Public Health, Laboratory Experiment, and Asymptomatic Carriers in Japan, ca. 1920–1950

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Abstract From the 1920s and 1930s, discussion of asymptomatic carriers started to appear in Japan and quickly became well established. Two important frameworks here were public health and laboratory experiment. Japanese public health policies existed in theory, isolating asymptomatic carriers within their own family to prevent infection of others. These theoretical policies did not, however, attract great attention either from doctors, carriers, or family members. The crucial aspect in Japan was laboratory experiment. Japanese doctors concentrated on experimenting with animals as carriers of typhoid and other asymptomatic infections, trying to incorporate the latest theories of life and death taken from physiology. One reason for the relative neglect of the public health and isolation policy was the ongoing presence of a large number of patients with such diseases; another was the prestige of the laboratory as intellectual authority among well-trained doctors.

Keywords infectious diseases • carrier • typhoid • dysentery • public health • laboratory animal experiment • human experiment • Unit 731 • Typhoid Mary

1 Introduction

An asymptomatic carrier is usually a person who has become infected with a pathogen, but who displays no signs or symptoms. Although unaffected by the pathogen themselves, carriers can transmit it to others.1

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Medical historians’ knowledge of the history of asymptomatic carriers of infectious disease in various countries is still patchy, and it is a somewhat difficult research subject for the period before the late nineteenth century and the use of microscopes and other devices to discover pathogens. For carriers of HIV/AIDS we do have reliable knowledge for many countries. Peter Baldwin has argued that a so-called good society should have uncorrupted bodily fluids in the control of HIV/AIDS (Baldwin 2005); the identification of those infected was a thinly disguised attempt to identify and then exclude homosexual men or those with a history of intravenous drug abuse. Other scholars of HIV/AIDS are of the same opinion. A common reaction of a population on learning of the HIV/AIDS epidemic in the 1980s was a demand for the isolation, quarantine, and surveillance of AIDS patients and of asymptomatic carriers of the pathogen who were also gay. Some authorities in the United States even considered the criminalization of behavior which infected others. Generally speaking, these measures were less proposals for effective measures than expressions of panic, of a deep sense of fear, and of the threat against the sense of self (Rubenstein, Eisenberg, and Gostin 1996; Gostin and Lazzarini 1997; Tauber 1994). If we look at the HIV/AIDS situation in Japan in the 1980s and 1990s, we know that there existed a link between advanced medicine and the spread of HIV/AIDS, due to the use of blood products contaminated with HIV in hemophilia patients (Feldman and Bayer 1999; Feldman 1999).

As for asymptomatic typhoid, medical historians and STS scholars are all quite familiar with Judith Walzer Leavitt’s masterpiece *Typhoid Mary: Captive to the Public’s Health* (1996), in which she discussed the tragic life of Mary Mallon in New York in the early twentieth century. “Typhoid Mary” was discovered to be an asymptomatic carrier of typhoid through the contemporary development of bacteriology. After infecting dozens of people, Mallon was arrested and isolated, finally spending close to three decades in quarantine in hospitals on North and South Brother Islands in New York. Leavitt also showed resonances between the social history of Typhoid Mary in the early twentieth century and debates about carriers of HIV/AIDS in the 1980s and 1990s. The major question in the late twentieth century was the screening, identification, and confinement of homosexuals. So we have here an interesting and inspiring historical case of similarity in early twentieth-century typhoid and late twentieth-century HIV/AIDS.

Our knowledge of the history of asymptomatic carriers of typhoid and similar infectious diseases in other countries is, however, lacking. This paper attempts to pick up the subject in Japan from around 1920 to around 1950. Historians’ knowledge of asymptomatic carriers here has so far been very limited. Did Japan have its own version of Typhoid Mary, or did it construct asymptomatic disease in different contexts? What follows is an attempt to introduce the subject of asymptomatic carriers in Japan in the second quarter of the twentieth century, when the subject began to attract serious medical attention. The situation of the asymptomatic carrier in Japan was very different from that of Mary Mallon, as ways in which the idea of the carrier was constructed were distinctly different in the two countries during the period. The crucial aspect of the Japanese study of carriers was the importance of laboratory science and experiments using live animals. Laboratory science, rather than public health measures, was the major thread in the construction of carrier status in Japan, and this paper will try to provide answers as to why that was the case. One interesting connection suggested by the evidence is the use of infectious diseases by doctors who worked in
Unit 731 of the Kwantung Army, which conducted systematic human experiments on Chinese and Russian prisoners and people of other nations. Unit 731 murdered perhaps several thousand people in its laboratories in Manchuria. Although it is unlikely that Unit 731 was the major inspiration in conduct regarding asymptomatic disease, much evidence demonstrates the closeness of animal and human experimentation during this period.

