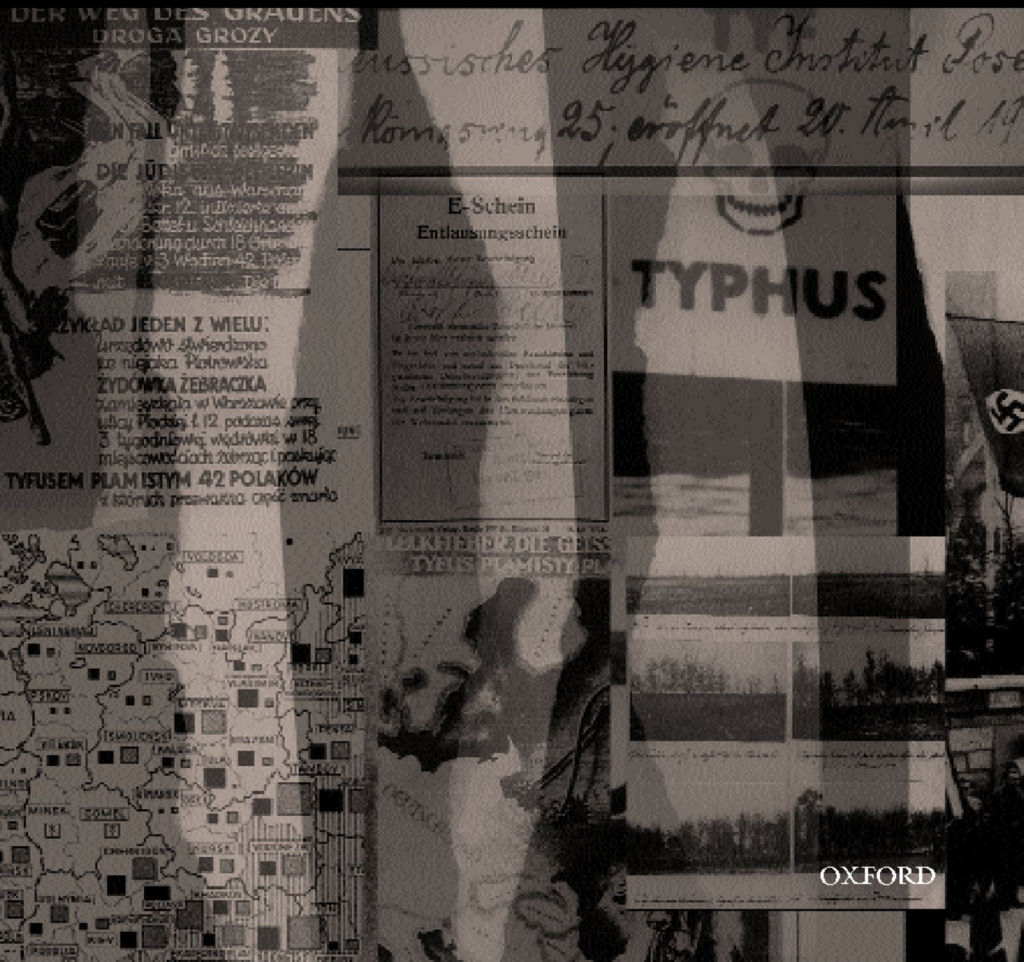
EPIDEMICS and GENOCIDE in EASTERN EUROPE, 1890–1945

PAUL WEINDLING



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Paul Julian Weindling

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For my mother, Erica Weindling.

In memory of Julian Weindling (born 13 Jan 1875 in Klasno,
Wieliczka; resident of Zakopane), his wife Amalia,
and their daughter, Nusie; their fate unknown

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The brilliant opening academic conference of the US Holocaust Museum in 1993 impressed me with the importance of drawing on survivors' testimonies. The Museum has taken due account of medicine as part of Holocaust history. The 1995 conference at the YIVO Institute on Jewish Medical Resistance developed my understanding of ghetto medical services, not least because of the survivors' memories.

My family—Julia, my daughters Silvia and Miranda, and baby Felix patiently endured my obsession with lice. My mother many years ago had impressed me with her experiences of the discomfort of bedbugs in prison in Bucharest on an unsuccessful attempt to escape post-Anschluss Austria. She has been mercifully fortunate, but others were not: hence the dedications.

NOTE ON NAMES OF PLACES AND PERSONS

Where there is a commonly recognized name in English, e.g. Cracow or Vilna, this has been used throughout. Otherwise, place-names are generally given in the language of the prevailing political authority: for example, Lemberg under Austrian rule, from 1919 Lwów, then under Soviet occupation during 1939–41 Lvov, and again Lemberg under German occupation. At times usage varies in accordance with the sources: thus the Austrians used the name Oswiecim prior to Polish independence, while under German rule Auschwitz is appropriate. I have exceptionally retained German forms of Polish or Russian place-names when the equivalent is unclear or when these were part of plans for post-conquest economic development.

The names of persons are given according to their national identity, e.g. Ludwik Hirszfeld rather than Ludwig Hirschfeld. Self-styled forms have been used, e.g. Serge Balachowsky. I have kept the idiosyncratic listing of names and national identity used by Balachowsky in his listing of Buchenwald vaccine researchers. Where the original forms of names are unclear, these are given as in the sources used.

FOREWORD

Delousing became routine during the First World War, based on the recent discovery that lice spread typhus. By the time of the Second World War migrants and deportees had become conditioned to expect the ordeal of delousing at border crossings, ports, railway junctions, and on entry to camps. The Nazis stigmatized ethnic undesirables as human vermin and as poisoning the Aryan race. As racial therapy became intertwined with the control of epidemics from the east, the preventive strategies of sanitary experts merit scrutiny. The cruel fiction that the crematoria of Auschwitz were for delousing raises the question as to how the medical eradication of parasites was linked to genocide.

In confronting typhus we see twin processes of sanitary policing, and its racialization with typhus characterized as a *Judenfieber*. Preventing epidemics involved a battery of sanitary technologies to cleanse, disinfect, fumigate, and cremate. The campaigns against lice dragooned civilians into compliance with draconian sanitary regimes, and ethnic minorities became vulnerable to extortion, destruction of personal property, and racial violence. The campaigns were predicated on a metaphorical divide between the advanced sanitary conditions of Western Europe, and a pathogenic and primitive east. The Second World War saw megalomaniac racial engineering of the genocidal *Generalplan Ost*, involving plans for 'clearance' and transplanting of reinvigorated ethnic German stocks in the occupied eastern territories. This had as its corollary what amounted to an anti-epidemic *Seuchenplan Ost*, first to segregate and then to eradicate the human carriers of epidemic infections. Medical experts and subordinate troops of disinfectors targeted ethnic foes as the sources of infections, menacing the health of German 'colonists' in the east, the German heartlands, and the predatory forces of the army and SS.

A brief historiographical review, and some explanation of the gestation of this work will—I hope—be helpful. My intial concerns were with the sanitary and symbolic significance of borders, transport, and sanitary policing. Two groups merited special attention: the migrants crossing Germany from eastern Europe on their way to the United States, and the ethnic German 'colonists' in Russia. The Treaty of Versailles was traumatic for the German sanitary experts, while the Allies recognized that the central European successor states required national hygiene installations. The new hygiene institutes and delousing stations could provide a virtual iron curtain (or what the Germans called 'an epidemic protection wall') to prevent typhus as a devastating new 'Black Death' from the east. Graphic reports by League of Nations Epidemic Commissioners, depicting the Russian famine and typhus epidemic of 1921 as a 'Holocaust' poised to engulf the new Europe, prompted my first reflections on the genocidal significance of the disease. The Commissioners' reports alluded to tensions between measures sponsored by the Allies and those of a German epidemic relief expedition in Russia. I set out to examine how the

German medical experts appeared on the international stage of epidemic control, and to compare German responses to epidemics from the east to those of British, French, and United States sanitary experts. Medical élites established new sanitary infrastructures and powers, amounting to a distinctive form of medical imperialism. Yet the exterminatory medical Sonderweg still required explanation.

At first my approach to delousing was in its use as a means of sanitary conditioning of people forced to submit to baths, the shaving of hair, and to fumigation of clothing and possessions. Yet delousing was far more than a regime of social control. Resistance and evasion, and long-standing customs need to be taken into account. Issues arise concerning differing ideologies, interests, and affiliations among the sanitary experts and the perpetrators of genocide. The relations between medical views of infectious micro-organisms and anti-Semitism prompt review of German bacteriology. Nazi enthusiasts exaggerated the anti-Semitism of the pioneers of bacteriology. There were distinguished bacteriologists who were Jewish (including Ferdinand Cohn, the Breslau botanist who coined the term 'bacterium', Paul Ehrlich, and August von Wassermann). The interaction of medicine and ideas of racial purification involved not only the transfer of techniques but the deployment of a medical voccabulary to strengthen the racial metaphor. Moreover, the racial aims were complex: among the rationales motivating the medical advocates of expanding German *Lebensraum* was the sustaining of ethnic German communities in the east. The material on typhus prompts consideration of a great diversity of medical strategies, perceptions of the disease, and popular evasion of public health measures.

The whole idea of a self-evident disease with a single agent of transmission—the louse—did not accord with the medical discourse on bacteria, viruses, and geographical factors. Why did the mentalities of those in command of epidemic control strategies vary? How did scientific and racial impulses interact in medical programmes to combat epidemics from the east? What popular responses were there to the coercive regimes of delousing? It became necessary to take account of multiple strategies of the prepetrators, evasion, resistance, and an ability to turn the German fear of typhus to advantage. Virtually every survivor's account of the Holocaust confronts not only death but also the malignant shadow of disease. The rich sources demand a complex account, but I hope one that a patient reader will appreciate as more authentic than just the operationalizing of an exterminatory medical strategy.

The survivors who pioneered Holocaust history provided powerful testimony of how medical science was poised between assistance and destruction. In 1946 Marc Dvorjetski described how typhus and a range of other diseases were fought by Jewish sanitary services in the Vilna ghetto, which replicated advanced models of social and preventive medicine. Dvorjetski evocatively raised the issue of the different types of Jewish medical resistance. One may legitimately ask, resistance to what? Answers were provided by Désiré Hafner in a medical dissertation in 1946, where he argued that the Nazis used typhus as a powerful means of extermination in the camps, and by Isaiah Trunk's trenchant study, published in 1953, of typhus in the

Warsaw ghetto. Trunk argued that: 'In their campaign of annihilation against the Jewish population of Poland, the Nazis employed not only the well-known technique of "deportations" to the death camps, but also used bacteria . . . By deliberate design the German authorities created conditions in the ghettos which made the outbreak of epidemics inevitable.'[1] Ludwik Hirszfeld, an eminent serologist, drew the same conclusion about the murderous intent of German sanitary measures from his experiences on the Health Council of the Warsaw ghetto. In 1946 the chemist Primo Levi and the bacteriologist Lucie Adelsberger contributed analyses of how malnutrition, water shortage, and inadequate sanitation resulted in louse infestation, rampant scabies, and lethal diarrhoea. Adelsberger noted that it was not possible to survive more than six months on the normal diet, and memorized records on decreases in blood protein and ascorbic acid with progressive starvation. She noted how the dangers of the camp sharpened the will to survive and resist disease, particularly among those who although starving had not wholly succumbed to malnutrition. Survivors accused the Germans of having deliberately fanned the flames of infectious disease among overcrowded, starved, and physically exhausted ghetto internees and concentration camp prisoners.[2] Hermann Langbein, the prisoner-secretary to the Auschwitz physician Eduard Wirths, and Eugen Kogon, the prisoner-secretary of Buchenwald bacteriologist Erwin Ding, highlighted how in the permanent subterranean struggle against the SS, it was disease and death which provided opportunities for subterfuge and sabotage.[3] While eradicating the filth and disease of eastern peoples was a leitmotif of the German mission in the east, epidemics were caught up in a struggle between experts seeking to impose control measures, and popular strategies of evasion and resistance. The topic gained in cultural significance, as Alex Bein, a historian of Zionist ideas, examined how biological notions of the parasite came to pervade Nazi racism.[4]

Between the 1960s and 80s historians of Nazi Germany were preoccupied by political mobilization, the build up of the war economy, and with the genocidal role of bureaucrats and the Nazi élite. Medical questions, racial sensibilities, the mentalities of experts and their underlings, and sheer individual idiosyncrasy were eclipsed as structure, function, and ideology came to dominate Holocaust history. Disease and disability regained attention by 1990 for several reasons. Nazi

[1] M. Dvorjetski, *Le Ghetto de Vilna (rapport sanitaire)* (Geneva, 1946); D. Hafner, *Aspects pathologiques du camp de concentration d'Auschwitz-Birkenau* (Tours, 1946), cited by C. Romney, 'Les Témoignages des médecins déportés à Auschwitz', *La Pensée et les hommes*, 39 (1992), 95–112; I. Trunk, 'Epidemics and Mortality in the Warsaw Ghetto, 1939–1942', *Yivo Annual of Social Science*, 8 (1953), 82.

