HISTORY | RESEARCH ARTICLE

Pathology laboratory: An institution of tropical diseases in Medan, East Sumatra, 1906-1942

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Abstract: This study aims to explain the history of Medan Pathology Laboratory in the area of health in East Sumatra. The main discussion expressed in this study is the purpose of the establishment and the role of the Medan Pathology Laboratory in the health problems of the population and plantation workers in East Sumatra. The Medan Pathology Laboratory was founded on the initiative of a plantation owners in 1906. Many doctors and experts worked in the laboratory and carried out research on tropical diseases. The research included bacteriology, serology, chemistry, pathological anatomy, and vaccine development. In its development, this institution was able to solve problems related to epidemics in plantation areas such as cholera, dysentery, and beriberi. The experts and doctors at this institution found a relationship between the causes of the disease and the lifestyle of the plantation community and environmental conditions in East Sumatra. The sources used including documents and archives consisting of documents and annual laboratory reports, reports and notes from doctors who worked at the East Sumatra plantation hospital. This study used historical methods consisting of heuristics, verification, interpretation, and historiography.

Subjects: History of Medicine; Imperial & Colonial History; Social & Cultural History; Asian History

Keywords: diseases; East Sumatra; health; Medan Pathology Laboratory; plantations

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PUBLIC INTEREST STATEMENT

The Medan Pathology Laboratory aimed to disseminate hygienic and sanitary views by conducting research on tropical diseases. In conducting its research activities, the role of the Medan Pathology Laboratory was mainly in eradicating diseases that had plagued East Sumatra. This research activity involved doctors and experts in the field of tropical diseases. This paper emphasizes the purpose and role of the Pathology Laboratory in the interests of improving the health of the population and plantation workers in East Sumatra, the Dutch East Indies in the period 1906 to 1942.
1. Introduction
Health issues could be a serious problem along with the development of population in a region. In East Sumatra, health issues were a low priority, at least until the industrial plantations entered this region in the 1860s. The massive opening of the industrial plantations had had a significant impact on the development of this region. One of the impacts was health issues on the plantations of East Sumatra.

The rapid development of the industrial plantation in East Sumatra can be described in a proverb “bagaikan gula yang dikerubungi semut” (where there is sugar, there are bound to be ants). This proverb describes the large number of residents from other regions who came to this region for a living, in addition to local residents and plantation workers. This situation certainly had a big impact on the development of the population in the region of East Sumatra. In addition, environmental conditions also changed drastically as a result of the expansion of plantation area.

The drastic changes in demography and environment in the late 19th century affected health problems experienced by the population in this region. Severe working conditions were also a major cause of widespread outbreaks of tropical diseases in the region. Most of those infected with the outbreaks and diseases were workers on the plantations. They suffered from several types of diseases such as cholera, dysentery, typhus, beriberi, malaria, and tuberculosis. Tuberculosis was usually caused by air vents in plantation wards, while other diseases were caused by poor settlements and sanitation (Kouwenaar, 1936:287-8).

At first, there was an assumption from the West that the emergence of the disease was due to the unhealthy Dutch East Indies territory. This assumption occurred due to the fact that the modern health thinking was closely related to Western colonialism practices. At first, the Western nations considered that the tropical environment in Asia was incompatible with the physicality and race of the white people. They considered it as an unhealthy environment, therefore modern health facilities and practices needed to be built. For instance, Warwick Anderson (2006) states that the development of health and sanitation in Philippine at the turn of the 19th century was an attempt by the colonial Americans to civilize the local population. The practice of American colonialism’s rationality entered into the technical framework of modern health which changed the habits of the local population. They reformed the hygiene and health of local residents (Anderson, 2006).

The view of diseases associated with racial relations and environmental adaptation changed at the turn of the 20th century. Hans Pols (2018) explains that at the turn of the 20th century, research in the field of health found an association between tropical diseases and parasites, microorganisms, and other disease vectors, and not from the difference between climate and physical character. Therefore, the development of health science pushed to grow strategies in eradicating these tropical diseases. In the Dutch East Indies, the strategies undertaken in eradicating disease and improving health were by managing both urban and village areas, establishing health facilities and promoting healthy living (Pols, 2018:10).

Attention to the health problems in the Dutch East Indies was not only carried out by the colonial government but also by the industry players. The rapidly developing plantation industry in East Sumatra had an impact on increasing health problems and outbreaks of tropical diseases in the region. Outbreaks such as cholera (1891), beriberi (1896), and influenza (1918) caused many deaths in East Sumatra (Schuffner & Kuenen, 1910; Snijders, 1921; Vervoort, 1921). These outbreaks attacked workers who worked at the plantations. This was one of the factors in the health improvement initiatives carried out by plantation companies. The health conditions of workers on plantations affected the level of labor productivity which was an economic consideration of the plantation companies.