2 Public Health and Bacteriology in the Early Twentieth Century

In 1890, Robert Koch (1843–1910) was invited to deliver a lecture at an international congress and confessed to the audience that he was divided as to whether he would “lecture on hygiene, the science with which I am currently most occupied, or on bacteriology, the science to which I devoted myself almost exclusively in earlier years” (Koch 1987). The two worlds of hygiene and bacteriology were closely interrelated in analyzing the question of asymptomatic carriers. Hygiene around 1890 was about life, death, and diseases of the populations of certain areas, based on knowledge about how human beings were connected with each other and with the wider world through biological, social, economic, and cultural means. The aim of hygiene was to improve the health of the population in this biosocial landscape through various measures. The basic unit of hygiene was the individual human being connected with others. The world of bacteriology on the other hand was based on the observation of pathogens and related matters. Scientists created a number of new observational tools, instruments, facilities, and materials to examine these pathogens. Koch himself emphasized the crucial importance of research facilities and technological devices such as experimental and optical technology, improved lens systems, aniline dyes, and liquid and solid media for the cultivation of pathogens. One needed to source a specific single species of germ and obtain pure cultures thereof. Different species of bacteria needed to be demarcated. Medical scientists should use morphological, chemical, biological, and later immunological characteristics. In the context of cure and prevention, the development of therapies, vaccines, antitoxins, toxoids, and all kinds of material were rapidly becoming complex (Weatherall 1990; Worboys 2000). Medical scientists were primarily interested in pathogens and their phenomena in living things and only secondarily in the actual human beings who carried those pathogens.

The priority of pathogens—and not the patient or their symptoms—was the crucial point in Mary Mallon’s case. Subclinical carriers represented the gap and the connection between hygiene and bacteriology. A person who did not experience or exhibit clinical symptoms of a disease but who kept the pathogen in their own body and could infect others was problematic. So long as the carrier remained asymptomatically, bacteriological examination was the only way to prove them a carrier. On that scientific basis, an individual who was not a patient became the target of a public health procedure as a source of infection. Naturally, the development of public health and the establishment of bacteriology supported each other. One of the earliest references to carriers was in the 1880s: a cholera epidemic in France in 1884 revealed the importance of asymptomatic carriers who did not show any obvious symptoms but who carried pathogens to other areas. The rapid development of transportation and the use of trains and cars made threats to hygiene geographically widespread (Aisenberg 1999).
The most famous paper in bringing medical attention to the issue of carriers was that of Koch. In 1902, he argued that many typhoid patients had been infected not by other patients but by carriers. Koch directed a bacteriological and public health campaign toward “sanitizing” armies and was regarded as the first scientist to point out the importance of carriers in creating epidemics (Brock 1999). A saying by another German bacteriologist, “Kein Bazillenträger, da kein Typhoid” (No carriers, no typhoid), was quoted so many times that it became commonplace. In the late nineteenth and early twentieth centuries, the attention paid to asymptomatic carriers started to grow in several countries which had developed public health and bacteriological sciences.

One needs to be careful and pay close attention to temporal developments and regional differences. Historians such as Mendelsohn have pointed out that the world of public health in the twentieth century started to move out of the simple cult of purity to a more complicated attitude toward the cause of infectious diseases. The words of Koch in his search for the carriers of typhoid were aggressive and militant: “[Search] out and render harmless each person who harbors typhoid bacilli in his organism” (Mendelsohn 1998; Brunton 2004). Both in England and in Germany, however, epidemiology and bacteriology started to become much more complicated in the 1920s. The simple model of microbe hunting and the search for cleanliness was increasingly replaced with more multifaceted views. British doctors such as Major Greenwood (1880–1949) and German bacteriologists such as Fred Neufeld (1869–1945) were moving toward a holistic view of epidemics and pathogens (Mendelsohn 1998). Also, there were crucial regional differences in the relationship between bacteriological attitudes and those concerning public health. Anne Hardy (2001) has pointed out that, while in Germany and the United States the triumph of the bacteriological method of the investigation of contact followed in the early twentieth century, in Britain research was based more on the epidemiological survey and biometric analysis of actual cases. Gradmann has also pointed out that imperialism in tropical colonies and the environmental viewpoint of diseases shared by humans and animals were important in the creation of the carrier for Koch (Gradmann 2010; Giles-Vernick and Webb 2013; Tilley 2011). Historians of medicine have so far shown that the issue of asymptomatic carriers was much more complicated and related to more fields and subjects than was the relatively simple case of the discovery and confinement of Mary Mallon.