[2] H. Hirszfeldowna (ed.), *The Story of One Life* (Fort Knox, Ky., n.d.), 216–73; L. Hirszfeld, *Historia jednego życia* (Warsaw, 1946); L. De-Benedetti and P. Levi, 'Rapporto sulla organizzazione igienico-sanitaria del campo di concentramento per Ebrei di Monowitz (Auswitz—Alta Slesia)', *Minerva Medica*, 2 (1946), 535–44; L. Adelsberger, 'Medical Observations in Auschwitz Concentration Camp', *Lancet* (2 Mar. 1946), 317–19.

[3] E. Kogon, *Der SS-Staat. Das System der deutschen Konzentrationslager*, 23rd edn. (Munich, 1993); H. Langbein, *Menschen in Auschwitz* (Vienna, 1972); id., *Against All Hope. Resistance in the Nazi Concentration Camps* (London, 1994).

[4] A. Bein, 'The Jewish Parasite. Notes on the Semantics of the Jewish Problem with Special Reference to Germany', *Leo Baeck Institute Yearbook*, 9 (1964), 3–40.

euthanasia at last received serious historical attention as crucial in the genesis of genocide; the concern with the radicalization of the Holocaust on the eastern peripheries raised questions as to the role of racial experts in the east. The critique of modernity meant that the Holocaust became a product of calculated, rational planning rather than racist irrationalism. Finally, Marxist concerns with the socioeconomic structures of fascism were displaced by a new stress on Nazi Germany as a racial state and on the grandiose fascist masterplans to rejuvenate society. The disintegration of opaque sociological categories meant that greater significance was ascribed to individual experiences of 'ordinary men' as perpetrators, and to those of the victims.

The 1980s saw the rise of studies of Nazi medicine, often in protest against lingering authoritarian values and the remnants of racial ideas in the medical establishments in the two Germanies. The initial focus was on the eugenic component of public health and population policies in the emerging German welfare state. Medical and social assistance were increasingly coercive involving detention, invasion of the body with forced sterilization, and ultimately destructive of human life. My analysis of these developments, *Health, Race and German Politics between National Unification and Nazism*, was written very much from the position of a *Primat der Innenpolitik* of the responses by professional élites to the social misery of a rapidly industrializing nation. Bacteriology and tropical medicine (as opposed to social medicine), and the German borders (as opposed to urban public health) provide scope for a complementary study which deal far more directly with genocide.

It was possible to weave a new fabric of racialized medicine from some anomalous loose ends. Mark Adams, the historian of Soviet genetics, in 1985 caught sight of some material on the Moscow Institute for Racial Pathology buried in a footnote in my paper on the Kaiser Wilhelm Institute for Anthropology, Human Heredity and Eugenics; he prompted me to work up the materials on the German racial laboratory in Moscow.[5] But this research only became viable with the collapse of the Berlin Wall, when a range of historical sources became accessible, such as the papers of Heinz Zeiss and of the German embassy in Moscow, documenting German–Soviet medical co-operation.[6] Earlier attempts at comparing 'socialist' Weimar eugenics and Soviet eugenics, notably by Loren Graham, have had to be reconceptualized by investigating 'geo-medicine' and 'racial pathology' as nationalist constructs.[7]

The wave of historical research on eugenics, psychiatric abuses, and population policies neglected bacteriology as an apparently value-neutral sphere, and of

[5] P. J. Weindling, 'Weimar Eugenics in Social Context; the Founding of the Kaiser Wilhelm Institute for Anthropology, Human Heredity and Eugenics', *Annals of Science*, 42 (1985), 303–18; id., 'German–Soviet Co-operation in Science: The Case of the Laboratory for Racial Research, 1931–1938', *Nuncius. Annali di Storia Scienze*, 1 (1986), 103–9.

[6] Id., 'German–Soviet Medical Co-operation and the Institute for Racial Research, 1927–ca.1935', *German History*, 10 (1992), 177–206.

[7] L. R. Graham, 'Science and Values: The Eugenics Movement in Germany and Russia during the 1920s', *American Historical Review*, 22 (1977), 113–64.

diminishing importance given that infectious diseases were on the decline. But a whole new perspective came to be opened up, requiring a reconsideration of what had hitherto been marginalized. Tackling how experts in infectious diseases sought to defend the German heartlands and to colonize areas for German settlement prompted me to confront the issues of infectious disease and genocide. It became possible to add a medical dimension to the work of Michael Burleigh and Wolfgang Wipperman on the German 'racial state', as they mapped the contours of *Ostforschung* and the German sense of a historic mission in the east. The history of German Jewry has gained in subtlety and sophistication, well exemplified by Aschheim's depiction of the German-Jewish ambivalence over the *Ostjuden*. These developments meant that it was possible to build on a substantial literature on German nationalist opinions on the Polish question and the post-First World War territorial settlement.[8] The idea of a Jewish parasite acquired new meanings in the positivistic and professionalized realm of microbiology and disinfection.

Christopher Browning pointed out the force of medical arguments to confine Jews to ghettos.[9] The transition from ghettoization to extermination raises complex issues concerning the rationales and procedures of delousing and epidemic control. The rallying cry of stamping out epidemics clearly meant eradicating the racially inferior carriers of lice. Lüdger Wess, who investigated links between the clique of Generalgouvernement sanitary bureaucrats, identified by Browning, and the Hamburg Tropical Institute, concluded that ghettoization was only the most conspicuous tip of a vast iceberg represented by typhus in the Holocaust.[10] Longer-term responses to typhus as an epidemic hazard from the turn of the century had to be taken into account, along with the ideas and actions of 'ordinary doctors', disinfectors, and purveyors of hygienic technologies when confronting epidemics from the east. To recover how disease was manipulated, it became necessary to examine the structures of medical expertise and public health organization, and the distinctive roots of biological forms of racism in bacteriology and eugenics.

Holocaust historians have moved away from seeing the perpetrators' sole motive as the irrationalism of an exterminatory *völkisch* racism, regarding this as insufficient to explain the imposition of Nazi genocide. Emphasis on the rational elements of modernity—especially the 'solution' of a range of socio-economic problems—has provided interpretative space for the role of eugenics and bacteriology, neatly conflated as 'racial hygiene'. As Steven Aschheim has perceptively remarked, there is no clear link between popular anti-Semitism and the Holocaust.[11] Historians of Auschwitz, notably Deborah Dwork and Robert van Pelt,

[8] S. E. Aschheim, *Brothers and Strangers. The Eastern European Jew in German and German Jewish Consciousness, 1800–1923* (Madison, Wis., 1982); M. Burleigh, *Germany Turns Eastwards. A Study of Ostforschung in the Third Reich* (Cambridge, 1988).

[9] C. R. Browning 'Genocide and Public Health: German Doctors and Polish Jews, 1939–1941', in id., *The Path to Genocide. Essays on Launching the Final Solution* (Cambridge, 1992), 145–68.

[10] L. Wess, 'Menschenversuche und Seuchenpolitik—Zwei unbekannte Kapitel aus der Geschichte der deutschen Tropenmedizin', 9/2 (1993), 10–50.

[11] S. E. Aschheim, *Culture and Catastrophe. German and Jewish Confrontations with National Socialism and Other Crises* (New York, 1996), 118.

have pinpointed the changing functions of this inferno within the context of German *Ostraumpolitik* and the strategies for securing living space for a constricted and degenerating population.[12] Their account combines ideological (including medical) issues with chillingly vivid detail on the killing installations. Necessarily meticulous research has been conducted on the camp as an inferno produced by a genocidally twisted variant of town planning, and Jean-Claude Pressac has disentangled the genocidal gas chambers from delousing installations.[13] The broader context of typhus becomes relevant as Zyklon was stockpiled in the camp for use by a well-drilled brigade of disinfectors before the genocidal gas chambers were devised. Sanitary experts had to protect the highly vulnerable racial élite from outbreaks of infection. 'Normal' sanitary science had a lethal potential in shaping exterminatory practices.

Interest in the genocidal activities of German technical experts in the east represented a shift from ideological fanatics to expert groups and specialist occupations. Again, survivors' historical work has pointed the way forward. Kogon noted how Hitler had drawn a distinction between the sporadic nature of the traditional pogrom and his visions of relentless power once anti-Semitism was conceived as a science. One direction was that taken by historians of the German army in the east, demonstrating that genocide was not limited to the exterminatory special detachments. While this ultimately went in the direction of 'ordinary men' (or as Daniel Goldhagen specified 'ordinary Germans'), racial strategists gained in importance. This was confirmed by renewed emphasis on the *Generalplan Ost*, and Götz Aly argued that economic *Raumplanung* provided the impetus for deportations and genocide.[14] To overcome somewhat exaggerated claims made for the Holocaust as a product of economic rationalism, the debate shifted back to racial strategies in the east, throwing open the question of the complex ideological inputs to race.

As far as this account is concerned, the evidence pulls in three directions: the narrative moves backwards from the experiences of typhus victims in the Holocaust, and then forwards via medical concepts of the parasite; and there is a shift from tropical medicine in Africa and the Middle East to Eastern Europe. Medical *Ostpolitik* was shaped by German concerns to develop sanitary defences against diseases from the east, by outrage at the loss of these defences and a new vulnerability to epidemics with the Versailles settlement, and efforts to compensate by developing medical outposts in Russia and to sustain ethnic German communities. The selection of issues—epidemic control measures and medical research in the east, disinfection procedures, medical entomology and notions of the parasite, poison gas technology, and cremation—arise from their unique conjunction in the Auschwitz crematoria and as part of epidemic 'control' measures in the east. But

[12] R. J. van Pelt and D. Dwork, *Auschwitz 1270 to the Present* (New Haven, Conn., 1996).

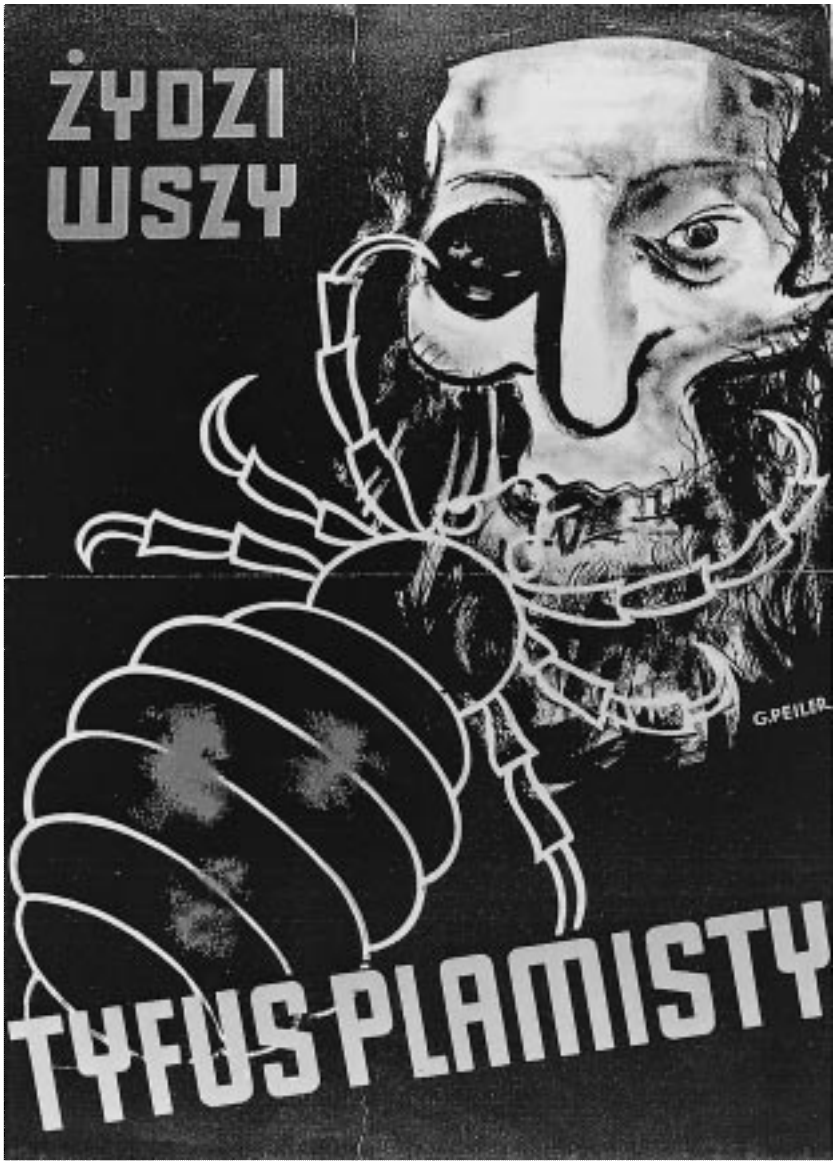
[13] J.-C. Pressac, *Auschwitz: Technique and Operation of the Gas Chambers* (New York, 1989); id., *Les Crématoires d'Auschwitz. La machinerie de meutre de masse* (Paris, 1993).