Apart from the disease epidemic, plantation owners were obliged to provide health services for workers. This was stipulated in the Indies Labor Regulations in 1880 (Staatsblad van Nederlandsch-Indie 1880 No. 133). The regulation regulated the relationship between employers and workers (Wertheim, 1987:358–9). Health maintenance carried out by plantation companies for workers was
one of the steps to improve the quality of workers’ health. Apart from that, plantation companies also carry out preventive measures and research on tropical diseases. Initiatives carried out by the plantation companies included establishing hospitals, promoting health awareness to the workers, improving sanitation in plantation environments, and eradicating tropical diseases. One of the steps taken was to establish a disease research laboratory, the Medan Pathology Laboratory. This laboratory played an important role in improving health through research in the fields of bacteriology, serology, chemistry, pathological anatomy and vaccine development (Ochsendorf, 2018: 87–88). The establishment of this laboratory policy was an initiation of the plantation companies, where in its development was assisted by the Dutch East Indies colonial government. In general, the existence of this laboratory had given a significant impact on health problems in East Sumatra.

This paper focuses on the history of the Medan Pathology Laboratory in East Sumatra. The main questions posed are, what is the purpose of establishing the Medan Pathology Laboratory? And how far are its existence and role in the context of health in East Sumatra? The writers used a historical method which consists of four stages. The first stage was heuristics, which was to collect documents and archives consisting of documents and annual laboratory reports, reports and notes from doctors who worked at the East Sumatra plantation hospital. After the sources were collected, then verification was carried out. The data were then interpreted to obtain the facts which were written in the historiography process.

2. Health problems in East Sumatra

The region referred to as East Sumatra is part of the province of North Sumatra today. The region includes Langkat, Deli Serdang, Batubara, Asahan, Simalungun and Karo. During the colonial period, this region was called Residentie Oostkust van Sumatra (the East Coast Residency of Sumatra). This region experienced rapid development along with the industrial plantations. The starting point of this development was driven by a Dutch entrepreneur, Jacobus Nienhuys. At the beginning, J. Nienhuys introduced tobacco cultivation in Deli in 1863. Since then, the region of East Sumatra grew into the most important economic center in Sumatra. Along with the industrial plantations in East Sumatra, this region was later developed as a cultuurgebied (plantation area). As time went by, the plantation economy in East Sumatra contributed enormous foreign exchange to the Dutch East Indies. These factors made this region unique from the other regions of the Dutch East Indies (Wie, 1977:1–4). Its development encompassed regional, demographic, economic, social, political, and cultural aspects.

The development of the plantation industry brought about changes in the East Sumatra region. One of the changes was demography. The local population consisted of ethnic groups of Malays, Karos, and Simalungun, later became a minority group. The migrant population consisted of Europeans, Asians (Chinese, Indians, and Arabs) and Bumiputera residents such as Javanese, Minangkabau, Mandailing, and Acehnese. (Loderichs et al., 1997:10,33–4). This change was introduced by migrants due the industrial plantations that developed so rapidly in the early 20th century. They migrated to East Sumatra working as laborers on the plantations. The first group of workers who migrated to East Sumatra in the late 19th century were Chinese laborers, followed by Javanese laborers who became the majority population group in the early 20th century until now.

In addition to the diverse ethnic groups that inhabited the region of East Sumatra, the quantity of the population increased significantly. Based on estimated data made by Thee Kian Wie in the 1850s, the region of East Sumatra was inhabited by approximately 150,000 people. In 1890, the population in this region increased dramatically by 285,000 people. Such increase was mainly caused by Chinese workers entering into the plantations in East Sumatra. At the turn of the 20th century, the population of East Sumatra continues to increase. Based on the data, the population of East Sumatra were 568,417 people in 1905, 773,106 people in 1913, 1,197,554 people in 1920, and the census conducted in 1930 indicated that the population in this region was 1,693,200 people (Wie, 1977:42).

As explained earlier, the trigger factors for such increased demography in East Sumatra were the migration of the population of bumiputera and the recruitment of laborers by plantation companies. In
this case, laborers brought to East Sumatra continued to increase in quantity from year to year. The data show that the number of active laborers on the plantations was approximately 170,000 in 1910, increased to approximately 308,000 people in 1920, and increased again to approximately 372,000 people in 1930. However, the data show that the number of workers on plantations in East Sumatra decreased between 1920 and 1930 (Kouwenaar, 1936:286).

The increasing number of people in an area will affect various aspects, not only on economic, political and cultural aspects but also on environmental and health aspects. This was a driving factor for the emergence of various outbreaks. In addition, clearing forests for plantation land also led to changes in environmental conditions. The working environment of laborers on plantations was very closely related to the spread of diseases and outbreaks that occurred in this region at the turn of the 20th century. In addition, the problem of hygiene of the working environment of laborers resulted in the spread of diseases among workers. Diseases such as dysentery, cholera, typhus, and malaria were diseases caused by poor environment and sanitation. These environmental changes significantly affected the occurrence of outbreaks in a region. In the case of East Sumatra, before the industrial plantation, there was no literature which mentioned an outbreak in this region.