3 Carriers of Typhoid and Other Diseases in Japan

In Japan, carriers became the subject of serious attention from public health and bacteriological science around 1920. This was a product both of influence from overseas and a change in the epidemiological situation in Japan. Germany, the United States, and other Western countries recognized the importance of carriers around 1900, and Japanese doctors started to publish medical papers on them around 1920, mainly because Japan had entered into a new phase in its epidemiological history in the 1910s. By 1890, Japan had emerged from a nightmarish series of major epidemics of acute infectious cholera, with more than 100,000 deaths in the years 1879 and 1886. In 1900, Japan experienced a huge cholera epidemic that claimed some 40,000 lives. In the late nineteenth century, Japan was also caught up by infectious diseases which had
established themselves in that country: typhoid and dysentery followed a similar rising course in the late nineteenth century and decline in the early twentieth century. Typhoid had its first heyday in the 1880s and after a decline flared up again in the 1910s and 1920s. Dysentery started to spread in the 1890s, slowly moving up the Japanese archipelago from south to north and climaxing in 1894 with about 170,000 patients and 40,000 deaths. The number of cases of these two waterborne diseases failed to decrease and often became epidemic. Among the acute infectious diseases which were the subjects of the 1897 Law for the Prevention of Contagious Diseases (LPCD)—the first national law on infectious disease in Japan—typhoid and dysentery were the two major threats, along with their carriers.

The late nineteenth century was a period of actual large-scale epidemics of acute infectious disease, and the government had little time to conduct surveys. Only in the 1910s did major health surveys start to appear (Suzuki 2008), influenced by developments in public health, epidemiology, and health surveying in Europe and North America. They were also an engagement with the major problems of health created by the modernization and industrialization of Japan. Tuberculosis among female workers who had migrated from rural areas was a major theme in medicine, public health, and even literature and other representations (Johnston 1995; Fukuda 1995). Physiological and psychological fatigue among workers in large hospitals was also measured and interpreted. Industrial accidents which led to post-traumatic stress disorder in high-risk workers such as miners or railwaymen were studied (Sato 2013). Both national and local governments surveyed health and illness, as well as the financial cost and distribution of medical care. The government was interested in enhancing human resources as the basis of empire, while the left was keen to criticize and publicize neglected illnesses, harm, and deprivation among workers.

The LPCD was amended in 1921. In August 1919 there had been an issue with cholera in Tokyo, and the Metropolitan Police had trouble identifying carriers who traveled in and out of the city using the railways (Asahi Shinbun, August 1919). Incorporating domestic experience and influence from overseas, the LPCD set out new rules on carriers. Generally speaking, this amendment took up the position of identifying the carrier with the patient, but this does not fully summarize what the change did. The amendment in fact created two types of carrier, namely, those of cholera, and those of other diseases such as dysentery, typhoid, paratyphoid, diphtheria, and epidemic cerebrospinal meningitis. Carriers of cholera were strictly identified with the status of patient and had to be confined in isolation hospitals under strict rules, reflecting the enormously high mortality and very rapid dissemination of the disease (Tsuchiya 1928). Around the year 1920 the number of patients and carriers of cholera was small, however, when a paper was written on cholera in Osaka, it was relatively brief, dealing with just fifty families (Harada 1921). In contrast, dysentery, typhoid, and other diseases presented problems of a different dimension. With a much larger number of patients, who stayed much longer in isolation hospitals than did cholera patients, keeping carriers of typhoid or dysentery in hospitals was out of the question (Baba 2006). Such patients had to be controlled in their own homes, using that home as

