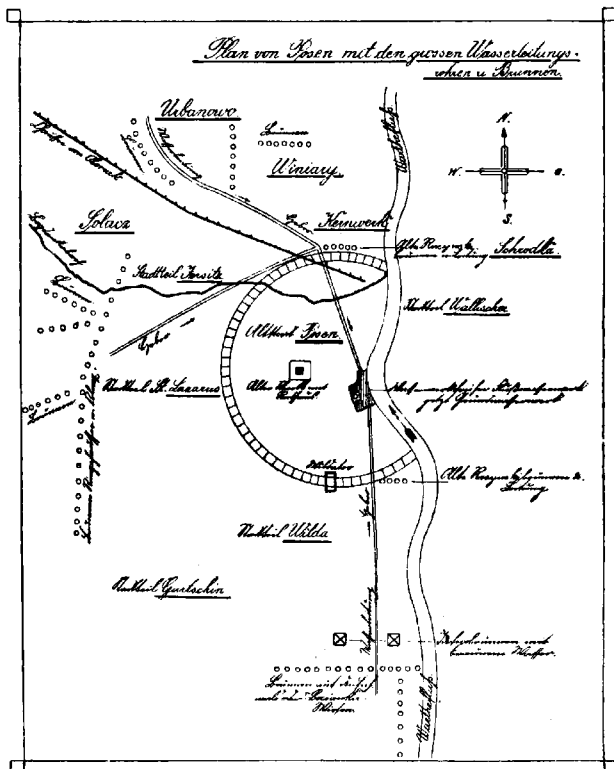


FIG. 8. The water supply system of Posen (Poznan) in 1911 as outlined by Wernicke himself [23]. Indicated are the historic city (located within the central circle), the river Warthe (curved line on the right), the main water conduit (top to bottom in the middle of the drawing), the wells in the groundwater territories in the north, west and south of Poznan (dotted)

it has had one fault: 'It was brown like coffee' which was how Wernicke himself had to describe it [23]. The reason for this discoloration was a brown coal layer positioned under the bed of clay. There were many possibilities to remove the organic material from the water but these were complex and expensive. In 1906 Wernicke found an easy method to clean the water. If the brown, deep water was mixed with the more superficial ferruginous groundwater it had two consequences: the organic substances and the iron and manganese compounds precipitated out. With the new efficient Jewell-filters, these compounds could be removed and clear water was obtained easily with this novel method, which had not been used previously anywhere else before [23]. In 1908 new deep wells [FIG. 7] were built on the meadows of Eichwald and a new Jewell-filter completed in 1909 in the water production facility.

In 1911 Wernicke wrote: 'With the three developed groundwater territories in the north and west of Posen (Poznan) and in the south (the meadows of Eichwald) [FIG. 8] and with the new methods of utilisation of the deep water, the drinking water needs of the inhabitants of Posen (Poznan) will probably be ensured for a long period of time. — Our water from the conduit is a clear, pure, pleasant tasting water which is free of infectious or pathogenic agents and is available in sufficient quantity for the whole city' [23].

Clean water for everyone was one of the main concerns of Wernicke. He believed that 'the more cultured people are, the higher is their consumption of water.' [19] He also published some scientific articles about the issue of water supply and health care [24]. The city of London was a pioneer in the implementation of a water supply; in Germany city water supplies were initially introduced in Hamburg and Berlin and followed by Posen (Poznan) — earlier or simultaneously with German cities of comparable size [23]. Poznan owes much to Wernicke concerning this issue.

3.4. Wernicke's contribution to hygiene and disinfection in Posen (Poznan)

Wernicke was also very interested in hygiene and disinfection as a means to combat infectious diseases. He investigated and published effective measures for the disinfection of living spaces following various infectious diseases [25, 26]. But he was not only interested in the scientific work *per se* — he also tried to introduce new scientific insights into daily life. For example he introduced and trained people to carry out disinfections [27]. Furthermore he performed educational and explanatory work across the social classes: Wernicke published on the relationship between domestic hygiene and infectious

disease in the bulletin of a tenants association [28] as well as in scientific journals [29]. In 1910 Wernicke was a member of the German preparation committee for the Third International Congress of the School Hygiene in Paris [30]. The following year Wernicke supported with great commitment the International Exhibition on Hygiene in Dresden, an exceptional event for the young discipline of hygiene [31].

3.5. Wernicke's work on infectious diseases and immunology in Posen (Poznan)

Besides his special interest on hygiene issues, Wernicke continued his bacteriological and immunological experiments in Posen (Poznan). His broad scientific interests are reflected in publications concerning developments on the studies of tuberculosis (1904) [32], new investigations on cholera (1905) [33], serological changes during an infection of syphilis (1908) [34] and actual knowledge of immunity against anthrax (1914) [35]. The main aim of his studies was to reduce infection rates, morbidity and mortality of infectious diseases. Over the course of his scientific life he moved from seeking to understand the basic science of immunology more towards the search for effective strategies to prevent disease infection.

The epidemiology and the prevention of tuberculosis was an particular issue for Wernicke in Posen (Poznan). He was member of the 'International Association against Tuberculosis' [36]. Several publications of Wernicke on tuberculosis demonstrate his interest in this highly prevalent disease [32, 37, 38]. Wernicke carefully documented every case of tuberculosis in the city of Posen (Poznan) and so could identify regions, streets and even houses with a high burden of this illness. He used this knowledge to target prevention programmes [13]. Wernicke initiated and supported the building of hospitals, sanatoriums and welfare centres for those individuals with tuberculosis [13].