One of the contributors to the large number of outbreak cases and high mortality rates in East Sumatra was the environmental conditions of plantation workers. Environmental conditions and exploitation of workers affected their physical condition and health. This was exacerbated by the torture and punishment imposed on workers who committed work errors (Stoler, 1983). In the van den Brand brochure that shocked the Dutch public, it was stated that there were practices of debauchery and fraud against plantation workers. In fact, these practices had occurred since prospective workers were recruited from their place of origin (Van Den Brand, 1902). The poor living conditions of workers and the environment and tropical climate had resulted in various types of disease outbreaks that infected plantation workers. Previously unknown, many cases of outbreaks occurred in the late 19th century until the early 20th century. Outbreaks that mostly occurred were tropical diseases. The problem of hygiene of the work environment was the main cause in the spread of the outbreak. The diseases caused by dirty environmental conditions and poor sanitation were cholera, dysentery, typhus, and malaria. Poor environment and sanitation were a result of inadequate labor settlements at the beginning period of plantations, causing many infectious diseases and becoming outbreaks in the late 19th century (Kouwenaar, 1936:287–290 and 295–301). The other factors were tropical climate which was something new for Chinese workers, and the condition of the body that was susceptible to disease that accelerated the outbreak among plantation workers.

In 1891, an outbreak resulted in high mortality in East Sumatra, namely cholera. This was caused by Chinese laborers who came massively to East Sumatra (Snijders, 1921: XLVIII). The data indicate that at that time cholera was endemic in China. In addition, transporting and placing Chinese laborers on the same deck of the ship with other laborers accelerated such transmission (Breman, 1992:153). The case of cholera did not only occur in China. In the same year cholera was also endemic in Java. The mortality rate at that time reached more than 10,000 people, although this was not the highest mortality rate (Gardiner & Oey, 1987:75–8). However, it should be noted that the cholera outbreak in Java was not the cause of the outbreak in East Sumatra, because in that year there were not many Javanese workers brought to this region. Their significant arrival in East Sumatra began in the early 20th century.

In addition to cholera, the disease that was endemic in East Sumatra in the late 19th century was beriberi. At first this disease was still a mystery and its cause and background were unknown. Some theories explain that this disease was caused by environmental and climate factors. However, there are several studies that link this disease with ascariasis, anemia, poison infections from swampy environments (Donath, 1945:75). This disease attacked laborers on plantations due poor food and nutrition conditions. This condition frequently occurred at the beginning of the plantation opening, so the spread of the disease was relatively fast. This is also because many plantation companies had not taken the health problems of workers into consideration because they were still pursuing high profits, especially plantations managed by individuals.
The next outbreak that occurred in East Sumatra and even in the Dutch East Indies region in general was influenza pandemic. This outbreak almost globally occurred between 1918–1919 after the World War I. In 1918, half of the deaths in East Sumatra were caused by this outbreak. One of the factors was the outbreak brought by laborers who entered the plantation. Another factor was that two large hospitals on the plantation canceled to supervise sanitation over laborers which was previously agreed upon by the hospital union on the plantation (Catalogus, 1927:10). In 1918, out of 252,439 laborers on the plantations, 5,937 of them died. In East Sumatra, influenza pandemic resulted in a population death of 2,027 people (Vervoort, 1921:3 and 9).

In addition to being endemic, the tropical climate of East Sumatra could trigger diseases that had not previously been found in this region. These diseases were dysentery, typhus, hookworm (ankylostomiasis), malaria, pest, smallpox, pneumonia, tuberculosis, fever, meningitis, and leprosy (Kouwenaar, 1936:295–301). Some diseases were caused by an unhealthy and unhygienic environment. In addition, food patterns and poor settlements could lead to dysentery, typhus, malaria, hookworm, and pest (Schuffner, 1914:101).

The outbreak and spread of disease in East Sumatra had resulted in a high mortality rate in the transition from the 19th to the 20th century. According to Kouwenaar, a doctor assigned in the plantation, a factor that led to this was expansion of plantation areas, especially land clearing which changed environment that had a negative impact. The other factors were demographic change through the massive recruitment of laborers and the migration of bumiputera residents from other regions to this region for living. This situation had significantly increase demography, resulting in changes in the quality of health (Kouwenaar, 1936:287). Of the two factors, two problems were found, namely the problem of hygiene and sanitation which was crucial health issues in the 20th century.

In response to health issues in East Sumatra, plantation companies and the government made various efforts to maintain the health of the population. One of the efforts was to improve health facilities in this region. This effort was then realized by establishing several hospitals and placing health workers or doctors in them. Since then, the number of hospitals and doctors increased significantly. In 1910, there were 22 hospitals and 23 doctors. In 1930, the number increased to 47 hospitals and 53 doctors (Kouwenaar, 1936:287).

W.A. Kuenen, a doctor on the plantation, stated that health care was aimed primarily at workers on the plantation. This was because the conditions of laborers on the plantations were very alarming. The number of workers on plantations was 120,000 in the 1900s. Costs incurred by the plantation companies for maintaining laborers’ health were approximately f 7.00 until f 9.00 every year. Therefore, an average cost incurred for maintaining health of workers on the plantation was equal to f 960,000.00 every year. Health care costs were enormous, which indicated the seriousness of the plantation companies about this problem. The results indicated that within 10 years after the turn of the century, there had been a decline in the mortality rate of laborers on the plantations. Of every 1,000 laborers, the death rate was 60 people in 1897, and drastically declined to 15 people in 1907 (Kuenen, 1910:5).

