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LUDWIK HIRSZFELD IN THE NATIONAL INSTITUTE OF HYGIENE IN 1920-1941

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ABSTRACT

In this year, we commemorate the 130th anniversary of birth and 60th of death of Ludwik Hirszfeld, a prominent Polish scientist. Since 1920, he was the head of the Department of Bacteriology and Experimental Therapy of the National Institute of Hygiene (NIH). During the absence of Ludwik Rajchman in Poland, who was assigned to the League of Nations, he was a factual director of the NIH. Ludwik Hirszfeld governed the scientific, organizational and didactic activities in the Institute. Concurrently, he collaborated with research centres abroad, especially within the field of public health. Mission of the NIH was concentrated on a broadly defined issues aimed at combating infectious diseases, initiating and developing the production of sera and vaccines, their controlling and introducing to the country as well as training health care personnel.

INTRODUCTION

Prior to the First World War, Ludwik Hirszfeld stayed abroad, where he worked in different research centres. In 1907-1909, he was an assistant in the Department of Parasitology at the Cancer Research Centre in Heidelberg while in 1909-1911 in its Serologic Department. Ludwik Hirszfeld was a co-discoverer (with Emil von Dungern) of blood group inheritance; he also determined their nomenclature: A,B,AB, 0 (1911). He established a new discipline: seroanthropology by predicting and analyzing serologic conflict between mother and foetus. Until 1920, he held the position of assistant in the Faculty of Hygiene at the University in Zurich, where in 1914 he habilitated on hygiene and immunity (relation between immunological response and blood coagulability). In 1915, he was granted a military leave for participation in typhus epidemic control in Serbia. On the Macedonian front line, he established and managed microbiological laboratory and trained personnel to combat infectious diseases.

In this period, he discovered paratyphoid fever bacillus C, referred to as *Salmonella hirszfeldi*.

At the beginning of 1920, the National Department of Sera and Vaccines Evaluation at the NIH was established, modelled on the Ehrlich's Institute for Experimental Therapy in Frankfurt am Main. Ludwik Hirszfeld was appointed to be the head of this Department.

Initially, the National Department of Sera and Vaccines Evaluation was an independent unit, in which sera and vaccines produced in the NIH and private factories were tested. In 1925, it was merged with the Department of Bacteriology, forming the Department of Bacteriology and Experimental Therapy of the NIH which was in charge of Ludwik Hirszfeld. In the subsequent years, the following departments were formed: Microbiological Diagnostics, Serum Evaluation, Parasitology and Vaccine Evaluation. Each of the departments conducted researches into different pathogen species, causing infectious diseases, isolated during epidemics, including typhus, typhoid fever, dysentery, diphtheria, scarlet fever, syphilis. Research findings were used in the diagnosis of these diseases, description and control of epidemics and production of sera and vaccines.

NIH AS A RESEARCH CENTER IN CHARGE OF HIRSZFELD

"I have achieved what I dreamt of: I could work for the country, possessing the most beautiful apparatus which Polish researcher have ever had at disposal" (1, p.118).

Ludwik Hirszfeld managed the scientific activities of the NIH, using but also introducing new discoveries in the field of microbiology and immunology. He be-

lieved that a magnitude of practical tasks in the Institute hindered "…establishment of research centres, creativity and disinterested curiosity, required for theoretical work…" (2).

"Entirely pure science, without applied science, is impossible in institutes like ours as they serve for direct sanitary tasks: they have to form scientific basis for health protection" (1, p.160). Ludwik Hirszfeld decided to complete such tasks.

In the "Report on scientific activities of the National Institute of Hygiene and National Department of Sera and Vaccines Evaluation in Warsaw (for the 5th anniversary of its establishment)", L.Hirszfeld discussed the activities undertaken by particular departments and presented the possibilities of their development as well as scientific progress of his colleagues (2).

In this period, researches were mainly focused on typhus, typhoid fever, dysentery, diphtheria, scarlet fever whose epidemics constantly occurred in Poland.

Having analyzed the blood smear of patients suffering from typhus, Ludwik Anigstein concluded that band leukocytes in the first phase of disease accounted for 30-45% of all white blood cells and its number was decreasing in its second phase. Such phenomenon was to serve as an indicator in the first phase of disease. He also studied jaundice of non-bacterial origin.