[14] G. Aly, *Endlösung. Völkerverschiebung und der Mord an den europäischen Juden* (Frankfurt/M., 1995); D. J. Goldhagen, *Hitler's Willing Executioners. Ordinary Germans and the Holocaust* (London, 1996).

viewed contextually from the 1890s they only sporadically interact until the emergence of the genocidal *Seuchenplan* at the time of the German invasion of the Soviet Union in 1941. Even then, the genocidal measures were marked by controversy among SS and military bacteriologists, technical incompetence, and widespread resistance and evasion from groups targeted for disinfection.

Judging the record of German bacteriologists in the immediate post-Second World War era, the Allies were torn between attempts to evaluate German expertise, and the ethical condemnation of human experiments. The Nuremberg Medical Trial avoided prosecuting German doctors for genocide, and typhus figured prominently as part of the medical research programmes of the SS. The Germans turned their academic feuding and careerism into spurious resistance. The onset of the Cold War marked the death knell for a vigorous policy to prosecute medical war crimes, and the burial of the genocidal significance of anti-typhus measures. It is time to exhume the body of a decayed mentality of combating epidemic threats from the east as a sanitary therapy for German racial ills.

I
MICROBES AND MIGRANTS



1. 'JEWS–LICE–TYPHUS'. German propaganda poster in the Generalgouvernement, 1940

1
Disease as Metamorphosis

i. Fevered Visions

> He was seized by the wish not to have a face. Not because he was afraid that someone would denounce him; no, he suddenly felt that he had a repugnant sinister face. The face from the poster 'JEWS–LICE–TYPHUS'.

The Nazi image of the parasite shot a pang of terror through Marek Edelman, when he saw the typhus poster in a Warsaw tram. Having survived the Warsaw Ghetto uprising he was revolted by how German propaganda whipped up anti-Semitism by depicting the Jewish body as malign and pathogenic. The posters and a grotesque anti-Semitic exhibition of spring 1943 marked the culmination of an anti-Semitic press campaign accompanying the destruction of the Ghetto. Bacteriologists gave scientific precision to the concept of the parasite by associating Jews with lice as carriers of the typhus germ. The Germans, who themselves were terrified by the prospect of epidemics, exploited the fear of disease to advance their strategy of establishing racial hegemony in the East.[1]

Despite the Nazi tactic of denigrating Jews as lice, the morbid image of the insect could be brushed aside in a spirit of defiance: 'I wished I were an insect'—the whim of Sala Pawlowicz marked how the freedom of insect existence could be preferable to the brutalizing ordeals of slave labour in a German armaments factory. Observing a single, scurrying insect made her envious. By way of contrast, the campaigners against insect predators used images of collectivities—of insect swarms spreading epidemics—or of a stylized, single monstrous bug. The Germans intended the macabre Auschwitz poster 'One louse—your death' to ensure compliance with mass delousing procedures.[2] Yet was there a hidden subtext, as the skull's grim features warned of impending death from 'disinfection'?

While the representation of typhus was shaped by the politics of genocide, the experience of delirium challenged the racialized view of disease. The sick experienced a delusion, which could strengthen the will to overcome the annihilating circumstances. It was when in the grips of the disease that the afflicted could transcend the confines of the racially condemned body. Contracting typhus while on a

[1] H. Krall, *Shielding the Flame. An Intimate Conversation with Dr. Marek Edelman, the Last Surviving Leader of the Warsaw Ghetto Uprising* (New York, 1986), 15; Edelman, opening address to YIVO/New School 1996 conference on Jewish Medical Resistance during the Holocaust; L. Wess, 'Menschenversuche und Seuchenpolitik—Zwei unbekannte Kapitel aus der Geschichte der deutschen Tropenmedizin', 9/2 (1993), 41 for the poster campaign. J. M. Glass, '*Life Unworthy of Life*' (New York, 1987), xix.

[2] The poster was plastered all over the camp in 1943 according to L. Adelsberger, *Auschwitz. A Doctor's Story* (Boston, 1995), 50; L. J. Micheels, *Doctor #117641. A Holocaust Memoir* (New Haven, Conn., 1989), 140–1.

death march in the last gasps of the war, Sala feverishly imagined her liberation. Her vision of a strange, wonderful land where her murdered family were reunited at her splendid wedding enabled her to escape psychologically all the deprivations, the coercive discipline, and medical stigma. Succumbing to the disease induced a sense of freedom from the burdens of the body as an object of racial persecution.

The term 'typhus' derived from the ancient Greek for smoke, vapour, or stupor, because of the delirious state characterizing the disease. While its external sign was a distinct rose-like rash, physicians observed a muttering delirium, a comatose stupor, and tremors which culminated in a feverish crisis. The military film *Kampf dem Fleckfieber* showed patients as passive and vegetative.[3] In this lethal form Renzi Rosa Berkowitz became unconscious when sick with typhus in a camp at Zibulowka in Transnistria, and her baby froze to death.[4] Everyday norms were rejected: a medical prisoner in Theresienstadt, Dr A. Weiss, noted that during incubation of the fever there were signs of nervous strain, depression, and revulsion against eating.[5] Although the coma stage could resemble death, when the delirium was at its height patients had crazed dreams, wild visions, or acute phobias—their bodies might twist in emaciated coils, and they might sob, scream, and stammer incoherently. When fever struck the skeletal Bogdan Wojdowski in the Warsaw Ghetto he felt engulfed by the green gas of the sky.[6]

Yet bouts of typhus meant the body could feel pleasantly released and dismembered with limbs floating freely, transcending the grim brutality of the camps and the racialized human physiology. The memory of the sensations remained powerfully vivid. An Auschwitz prisoner, Wiesław Kielar, commented on his experience of typhus: 'I was delirious but my delirious dreams were not altogether unpleasant.'[7] Claudette Bloch remembered that fever brought on a vision of being seated in an armchair at home in the presence of her mother—she lay exhausted in a truck after three days' continuous marching from Auschwitz to Ravensbrück.[8] Struck down by fever, Esther Brunstein 'recalled the images of all that was dear to me, bidding farewell to my loved ones and my young life'.[9] Fragmentary accounts of individual experiences suggest that it would be a trap to accept unreflectingly the Nazi medical categories. At the point when disease was most acute, the delirium constituted a spiritual resistance—a triumph of the individual will against medical genocide.

For the afflicated, the disease could be a refuge: a concentration camp internee—Dr Hanus Kafka, deported from Theresienstadt via Auschwitz to Kaufering near Dachau where he contracted typhus in January 1945—dreamed feverishly of being

[3] The film was produced during 1941–2: *Kampf dem Fleckfieber*, Leonaris-Film Dr Georg Munck AV Medien Gmbh.

[4] Yad Vashem Archives (YVA) 03/2461 testimony of Renzi Rosa Berkowitz née Engler.

[5] A. Weiss, *Le Typhus exanthématique pendant la deuxième guerre mondiale en particulier dans les camps de concentration* (Paris, 1954), 45, 53, 58–9.

[6] Adelsberger, *Auschwitz*, 52–3. B. Wojdowski, *Bread for the Departed* (Evanston, Ill., 1997), 271–3.

[7] W. Kielar, *Anus Mundi: Five Years in Auschwitz* (London, 1981), 102.

[8] Interview with Claudette Bloch Kennedy, 28 Feb. 1997. Dr Kennedy recollects the disease as malaria; her friends considered it typhus.

[9] E. Brunstein in: 'Belsen in History and Memory', *Journal of Holocaust Education*, 5 (1996), 214.

tossed about in a ship heading to a land of freedom.[10] Dr Isak Arbus, an imprisoned Polish army medical officer, while ill with typhus in 1940 hallucinated that the Germans were retreating.[11] A sick physician wandered between visions of international medical conferences and the typhus barracks in Birkenau. Lucie Adelsberger, who had researched at the Robert Koch Institute on immunology and allergies until her dismissal in 1933, recorded how, as a patient at Birkenau, she experienced doubling of the self: 'I remember observing every single detail in the Gypsy block during my bout with fever while at the same time sojourning in the Engadin behind Sils-Maria in the Malojan heights with the sun playing over Segantini's grave and myself gazing out onto the bluish-pink fields of the Bergell Valley.'[12] There is a sharp rift between the disease as experienced, and the public health discourse of prevention and eradication. The surreal distortions experienced by the emaciated sick contrasted with the rigid categories of scientific hygiene—with glorification of the wholesome and well-formed body, and of rigidly defined diseases with a single pathogen, and uniform symptoms, and the afflicted reduced to being encephalated animals with skeletal, deranged features.

While the experience of typhus took quite distinctive forms during the Holocaust, intense psychological impulses were evident at other times. Typhus patients often had to be restrained. During the Russian civil war cases were recorded of a patient shooting wildly around an improvised military hospital, or crossing the snows of the Siberian Steppes clad only in a shirt under the impression of running away from lice. An unloved wife accused her medical husband of an all-consuming passion for anatomy, and the starving phantasized of banquets, or dived into a black ocean of morbid despair, floundering in apocalyptic struggles between life and death. An English nurse in Serbia during the First World War hallucinated with images of the idyllic countryside back home. The body felt fractured in a world of disassociations—a sick nurse touched her three faces; patients complained that another person was in the bed, asked for their chin to be removed for shaving, or for their legs to be hung up as if clothing in a wardrobe. After recovery from the disease, character changes would persist, as well as lethargy, disorientation, transient delusions, memory loss and absent-mindedness punctuated by further delusions, and even bouts of paralysis, and finally of personality change.[13]

[10] S. Pawlowicz, *I Will Survive* (London, 1966), 100–1, 108, 200–1. Personal communication from E. H. Strach, 22 Sept. 1995 concerning the memoirs of Dr Hanus Kafka.

[11] I. Arbus, 'Memoirs of Heroic Deeds of Jewish Medical Personnel in the Camps', paper to YIVO/New School 1996 conference on Jewish Medical Resistance during the Holocaust, and personal communication.

[12] Adelsberger, *Auschwitz*, 52–3. Segantini was an Italian landscape painter, and the editors of her memoirs suggest that Adelsberger recalled his triptych 'Life, Nature, Death'. On hallucinations see also T. Radil-Weiss, 'Men in Extreme Conditions: Some Medical and Psychological Aspects of the Auschwitz Concentration Camp', *Psychiatry*, 46 (1983), 259–69.

[13] For patient experiences see Alexandra Rachmanowa, *Studenten, Liebe, Tscheka und Tod* (Salzburg, 1931); 327–9, 335, 341 for a patient's account of an isolation ward in Russia in 1919; 378–9 for delirium of political persecution; 333–5 for fellow patients' delirious states and suicide; K. Schneider-Janessen, *Arzt im Krieg. Wie deutsche und russische Ärzte den zweiten Weltkrieg erlebten* (Frankfurt/M., 1993), 179, 181; F. Farnborough, *Nurse at the Russian Front* (London, 1974), 182, 240–1, 324; M. Krippner, *The Quality of*

The challenge of disease heightened the will to resist. Moshe Koerner who suffered two months' sickness with typhus when deported with the Czernowitz ghetto to Mogilev in the Ukraine observed that moral strength and an individual will to survive kept the sick alive in the midst of disease, dirt, and squalor.[14] Various types of medical resistance were elucidated by the physician Marc Dvorjetski, who had rejected the office of head of the sanitary police in the Vilna ghetto because he did not wish to be identified with the ghetto police force.[15] While Dvorjetski's focus was mainly the activities of physicians and nurses, he also included the concept of popular spiritual resistance. A colleague who concealed typhus cases in the Vilna ghetto hospital, Abraham Wajnryb, regarded resistance as a spectrum in the struggle to survive against persecution, including individual survival and an organized 'operation typhus' to control and conceal the disease.[16]

The determination to transcend not only the sickness but also the exterminatory conditions of the camps revealed by survivors' testimonies contrasted with the objective medical view of rampant infections. Persons considered as infected or as carriers of infected lice were subjected to brutal sanitary procedures of delousing, disinfection, and quarantine. The responses to typhus in the Holocaust derived from a broader hygienic paradigm. Quarantine of individuals or of whole communities, and fumigation against foul airs had become routine by the seventeenth century. Yet what was novel was that from the 1890s hygienic propaganda demonized insects as pathogenic vermin, as *Ungeziefer*. Medical scientists assigned specific diseases to insect species, and concocted a battery of preventive measures using chemicals and gases which were far more powerful than those deployed for the cordon sanitaire during the Enlightenment. In the past lice had been regarded as medically benign, or commended for sucking out foul humours from the body.[17] But such coexistence gave way to a sanitary war on insect parasites. As hygienic campaigns alerted the public to the risks of insect pests and parasites, their monstrous images instilled the fear of a pathological descent into the pitiful condition of the verminous *Ungeziefer*.