The improvement in the quality of workers’ health had resulted in the reduction in the mortality rate. This was due to the eradication of tropical diseases and the maintenance of cleanliness for plantation workers. The steps taken were preventive measures and research against disease outbreaks. Preventive measures included providing clean water and food with good nutrition, a place to stay with ventilation rooms and a clean working environment (Van Loghem, 1920). Research on disease outbreaks was carried out by doctors in plantations to find the relationship between environmental and climatic conditions on the body conditions of plantation workers. After finding the cause of each of these diseases, therapy and treatment taken varied depending on the disease that affected the workers. However, the action that became the focus of improvement was the maintenance of hygiene and sanitation in plantations (Kuenen, 1914a).
Hygiene and sanitation issues in East Sumatra were other health problems which attracted the attention of the Dutch colonial in the late 19th century to the early 20th century. Therefore, various policies and regulations were made by the government in collaboration with plantation companies to address those problems by establishing hospital facilities and providing doctors and other health workers. In addition, there was a policy made to deal with health problems in East Sumatra. This policy was to establish a research institution or agency to conduct studies, as a forum for studying tropical diseases and health problems in the Dutch East Indies which were centered in Medan—as the heart of the plantation area. Because the institution was located in Medan, it was then named Medan Pathology Laboratory.

3. Medan pathology laboratory

Entering the 20th century, health problems were increasing in East Sumatra. They were not only a burden for the government, but also plantation companies. In the previous section (health problems in East Sumatra), various factors on health issues have been described, namely mass migration, deteriorating environmental changes as well as sanitation and hygiene issues in East Sumatra. To address and solve these problems, a health institution named the Pathology Laboratory was established in 1906. This institution was initiated by two high officials of two plantation companies, namely Van Vollenhoven, Chief Administrator of NV. Deli Maatschappij, and C.W. Janssen, company director of NV. Senembah Matschappij and NV. Medan Tabak Matschappij (Alkema, 1929:55). Accordingly, a research institute for tropical diseases and health problems was established about in East Sumatra. The research results of this institution eventually became a reference for tropical health problems in the Dutch East Indies.

At the time of its establishment, this institution was led by a doctor who at that time served at NV. Senembah Maatschappij. He was dr. W.A. Kuenen. He laid the foundations of the organization and the direction of the policy of the laboratory institution. In addition, he greatly contributed in research on tropical diseases which struck many laborers on the plantations (ANRI, n.d.: No. 358). Together with dr. W.A.P. Schuffner, they found a correlation between environmental conditions and the cause of an outbreak or disease. Several studies and policies made were followed by other plantation companies (Schoute, 1934:372). In addition, they had reduced the mortality rate of laborers on the NV. Senembah Maatschappij from 136 deaths per 1,000 laborers in 1891 to 10 deaths per 1,000 laborers in 1906. They applied some of the policies and regulations such maintaining hygiene in barracks and labor settlements, paying attention to nutritious and adequate food, and efforts to care for sick laborers with health facilities such as hospitals and clinics on the plantations (Schuffner & Kuenen, 1910:20).

W.A.P. Schuffner, who was a plantation doctor at the NV. Senembah Maatschappij, had had a significant impact on health care for workers in East Sumatra. His actions were then followed by various plantation companies in East Sumatra. Disease management was differentiated based on the type of disease, namely (1) diseases that attacked the digestive system, including cholera, dysentery, and typhoid; (2) beriberi; and (3) malaria. Cholera, dysentery and typhus were treated by taking care and providing food intake such as rice porridge, mashed beans and drinking water, like tea and lemonade. For severe conditions, vaccine injection was carried out (Schuffner, 1914:114). Similar to the previous disease, the treatment of beriberi was carried out by providing food intake containing vitamin B1. These included green beans, brown rice, and zilvervlijes (half-milled rice) (Schuffner & Kuenen, 1912:291–297). Meanwhile, the handling of malaria was carried out by building water channels in labor settlements with good sanitation and checking sewers so that there were no stagnant water breeding grounds for malaria-carrying mosquitoes. In addition, the mosquito nests were carried out. Treatment measures were conducted by distributing quinine drugs to workers who had been infected (Baermann, 1926:76–79). All of these actions were carried out after obtaining knowledge of the causes of the disease outbreak which W.A.P Schuffner had investigated.
Many research institutes on health problems were in the Dutch East Indies, especially in Java island. They were established to address various health problems which became a sensitive and large issue in the late 19th century. The health institutions established in the late 19th century until the 20th century were as follows:

1. Government Smallpox Institute and Nutrition Institute in Batavia
2. Public Health Center Laboratory which was established in 1888 as a plan of Eijkman Institute
3. Regional Laboratory of Central Java in Semarang
4. Regional Laboratory of East Java in Surabaya
5. Regional Laboratory of Sulawesi and Maluku in Makassar
6. Hygiene Technique Laboratory in Bandung
7. Institute of Nutritions in Batavia
8. Malaria Service Laboratories in Batavia and Surabaya; Leprosy Laboratory in Semarang
9. Pathological Laboratory in Medan
10. Veterinary Institute in Buitenzorg (Snapper, 1945:3).