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2 From 1876 to 1959, annual and monthly data on infectious disease in Japan are available: Legal Infectious Disease Statistics in Japanese Prefectures (Tomobe, Suzuki, and Reki-Show Project, 2006–2007).
a new device in health and hygiene (Suzuki 2008). Former patients, family members, and anyone who had had contact with the patients through various means were put under medical and bacteriological observation for varying numbers of days. Fourteen days for dysentery, twenty-one for typhoid and paratyphoid, and seven for diphtheria and epidemic cerebrospinal meningitis were the basic rules, although there existed misunderstandings about the correct procedure (Kanamitsu 1952). Food sellers, cooks, clerks at department stores, and those people whose occupation involved contact with a large number of people were other targets in the search for carriers. High-risk individuals had urine, stools, and other samples taken and examined at a laboratory. With the development of urbanization, modernization, and the equipment for public health examination, large cities had ample and well-developed facilities for bacteriological examination, as presented in the map of hygiene centers in Nagoya city in 1929 (Fig. 1). Finding carriers was thus mainly the business of the developed medical facilities of large cities.\(^3\) The state’s hygiene department was able to collect data on carriers of typhoid and dysentery from twenty-one prefectures, less than half of the total. In Kanagawa Prefecture, for example, some 120,000 high-risk individuals were screened, and 161 carriers of typhoid and paratyphoid and 446 carriers of dysentery were found (Murano 1937). Although there were also several reports from Japanese colonies, reports mainly emanated from major cities and were centered around advanced medical institutes or universities (A. Aoki 1937).

The public health section of the Tokyo Metropolitan Police, led by the very interesting police doctor Iguchi Jōkai (1883–1941), was engaged in the control of typhoid with an emphasis on carriers, and its detailed report published in 1933 tells how those carriers were controlled in their own homes (Iguchi 1933; Tokyo Statistical Bureau 1929, 1930). After the aforementioned amendment to the LPCD, between 1923 and 1930 the police bacteriologically vetted some 1.6 million residents of Tokyo and discovered some 1,300 carriers of typhoid. These were asked to have their bodily fluids checked, to wash their hands with specific detergents, to disinfect the toilet after use, and to disinfect urinals. Their families were asked to set up a toilet to be used only by the carrier and to set aside a towel for them alone to use. The carriers were also asked to avoid using public baths. Iguchi’s examination revealed that some of these rules were obeyed, but others were not. Hand washing and disinfection of urinals were followed, but a designated toilet was rarely adopted. The life of a domestically controlled carrier in Tokyo in the 1920s was not so different from one of progressive cleanliness, rather than that of Mary Mallon, isolated as she was for the rest of her life. The combination of the finding of pathogens in the laboratory and the control of a patient’s behavior at home did not create intense tensions between police and public.

There were, however, several instances of negative rhetoric and language regarding carriers if one reads the report on individual carriers who were responsible for infecting patients. This report, by the Tokyo Metropolitan Police, cited several healthy carriers who were responsible for a number of infections. The landlady of a boarding house who infected several lodgers and a confectioner whose sweets spread typhoid to patients were such figures. A young female carrier who became the lover of a noodle

\(^3\) There were some cases in which epidemics of typhoid and dysentery in rural areas were investigated and in which the doctor’s thoughts turned to carriers. One small typhoid epidemic occurred in a village close to Iizaka Onsen at Fukushima, with twenty-two patients attributed to a carrier (Watanabe 1931).
chef and continued to infect those around her was another such case. In the end she infected her lover’s wife, who later died of typhoid. The police report said that “she was a poisonous woman” (Iguchi 1933). On the other hand, the report could become sentimental or even lachrymose. When a woman who was a waitress at a restaurant and a carrier of typhoid died of the disease at an isolation hospital in Nagoya, doctors

Fig. 1 A Map of quarantines and bacteriological facilities in Nagoya in 1929. The Dawn of Modern Medical Science Digital Archive, Nagoya University.
commented that she was infected with typhoid by her own customer who took care of her after her divorce. Her doctor wrote of the respect due to this woman (Ochiai and Watanabe 1938). So the rhetorical construction of carriers could lead down both negative and/or positive paths, depending on their behavior. Although doctors noted that carriers tended to be female, they did not develop particularly misogynous views on this subject.