The Hamburg-based medical entomologist, Erich Martini, reflected that lice and fleas, linked to dust, filth and damp, replaced the demon harbingers of past plagues.[18] Insects were feared as sexual predators. When in 1911 Franz Kafka's Galician actor friend, Yitshak Löwy, confided that he had gonorrhoea, Kafka focused

Mercy. Women at War in Serbia 1915–18 (Newton Abbott, 1990), 49–50, 62–3; M. D. Mackenzie, 'Louseborne Typhus Fever', in A. Hurst, *Medical Diseases of War* (London, 1944), 235–60; Weiss, *Typhus exanthématique*, 45, 53, 58–9. Micheels, *Doctor #117641*, 164.

[14] YVA 03/914 testimony of Moshe Koerner.

[15] M. Dvorjetski, *Le Ghetto de Vilna (rapport sanitaire)* (Geneva, 1946), 15; id. (also Dworzecki), *Histoire de la resistance anti-Nazie juive (1933–1945)* (Tel Aviv, 1965). id., 'Le Résistance médicale juive et la médecine nazie à l'époque de la catastrophe', *Revue d'histoire de la médecine hébraïque*, 15 (1952).

[16] A. Wajnryb, 'Medizin im Ghetto Wilna', *Dachauer Hefte*, 4 (1993), 99–101.

[17] R. Hoeppli, *Parasites and Parasitic Infections in Early Medicine and Science* (Singapore, 1959), 164–5; on living lice as remedies, ibid. 201–2; H. Zinsser, *Rats, Lice and History* (Boston, 1935), 186–7.

[18] E. Martini, 'Praktisch-entomologische Erinnerungen aus dem Weltkriege', *Zeitschrift für hygienische Zoologie*, 32 (1938), 51–8, 65–78, 77.

his repulsion on a fear of lice: 'When my hair touched his as I moved my head towards his, I became afraid of the possibility of lice.'[19] That Kafka's father derided visiting Jewish actors as *Ungeziefer* showed how commonplace it was to condemn traditional customs as diseased and depraved.

By 1914 medical propaganda warned how swarms of lice, flies, and other dreaded bugs carrying as yet undetermined diseases threatened civic order, military efficiency, and the emotive issue of infant deaths.[20] The publication of Kafka's fable *Metamorphosis* in 1915, dissecting the experience of an awakening as an indeterminate species of bug, occurred at a crucial turning-point in the history of medical offensives against infectious diseases.[21] Kafka drew on the widespread concern with insect predators: bedbugs were medically suspect, and deprived their hosts of sleep. The most vicious threat to European civilization was vested in the *Kleiderlaus*, known to the English as the body louse.

By the time of the First World War, bacteriologists demonized lice as carriers of the newly discovered micro-organism causing typhus. Biologists extended their expertise to the human hosts of insects, and classified supposedly surplus people, notably migrants, pedlars, Jews, and gypsies, as human parasites menacing national hygiene. Soon, an epidemic of posters in central European cities warned of the dangers of *Ungeziefer*. Cohorts of bacteriologists explored the hidden empire of micro-organisms, while claiming that they were defending European civilization against the microbial hordes; disinfection squadrons policed borders, sealed infected areas and penetrated into contaminated housing in order to burn, poison, or otherwise disinfect infested possessions.

The hygiene experts who masterminded mass delousing bombarded soldiers and civilians with scientifically tested disinfectants and sanitary measures. These amounted to a modernistic campaign against traditional customs: beards and long hair were condemned as habitats of insect parasites. The dictates of hygiene demanded clearance of any insect refuge—including the voluminous domestic ornamentation derided by modernists. Seen in a wider social context, hygiene was a rationalizing force, affecting every aspect of living conditions from a post-coital douche to prevent sexually transmitted diseases to the fumigation of food stores in immense warehouses. The Western nations' pride in being in the vanguard of medical progress was accompanied by derision for Eastern peoples clinging to archaic habits, dress, and beliefs. Modernist notions of clearance spurred the

[19] H-G. Koch, M. Müller, and M. Pasley (eds.), *Franz Kafka. Tagebücher* (Frankfurt/M., 1990), 93; S. Gilman, *Franz Kafka. The Jewish Patient* (New York, 1995), 161.

[20] Kafka's fictitious insect had an indeterminate form, which makes it impossible to pin down with any zoological precision; commentators have suggested some type of bed bug, beetle, cockroach, and a louse as candidates. *Ungeziefer*—a term that Kafka's father had employed to denounce visiting Jewish actors. Cf Diary for 21 Oct. 1913: 'Ehrenfels's seminar ... I keep thinking of the black beetle', M. Brod (ed.), *The Diaries of Franz Kafka* (Harmondsworth, 1972), 234. S. Corngold, *The Commentators' Despair: The Interpretation of Kafka's Metamorphosis* (Port Washington, NY, 1972) for various identifications (see p. 228 for Wilhelm Stekel's view of the insect as a louse, representative of sadistic fantasies).

[21] The story was first drafted from Nov. to Dec. 1912—a crucial time in the identification of the body louse as vector of typhus.

relentless process of stripping away all the habitats of the swelling ranks of parasites.

ii. The Disappearance of a Disease

Exhuming a corpus of medical debates and interventions by Western Powers in Eastern Europe between the 1890s and the aftermath of the Second World War involves dissecting mentalities rather than hard statistics of the spread of epidemics. For underlying the numbers of telegrams by alarmed medical officers in remote eastern provinces reporting suspected typhus cases among itinerant workers, gypsies, *Ostjuden*, or prisoners of war was the medical stigma surrounding ethnic undesirables. Similarly, it is less a question of analysing the statistical fluctuations of epidemics, or of assessing whether delousing, quarantine, or vaccines were most effective in saving lives and preventing infections. For the fear of what in 1900 was a virtually dormant disease was so magnified as to legitimate draconian control measures.

Bacteriologists sought to classify and control a 'Third Reich' of insect and microbial organisms through mass prevention and eradication programmes. Public health experts conceded that quarantine, destruction of personal possessions, and sanitary controls infringed civic liberties and disrupted economic life; but that the priorities of scientific advance and disease control overrode individual casualties. Typhus was feared as a new Black Death, poised to eradicate European civilization. Bacteriologists enforced delousing routines to contain migrants from the east in their place of origin, in sealed trains, on disinfested ships or in transit camps on borders, at railway junctions, and in ports. National and international concerns conspired to impose ever more rigorous sanitary measures. At the domestic level, the anxieties were generated by domestic social tensions in Germany and the right-wing demands for acquiring *Lebensraum* in the east. International sanitary controls on migrants seeking to escape persecution and poverty also shaped delousing. The nativist lobby among the 'WASPs' in the United States urged the exclusion of 'lousy' eastern Jews, and a chain of disinfection stations imposed stringent measures on German borders and in ports. Immigration of 'surplus peoples' from Europe became restricted in the early twentieth century, as migration and border controls intensified the suspicion that transmigrants were disease carriers. Public health officials saw the movement of poor and persecuted populations from the Eastern margins of Europe as a threat to the improved levels of public health within Germany and in the wider world.

Sanitary authorities and bacteriologists increased their powers by magnifying epidemic threats. How was the malignant monster of an epidemic visualized? Why were certain groups seen as potential epidemic risks and subjected to the hygienic rites of showers, shaving, and the burning of their possessions? What strategies of control and repression lay behind the draconian routines of delousing? And how was the tragic amalgam of stigma and medical science that constructed typhus

overcome by resistance, evasion, and collective solidarity? The metamorphosis of humans into parasites had a multiplicity of outcomes involving diverse contexts, technologies, transpositions, deceptions, and tragedies.

The sociologist Theodor Adorno interpreted Kafka's *Metamorphosis* as prefiguring dehumanization and the biological regression of the concentration camps.[22] The grotesque deception of a delousing installation was supported by signs 'to the baths' and 'to disinfection', by false shower heads, dummy pieces of soap, the issuing of towels, 'changing rooms' with numbered hooks, and verbal exhortations that after delousing would come hot soup and other comforts. The Nazi transformation of cleansing into killing exploited expectations of delousing as a routine and widespread medical procedure for migrants. The modern rituals of hygiene facilitated the destruction of persons stigmatized as parasites on an unprecedented scale. 'I wished I were an insect'—a whim but also a token of inner resistance, marking a refusal to accept hygienic regimentation and genocide.

The formulating of typhus as a specific disease with a defined biological basis reveals much about the ideas, convictions, and allegiances of medical élites. The 'microbe hunter' magnified diseases so that these took on gargantuan proportions of a monstrous menace, thereby glorifying the researcher as a medieval knight slaying the dragon of pestilence. The medical literature endowed typhus with dimensions that made the disease as real an enemy as a hostile nation-state, a colonial territory, a devious villain, or—to invoke another biological set of myths—a parasitic and alien, marauding race.[23] Bacteriologists encountered the hazards of louse-infested persons, worked with the pathogenic germs in laboratories, and faced the toxic effects of chemical disinfectants like formaldehyde; they might contract diseases carried by rats who lived among corpses and dead animals stored for pathological examination, or inhale the lethal germs.[24] There was a scramble for authority over the hitherto hidden realm of bacteria. The 'great man' view of medical history required great diseases to tame and eradicate—so the heroic discoveries of Robert Koch and his disciples were proclaimed as national triumphs, despite uncertainties about the cure and control of many diseases.

Medical advances resulted in the redefinition of the disease first in terms of its pathological effects on the body, and then in terms of biology. Until the 1830s typhus was a general term for a set of feverish symptoms, high fever, red spots or a rash, and delirium. Between the 1830s and 50s clinicians and pathologists used evidence from autopsies to distinguish between 'typhoid' as a water-borne disease arising from poor sanitation, and 'typhus' or *Fleckfieber* as a disease of poverty and overcrowding. When epidemiologists accepted the distinction, German statistics on 'typhus' actually referred to typhoid, whereas the category *Fleckfieber* (literally

[22] Corngold, *Commentators' Despair*, 46–7.

[23] For the historical background see I. Löwy, 'Immunology and Literature in the Early Twentieth Century: *Arrowsmith* and *The Doctor's Dilemma*', *Medical History*, 32 (1988), 314–32.

[24] Geheimes Staatsarchiv Preussischer Kulturbesitz, Berlin (hereafter GSTA) Rep 76 VIII B Nr 3017 Hygiene Institut Posen. Die Bauten, 19 Dec. 1903 for rat infestation.

'spotted fever') denoted typhus. Karl Joseph Ewald in 1880 and Koch's assistant Georg Gaffky in 1884 isolated the bacterium causing typhoid. Whereas typhoid declined due to improved water quality and food hygiene, reduction in typhus rates required eradication of a hidden and unknown cause.[25]

Although typhus had an array of symptoms, not least a distinctive rash, it proved to be elusive, when it came to the application of the strict causal criteria of Koch's bacteriology. Unlike the Koch school's triumphs in locating the bacteria of anthrax, cholera, diphtheria, or tuberculosis, no typhus germ could be proven: for it was impossible to carry out Koch's procedures concerning the cultivation of bacteria and their injection into a laboratory animal to replicate typhus. Establishing a bacteriological cause for a disease was only a first stage; it had to be determined whether the spread of the bacteria could be checked by disinfection, isolation, and sanitary improvements. Therapies were very difficult to attain, as Koch found to his cost in launching his controversial tuberculin 'cure' for tuberculosis in 1891. When Emil Behring, assisted by Shibasaburo Kitasato, Erich Wernicke, and Paul Ehrlich, pioneered a serum to 'cure' diphtheria in the 1890s, this was hailed as constituting a model to prevent and control all infectious diseases. But the euphoria surrounding this innovation rapidly dissolved into debates about the virulence of the bacillus, and the effect of climatic and other physical and social factors. Typhus exposed medical impotence as the germ remained frustratingly invisible and the disease appeared to be unresponsive to sera, chemical therapies, or vaccines.