Health laboratories established by the government and some in collaboration with the private aimed to complete and conduct research in the health sector which was a sensitive issue at that time. The epidemic and high mortality rates in the colonial population threatened the colonial administration. This was not only social and health problems, but also related to economic and political problems. The establishment of a pathology laboratory in Medan was even initiated by a private plantation company, and later the government took part in it. This could explain that in East Sumatra, especially in Medan, the role of companies was greater than the colonial government. Therefore, economic, social, and health policies had to involve the participation of plantation companies.

The Pathology Laboratory aimed to disseminate and provide information related to the problems of hygiene and sanitation in East Sumatra. In addition, cultural propaganda for a clean and healthy lifestyle was also carried out. The laboratory served to provide assistance to doctors or health professionals who conducted research in this laboratory. Furthermore, this institution also provided assistance to doctors who conducted research. Therefore, this institution would have doctors who were competent in bacteriological and serological aspects. Some of the activities undertaken in this laboratory were prophylaxis vaccination (disease prevention), treatment therapy, and diagnosis preparation for cases of disease (ANRI, n.d.: No. 358).

The laboratory consisted of the main building of the laboratory, an area where staff and employees lived and a library. Inside the building area, there was also a laboratory for the department of pathology and bacteriology. In 1913, the building was jointly used with Deli Proef Station (the Deli research institute). In addition, there was also a library building which contained textbooks, monographs, magazines, brochures, reports totaling 3,258 (ANRI, n.d.: No. 358). Since then, this institution had gradually increased. The increase in the research could be seen from the number of research conducted, which was 1,311 in 1910, experiencing a fairly drastic increase to 30,372 in 1930, but decreased to 28,553 in 1934 (Kouwenaar, 1936:287).

In the early stages of the operation of the Pathology Laboratory, all administrative activities were fully supported by the NV. Deli Maatschappij, NV. Senembah Maatschappij and NV. Medan Tabak Maatschappij. Gradually, many plantation companies, private plantations, and plantation hospitals joined the laboratory as members. Members of the laboratory gave contributions or membership dues every month. In the period of 1909–1920, 45 plantation companies became members of the pathology laboratory in Medan. Table 1 below shows details of the members of the laboratory.
The number of members gradually increased, especially from rubber plantation companies. Each member contributed dues to finance this laboratory. The dues were calculated based on the number of workers on each plantation. As a member, the plantation was required to pay dues of f 0.50 per laborer per month (Wolff, 1930:7). In addition to dues, there were also contributions from the Dutch colonial government. In 1918, the Dutch colonial government issued a policy to assist the operational costs of the institution by giving f 500.00 every month (ANRI, n.d.: No. 358). In the next stage, the operational budget increased every year. Afterwards, the management and distribution of the operational budget of the laboratory was channeled by a government health institution, namely Burgerlijken Geneeskundige Dienst (BGD) (Alkema, 1929:55).

The first director was dr. W.A. Kuenen who served in the period 1906-1916. During his tenure, the organization and work of the institution were performed by dr. J.J. van Loghem in the period 1908-1909, then replaced by dr. H. Vervoort in the period 1913-1914. The assistant position for the serology and bacteriology section was occupied by J.v.d. Bosch in the period 1909-1912 and P. de Haan in 1915. Meanwhile, the doctors who worked in the laboratory were dr. Van Loghem in 1915, dr. H. Vervoort in 1910 and 1913-1916, dr. N.H. Swellengrebel in 1912, dr. M. Blum and a plantation doctor dr. N.H.v.d. Heyden in 1913, E.P. Snijders (1914–1921), a plantation doctor dr. E.v.d. Velden (1915), dr. I.W. Holm, a plantation doctor dr. A. Klett, and three government Bumiputera doctors, namely dr. Ahmad Mochtar, dr. Andu, and dr. Moh. Sjaaf in 1916 (ANRI, n.d.: No. 358).

After dr. W.A. Kuenen, the laboratory director was held by dr. H. Vervoort who served in the period 1916–1927. The organizational structure and work of the institution were performed by dr. E.P. Snijders during the period 1920–1921 and assistant of serology and bacteriology section by dr. P. de Haan (1917–1921). Meanwhile, the doctors who worked and conducted research in the laboratory were dr. G. Folpmers, four plantation doctors, namely dr. W. Kouwenaar, dr. R.V. Vollenhoven, dr. O. Imhoff, dr. P.P. Leendertz, and two Bumiputera government doctors, dr. Sitanala and dr. Raden Pratomo in 1918, and four plantation doctors, namely dr. G.W. Pott Holstede, dr. K. Surbek, dr. E.R. Luyken Roskott, and dr. J. Feilzer in 1919 (ANRI, n.d.: No. 358).

On 1 November 1920, there was a transfer and cooperation of the laboratory institution with plantations associations, namely Deli Planters Vereeniging (DPV) and Algemeene Vereeniging Rubberplanters ter Oostkust van Sumatra (AVROS). This transfer was still carried out although the condition of the plantation was less profitable in recent years. The transfer in the management of the Pathology Laboratory resulted in changes in the composition of the leadership of the institution, so that the policies made also underwent changes (ANRI, n.d.: No. 358).