Carriers, in the world of public health in Japan during the earlier part of the twentieth century, present a story of the progress of cleanliness within the family. Although this is an important part of the modernization and medicalization of Japan, one gets the impression from the wider context that this is a somewhat ordinary tale; England too from the mid-nineteenth century to the early twentieth depicts the coexistence of public health and domestic space, although not concerned with diseases like typhoid (Mooney 2015). But if one looks at the realm of animal experimentation in the laboratory, one is struck by the energetic development of science and experiment. The next section will examine that dynamic research into the subject of carriers in the laboratory.

4 Experiments in Laboratories

Linda Hogle (2008) has argued that emerging medical technologies are tightly connected with other aspects of daily life, commerce, and governance. In Japan during the period between 1920 and 1950, the central driving force in the construction of the carrier came from laboratory science and the experimental and technological manipulation of live animals.

The introduction of Western medical science into Japan, which used to be a center of traditional Chinese medicine, ran successfully from the late nineteenth century, and this was particularly the case with bacteriology. Great pioneers of bacteriology in Japan such as Kitazato Shibasaburo (1852–1931), Shiga Kiyoshi (1871–1957), and Hata Sahachiro (1873–1938) worked with giants of bacteriology in German universities and institutes such as Koch and Paul Ehrlich (1854–1915) (Kim 2014). Japanese doctors and bacteriologists were particularly keen to start their papers on carriers with reference to Koch, who through disciples such as Kitazato was regarded as the founder of modern scientific medicine. Japanese bacteriology was well prepared to tackle the question of carriers, and their importance in public health has already been recognized. In the 1930s, one bacteriologist wrote that public health was being transformed from patient centered to carrier centered (Nihira 1937).

This basis of a flourishing bacteriology combined with the grave situation of the established epidemic diseases of typhoid and dysentery in Japanese cities. Doctors in Japan compared the situations in Western countries with that of Japan, and they all lamented that it was a matter for great shame. Young German doctors might never have

4 Indeed, one can argue that Mary Mallon was treated with some signs of kindness compared with the ostracization of Japanese and Chinese immigrants who were responsible for spreading infectious diseases (Harrison 2004).

5 One patient suffering from cholelithiasis (gallstones) was found to be a healthy carrier of typhoid. After surgery she lost that carrier status (Hayashi 1931). Another interesting case of the disappearance of asymptomatic carrier status occurred after the delivery of a child (Oba 1930).
even seen a patient actually suffering from typhoid, while the number of typhoid patients in Japan remained very high, in the tens of thousands. Japanese doctors also agreed that the major reason for this was the sewerage system in Europe and North America, whereas Japan was still trying to introduce such a system in a handful of major cities (Murano 1937). The underlying stratum here was a combination of an imperialist viewpoint and a colonial epidemiological situation: an advanced bacteriological science and a mediocre or even poor situation in terms of infectious disease. Typhoid and dysentery were two major infectious diseases whose carrier status became a major research question.6

In the 1920s and 1930s, Japan began to enjoy advanced laboratories equipped with all kinds of the latest technologies, while Japanese medical scientists had contributed to the discovery of new facilities (Hayashi 1931). Bacteriological research methods in the laboratory rapidly improved. Developed nations were keen to improve the health of the populations of their own countries and colonies for economic and military purposes. Finding and identifying infectious diseases remained a top priority. Bacteriological and immunological handbooks for public health workers and clinicians were getting thicker; Nakamura Yutaka’s *Handbook of Bacteriological and Immunological Experiments* went through many editions and in 1938 had more than 1,200 pages (Y. Nakamura 1938). Such handbooks included basic information such as sterilization, disinfection, various means for the cultivation of microbes, the use of microscopes, and even various methods for staining.