In diphtheria laboratory, established in 1927, Julia Seydel investigated biology and morphology of different strains of *Corynebacterium diphtheriae* and their variability. In this laboratory, Ludwik and Hanna Hirszfeld and paediatrician Henryk Brokman analyzed the transmission principles of diphtheria and other childhood infectious diseases.

Stanisław Sierakowski with his assistants (H. Rabinowiczówna, Z. Modrzewska, E. Salomonówna) studied the effects of external conditions on bacterial growth: thickness of culture medium, temperature, medium Ph.

Helena Sparrow conducted researches on vaccines against typhus and scarlet fever. It consisted in immunization by administering pathogen together with convalescent's serum.

Under guidance of Hirszfeld, researches on *streptococci* and their poisons were performed.

In this respect, Hirszfeld collaborated with dr Feliks Przesmycki. He employed him in the Department of Bacteriology and Experimental Therapy and appointed him for the position of the head in the Microbiological Diagnostics. Dr Przesmycki carried out researches on antisera in animals and production of antibodies, pathogenesis of scarlet fever, diphtheria, pneumococcal infections, virulence of *bacillary dysentery*.

Hirszfeld claimed that for bacteriologists the most important tasks are to investigate the sensitivity and variability of pathogens.

Feliks Przesmycki recalled that the years between 1925 and 1933 were the most creative in the scientific activities of the NIH (3).

Researches conducted in the Department of Bacteriology and Experimental Therapy constantly referred to the previous discoveries and Hirszfeld's interest in blood groups; biochemical, immunological and anthropological researchers were associated with serology.

Wanda Halberówna was the closest colleague of Hirszfeld in this field. She studied serological groups while during researches on cancer, commenced in the NIH in the 30s, she was involved in the analysis of antigenic properties of normal and cancerous tissues.

Hirszfeld expected that experimental studies on cancerous tissues would result in receiving antiserum. "Based on these experiments, I made an assumption that morphological changes in blood may result from the presence of immunity cells directed against different blood cells of somebody's own body" (1, p.172).

Hirszfeld's passion for 'pure science' did not affect didactic activities within hygiene and epidemiology in the branches of the National Hygiene School.

Training courses were the domain of the National Hygiene School. For the successive decades, the authorities in the field of hygiene, social medicine, sanitary administration, biochemistry, statistics, epidemiology, occupational hygiene and sanitary engineering such as Marcin Kacprzak, an incomparable propagator and promoter of hygiene, Stanisława Adamowiczowa, an expert in statistics and epidemiology of infectious disease not only in Poland but also in the whole Europe, were trained in its branches.

LUDWIK HIRSZFELD AND HIS COLLEAGUES IN THE NIH

Physician-biologists, pharmacists, chemists, laboratory technicians with practice in hospitals, who were trained in foreign universities in the times of partition, and frequently, as it was in case of Ludwik Hirszfeld, also persons practising in microbiological laboratories and quarantine stations during and after the First World War: Helena Sparrow, Feliks Przesmycki, Wiera Głowacka, Józef Celarek were employed in the NIH.

In "The Story of One Life", Hirszfeld recalled his colleagues from the NIH as scientific elite:

Ludwik Anigstein – the first parasitologist in the NIH, expert in subtropical medicine, Stanisław Sierakowski – an expert in microbiological methods, Marcin Kacprzak – "hot heart and excellent pen" of professor and promoter of hygiene, Brunon Nowakowski – a hygienist, expert in occupational hygiene, Stanisława Adamowiczowa – an activist of the international women's movement, Józef Lubczyński, Aleksander Szniolis – the

best sanitary engineers in Poland, Edward Grzegorzewski – initially, a volunteer in the NIH, Rockefellerist, co-founder of the WHO, Witold Chodźko – a director of the National Hygiene School, Jerzy Morzycki – a good organizer of the NIH branches, Tadeusz Sporzyński – a head of factory producing cowpox. Following the Second World War, a number of these persons worked in the NIH for many years and formed scientific personnel at universities and medical academies.

A separate beautiful part of the NIH history was made by the assistants of Ludwik Hirszfeld: Róża Amzelówna, Helena Rabinowiczówna, Wanda Halberówna, Julia Seydel - colleagues and co-authors of his publications.