In terms of organizational structure, this institution consisted of a board of directors which in 1921 consisted of 2 DPV representatives, 2 representatives from AVROS, and 1 director of the laboratory institution. Afterwards, the structure of the institution consisted of directors, deputy directors, laboratory doctors, serology and bacteriology assistants, and secretary. In addition to the organizational hierarchy, which consisted mainly of Europeans, there were also staff and workers from among the bumiputera namely foremen, laboratory workers, helpers, servants, office clerks, photographers, and drivers (ANRI, n.d.: No. 358).

When dr. H. Vervoort became a laboratory director in the period 1921–1927, the director's work in the period 1927 was carried out by dr. J.W. Wolff. Doctors who worked and researched in the laboratory during this period were M. Straub (1921–1922), M.H. Knoch Jr. (1922–1921), R.M. Marwata Mangkowinoto (1924) a bumiputera government doctor, dr. J.W. Wolff (1925–1927). Starting in 1921 there was a laboratory secretary held by L. Meijering. In 1927–1928 the duties and work of the secretary were carried out by Ch.A. van Rijck (ANRI, n.d.: No. 358).

In the period 1928–1940, the director of the Pathology Laboratory was held by dr. W. Kouwenaar. In 1929–1930, the duties and work of the director were performed by dr. J.W.
| Joining Year | Name of Member                                                                 |
|-------------|--------------------------------------------------------------------------------|
| 1909        | Deli Batavia Mij.                                                                |
|             | Amsterdam Deli Cie.                                                              |
|             | Deli Langkat Tabak Mij.                                                         |
|             | Amsterdam Langkat Cie.                                                          |
|             | Onderneming Arnhemia (Rotterdam Deli Mij.)                                      |
|             | United Langkat Plantation Cy.                                                    |
|             | Bindjei Tabak Mij.                                                              |
|             | Asahan Tabak Mij.                                                               |
|             | Hospital Vereeniging Padang en Bedagai                                          |
|             | Central Hospital Martabing                                                      |
|             | Hospital Rantau Pandjang                                                       |
|             | Central Hospital Perbaoengan                                                    |
|             | Deli Spoorweg Mij. (D.S.M.)                                                     |
| 1910        | Rimboen Tabak Mij.                                                             |
|             | Soengal Tabak Mij.                                                              |
|             | Hollandsche Amerikaansche Plantage Mij.                                         |
|             | Serdang Doctor Fonds                                                            |
|             | Serdang en Bedagai Doctor Fonds                                                 |
| 1911        | Tabak Mij. Soengei Diski                                                        |
|             | Tabak Mij. Tjinta Radja                                                         |
|             | Bataafsch Petroleum Mij. (B.P.M.)                                               |
|             | Simeloengoen Hospital                                                           |
|             | Siantar Doctor Fonds                                                            |
|             | Tanjung Kassau Hospital                                                          |
| 1913        | Hospital Vereeniging Telak Dalam                                               |
|             | Hospital Vereeniging Tanah Besih                                               |
| 1914        | Central Hospital Ajer Tawar                                                     |
| 1915        | Hospital Vereeniging Lima Poeloeh                                               |
|             | Onderneming Kwala Pessilam                                                      |
| 1916        | Hospital Bekioen                                                                |
| 1917        | Central Hospital Bindjei                                                        |
| 1918        | Deli Cultuur Mij.                                                               |
|             | Gouvernement van Nederland Indie                                                |
| 1919        | Bila Sumatra Rubber Lands                                                       |
|             | Onderneming Bah Boelian                                                         |
|             | Soengei Rampah Rubber & Cocoanut Pl. Cy.                                        |
|             | Sumatra Para Rubber Plant Cy.                                                   |
|             | Central Hospital Kwala Simpang                                                  |
|             | Central Planters Hospital Langsa                                                |
|             | Central Hospital Vereeniging Boven Asahan                                       |
|             | Hospital Soengei Bedjangkar                                                    |
| 1920        | Tabak Mij. Arendsburg                                                           |
|             | Onderneming Tindjowan                                                           |
|             | Cont. Pl. Cy. (Hoeta Padang)                                                    |
|             | Sumatra Industry Cy. Ltd. (Silau Toewa)                                         |

Source: ANRI, n.d.: No. 358.
Wolff. The laboratory secretary was still held by L. Meijering until 1940. In 1930, the director was assisted by several sections, namely the head of the Bacteriology-Serology section which was held by dr. E.P. Snijders, the head of the Bacteriology section by dr. J.W. Wolff, and laboratory secretary by L. Meijering. The works in the laboratory were assisted by several assistants, namely Bacteriology assistant by P. de Haan, Chemistry section assistant by G. van Wijngaarden Hzn and a librarian by Mej. M.J. Mann (ANRI, n.d.: No. 358).