New theoretical viewpoints proposed by scholars based in Europe were quickly introduced and examined in Japanese bacteriological laboratories. During the period covered in this paper, the most important was that of the bacteriophage in the 1910s. Especially important in Japan was the theorization of Félix d’Hérelle (1873–1949), a French-Canadian doctor who worked at the Pasteur Institute in Paris. In the 1920s, d’Hérelle proposed a further theory about the creation of the carrier state through the function of the bacteriophage: where the phage completely destroyed the pathogen there were no pathogens left in the body; but when the phage did not fully overcome the toxic nature of the pathogen, pathogens remained and created a carrier status. Checking the toxic nature of pathogens by means of the phage was one advanced research question in the 1920s. Many bacteriological researchers in Japan assumed the theory of the role of the phage in the creation of the carrier state and conducted a series of experiments. In 1925, Tsukuba Takehiko and Takita Junzo, two young and eminent bacteriologists at the elite Kitazato Institute, published a paper on the relationship between the pathogens of typhoid drawn from various carriers and the bacteriophage, trying to assess whether d’Hérelle’s assumption was correct (Tsukuba 1925). The frequent appearance of bacteriophages in such varying places as the excrement of

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6 Diphtheria was another important infectious disease which bore the problem of carriers. A certain village was selected as a place for an intensive search for carriers. What researchers found was an astonishing number of healthy carriers—more than ten times the number of patients. Patients, their families, neighbors, and pupils of elementary schools were screened, and carriers were discovered and studied (Nihira 1937). For the classic imperialist view of other diseases such as leprosy, see Edmond 2006 and Tanaka 2015.

7 Takita Junzo (1896–1957) graduated from Keio University and became a member of the Kitasato Institute. In 1935–36 he studied at the London School of Tropical Medicine and in 1941 became director of the Institute of Health Science for North China Transportation, an national railway company.
healthy persons and of newborn babies, though, demonstrated the lack of relationship between the disease and its bacteriophage. Naito Ryoichi (1908–82), a young bacteriologist at Kyoto Imperial University, argued against the key status of the bacteriophage in the making of carrier status (Naito 1936).

Other great medical theorizations were soon checked in the light of experimental bacteriology. Clemens von Pirquet (1874–1929) coined terms including “allergy” and “allergen” to express basic ideas about the human immunological reaction. This idea of analyzing the immunological reaction to typhoid pathogen lipids was pursued by Watanabe Toshihiko, who worked at the municipal hospital in Nagoya. Using about one hundred patients typhoid patients and ten carriers, Watanabe concluded the importance of the immunological reaction in the discovery and understanding of carrier status (Watanabe 1935). Japanese scientists thus acknowledged the importance of the explanatory model of carrier status from the viewpoints of both scientific research and public health. The clarification of the mechanism of carrier status was to be a great piece of theoretical progress, while effective means to reduce the number of carriers was to be greatly profitable to public health. Ueshima Takeshi, a bacteriologist at Nagoya Imperial University, even remarked that it should be rewarded with a Nobel Prize (Ueshima 1940).

The “cure” for asymptomatic carrier status was thus the meeting point of experiment and theoretical analysis. The antagonism between several microorganisms was one of the points of discussion. The antagonism between the typhoid and paratyphoid bacillus and the bacteria used to ferment natto, a traditional Japanese food made from soybeans, was an interesting development for laboratory scientists who combined economics, public health, and laboratory experiments. Matsumura Tsutomu, a graduate of Kyoto Imperial University, organized his experiments in three stages: using test tubes, live animals, and rabbits which had become asymptomatic carriers of typhoid. Matsumura pointed out that many experiments on antagonism in different germs were unsuccessful in their effectiveness in live or carrier animals. He carried his successful experiments in vitro to those in vivo. Differing amounts of natto bacteria and of typhoid/paratyphoid germs were injected into the abdominal cavities of mice, and the survival rate of the animals was observed. The results suggested, Matsumura (1934) argued, that when natto bacteria had been injected one or two days before the injection of pathogens the animals were likely to survive the disease. He then proceeded to the experiments on rabbits which had become carriers of typhoid. Applying knowledge of the gallbladder as the locus of carried pathogens, which Mary Mallon’s case had led people to reject, Matsumura injected typhoid into the gallbladders of rabbits. In the end, he was able to obtain fifteen typhoid carriers and to conduct experiments using natto bacteria. The results demonstrated, he argued, that natto bacteria possessed the power to kill typhoid carried in the body and viscera of rabbits. He finished his paper with a very optimistic forecast—that eating natto would be an effective way to control typhoid epidemics by decreasing the number of carriers. This paper by Matsumura was taken up by a journalist at Yomiuri Shimbun, who turned his experiments into an article published on 1 September 1936. Claims extolling natto as a preventative food started to appear on packaging and advertisements. One doctor who worked at a municipal hospital at Sendai was not satisfied and conducted experiments by injecting natto soup into typhoid patients, finding no results to back its efficaciousness (Sakurada 1936–37).
Several bacteriologists who worked at well-equipped institutions such as major universities or elite institutes conducted a series of elaborate and well-developed experiments on carrier germs. In the late nineteenth and early twentieth centuries, prestige and research excellence were monopolized by institutions in Tokyo. In the 1920s, however, major universities and medical schools in major cities outside Tokyo also became important. Such places accumulated know-how and procedural skills. One of these powerful centers was Kyoto Prefectural Medical School, the oldest modern medical school in Japan’s former capital. At the department of hygiene and microbiology, led by Professor Tsuneoka Ryozo (1879–1944), young doctoral students such as Shida Kakujiro, Matsumura Tsutomu, Takahashi Tatuo, and Nakagawa Takuya conducted elaborate experiments on typhoid carriers using live animals. As mentioned above, Matsuoka developed experiments on natto and typhoid carriers. Shida conducted various manipulations of the typhoid germ using different techniques: injection into the veins of rabbits, observation of the germ in their bile, and infection of the gallbladder and its effect on the tissues of the duodenum. Shida also took microscopic photographs and published them in a journal (Fig. 2). Likewise, Takahashi tried to demonstrate the effective value of salvarsan against typhoid carrier status, conducting a seminar series of experiments on live animals using very similar experimental methods. One interesting development of Takahashi’s experimentation was the creation of a fistula in the gallbladder of a rabbit. This method allowed the scientist to measure the amount of bile after the injection of typhoid germs (Takahashi 1937). Nakagawa too conducted a number of experiments on immunology using rabbits (Nakagawa 1942).