Scientific climate in the NIH. The most important task of a head is to create a climate. Not everyone can do this. I attempted to create this internal climate for 20 years (1, p.151-152).

"….a head should not only propose subjects but also make young persons to create them spontaneously. How it should be done? A head should be delighted when a young person figures out or discovers something. These are the main tasks of head: to induce excitability in young persons and be pleased with the results… Scientific climate disappears when the efforts of creative spirit are no longer respected…."

Ludwik Hirszfeld perceived science as a "mystery of scientific reasoning", discerning a relation between scientific and artistic creativity. He claimed that science is an autonomous virtue and a good of universal nature.

He was open to course participants and volunteers – e.g. in 1926-27, a total of 25 and 10 volunteers worked in the Department of Bacteriology and Department of Chemistry, respectively, of whom many were later employed in the head office of the NIH or its branches.

Irrespective of the fact that training courses were organized by the National Hygiene School, Ludwik Hirszfeld predominated over other lecturers. He lectured, inspired, introduced the researches conducted in the NIH to course participants. Of eight participants of courses on bacteriology and immunization for officer cadets of military reserve force in 1934, a few were employed in the NIH - Kazimierz Lachowicz, Juliusz Rychard, Leontyn Dmochowski, Wacław Mirkowski (5), who committed their professional life to the work in the Institute.

Every week, personnel meetings were convened to discuss the results of own researches and investigate foreign publications. Ludwik Hirszfeld undertook efforts to publish articles in Polish journals: Warsaw Medical Journal (Warszawskie Czasopismo Lekarskie), Polish Doctor (Lekarz Polski), Social and Medical News (Nowiny Społeczno-Lekarskie), Health (Zdrowie), Cancers (Nowotwory) and foreign journals, most frequently in German language: Zeitschrift für Immunforschung, Klinische Wochenschrift, and French language: Comptes rendus de la Société de biologie. Of importance, however, was for him to create an archival journal, issued by the NIH.

Since 1920, the Epidemiological Review (Przegląd Epidemiologiczny) was issued whose name was converted to the Experimental and Social Medicine (Medycyna Doświadczalna i Społeczna) after a few years. Ludwik Hirszfeld made the NIH journal available for academic scientific workers and promoted its reading in students.

L.Hirszfeld was a member of international scientific associations, he also formed such institutions in Poland - Polish Biological Association. In 1931-35, he held the position of president of the Polish Society of Microbiologists and Epidemiologists (Polish Society of Microbiologists) established by Roman Nitsche, Feliks Przesmycki and Zygmunt Szymanowski in 1927. He participated in their sessions.

ORGANIZATIONAL INITIATIVES IN THE NIH IN THE 30S

All objectives defined in NIH Statute as of 1927 were completed in the 30s.

One of the objectives was development of NIH branches, whose number increases to 13 in 16 provinces. Cooperation between NIH branches and field units of health was improved. Heads of the branches served as the official counsellors of health division chiefs while physicians-epidemiologists of the branches were concomitantly the officers of provincial health offices. Ludwik Hirszfeld remembers: "By dint of this cooperation, we not only participated in the control of epidemic but we were also on the best way to develop the epidemiology for Poland" (1, p. 158).

Another accomplishment was development of database of official data on hospitals, social institutions, governmental and academic units, where samples could be tested in case of infectious disease detection. So far, many emerging cases of diseases were not bacteriologically tested. In this way Ludwik Hirszfeld's postulates on organization of epidemiological surveillance system, outlined in the article "Microbiological services in the country" („Obsługa bakteriologiczna państwa") (Lekarz Polski 1934, 10, No. 5, p.31), were realized.

Merging the Departments of Food Evaluation with NIH appeared to be an organizational success, because sanitary monitoring of water and food was thus started. Uniform methods of water and food examination based on "Outline of bacteriological technique" („Zarys techniki bakteriologicznej") by Feliks Przesmycki and many other NIH publications were developed in NIH main premises, and implemented. They were also used

in infectious diseases bacteriological diagnostics. Developed methodology was used in NIH branches and cooperating field units.