Bacteriologists commanded an arsenal of disinfectants and hygienic weapons—showers, chemical poisons, and incineration facilities—to tame and eradicate typhus. Yet the fear of contracting typhus and of its rapid spread resulted in medical delusions concerning methods of control. The irony was that the disease spontaneously disappeared from the European heartlands by the early twentieth century without medical intervention other than as part of a general sanitary 'clean up'.[26] Isolated cases and localized epidemics flared up, but it was questionable whether the disease could spread like wildfire throughout the German Reich with its developing sanitary infrastructure as long as rudimentary personal hygiene and sanitation were sustained.

Even if no conclusive proof could be established concerning the role of lice in spreading typhus, lice infestation was deemed to be an entrenched problem. Poverty had long been linked with lousiness and the role of lice in spreading dis-

[25] Notably William Gerhard in Philadelphia, P. C. A. Louis in Paris, and Alexander Stewart observing the diseases in Glasgow and Paris during the 1830s, with confirmation from William Jenner 1849–53; A. P. Stewart, *Some Considerations on the Nature and Pathology of Typhus and Typhoid Fever Applied to the Solution of the Question of the Identity or Non-identity of the Two Diseases*, in *Selected Monographs* (London: New Sydenham Society, 1886), 159–226; U. Lindemann, 'Die Geschichte der Krankheitsbezeichnung "Typhus" und der Wandel der Typhuslehre im 19. Jahrhundert in Deutschland', diss. med. dent. FU Berlin, 1986; J. Vögele, 'Typhus und Typhusbekämpfung in Deutschland aus sozialhistorischer Sicht', *Medizinhistorisches Journal*, 3 (1998), 57–79.

[26] P. J. Weindling, 'Medicine and the Holocaust: The Case of Typhus', in I. Löwy (ed.), *Medicine and Change: Historical and Sociological Studies of Medical Innovation* (Montrouge and London, 1993), 447–64.

eases was sporadically suspected before the twentieth century. Poor law workhouses had 'louse ovens' where the inmates' rags were disinfected. The grandmaster of classification, Carol Linnaeus, identified lice in 1758 as 'pediculus', demeaning them with the Latin for 'foot slaves'. Lousiness was dignified in medical Latin as 'pediculosis'; infestation was taken as a general sign of ill health while being associated with boils, carbuncles, and other skin infections. Worse still was 'Phtiriasis' when the lice penetrated the swellings. Lousiness was accompanied by so much discomfort that heavy infestation was regarded as an epidemic condition, irrespective of whether the lice carried infections.[27]

Nineteenth-century sanitary regulations for migrants involved a general cleansing rather than specific measures against epidemic diseases apart from an insistence on smallpox vaccination. A Prussian decree of 1835 required compulsory disinfection of the sick and of all persons in attendance, and of their excreta, clothing, lodgings, and possessions by means of washing, fresh air, burning, boiling, and spraying of disinfectants like chlorine. When thoroughly carried out, these measures destroyed clothing and personal possessions and harmed the respiratory organs. Typhus required a full-scale disinfection as a disease attributed to miasmatic foul air in enclosed spaces like hospitals and workhouses.

Lice were visibly pathogenic. A poor law physician at Insterburg in East Prussia described in 1866 notable cases of louse infestation: impetigo disfigured the skin with viscid and foul-smelling sores, matted scabs and crusts formed at the nape of the neck, a condition known as *plica Polonica* and associated with poor Jews; lice congregated beneath the skin causing swellings and abscesses, and a rough, black discolouring of the skin resulted from haemorrhaging due to louse bites.[28] 'Louse rash' was linked to swellings known as furuncula, and eczema-like skin inflammations. Lice could breed so rapidly that they coated the body in a virtual black fur—whether death arose from the infection or sheer loss of blood was a moot point.[29] Although accusations had long been made that lice were a cause of plague, leprosy, and beri-beri, conclusive experimental evidence was lacking.[30]

The pre-bacteriological emphasis was on the social environment where infection occurred: typhus was synonymous with 'gaol fever', 'ship fever'—prison ships were referred to as floating tombs, 'camp fever', 'hospital fever' or even 'factory fever'. Such terms reflected concern with crowds and filth in public institutions. The disease was attributed to impure air, but the causes were exacerbated by overcrowding and starvation. Liberal-minded physicians attributed epidemics to ignorance, and social and environmental conditions rather than to a single ferment, germ, or parasite. The radical Berlin pathologist, Rudolf Virchow, diagnosed the Silesian 'famine fever' in 1848–9 as a symptom of oppression by the autocratic Prussian state. His nationalist remedy for what he described as louse-infested,

[27] E. Friedberger, *Zur Entwicklung der Hygiene im Weltkrieg* (Jena, 1919), 159–63.

[28] Cited by Hoeppli, *Parasites and Parasitic Diseases*, 354–6.

[29] E. H. Strach, personal communication 22 Sept. 1995.

[30] G. H. Nuttall, 'The Part Played by *Pediculus Humanus* in the Causation of Disease', *Parasitology*, 10 (1918), 68–71.

overcrowded, and dirty Poles was a good dose of German education and liberal political reform to inculcate a sobre regime of hard work and cleanliness: he aimed to cure the social malaise underlying the spread of the fever.[31] Virchow defined typhus as a group of diseases attacking the nervous system, emphasizing the psychological aspects of the illness. His analysis of local living and climatic conditions was typical of the pre-bacteriological era of medical surveys of the intertwined climatic, socio-economic, and biological factors.

Although outbreaks of typhus among laundresses meant that vermin-infested clothes were suspect, the prevailing medical concern with environmental conditions meant that no causal link between typhus and lice was made. Virchow observed that the poor huddled around stoves to keep warm in winter, and he noted how they were crawling with lice, which he saw as symptoms of general uncleanliness. The less frequent changing of clothes and seasonal reluctance to wash during the colder months accounted for the winter peak in typhus. A classic work on the epidemiology of fevers by Charles Murchison established that fevers spread rapidly in a locality or house, and that personal belongings and clothing could be 'saturated with the typhus poison'.[32] That migrant labourers were known to be susceptible to only mild attacks of typhus was attributed to acquired resistance to the disease in areas where it was endemic, while the non-immune would have a blazing fever and risked death. The dying down of epidemic infections created a fear that the scourges of dearth and disease would return with increased intensity. Pasteur's nascent science of immunology showed that the absence of disease increased vulnerability to infection: if immunity had not been acquired earlier in life, the effect of typhus would be severe.

As typhus, cholera, and malaria were endemic in parts of Eastern Europe, preventive strategies were intensified in the 1890s. The severity of sanitary controls on state frontiers accompanied the emergence of more rigid disease categories and the search for specific causes. Hygienic reformers prescribed local sanitary improvements—the reduction of overcrowding, the provision of washing and public laundering facilities, education and the inculcation of the rudimentary facts of hygiene—whatever was necessary to prevent unwashed and ragged populations huddling together for warmth and comfort. The medical historian, Georg Sticker, observed that police eradication measures against rats and fleas were in vain: far more important was inculcating a sense of cleanliness among the people.[33]

The shift from the reforming liberalism of Virchow's cellular pathology to bacteriologically based concepts of infection meant that typhus was transformed from a

[31] R. Virchow, 'Mittheilungen über die in Oberschlesien herrschende Typhusepidemie', *Archiv für pathologische Anatomie und Physiologie und für klinische Medicin* (1849), ii. 143–322, tr. in L. J. Rather (ed.), *Rudolf Virchow. Collected Reports on Public Health and Epidemiology* (Canton, Mass. 1985), i. 205–319.

[32] C. Murchison, *A Treatise on the Continued Fevers of Great Britain*, 3rd edn. (London, 1884), p. xx; Nuttall, 'The Part Played by *Pediculus Humanus* in the Causation of Disease', 47 citing observations made by James Lind in 1833 on laundresses.

[33] G. Sticker, *Die Bedeutung der Geschichte der Epidemien für die heutige Epidemiologie. Ein Beitrag zur Beurteilung des Reichsseuchengesetzes* (Giessen, 1910), 37.

morally and politically construed disease as arising from poor education and social deprivation to being perceived as caused by a specific but still mysterious micro-organism.[34] Some public health experts continued to stress the importance of environmental factors, others considered that general cleansing measures were out of step with advances in the bacteriological understanding of specific diseases. Yet typhus initially eluded the pioneers of bacteriology: Koch believed that the infectious typhus substance was spread by dust, and that ventilation with open windows and doors was the best defence against the disease—an etiology revived during the Second World War; he also thought that relapsing fever might be spread by bugs and fleas (wrongly, as lice were the culprits), and (rightly) as best combated with insect powder.[35] Hans Zinsser, the American bacteriologist and eloquent biographer of the disease, commented, 'Before the true causes of the disease were uncovered, almost every known microorganism had, at some time or another, been implicated.'[36]

Because there was no known cause of typhus, the routine bacteriological tests could not detect the presence of any causal micro-organism. In 1877 Koch had puzzled over a case of typhus as he was unable to detect any 'micrococi'.[37] In 1904 the Reich Health Office established guidelines for the prevention of typhus; but the hazards of body lice as the vector in transmitting the infection were overlooked. In 1907 the authorities still suspected that typhus was transmitted by an air-borne germ. Patients had to have their ears, nose, and eyes disinfected with powerful chemicals; their possessions were doused in chlorine, or steamed, boiled, or burned, and rooms were gassed with formaldehyde.[38] The more that bacteriological testing became routine, the less visible typhus became: it could not be detected by conventional procedures and general hygienic improvements diminished its incidence.

Virchow sanguinely observed how 'the threatening spectre of hunger typhus epidemics' erupted only intermittently.[39] Epidemics occurred in 1876–7 in Upper Silesia, in 1878 in Berlin, and finally in 1881 in West Prussia (a province with a substantial Polish population). The Prussian authorities accused vagabonds of importing the disease, and denounced the overcrowding and poor living conditions of railway navvies and of road-building gangs.[40] The sporadic cases of typhus were attributed to migrant apprentices, seasonal labourers from the east, tramps,

[34] A. Hirsch, *Handbook of Geographical and Historical Pathology* (London, 1883), i. 545, 574.

[35] R. Koch, 'Die Bekämpfung der Infektionskrankheiten, insbesondere der Kriegsseuchen. (Rede, gehalten zur Feier des Stiftungstages der Militärärztlichen Bildungsanstalten am 2. August 1888)', *Gesammelte Werke von Robert Koch*, ii, pt. 1, pp. 281–2; id., 'Seuchenbekämpfung im Kriege', ibid., 291–2.

[36] H. Zinsser, *As I Remember Him. The Biography of R.S.* (Boston, 1940), 217.

[37] Möllers, *Koch*, 108–9; Heymann, *Koch*, 225–6.

[38] 'Bekanntmachung betreffend Desinfektionsanweisungen für gemeingefährlichen Krankheiten', *Reichsgesetzblatt*, 17 (1907), 95 ff., includes 'Desinfektionsanweisung der Fleckfieber (Flecktyphus)' (124–32); E. Roesle, *Über Wohnungsdesinfektion mit Formaldehyde, speziell mit Lingnerischen Apparate* (n.p., n.d.).

[39] Rather, *Virchow*, i. 319, 418.

[40] M. Pistor, *Geschichte der preussischen Medizinalverwaltung*, 117. For a similar accusation by the Reich Health Office see A. Roche (ed.), *The Imperial Health Manual* (Dublin and London, 1896), 228–9.

and pedlars.[41] Attention turned to the borders—so as to keep out all carriers of epidemic disease.

From 1894 typhus disappeared from the Prussian army.[42] In Germany typhus rates slumped to just one case in 1901, and between 1901 and 1914 there were seven deaths, mostly of migrant workers crossing from Russia.[43] The incidence of typhus was remarkably low in Germany if compared to 390 deaths in England and Wales between 1899 and 1913, 147 deaths in Scotland between 1905 and 1914, and 1,043 deaths in Ireland, renowned for endemic typhus, between 1899 and 1913.[44] The stigma attached to the Irish as typhus carriers was similar to German resentment of Eastern European migrants. Epidemiologists identified Belfast and Dublin, along with Liverpool and Glasgow, as the last strongholds of typhus.[45] Yet without an identified bacteriological cause there was nothing to screen for: prior to the First World War British port health regulations dealt with cholera, yellow fever, and plague, but ignored typhus.[46] British medical officials brushed off US demands for tougher procedures as presumptuous interference, whereas the German port health authorities complied as fitting in with their desires for tighter controls. By 1900 typhus displaced cholera as the most feared epidemic disease which could engulf Europe.