4. The role of medan pathology laboratorium

The Pathology Laboratory was a place for conducting research and diagnosing various tropical diseases that appeared on many East Sumatra plantations in the late 19th century. The research aimed to discover the causes of a disease, the correlation of symptoms and the environment with outbreaks of disease in a particular area, especially plantation areas (Volker, 1928:175). Many research had been conducted by the Medan Pathology Laboratory. At first, all of the work and research distribution was coordinated by the director who was in charge of the institution. However, in 1916 several work adjustments were made by the institution namely the activities of the bacteriology department, anatomical pathology, and the supervisor of chemical analysis held by dr. E.P. Snijders, while the serology department, vaccination preparation, and hygiene activities were responsible to the director of the institution, dr. H. Vervoort (ANRI, n.d.: No. 358).

In addition to internal activities undertaken by personnel from the pathology laboratory institutions, staff or doctors who conducted research in the laboratory also did outside activities such as research, health congresses, eradication of diseases and so forth. For instance, in 1909, deputy director of dr. J. J. van Loghem represented the institution to attend the Bombay Health Congress in India. In 1913, the director of the institution dr. W.A. Kuenen gave a lecture on the problems and treatment of amoeba dysentery disease representing the Medical Society in the Dutch East Indies at the Congress of the Far East Tropical Health Association held in Saigon. In 1915, dr. H. Vervoort, together with the director of the Gemeente Public Works Office of Medan, J. Hogervoorst, made a working visit to Singapore and the Malay Peninsula State Government to study waste disposal and burning as well as other problems concerning urban hygiene and sanitation. In the same year, the director of the institution dr. W.A. Kuenen held an official trip to study health problems to Java. He studied and investigated pest outbreak in Java (ANRI, n.d.: No. 358).

Pest outbreak in Java became a serious problem and a sensitive issue in the mid-decade of 1910 to the 1920s. From various Dutch colonial health reports, it was found out that pest outbreak in Java caused a high number of deaths (ANRI, 2012: No. 5004). This made other regions trying to protect by conducting research and studies related to the pest outbreak. Following up on studies and preliminary research conducted in 1915, in 1916 dr. H. Vervoort and dr. E.P. Snijders made official and research visits to Java again. Moreover, in August 1918 to November 1920, dr. H. Vervoort was appointed as a doctor who led eradication of pest outbreak and disease on the East Coast of Sumatra (ANRI, n.d.: No. 358).

In early 1919, dr. H. Vervoort was assigned by the head of the Burgerlijken Geneeskundigen Dienst (Civil Medical Service Inspectorate) to conduct further research and studies regarding repairs to houses, barracks, warehouses and settlements to Java island. This was done because there were many causes and risks of pest outbreaks in those areas. In addition, he also received special orders from the employers’ association in Deli related to this by visiting and conducting further inspections in offices and settlements of plantation workers. This policy was made in line with the reorganization of hygiene and sanitation management in all plantation areas (ANRI, n.d.: No. 358).

In November 1919, dr. Vervoort conducted an investigation to Java island on the orders of the board of directors of Algemeen Delisch Emigratie Kantoor (ADEK) or General Deli Emigration Office. During his visit, dr. H. Vervoort was assigned to ensure the causes of the disease and the high number of deaths from influenza among Javanese labor immigrants and identify measures to
improve the health conditions of labors on plantations. The step taken was re-examining laborers recruited by the DPV and AVROS in Medan. This re-examination coordinated with the ship doctors and doctors at the laborers gathering site (Hong) in Deli (ANRI, n.d.: No. 358). This was also done to prevent widespread transmission of influenza disease.

The health surveillance of immigrants was actually conducted at the entrance gate to East Sumatra, namely Belawan port. Immigrant health was supervised by establishing the Deli Quarantine Station in Belawan port. This health surveillance facility was created as the first shelter for plantation laborers. This shelter served as a place to select and separate healthy laborers with laborers who had infectious diseases and the like (Kuenen, 1914b:7–8). The Quarantine Station was established in 1911 on the advice and initiative of dr. W.A. Kuenen and fully supported by the DPV. At the beginning of its establishment, dr. W.A. Kuenen led the Quarantine Station. Moreover, from December 1910 to January 1913, he supervised Chinese and Javanese laborers at the DPV gathering place (ANRI, n.d.: No. 358).

Over time, the pathology laboratory developed rapidly, which could be seen from the number of members of the institution. In 1929, the number of members of this institution reached 414 plantations with a total workforce of 327,200 people. They were 93 members from DPV, 278 members from AVROS, and 43 members outside of the two organizations. In that year, operational costs reached f 175,232.58. The total budget included contributions or subsidies from the Dutch colonial government of f 12,000 (Wolff, 1930:6-7).

Throughout the 1930s, most medical practitioners in hospitals in East Sumatra visited the laboratory and discussed and exchanged ideas about the health problems existing at that time. These activities were routinely done and proven to be very useful for health care in this region. Communication and contact were maintained so that the laboratory played a role in dealing with health issues on the plantation. Health or diseases data and information acquired in the field were taken to the laboratory for further investigation (ANRI, n.d.: No. 358).