New branches of the National Hygiene School, such as: Occupational hygiene, Psychological hygiene and Sanitary engineering were developed. Since the National Hygiene School was formed, i.e. in 1926 until 1938, a total of 161 training courses were organized, in which 8,614 persons participated, including 2,455 physicians. Of these courses, those concerning public hygiene for physicians – candidates for public health care, medical microbiology as well as courses for sanitary inspectors were predominant.

NIH activities were financed by ministerial subsidies, but also, in considerably small proportion, by NIH itself. Unit of Sera and Vaccines Production oh NIH became a company in 1927 and all of its costs were covered by the profits gained from the sale of biological preparations: sera, vaccines, preparations for veterinary purposes and organ-based preparations (insulin). Sera, vaccines and other biological preparations (insulin, preparations for veterinary purposes) were ordered by state, civil and military authorities and distributed in home market by wholesalers and pharmacies. This activity was particularly important for NIH as it did not avoid financial difficulties.

The Institute in collaboration with Association of Preventive Medicine (managed by Witold Chodźko PhD) together with Warsaw Health Division, which granted the funding, conducted mass vaccination campaigns against diphtheria and scarlet fever.

INTERNATIONAL COLLABORATION OF THE NIH IN THE TIMES OF LUDWIK HIRSZFELD

"National Institute of Hygiene was placed in the orbit of great sanitary movement (1, p.115), and development of the Institute proceeded under close contact with the Hygiene Committee of the League of Nations".

In 1920, a conference concerning the control of epidemic in the East, where its beginning was observed, was convened by the League of Nations in Warsaw. A speech was delivered by dr Ludwik Rajchman. In this conference, researchers from all parts of the world were present. The Hygiene Committee of the League of Nations initiated international work on the standardization of anti-dysentery serum, serodiagnosis of syphilis. During a scientific conference in Copenhagen in 1928, Stanisław Sierakowski and Helena Rabinowiczówna were awarded the second place (after England). Experiences of particular institutes from Europe and America were shared as well as the most optimal methods of testing were developed. Ludwik Hirszfeld was a permanent member of the Standardization Committee of the League of Nations and took part in its annual sessions. On the commission of the League of Nations, the collaboration with the Serological Institute in Copenhagen with regard to the standardization of serum titration methods was initiated. Prof. Th.Madsen from Copenhagen – 'a genius of standardization' coordinated this work.

On a request of other research centres, the Unit of Sera and Vaccines of the NIH sent them standard sera. Such form of collaboration was present in the whole Europe.

Two congresses were held with regard to the control of diphtheria and scarlet fever, in 1929 in Paris and in 1931 in London, in which the NIH actively participated.

Dr Witold Chodźko, the director of the National Hygiene School, as a member of the Hygiene Committee of the League of Nations, took part in the sessions of the Committee and delivered speeches on the programmes of the Hygiene Schools in Zagreb and Budapest. He represented the Polish Government in the International Office of Public Hygiene by submitting memorials on sanitary issues.

Stanisława Adamowiczowa from the National School Hygiene was a permanent connection between the NIH and Hygiene Section of the League of Nations, reporting data on infectious diseases in Poland.

Collaboration with the Institut Pasteur consisted in awarding stay grants – dr Helena Sparrow was given a grant following her successful experiments with vaccines against typhoid fever in the NIH. She collaborated with Charles Nicolle.

Helena Rabinowiczówna, an alumnus of the Medical Univeristy in Geneva, also was awarded the Institute's grant.

The Rockefeller Foundation organized international scientific exchange and funded grants for young researchers.

Rockefellerists from the NIH: Feliks Przesmycki – a physician, microbiologist, co-organizer of the NIH, the head of the Diagnostics Division, branch inspector, after the Second World War – the director of the NIH (1945-1963), Józef Celarek – a physician, bacteriologist, head of the Production Division in the NIH, Marcin Kacprzak – a physician, hygienist, promoter of hygiene, professor, rector of Medical Academy in Warsaw, Edward Grzegorzewski – a physician, working in the NIH as the volunteer and then in sanitary services, after the Second World War, the co-founder of the World Health Organization, Bruno Nowakowski – a hygienist (Occupational Hygiene in the National Hygiene School, professor of hygiene in Vilnius and Cracow, Stanisław Sierakowski – a bacteriologist – who studied in the 20s at the Johns Hopkins University in Baltimore.