Environmental explanations were challenged just before the outbreak of the First World War by the discovery of a specific pathogenic organism being deposited by the body louse. Infection occurred not from louse bites but when the human host scratched the micro-organisms into the flesh where the louse had drawn blood. Bacteriologists distinguished typhus from other louse-borne diseases like relapsing fever. The role of the louse as a carrier of the typhus germ was revealed amidst the frenzy of rising war fever between 1910 and 1914. Observations on lice were made during Spanish epidemics, and by Richard Otto, a German bacteriologist, based on Crimean and Balkan evidence. The hunt for the causal organism was pursued by means of epidemiological and experimental observations on colonial subjects. Although bed bugs, lice, and fleas were suspect as carriers of typhus, in 1903 the Spanish researcher Cortezo postulated the louse as the carrier, and in 1907–11 researchers in India, Algeria, and Egypt linked louse infestation to outbreaks of relapsing fever among natives who (reputedly) hardly ever washed or changed their clothes.[47] In 1909 Charles Nicolle, the Director of the Pasteur

[41] H. Hetsch, 'Flecktyphus in Deutschland im 19. Jahrhundert', *Zeitschrift für Hygiene*, 124 (1942–3), 241–9.

[42] H. H. Ries, 'Über die geschichtliche, insbesondere die kriegsgeschichtliche Bedeuting des Fleckfiebers', med. diss., Hamburg, 1944, 45.

[43] Bundesarchiv Koblenz (hereafter BAK) R 86/1039 Bd 1.

[44] Nuttall, 'The Part Played by *Pediculus Humanus*', 45; Hirsch, *Handbook*, i. 555.

[45] B. Luckin, 'Evaluating the Sanitary Revolution: Typhus and Typhoid in London, 1851–1900', in R. Woods and J. Woodward (eds.), *Urban Disease and Mortality* (London and New York, 1984), 102–19.

[46] e.g. *Regulations as to Cholera, Yellow Fever and Plague (Ships Arriving from Foreign Ports)* (London: Local Government Board, 1907). For a novel concern with typhus: R. J. Reece, 'Port Sanitary Administration', *British Medical Journal* (1922), 1–10 (as offprint).

[47] Nuttall, 'Part', 58–9.

Institute of Tunis, noticed the absence of typhus at the native hospital where newly admitted patients were bathed and dressed in clean hospital clothing. He demonstrated that lice feeding on experimentally infected chimpanzees could infect healthy chimpanzees.[48] In 1913 researchers at the Pasteur Institute, Algiers proved that when louse-infested persons scratched themselves, the bursting of lice near an abrasion would induce relapsing fever, and they conjectured that scratching in infected louse faeces caused typhus. Three natives were 'voluntarily' infected with crushed lice, and the diagnosis of typhus was confirmed by infecting monkeys and finding suspected typhus germs in the bodies of the implicated lice.[49]

By the outbreak of war in 1914 the lethal role of the louse was beginning to be accepted, but the evidence was inconclusive as to whether head lice (similar to the body or clothes lice apart from their habitat), fleas, and bed bugs were culprits in spreading typhus, and it was still not known whether typhus could also be transmitted by person-to-person contact.[50] Austrian military regulations in 1911 and civil legislation of 1913 commanded eradication (*Vertilgung*) of *Ungeziefer*, as lice, bugs, and fleas were the likely culprits of typhus and relapsing fever. Lice were accused of sucking the blood of the sick and then injecting the contagious particle by biting the healthy. Dousing clothes in petrol, and immersing infested persons in warm baths after rubbing them down with medicated soap were prescribed.[51]

The question whether the louse was the sole vector of typhus prompted more human experiments—when infected typhus blood was injected or crushed nits were used to innoculate persons by scarification.[52] The possibility of direct infection by droplets of saliva expelled by coughing in the air was debated. Experiments on prisoners were inconclusive. The disciples of Pasteur, Alexandre Yersin and J. Vassal in Indo-China, tried to prove the transmission of typhus by the direct injection of typhus blood in humans. The causal microorganism was by no means obvious. In Algeria in 1914 distinctive 'microbes' (the Germans preferred to speak of bacteria) were identified in the lice living on the sick, but Nicolle, Georges Blanc, and Ernest Conseil in Tunis found this pathogen in typhus-free districts.[53]

[48] C. Nicolle, C. Comte, and E. Conseil, 'Experimental Transmission of Exanthematic Typhus through Body Lice', in N. Hahon, *Selected Papers on the Pathogenic Rickettsiae* (Cambridge, Mass., 1968), 37–40; M. Huet, *Le Pommier et l'olivier. Charles Nicolle, une biographie (1866–1936)* (n.p., 1995), 86–95; L. Gross, 'How Charles Nicolle of the Pasteur Institute Discovered that Epidemic Typhus is Transmitted by Lice: Reminiscences from My Years at the Pasteur Institute in Paris', *Proceedings of the National Academy of Sciences of the USA*, 93 (1996), 10539–40.

[49] Experiments of E. Sergent, H. Foley, and C. Vialette, *Archives de l'Institut Pasteur de l'Afrique du Nord*, 1/3 (1921), reported as 'Experimental Transmission of Typhus to Man', *Lancet* (4 Mar. 1922), 445; J. R. Busvine, *Insects, Hygiene and History* (London, 1976), 239–42; Nuttall, 'Part', 61.

[50] His, *Front*, 37.

[51] *Vorschrift über die Verhütung und Bekämpfung der Infektionskrankheiten im k. u. k. Heere* (Vienna, 1911), 63–5, 128–9; W. Prausnitz, *Desinfektion* (Vienna, 1914), 4 concerning Gesetz betreffend die Verhütung und Bekämpfung übertragbarer Krankheiten, 20–1.

[52] Nuttall, 'Part', 48–50. The first such experiment was a fatal self-experiment by Moczutovski in 1900. 'Experimental Transmission of Typhus to Man', *Lancet* (4 Mar. 1922), 445; *Archives des Instituts Pasteur de l'Afrique du Nord*, 1/3 (1921).

[53] R. P. Strong, G. C. Shattuck, A. W. Sellards, *et al.*, *Typhus Fever with Particular Reference to the Serbian Epidemic* (Cambridge, Mass., 1920), 44–57.

The eventual discovery of the causal organism of typhus was an opportunity to commemorate researchers who died 'on active service'. The double-barrelled name of the pathogen (*Rickettsiá prowazeki*) causing typhus derived from two heroes of research into the louse-based transmission of the typhus 'virus', Howard Taylor Ricketts and Stanislaus von Prowazek. Ricketts found that the body louse had an important role as a vector of typhus in studies of the Mexican epidemic of 1910, when he succumbed to typhus. In 1916 his name was bestowed on the class of invasive micro-organisms smaller than the smallest known bacteria and which came to be known as 'rickettsiae'.[54] The characteristics of rickettsiae remained controversial, so that the idea persisted that typhus was a group of diseases rather than a single disease with a unique pathogen. Variants of typhus were discovered, notably rat-borne typhus in America and scrub typhus in Asia. Bacteriologists modified their notions of a uniform disease with a single cause by paying attention to varying forms of the disease and types of causes, for example, inhaling dust containing louse faeces.

iii. International Controls

The factual observations of medical researchers should not obscure how typhus has to be approached at a symbolic level as a set of metaphors; these expressed in the objective terms of medical science the threats of alien, non-European behaviour, culture, and social conditions. The fear of an epidemic spreading like wildfire legitimated international administrative responses, designed to exclude, contain, and segregate the ethnically 'primitive'. The perception of typhus as a potential menace to socio-economically advanced European nation-states was far greater than its actual incidence measured in terms of reported cases. Despite the *Angst* surrounding a cataclysmic typhus epidemic, and localized outbreaks of the disease, the expected epidemic apocalypse never occurred, and arguably never could have occurred given that typhus could be checked by regular washing and laundering of clothes. By the twentieth century diseases like malaria and typhus were relegated to endemic pockets on the margins of Europe, where cholera was tamed, and plague was more an object of historical study than an actual threat. Bacteriologists hoped that an effective system of medical controls on borders and an improved sanitary infrastructure would guard the European continent from alien 'Asiatic' infections.

Innovative branches of medicine like pathology and parasitology imposed systems of order and control on micro-organisms and their insect carriers. The modern body politic was kitted out with elaborate border controls and passports,

[54] *Contributions to Medical Science by Howard Taylor Ricketts (1870–1910)* (Chicago, 1911); V. A. Harden, 'Rocky Mountain Spotted Fever Research and the Development of the Insect Vector Theory, 1900–1930', *Bulletin of the History of Medicine*, 59 (1985), 449–66; id., *Rocky Mountain Spotted Fever. History of a Twentieth-century Disease* (Baltimore, Md., 1990), 109; H. da Rocha Lima, 'Zur Aetiologie des Fleckfiebers', *Berliner klinische Wochenschrift*, 53 (1916), 567–72, tr. in N. Hahon (ed.), *Selected Papers on the Pathogenic Rickettsiae* (Cambridge, Mass., 1968), 74–8.

and trimmed with the formalities of medical inspection, delousing, quarantine, and compulsory vaccination. The controls were all the harsher as typhus carriers were identified either by the presence of lice (which may or may not have been infected) or by the indirect and much disputed Weil–Felix serological test. Sanitary authorities policed national frontiers, and international conventions regulated disinfection and quarantine measures, while medical relief organizations sought to eradicate typhus at source. Escape from racial persecution and social misery became ever harder, as typhus spurred German public health officials to seal the nation's eastern borders against refugees from the east.

The internationalism of medicine boosted the status of medical officials with conferences, sanitary agreements, and exchange visits to colleagues' laboratories and sanitary facilities. Maritime health agencies employed bacteriologists to police the spread of bacteria and of their human and animal hosts. Port and city health officers and the new institutes for tropical medicine competed to magnify their facilities and powers. Disinfecting goods and the quarantining of persons and livestock were to prevent plague, cholera, and typhus invading the European heartlands, by excluding undesirable germs, parasites, and their human hosts. Bacteriologists rallied to the defence of national borders, claiming that they were sustaining European civilization against the microbial hordes; disinfection squadrons sealed off infected areas and penetrated into contaminated housing in order to burn or disinfect infested possessions. The harder out-migration became, the more social tensions built up: those who might otherwise have migrated were stigmatized as parasites, providing a scientized form for the persecution of social outcasts—of Jews, gypsies, and of the multiplicity of ethnic minorities throughout Europe whose sporadic distribution stained the map of nation-states. The First World War drastically reduced migration from the east, and the Versailles Treaty favoured ethnically homogeneous nation-states. Sanitary techniques once designed to promote European settlement in overseas colonies were harnessed to sustain national integrity against epidemics from the east.

Typhus control and eradication measures constituted a medical discourse on the barbaric threats to European civilization from the Asiatic margins.[55] The fear of an epidemic conflagration meant that various waves of epidemics like plague, 'Asiatic' cholera, and typhus were conflated as leading to global devastation. Dostoyevsky concluded *Crime and Punishment* (written during 1865–6) with the imprisoned Raskolnikov dreaming that Europe had succumbed to an unknown and terrible plague from the depths of Asia, as a new kind of microscopic germ infected villages, whole towns, and peoples, leading to insanity and an epidemic of violent killing; only a few chosen people would survive to start a new race. Horrific new plagues combined known characteristics of various diseases but in a composite and more lethal form. National ideologues attributed immense power to the invisible bacterial foes. The boundaries blurred between sober observation and racial

[55] That Hippocrates in the fifth century BC characterized 'the Asiatics' as cowardly and mentally feeble was noted by German advocates in support of a renaissance of environmental epidemiology. Hippocrates, 'Airs, Waters, Places', 16.

demonology, suggesting that social ills could be attributed to a macabre world of grotesque diseases and human parasites.[56]

Delousing and disinfection procedures were scientized rites of purification for supposedly parasitical populations. In 1868 Virchow reflected on medieval fears of Jews having poisoned wells, when seeking to raise support for the victims of a typhus epidemic in East Prussia:

> Epidemics and the persecution of the Jews belong together from a certain internal necessity—a sad example of how the human intellect, even in a quite justified direction of research, is diverted into a totally wrong approach through prejudice, the innocent ultimately having to pay for the guilty.[57]

Medical science advanced on lines which rendered Virchow's observations prophetic. All proportions came to be in disarray as the microscopic underworld of pathogenic germs became magnified into the grotesque *homo parasiticus*.[58] The historical journey from the cleansing of migrants to their eradication was underway.

[56] A. Bein, 'The Jewish Parasite. Notes on the Semantics of the Jewish Problem with Special Reference to Germany', *Leo Baeck Institute Yearbook*, 9 (1964), 3–40.

[57] R. Virchow, 'On Hunger Typhus and Related Forms of Disease. (Lecture read on the 9th of February 1868 for the Benefit of Typhus Cases in East Prussia)', in L. J. Rather (ed.), *Rudolf Virchow. Collected Essays on Public Health and Epidemiology* (Canton, Mass., 1985), i. 443.