In the same year, doctors at the Pathology Laboratory conducted a research on typhoid fever in the tropical environment. Several experiments in the laboratory were conducted together with dr. Anigstein. At the end of this year, dr. E.P. Snijders and dr. W. Kouwenaar represented the Dutch East Indies colonial government to attend the eighth Congress of the Tropical Medicine Association in Bangkok. This congress was held in order to globally exchange ideas and discuss with medical practitioners related to the issue of tropical diseases. The work and research conducted by doctors in the laboratory had provided benefits for knowledge about diseases and outbreaks in tropical environments, so that medical practitioners could use them in the policies for hygiene and health on the same problem (ANRI, n.d.: No. 358).

In 1931 a number of steps were taken by the personnel of the Medan Pathology Laboratory, including the limitation of visits to hospitals in the East Sumatra region as was always done in the context of research. This was done by the laboratory personnel due to a reduced budget. The cause was the crisis of Malaise which shook the world. The impact was even felt in the plantation industry in East Sumatra. Nevertheless, several research trips were still taken, such as studies on diseases in Simalungun region. Other regions visited in the study were the mountainous areas of Karo and Toba. This was related to epidemiological research on rhinoscleroma. Other disease studies were related to fever in South Asahan. Other research trips were taken in Alas in relation to a highly increasing malaria outbreak (ANRI, n.d.: No. 358).

In the same year, the laboratory publication section published a series containing information about “company labor deaths in East Sumatra and Aceh in 1930”. After that the publication continued with other information, namely “the death of company workers in the outside area (except the east coast of Sumatra and Aceh) in 1930”. In the same series, information was also published on “corporate labor deaths in areas outside the Dutch East Indies in 1931 and 1932”.

This publication was carried out in collaboration with the Medan pathology laboratory, the Labor Inspectorate of the Dutch East Indies government in Medan, and the company’s health sector (ANRI, n.d.: No. 358).

In a monthly report from the epidemiological section, a disease had spread caused by bacterial infections found in local residents. This disease was called rhinoscleroma, which infected the nose and made it difficult to breathe. Conducted on Batak population, this research concluded that transmission was found mainly to Batak population who had not yet embraced a religion. The infection was also found in fewer numbers in the Christian Batak population and was not found at all to the Islamic Batak population. The factor was the difference in the level of hygiene of these population groups. In addition to the contact between sufferers, the cause of the spread of the disease was also due to pollution levels and poor environmental hygiene. In addition to the Batak population in residential areas, this disease also infects Batak population living in plantation areas along with Javanese and Chinese laborers. In the research conducted, transmission of this disease required very intense contact and unclean ways of life. The risk of transmission to laborers on plantations was relatively smaller as long as hygiene on plantations was kept and maintained by plantations (ANRI, n.d.: No. 358).

Throughout the 1930s, hospital visits continued to be made. However, in 1936 this was somewhat hampered by the replacement of dr. J.W. Wolff whose role was very important for the laboratory. Doctors continued to make connections between medical practitioners in Java by participating in discussions and conventions on cancer, tuberculosis, and providing information on health services and hygiene of plantation companies in East Sumatra. Intensive discussions were also held on health services at the head office of the public health service in Batavia (ANRI, n.d.: No. 358).

5. Conclusion
The Medan Pathology Laboratory was established in 1906 as a health research institution that had an influence on health issues, especially in East Sumatra. The establishment of this institution was initiated by plantation companies, especially NV. Deli Maatschappij, NV. Senembah Maatschappij, and NV. Medan Tabak Maatschappij. This institution was established as a forum for research and diagnosis of various tropical diseases that had appeared on East Sumatra plantations in the late 19th century. The research aimed to find the cause of a disease, the correlation between symptoms and the environment with outbreaks of disease in an area, especially plantations. In addition, this institution also conducted cultural propaganda on clean and healthy behavior. This institution served to provide assistance to doctors or health professionals who conducted research in this laboratory. This institution had doctors who were competent in conducting research related to bacteriology and serology.

Over time, the Medan Pathology Laboratory had conducted several studies and discoveries related to diseases and health problems in East Sumatra. Several types of diseases had been found to be the cause and the correlation of why the diseases were endemic, such as cholera, beriberi, influenza and so on. This Pathology Laboratory was headquartered in Medan, having research room facilities, a library, and a housing complex for its employees. Most of these laboratory members were plantation companies which made a major contribution to the operation of this laboratory institution.

This laboratory has had a great influence in improving the quality of workers' health, promoting health awareness, and eradicating tropical diseases in East Sumatra. Research activities in the laboratory and travel personnel played big roles in providing knowledge about diseases and epidemics in the tropical environment, so that it can be utilized by medical practitioners in the context of the policies undertaken for broad health. In addition, research conducted on tropical diseases had reduced the mortality rate of plantation workers in East Sumatra, thereby increasing labor productivity on plantations.
Acknowledgements
We thanks to the conference convener International Conference of Science, Technology, Engineering, Environmental and Ramification Researches 2018 for their benevolence during conference of 2018 when the initial draft of this paper was first presented.

Funding
This research was funded by University of Sumatera Utara as stated in TALENTA Scheme No. 2590/UNS.1/R/PPMI/2018, March 2018.

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