Having used a grant from the Rockefeller Foundation, in 1923-27 Kazimierz Funk conducted in the NIH

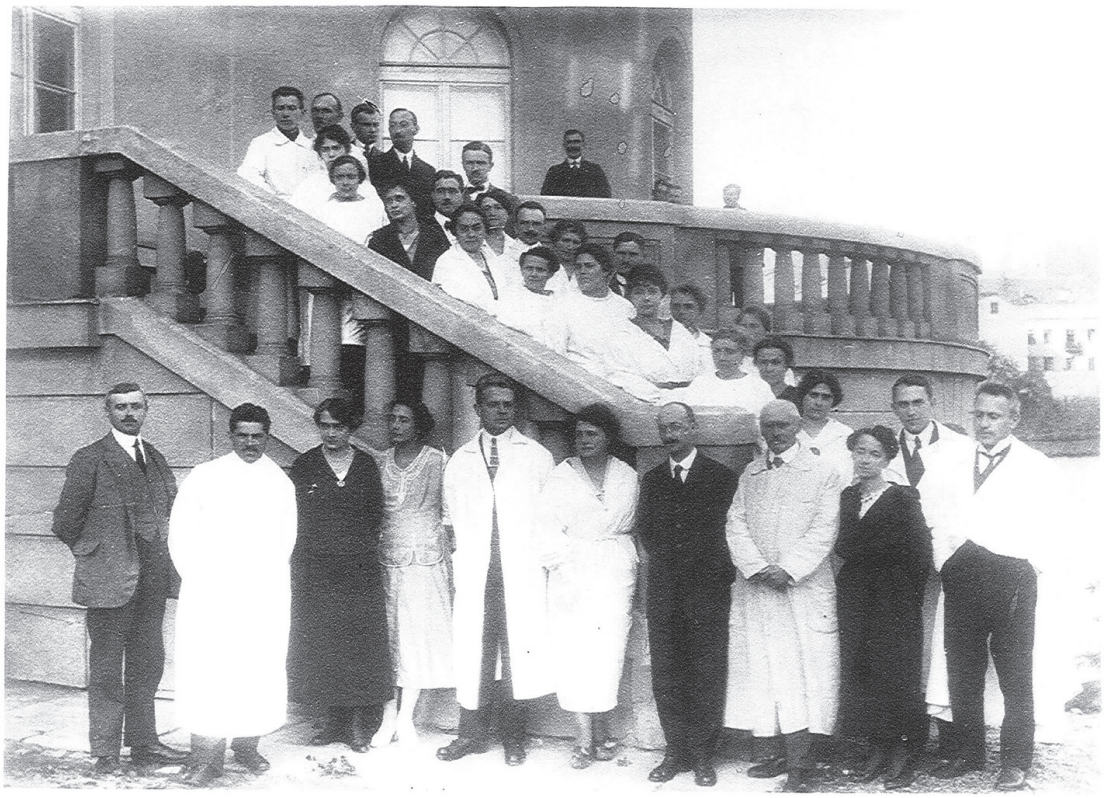

Fig 1. Director of the National Institute of Hygiene – Dr Ludwik Rajchman (the first row, the fourth person from the right) with his colleagues. Ludwik Hirszfeld - the first person from the right next to Stanisława Adamiczowa. Dr Feliks Przesmycki behind them. Stanisław Sierakowski, Julia Seydel and Helena Sparrow – the second, third and fourth person from the left and other unrecognized persons, including assistants, physicians and laboratory technicians. Early 1920s.

biochemical research on insulin, which were adopted by the Production Division in the NIH since 1925.

Ludwik Hirszfeld participated in the international sessions and he always supported his colleagues in their attempts to participate in delegations abroad (permission was given by the Ministry of Public Health, and then by the Department of Health Care in the Ministry of the Interior) for the purpose of scientific exchange, learning on processes of serum and vaccine production (dr Józef Celarek visited microbiological institutes in Paris, Berlin, London, Oslo, Vienna), Ludwik Anigstein participated in the control of infectious and tropical diseases in Kuala Lumpur, he was invited there following his highly-assessed research on typhus in the Parasitology Division in the NIH.