[58] Bein, 'The Jewish Parasite', 18, 21, 35.

2
Eradicating Parasites

i. Racial Therapies

In July 1941 Hitler proclaimed himself the discoverer of the Jew as the 'ferment of social decay'. He compared himself to Robert Koch, the Nobel-prize-winning bacteriologist. Just as Koch had proved specific bacteria caused infectious diseases, so Hitler claimed to have detected how the 'Jewish race' as a 'bacillus', 'virus', 'toxin', or consumptive 'parasite' poisoned and infected the German body politic.[1] Convinced that infectiousness was an attribute of Jewish racial inferiority, the lethal threat of the Jewish pathogens justified resort to a strong antidote: Hitler prescribed elimination of 'Jewish bacteria' to revive the vitality of the Aryan race.[2]

When Hitler assumed the mantle of Koch, he believed that his armies were poised to capture the city of Kiev—a delusion confounded by fierce resistance until late September 1941.[3] While conquest of the east held out enticing prospects of natural resources and *Lebensraum* for German settlers, the invading German forces confronted climatic extremes and epidemic hazards. Bacteriology became entangled with the genocidal campaign to clear vast areas of Eastern Europe for settlement by racially valuable German stock. The Nazi war machine mobilized tropical medicine and bacteriology to provide a shield of immunity against lethal diseases in the east.

Hitler's medical rhetoric drew on an evolving body of German medical triumphs. Nazi medical propagandists projected an image of the German physician as a guardian of racial health and as an intrepid warrior against disease. Nazi medical historians attributed German scientific breakthroughs in the battle against bacteria to innate cultural superiority. They demonstrated that scientific advance arose less from experimental skills and more from a special 'racial' affinity for nature. As Germanic cultural heroes, bacteriologists were celebrated as heirs to 'storm and stress' romantic philosophers, seventeenth-century nature mystics, and

[1] P. Burrin, *Hitler and the Jews. The Genesis of the Holocaust* (London, 1994), 136. For further examples of the Jew as a 'ferment of decomposition' see R. A. Koenigsberg, *Hitler's Ideology. A Study in Psychoanalytic Sociology*, 3rd edn. (New York, 1992), 9–11, and on the national body as diseased, 16–19, and consumed by parasites, 19–20; H. Picker, *Hitlers Tischgespräche im Führerhauptquartier* (Stuttgart, 1976), 79, 1 Dec. 1941.

[2] R. A. Pois, *National Socialism and the Religion of Nature* (London, 1986), 59, 122–5, 131; S. E. Aschheim, *The Nietzsche Legacy in Germany 1890–1990* (Berkeley, Calif., 1992), 70–3.

[3] Kiev did not fall until the week after 19 September 1941, when German troops entered the city. The Germans massacred mainly Jewish children, women, and the elderly at the ravine of Babi Yar. A. J. Mayer, *Why Did the Heavens Not Darken? The Final Solution in History* (New York, 1988), 242–3, 248–9, 265–8. For the strategic significance of Kiev to Hitler See B. A. Leach, *German Strategy against Russia 1939–1941* (Oxford, 1973), 209–13.

Reformation iconoclasts like Paracelsus who claimed transcendent mastery over the natural forces of decay and disease. The physician was transmuted from a healer of the sick individual into a national Führer figure armed with new scientific powers over nature and human life. This vein of complex and evocative images was tapped to justify the extermination of 'parasites' and experimentation on racial inferiors.

A militant cohort of Nazi physicians and scientists rallied to Hitler's call for a struggle against diseased parasites. But the fusion of medical thinking on disease with Nazi ideology was frequently strained: medical officials could not agree on the origins and dissemination of epidemics, disinfection technologies, the merits of various vaccines, poison gases and of DDT, the value of cremation, and the viability of germ warfare, let alone over the racial predisposition to disease. Even among the well-drilled ranks of the SS, there were clashes over the constituting factors of race and disease. Key Nazi concepts like the *Volksschädling* developed in the context of differing methods for dealing with human parasites.

Hitler's sense of continuing the legacy of Koch's bacteriological breakthroughs was consistent with camouflaging genocide by means of the terminology and technologies of disinfection. The centenary of Koch's birth in 1943 was celebrated by depicting Koch as a Führer figure and his school as a monolithic scientific orthodoxy. The notion of a triumphal bacteriological *Blitzkrieg*, launched in 1892 by the 'unassailable' Koch school was a myth propounded by Nazi propagandists keen to heroize the German medical genius. There were dissident undercurrents in the portrayal of Koch. Influential epidemiologists pointed out the medical limitations of bacteriology in not taking account of biological variations and environmental circumstances. The focus on Koch obscured how diverse approaches in German hygiene had persisted.

ii. The Rise of Bacteriology

The Nazi image of Koch as a loyal servant of Prussia and the Reich, a fervent patriot, and a dutiful military medical officer has generated a dichotomy between bacteriological hygiene as militarist and state-oriented, or a more liberal, municipally based prioritizing of environmental factors and social conditions.[4] Koch's bacteriology has been portayed as being in conflict with the environmentalism of Max Pettenkofer, the holder of the first German chair in hygiene since 1865, and by 1882 as sceptical of Koch's 'fungus hunting'.[5] Set against the typology of a state-sponsored and militarist bacteriology was liberal and municipal support for bacteriological innovations: doctors and the public enthused over what amounted to social bacteriology. The Berlin municipal authorities backed the new therapies of

[4] A. Labisch. *Homo Hygienicus. Gesundheit und Medizin in der Neuzeit* (Frankfurt/M., 1992), 132–41.

[5] Heymann, *Robert Koch*, ii. 89. The other Bavarian universities of Erlangen and Würzburg also established teaching positions in hygiene in 1865. See H.-H. Eulner, *Die Entwicklung der medizinischen Spezialfächer an den Universitäten des deutschen Sprachgebietes* (Stuttgart, 1970), 154–5.

Koch's tuberculin and Behring's serum therapy in the 1890s. The boundary of state and municipality was in any case blurred in the Hanseatic city states of Bremen and Hamburg, as well as in Berlin with the police presidium's medical powers. The Prussian official responsible for universities, Friedrich Althoff, masterminded schemes linking state, municipal, and philanthropic resources: such mixed funding provided Paul Ehrlich with the Frankfurt serum testing and experimental therapy institute.[6] The ranks of Koch disciples contained a multiplicity of viewpoints, and Althoff supported the careers of Koch, Behring, and Ehrlich despite their manifold disagreements.

Far from any 'last stand' by the environmentalist Max von Pettenkofer at the time of the Hamburg cholera epidemic of 1892–3, an entrenched faction among the hygiene experts continued to support von Pettenkofer's localism and resisted Koch's laws for a uniform bacterial cause of each infectious disease.[7] In Berlin Koch was succeeded as professor of hygiene by Max Rubner, who was renowned for studies of the physiology of nutrition. In Munich, von Pettenkofer's successor from 1892, Eduard Buchner, investigated the effects of environmental factors in eradicating bacteria, demonstrating the importance of air, sun, and light in preventing tuberculosis. How an infection was ignited aroused an environmentalist counter-attack on the new bacteriology. Holistic critics pointed out how germs could lie latent, and that a disease could assume a variety of forms, contingent on local conditions. Adolf Gottstein, a lapsed bacteriologist, municipal medical officer in the Berlin district of Charlottenburg (and from 1919 ministerial director of the Prussian Medical Department) argued that improved housing and diet would enhance the body's powers of resistance to disease.[8] Bacteriology did not displace environmental reform.

Koch's mission was to discover causal links between a bacteriological species and a disease, so that a disease could be prevented by tracing how its causal bacteria spread. Bacteriologists refined their theories of causality, as their screening procedures taught them that exposure to a microbe did not necessarily result in an outbreak of disease. In 1903 Wilhelm von Drigalski, a military medical officer and former assistant to Koch, elaborated the concept of carriers as apparently healthy persons who harboured pathogenic bacteria, which he compared to domestic pet animals. The implications were that the healthy as well as the sick had to be screened. In 1903 a small army of bacteriologists was drafted into the area of Trier, Alsace-Lorraine, and the Saar to eliminate typhoid. They had special powers to track down the carriers of pathogenic bacteria. Such endeavours resulted in

[6] For the complexities of state supervision of the Berlin Magistrat see W. Ribbe, *Geschichte Berlins* (Munich, 1987), ii. 745; W. U. Eckart, 'Friedrich Althoff und die Medizin', in B. vom Brocke (ed.), *Wissenschaftsgeschichte und Wissenschaftspolitik im Industriezeitalter* (Hildesheim, 1991), 375–404.

[7] cf. R. J. Evans, *Death in Hamburg. Society and Politics in the Cholera Years 1830–1910* (Oxford, 1987), 490–507 for the argument that Koch's state-oriented bacteriology triumphed over Pettenkofer's localist environmentalism.

[8] A. Gottstein, *Das Heilwesen der Gegenwart, Gesundheitslehre und Gesundheitspolitik* (Berlin, 1924), M. Stürzbecher, 'Aus der Geschichte des Charlottenburger Gesundheitswesens', *Bär von Berlin* (1980), 43–113.

elaborate medical controls, and reached fever pitch during the First World War. Under the Weimar Republic, Neufeld the Director of the Prussian Institute for Infectious Diseases conceded that bacteriologists had over-extrapolated their model of infection and control.[9]

Although Nazi propagandists projected the image of Koch as a Germanic racial warrior, it is worthwhile examining how the historical record of bacteriologists' triumphs over the 'Third Reich' of micro-organisms in Imperial Germany was manipulated under Nazism.[10] Was an ideology of disease extermination revolving round the concept of *Ausrottung* (i.e. extermination) central to bacteriology, and did this link bacteriology to genocide? Did the legacy of Koch's bacteriology boost racial hygiene and how did this relate to 'geo-medicine'—the revamped term for Pettenkofer's environmentalism with explicit links to expansionist geo-politics? Did the Nazification of bacteriology misrepresent the founders of bacteriology as anti-Semitic, and did bacteriologists assist Hitler's racial crusade against the Jewish 'virus'? The responses of bacteriologists to 'Asiatic' epidemics indicate whether there was an inherent exterminatory potential in bacteriology and in related fields like parasitology.

Most founders of German bacteriology were fervent nationalists and imperialists, but only exceptionally were they anti-Semites. In 1876 Koch, then an unknown physician in the predominately Polish Eastern Marches, sought advice from the Breslau botanist Ferdinand Cohn, who remarkably for a university professor at the time was Jewish. Koch sent Cohn his preparations of anthrax bacilli, and continued to seek his guidance. Cohn had since 1868 pioneered study of bacteria by applying his skills in plant physiology, discovering that bacteria were plant species, and he developed techniques to culture and classify bacteria. Cohn facilitated Koch's transformation from an obscure provincial medical officer into a dynamic researcher at the Reich Health Office.[11] That Koch had few Jewish assistants arose not from any personal antipathy to Jews but because assistants' posts were filled by seconded military medical officers at a time when the Prussian army opposed promotion of Jews to the regular officer corps.[12] Koch was on cordial terms with the waywardly brilliant Ehrlich and the director of his serological department, August von Wassermann (both Jewish); his assistant and intended successor Carl Fraenkel (who in 1908 Germanized his name to Fraenken) had a Jewish background. Among the early bacteriologists, religion was no barrier to academic cooperation among converts to an exciting new branch of medicine, but this was to change. The Nazi

[9] J. A. Mendelsohn, 'Cultures of Bacteriology: Formation and Transformation of a Science in France and Germany, 1870–1914', Ph.D. thesis, Princeton, 1996, 560–775.

[10] W. Boelsche, *Das Liebesleben in der Natur* (Jena, 1905), is p. iii, 'Vom 'dritten Reich' und seine Liebe'.

[11] B. Heymann, *Robert Koch, i, Teil 1843–1882* (Leipzig, 1932), 220–3; P. Cohn, *Ferdinand Cohn. Blätter der Erinnerung* (Breslau, 1901), 181–91; J. Seide, 'Le Grand Botaniste et Bactériologiste Ferdinand Cohn', *Revue d'histoire de la médecine hébraïque*, 5 (1950), 23–52.