In particular, Wernicke was recognised for his work regarding a major typhus epidemic in Posen (Poznan) in 1904. He demonstrated that this epidemic was caused by the distribution of contaminated milk provided by a single dairy [13]. This knowledge was then used to end the epidemic.

It seems amazing that there weren't publications by Wernicke between 1899 and 1914 on the issue of diphtheria, the theme of his most intensive scientific work. But Wernicke was also engaged in the field of diphtheria immunisation and prevention in Posen (Poznan). He publicly complained that immunisation against diphtheria was not as common and wide-spread as it should be [39]. Several years later he wrote an article in which he

described his memories on the fight against diphtheria in Posen (Poznan) [40].

3.6. Wernicke's political bearing and his personal relationship to Posen (Poznan)

Wernicke was characterised by a patriotic spirit, he was a supporter of the monarchy and an opponent of social democracy [41]. Despite the considerable contribution of Wernicke to common issues such as water supply, hygiene etc. it cannot be denied that Wernicke's engagement with the Hygiene Institute and the Royal Academy was coupled with his patriotism. Establishing these institutes was to increase the German influence in Posen (Poznan) which was a city of 117,000 inhabitants (1910) — of which the minority was German speaking [42]. Wernicke supported ideas including the 'peaceful germanisation' of Poland in the years before the First World War [8, 43].

Wernicke denoted the years he spent in Posen (Poznan) as the happiest in his life. It was satisfying for him to transfer the knowledge from basic science to the daily life of people. He successfully taught broad sections of the population. As an example of people's gratitude to Wernicke we found a poem in his estate authored by teachers who were instructed by him [44]. Wernicke's reply was also a poem consisting of six strophes which demonstrated that he enjoyed this form of education [45]. Another example for Wernicke's citizen-orientated attitude was his work as a lecturer at the community college of Posen (Poznan) [46]. Wernicke also took on political duties as a member of the city parliament of Posen (Poznan) [47].

During his time in Posen (Poznan) Wernicke was offered different positions at the Universities of Berlin and Königsberg (Kaliningrad) [48–50]. Wernicke turned these opportunities down and stayed in Posen (Poznan). Wernicke owned an estate house near to Posen (Poznan) in Kardorf (Chartowo), which was carefully cultivated and loved [51]. Erich and Meta Wernicke had six children [2]: one son (Heinrich, *1895) and one daughter (Charlotte, *1897) moved with them to Posen (Poznan). Four additional children were born in Posen (Poznan): Friedrich-Karl (*1899), Johanna (*1901), Hans-Günther (*1902) and Ursula (*1911) [FIG. 9]. Years later Heinrich became a customs officer. Emil von Behring was a godparent to Heinrich demonstrating the close private relationship between these families. Heinrich died in 1981. Charlotte studied music and piano; she died in 1955. Friedrich-Karl fell in battle in 1918 in the First World War only 19 years old. Johanna died in 1987. Hans-Günther also studied medicine and like his father, Wernicke, his main interest was hygiene. He died in 1984. Ursula the youngest daugh-



FIG. 9. Erich Wernicke and his family in 1910: from left to right: Friedrich-Karl, Charlotte, wife Meta Wernicke, Hans-Günther, Erich Wernicke, Heinrich, Johanna; Ursula had not yet been born. From the 'Behringwerke' archives, Marburg, Germany, archive no 1396



FIG. 10. Family grave of Wernicke in the Kaiser-Wilhelm-Gedächtnis parish cemetery, Berlin-Westend, Germany, photos from E. Schulte

ter of Wernicke was a medical technical assistant and as she lived until 2006, we know many details of Wernicke’s life and family from her narratives [2].

4. Wernicke’s life after the First World War

Following the First World War, Wernicke continued to work at the Hygienic Institute of Poznan for one and a half years by order of the Polish government [9]. In 1919 Wernicke prepared courses and lectures on hygiene and bacteriology for Polish doctors. This was described in non-published memoirs of Tadeusz Szulc, Wernicke’s successor in the position as head of the Hygiene Institute: “Relations were friendly and when Wernicke cited some amusing phrases during lectures the student audience showed their approval according to tradition by loudly stamping the floor with their shoes” [52]. Szulc also described farewell banquets for German professors in the hotel “Palais Royal”, which shows that they must have been respected [53].

From 1920 until 1925, Wernicke was responsible for the build-up of the Hygiene Institute in Landsberg/Warthe (Gorzów Wielkopolski) [54, 55]. After retirement Wernicke returned to Berlin, where he worked on voluntary basis at the Institute for Hygiene of Water, Air and Ground [56]. Wernicke died of a heart attack on the 25th May 1928 in his Berlin flat. He was buried in the “Kaiser-Wilhelm-Gedächtnis-Gemeinde” cemetery [Fig. 10] [57]. In 1928 an obituary was published in the daily newspaper of Posen (Poznan) with the following text: “Also the modern city of Poznan benefited from Wernicke’s scientific advice regarding several important hygiene facilities and particularly its supply of clean water” [58].

TAB 1. Excerpt from the schedule of lectures during 1909/10 offered by the Royal Academy of Posen (Poznan); courses offered by Erich Wernicke during this time, Erich Wernicke Archive in the Berlin State Library — Prussian Cultural Heritage, Berlin, Germany, archive no 156.

1	Causes, dissemination, and control of widespread infectious diseases, with demonstration.
2	Lessons about immunity together with practices of modern serological investigation methods — for physicians and scientists.
3	Discussion of the actual literature concerning hygiene and medicine; only for physicians.
4	Introduction to bacteriology with practical bacteriological investigation methods — for physicians, veterinary surgeons, pharmacists and scientists.
5	Hygiene summer school for teachers.

Acknowledgements

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