NIH also held the sessions of the heads liable for producing sera and vaccines from the National Institutes of Hygiene in Warsaw, Prague, Zagreb, Sofia and Bucharest (1937).

Stanisław Weil, representing the Chemistry Division, participated in the deliberations on intoxicants of the Expert Committee of the International Office of Public Hygiene in Paris while in 1928 in the Congress of the International Union of Pure and Applied Chemistry in Hague and Congress of the Industrial Chemistry in Barcelona.

Researchers from different countries visited as well as were employed in the NIH (in 1926-28, a total of 100 researchers and sanitary officers worked in or analyzed the results of researches or the organization of the Institute) (8).

LUDWIK HIRSZFELD AS A DIDACTICIAN

In "The Story of One Life", Ludwik Hirszfeld wrote that teaching activities were of the highest importance for him. "I have never separated teaching from upbringing factors" (preface to the "General immunology"). For Hirszfeld, a lecture was like 'expedition for young spirits' and he compared it to a concert. Having discussed a disease, he referred to the parts of concert:

– **andante** (the basic tone, epidemics or individual disease, each disease has its own dramatic tension**)** **presto** (clinical course, unrelenting effects of infection), **adagio** (etiology), **finale** (prophylaxis) (1, p.154-155).

He gave lectures during courses in the NIH and at the Polish University (Wszechnica Polska). He attempted to give lectures at the Divisions of Medicine and Pharmacy. He was allowed to lecture there after being awarded tenure and then following promotion to professor – at

the University of Warsaw. During war period, he gave lectures for the participants of sanitary sections.

To the largest extent, he liked to gave lectures on bacteriology – to provide basic information without presenting the details that could be found in books – he talked about new discoveries. For illustrations, he preferred to use tables rather than epidiascope. Participants of his lectures could investigate their content for a longer time and consequently could remember more. In his lectures, he tried to present the horizons of knowledge and induce interest, curiosity, admiration and fascination in the listeners.

"The eyes of the listener are the test for the professor, whether he managed to attract him as the emotion enhance the absorbency of mind" (1, p.155).

In the Hygiene School of the NIH, he wished to combine the teaching of epidemiology – theoretical knowledge with practice in the field. "This internal ardour in describing the epidemic may have only one who have experienced this epidemic" (p.129).

Remarkable skills of Ludwik Hirszfeld in passing on the knowledge, his personality and fascination with scientific discoveries were especially reflected in the "General immunology", issued in 1949. Professor transcribed all his lectures prior to 1941 when he was divested of his apparatus in the NIH and moved to ghetto.

Preface is a lecture on understanding the immunology. "Immunology is a basis of bacteriology, epidemiology and pathology of infectious diseases while serology constitutes its section" (p.6).

This book serves as a course book, comprising microbiological knowledge from historical and modern perspective.

The first two lectures are devoted to the history of medical microbiology from ancient times to the 40s. of he 20th century and application of bacteriology in the field of immunization.

Lecture XXXXII includes the immunological assessment of vaccination, where the methods of medical statistics are also discussed.

Lectures are provided with illustrations, tables from factual and chronological perspective.

Definition of epidemiology: Lecture VI, concerning the routes of infection, includes the definition of epidemiology: "Epidemiology is a science on equilibrium and imbalance between visible and invisible world" (p.62).

SUMMARY

National Institute of Hygiene in charge of Ludwik Hirszfeld became a well-organized institution, included in a range of international initiatives in the field of public health. Furthermore, researches were conducted there pursuant to the standards issued by scientific institutions in Europe and United States and by the League of Nations on a basis of the recent discoveries. Science, cultivated by Hirszfeld and his colleagues in the NIH, was not considered separately from life. It had practical application. Hirszfeld's contribution to science and his achievements are still actual and subject to discussions.

Ludwik Hirszfeld expressed the assessment of his research activity in the preface to the "General immunology": "Nevertheless, some of the issues emerged or developed in my department became a subject for modern science. Here I will only mention constitutional serology and blood groups, serologic specificity of tissues, reverse and productive processes, serologic analysis of blood coagulability, coagulase reaction, aspects of latent infections. As well as an interpretation of vaccination and finally general approach to the biology of infections".

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