[12] K. Demeter, *The German Officer-Corps in Society and State 1650–1945* (London, 1965), 224–30. But note that Jews could be commissioned as Prussian reserve-officers, and the situation varied in each state.

biography of Koch by Hellmuth Unger, an influential poet-physician and advocate of euthanasia, suppressed mention of Cohn's name.[13]

The Nazi medical ideologists lavished even greater attention on Koch's renegade assistant, Emil Behring, whose somewhat manic personality was portrayed in terms of heroic struggle. Behring was an ardent nationalist, but he was not conspicuously anti-Semitic. Although the partnership between Behring and Ehrlich in developing serum therapy rapidly dissolved into bitter scientific and commercial disputes, Behring later sought to collaborate with Ehrlich on a remedy for tuberculosis. Behring's ideas of disinfecting blood and his development of blood serum therapies for diphtheria and tetanus led to theories of differential immunity in which heredity was a factor. But medical ideas of cleansing blood were not necessarily linked to racial purity.[14] Nazi historians posthumously recruited Behring, admiring his *Kampfgeist* as he clashed with the noted liberal Virchow. They delineated Behring's Germanic psychology, and discovered that not only had Behring corresponded with the racist philosopher, Eduard von Hartmann, but also that in unpublished writings on German national psychology, Behring gave vent to anti-Semitism: 'The Jew speaks German, but does not think as a German'.[15] Behring's wife, Else, had a partially Jewish family background, and his outlook was that of a conservative nationalist rather than of an anti-Semitic activist. In 1941 the author of a popular biography overcame Behring's deficiencies in the matter of anti-Semitism by having Behring's sister deliver anti-Semitic utterances, when it came to Behring's rivalry with Hans Aronson (vilified as a Jewish protégé of the liberal Virchow) over serum therapy. In 1942 the comment on the un-German Jew was highlighted in a series of sketches of 'physicians in the struggle for Germany'; the overall ideological thrust of dragooning Behring into the campaign against racial undesirables in the east was conveyed by the final portrait in this Germanic medical gallery which was of a Bromberg physician, Siegfried Staemmler, who was killed by Poles early in September 1939.[16]

While the key figure of Koch remained immune from the virus of anti-Semitism, other bacteriologists felt unease about the east. Carl Flügge, who argued that Silesia's vulnerability to epidemics necessitated a hygiene institute, confided to the Prussian Ministerial Director, Althoff, his revulsion from the 'alien species' among the population of Breslau. A colleague, Friedrich von Müller, classed Flügge as an antisemite among the ranks of the Breslau medical faculty. Flügge was a staunch friend of Koch, while seeking a compromise between Koch's bacteriology and Pettenkofer's environmentalism. When appointed to the chair of hygiene in Berlin in

[13] H. Unger, *Robert Koch. Roman eines grossen Lebens* (Berlin, n.d.), 100–22. L. Glésinger, 'Robert Koch et les Juifs', *Revue d'histoire de la médecine hébraïque*, 59 (1963), 15–24.

[14] For such a leap via notions of blood see S. Gilman, *Franz Kafka. The Jewish Patient* (New York, 1995), 110.

[15] H. Zeiss and R. Bieling, *Behring. Gestalt und Werk* (Berlin, 1941), 118–21, 141–8, 481–96.

[16] O. Gerhardt, *Stationen einer Idee. Behrings schicksalsvoller Weg* (Berlin, 1941), 11, 54, 56; H. O. Kleine, *Ärzte kämpfen für Deutschland* (Stuttgart, 1942), 252–61, 295–7.

1909, Flügge intensified support for racial and social hygiene. Yet he stopped short of ideas of racial purity, and he worked with several Jewish assistants. Among these was Bruno Heymann, who pioneered poison gas for delousing and researched a pioneering biography of Koch, which the Nazis exploited.[17]

Of the early bacteriologists, Ferdinand Hueppe, a lapsed Koch disciple, was the most noted exponent of Aryan ideology in writings on the racial hygiene of the ancient Greeks. He condemned Jewish ritual slaughter of animals, ostensibly because he regarded meat that had been bled as of lower quality. Hueppe's trenchant critique of Koch's bacteriology and advocacy of predisposition and racial factors in disease led him to formulate a theory of 'constitutional hygiene'. He advocated state measures to promote diet and exercise, and gained the admiration of the racial ideologue Houston Stewart Chamberlain, who had scientific pretensions as a botanist.[18] Yet Hueppe worked with Jewish assistants in Prague, and was careful to mount his attacks on Jewish traditions in scientific terms so as to appear to be correcting outmoded customs. While Hueppe can be ranked as a nationally minded critic of bacteriology, he remained closely linked to the scientifically oriented racial hygienists rather than to the racist and anti-Semitic ultra-right.

German Jewish doctors and scientists contributed much to their nation's world leadership in medical science. Religious background was generally irrelevant in developing bacteriology. The first generation of bacteriologists were 'ordinary Germans' in that they were zealous patriots and devoted to the national culture of the educated bourgeoisie; a virulent, deeply rooted, and widespread anti-Semitism was not evident amongst their ranks. Cohn and Koch spoke a common language of scientific patriotism. Cohn combined experimental hygiene with anti-Catholicism, and advocacy of Darwinism and evolutionary sociology. In 1874 in a speech to the Breslau meeting of German Scientists and Doctors, Cohn prophesied that a general staff of doctors would defend the peoples' health and national life against the invisible enemies in the air, soil, and water. By 1890 Koch was the acclaimed chief of this general staff.[19]

Despite Cohn's prophecy, a unified phalanx of Koch disciples did not materialize. The Koch school polarized into nationalist and liberal factions: one, more militarist in ethos, shifted from bacteriology to racial hygiene and geo-medicine, and another politically more liberal group was more orthodox in sustaining Koch's principles of causal bacteria. Before 1914 Rhoda Erdmann and Lydia Rabinowitsch-Kempner, both incidentally Jewish, worked at the Institute for Infectious Diseases,

[17] GSTA Rep 92 Nachlass Althoff B Nr 41 Bd 2 Flügge to Althoff 24 Nov. 1886, 29 June 1894; F. von Müller, *Lebenserinnerungen* (Munich, 1953), 92–3; H. Horn and W. Thom, *Carl Flügge (1847–1923). Integrator der Hygiene* (Wiesbaden, 1992), 26 consider that Flügge was not anti-Semitic given that he had several Jewish assistants; G. Henneberg, K. Janitschke, M. Stürzbecher, *et al.* (eds.), *Robert Koch, ii. Teil 1882–1908. Nach Fragmenten von Bruno Heymann* (Berlin, 1997), 10–16, 30–1.

[18] F. Hueppe, *Zur Rassen- und Sozialhygiene der Griechen im Altertum und in der Gegenwart* (Wiesbaden, 1897); Gilman, *Jewish Patient*, 135, 197–8; Weindling, *Health, Race and German Politics*, 110, 130, 170–3, 228.

[19] F. Cohn, 'Der Zellenstaat', *Deutsche Rundschau*, 27 (1881), 62–80; K. Litthauer, *Ueber Einrichtung von Desinfectionsanstalten* (Leipzig and Berlin, 1889), 3.

the bastion of Koch's ideas. In 1917 a political moderate, Fred Neufeld, took over as director of the Institute, and the 1920s saw a number of left-wing radicals among the ranks of bacteriologists. The expanding discipline of bacteriology provided Jewish researchers with career opportunities in state and municipal laboratories. Michael Hubenstorf has documented how the polarization in bacteriology culminated in one-third of the staff of the 'Prussian Institute for Infectious Diseases, Robert Koch' having to emigrate after 1933.[20]

Political values intruded into bacteriology in terms of explicit party political allegiances—for example, in Behring's conservative municipal politics, and in Koch's role as an agent of the Reich Health Office at the time of the Hamburg cholera epidemic; the conservative minister Gustav von Gossler pressured Koch into publicizing tuberculin therapy. Yet in contrast to Virchow as a liberal politician, bacteriologists were not so much political activists as supporters of a depoliticizing strategy to remove the causes of diseases as a means of reducing social conflict. Professors of hygiene mobilized the public to support educational campaigns against such scourges as syphilis or tuberculosis, and to accept disinfection and isolation.[21] Reservoirs of germs came under attack—whether harboured by prostitutes and vagrants, or in contaminated food and infested housing. Hygienic campaigns were predicated on the faith that once disease-producing hazards were eliminated, then orderly social life could flourish.

Military, state, municipal, and (as at Gelsenkirchen in the heart of the Ruhr) industrialists' recognition of the utility of Koch's work meant that his bacteriological procedures won official acclaim in Imperial Germany. The Prussian military authorities deployed bacteriologists, drilled in Koch's rigorous methods, and the armies of Baden, Bavaria, and Austria-Hungary, and the Reich navy followed suit. Koch was satirized for regimenting colonies of bacteria into categories of immutable species. He battled for the victory of his school by warning the military medical establishment that typhus as a disease of war could exterminate whole armies composed of the youthful male 'buds of the nation'. Koch's doctrine of specific bacterial causes meant that he rejected that diseases like typhus and tuberculosis were caused by generalized social misery.[22] Whereas reformers demanded costly intervention to counteract social deprivation and the spread of diseases, bacteriology required the targeted eradication of infective bacilli, or some means of curbing their reproduction. Bacteriology held out prospects of a technical solution to

[20] M. Hubenstorf, 'Aber es kommt mir doch so vor, als ob Sie dabei nichts verloren hätten', 355–460, 394–5.

[21] P. J. Weindling, 'Hygienepolitik als sozialintegrative Strategie im späten Deutschen Kaiserreich', in A. Labisch and R. Spree (eds.), *Medizinische Deutungsmacht im sozialen Wandel des 19. und frühen 20. Jahrhunderts* (Bonn, 1989), 37–56.

[22] R. Koch, 'Die Bekämpfung der Infektionskrankheiten, insbesondere der Kriegsseuchen. (Rede, gehalten zur Feier des Stiftungstages der Militärärztlichen Bildungsanstalten am 2. August 1888.)', *Gesammelte Werke von Robert Koch*, ii, pt. 1, pp. 277–8, 280–1. A. Hirsch attacked the narrowness of this approach in the following year: Hirsch, *Über die historische Entwicklung der Öffentlichen Gesundheitspflege. Rede gehalten zur Feier des Stiftungstages der militärischen Bildungsanstalten am 2. August 1889* (Bad Reichenhall, 1967).

economically burdensome diseases. Moreover, imperialists welcomed bacteriology as a means of control of infectious diseases in otherwise inhospitable colonial contexts. Hygiene had a dual character as a scientific discipline, and as a creed of national salvation to transcend political conflicts and to strengthen Germany as a world power.

Bacteriologists were scientific empire builders. Koch and his former assistant Bernhard Nocht in Hamburg built up institutions with expanding responsibilities over environmental conditions and housing, trade, and transport. Koch devised a battery of medical and social countermeasures against potential epidemics. He supported public education to improve general hygiene, notification of infectious diseases, disinfection measures, water filtration, effective sewer systems, and quarantine. Despite the rigour of his causal criteria, he did not advocate a single experimental strategy to cure diseases, to the exclusion of general hygienic measures. The bacteriologist was as much a scientific missionary preaching commandments of hygienic behaviour, as a medical police officer with powers to confine, isolate, and detain in tracking down pathogenic germs.[23]

Although bacteriologists claimed that animal and human experiments were in the long-term interest of the nation, they differed in their experimental ethics. Koch first tried his new tuberculin cure on himself, and others tested sera on their children. The enthusiasm for experimental medicine gave rise to ethical abuses and public protest. Medical experiments were carried out on the socially vulnerable as prisoners, the mentally ill, prostitutes, children, and native peoples under colonial rule. During the 1890s anti-vivisectionists denounced doctors for implanting worms in children and injecting gonococci for the study of the resulting inflammations.[24] Anti-vivisectionists protested that the poor were treated as 'experimental rabbits' in public hospitals. The debate concerning human experiments raged on, as laboratory-based medicine was condemned as soulless and mechanistic. After the Nazi takeover experimentalists welcomed the removal of democratic checks to their activities.

Koch supervised experiments with Atoxyl, an arsenical compound, in German East Africa and Uganda from April 1906 until November 1907 in order to treat sleeping sickness. In 1903 how a species of tsetse fly spread the disease was discovered, and the German colony appeared to be increasingly vulnerable to the spread of the disease from Uganda. Because Koch considered that repeated and large doses of Atoxyl were necessary, he established the first German 'concentration camp' for sleeping sickness therapy in the north-west of the colony. He was convinced that the British should also be persuaded to establish 'concentration camps' as part of a 'rational epidemic prevention'. The British in neighbouring Uganda came to use

[23] C. E. Rosenberg, *Explaining Epidemics and Other Studies in the History of Medicine* (Cambridge, 1992), 299.

[24] B. Elkeles, 'Medizinische Menschenversuche gegen Ende des 19. Jahrhunderts und der Fall Neisser', *Medizinhistorisches Journal*, 20 (1985), 135–48; ibid., *Der moralische Diskurs über das medizinische Menschenexperiment im 19. Jahrhundent*, (Stuttgart, 1996) P. J. Weindling, *Health, Race and German Politics between National Unification and Nazism, 1870–1945* (Cambridge, 1989), 168–9.