After Japan’s defeat in the Asia-Pacific War it is possible to sense both continuity and change in research into asymptomatic carriers. With the use of new sulfa drugs, Japanese doctors quickly became involved in experiments on these and discovered both their effects and a paradoxical increase of the number of short-term asymptomatic carriers of dysentery. In 1953, the Japanese Society of Infectious Diseases organized a symposium on asymptomatic carriers (Ochiai 1953). For obvious reasons, Japanese experimental doctors switched their allegiance from Germany to the United States and began to cite American doctors and procedures. Kumagaya Kenzaburo (1888–1981), who was to become a leading medical scientist on infectious disease, cited American doctors instead of German ones in his papers. Interestingly, Kumagaya cited mainly American works on using drugs for carriers of dysentery (Kumagaya 1952). At Yokohama Manchi Hospital, which used to be a hospital for acute infectious diseases, doctors published an article in 1953 on trials using the paratyphoid vaccine on dysentery carriers, which indicated a dependence on similar experiments on animals before 1945 (Kaneo and Hoshino 1953).

An important agent in the rise of animal experimentation may have been the development of military medicine by the Imperial Japanese Army. The technological orientations of the army had been pointed out from the time of the Russo-Japanese War.

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8 Nagoya became another research center into carriers. The Nagoya School of Medicine (which later became Nagoya Imperial University in 1938) and Nagoya Municipal Joto Hospital conducted a series of advanced research. The professor of the department of bacteriology was Oba Shiro (1884–1937), an industrial hygienist, who trained disciples including Watanabe Toshihiko, Ochiai Naotaro, Oimomi Masami, Nozaki Yoshio, and Ueshima Takeshi in the bacteriology of carrier status. A major subject of the Nagoya School was immunology and the creation of vaccines for carriers.
Louis Livingston Seaman, a US army doctor with the privileged status of a foreign military attaché, praised the hospitals and bacteriological devices found among Japan’s forces (Seaman 1906). Excellent works in English as well as in Japanese have been published, clarifying laboratory works on beriberi and other diseases, studying the care system for wounded soldiers and disabled veterans in the twentieth century, and

Fig. 2 Photographs in Shida 1928.
analyzing the trauma of soldiers under psychiatric care (Bay 2012; Pennington 2015; E. Nakamura 2018). This rise in the study of military medicine has been encouraged by discussion of Unit 731, which in the 1930s and 1940s conducted biological warfare in Manchuria and China against the Chinese and Soviet armies and the local Chinese population. Work by historians and journalists has revealed that Lieutenant General Ishii Shiro (1892–1959) and other military doctors led the Japanese army in secretly conducting biological warfare by attacking enemies with infectious diseases (Harris 2002; Gold 1996; F. Aoki 2008; Takao Matsumura 1997; Tsuneishi 1993). Such work has particularly focused on the use of Manchurian, Chinese, Korean, and Russian prisoners of war in live human experiments into cholera, plague, and frostbite. It has also demonstrated the use of typhoid, paratyphoid, and dysentery bacteria to attack enemies by infecting rivers, wells, and marshes: Soviet forces were thus attacked during the Nomonhan conflict in 1939, and Manchurians in Harbin and Chinese in Nanking were similarly attacked in the 1940s. At the basic level of finding preventative means to protect Japanese soldiers from infection in China and Manchuria, Unit 731 produced vaccinations against typhoid and other diseases, which were thus rendered asymptomatic. Perhaps most importantly, among several important researchers into asymptomatic disease in Japan, Naito Ryōichi, for example, was active in Unit 731 and, after the war, head of the Green Cross Corporation, which was later found guilty in Japan’s HIV/AIDS scandal. The rise of animal experimentation into asymptomatic carriers had strong connections with human experiments and the murder of prisoners in Unit 731, especially from the late 1930s on.

5 Conclusion

In Japan in the second quarter of the twentieth century, the question of carrier status in typhoid, dysentery, and other infectious diseases rested on two matters: public health and animal experimentation. Public health saw certain achievements, but they were relatively minor when compared with the use of animal experiments. Disease surveillance and preventative medicine based on the detection of pathogens were rather slow to come to Japan. The confinement of patients suffering from tuberculosis or mental illness was small when compared with contemporary European countries or North American states (Strange and Bashford 2003; Suzuki 2003). Although the idea of surveillance became active in some rural areas in 1938, Japanese society soon had to curtail the development of this new preventative detection measure due to the Asia-Pacific War (Aldous and Suzuki 2012). The Japanese public health sector also had to deal with the serious problem of a larger number of patients suffering from typhoid or dysentery caused by the poor development of sewerage systems (Nagashima 2004); rural areas lacked sewerage, and even large cities had only limited provision of sewers. Pursuit of the issue of the carrier in laboratory experiments on animals was more advanced (Bartholomew 1989). Prestigious universities and medical schools began to be built in Japan. Thanks to the medical experimental resources of academia and the military, carriers became a major subject of research. The contrast between the less developed epidemic situation and the quickly developing academic experimental capacity encouraged an emphasis on the latter.
The lack of a counterpart to Typhoid Mary and the strength of laboratory experiments in Japan thus represent the structure of power in medicine. In Japan, carriers of typhoid and other diseases resulted from the lack of confinement. The isolation of tuberculosis patients and sufferers of mental illness had just started in Japan, and in the 1920s public debate of such medical issues was relatively rare. Instead of using the public health sphere and public institutions, important changes took place in the academic and professional research scenes or in the use of well-prepared and expensive treatments. In the 1920s and 1930s, Japan started to add increasingly thick layers of animal experimentation into the landscape of the asymptomatic carrier. This was probably a good environment for the development of Unit 731 of the Imperial Army. The more crucial part was, and perhaps is, that Japan lacked and still lacks public discussion and is dominated by professional argument on the issue of asymptomatic carriers. If eminent doctors, responsible bureaucrats, or powerful drug companies have decided, or still decide, to be silent on the issue, there was and remains no structured route to criticism.

Thinking about asymmetric typhoid in Japan in the earlier half of the twentieth century in a different framework from that of Leavitt is to depart from and to incorporate the insights of the late Kanamori Osamu (1954–2016) into the further discussion of the Japanese history of medicine, science, and the body. Kanamori published a small book in 2006, essentially an abridged translation and summary of Leavitt’s masterpiece (Kanamori 2006). Although Kanamori clearly acknowledged his debt to Leavitt, his work comes rather close to international plagiarism, so to speak. Kanamori’s work has, however, interestingly suggested knowing more about the history of other asymptomatic carriers in other countries and about analyzing the creation of the concepts of carrier and of different forms of medical authority and power in the late twentieth century. I hope this paper will encourage historians and STS scholars to think about Kanamori’s productive use of legacies, whose great works will be a milestone of Japanese science studies.

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