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Disinfection in the laboratory: theory and practice in disinfection policy in late C19th and early C20th England

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This article examines the relationship between theory and practice in nineteenth century English public health disinfection practice. Disinfection undertaken by local authorities and practised on objects, spaces and people became an increasingly common public health practice in the last quarter of the nineteenth century, and was part of a newly developed public health system of 'stamping out' disease as described by Hardy. Despite disinfection's key role in public health policy, it has thus far not received significant investigation or historiographical attending. This article explores the development of disinfection policy at local level, highlighting that despite commentators assumptions that increasingly exacting standards of disinfection required professional oversight rather than that of the 'amateur' public, there was a significant gap between laboratory based knowledge and evidence derived from practical experience. Laboratory conditions could not replicate those found in day-to-day disinfection, and there were myriad debates about how to create a mutually understandable scientific standard for testing. Despite increasing efforts to bring local disinfection in line with new ideas promulgated by central government and disinfection researchers, the mismatches between the two meant that there was greater divergence. This tension lay at the heart of the changes in disinfection theory and practice in the second half of the nineteenth century, and illustrate the complexities of the impact of germ theory on public health policy.

Introduction

Disinfection as a public health intervention enjoyed a resurgence in popularity from the 1870s, with national and local legislation empowering and encouraging local authorities to disinfect houses, items and people. The development of germ theories, paralleled by an increasing focus on preventative public health, prompted the emergence of an integrated programme of disinfection, which, alongside notification and isolation, was directed against epidemic and endemic infectious diseases. Procedures such as sulphur fumigation, heat treatment and use of chemical liquids were used to purify infected places, people and objects. The underlying rationale was that the increasingly exacting standards of disinfection required in the new era of germ theory needed to be done by professional Medical Officers of Health (MOsH), rather than the 'amateur' public, in order to protect public health. Technological and chemical change, however, presented an increasingly wide range of disinfectants; choosing the most effective method was a difficult task. MOsH were expected to negotiate this new and troubling landscape to ensure that their policies prevented disease outbreaks.

However, germ theory had an ambivalent effect on local disinfection, and there was a significant gap between laboratory-based knowledge and evidence derived from practical experience. This gulf in the usefulness and use of knowledge meant that despite efforts to professionalise disinfection, local authority policy increasingly diverged from the ideal promulgated by disinfection researchers. This tension lay at the heart of changes in disinfection theory and practice in the second half of the nineteenth century, and illustrate the complexities of the impact of germ theory on public health policy. This article explores these developments; however, due to constraints of space, it does not cover the wider aspects of commercialisation, the day-to-day work of MOsH, or the institutions and practices of disinfection.

Disinfection as intervention

Disinfection had been practised throughout the nineteenth century; however, development of germ theories, antiseptic surgery and the public health agenda in the latter half of the century made the practice increasingly widely known. Germ theory also changed how disinfection was conceptualised and undertaken. Worboys[1] has argued that disinfection was remade as a germ practice, and increasingly was defined as germicide.[a] My research supports this. Ultimately, disinfection became redefined solely as 'germicide'; this process was essentially complete by the 1890s. Alongside this, the number of disinfection methods and disinfectants available increased rapidly, fuelled by chemical innovation and commercial development. This proliferation necessitated more sophisticated ways of deciding which methods and disinfectants were effective, and was

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[a] M. Worboys, *Spreading Germs*, (Cambridge: Cambridge University Press, 2000), 5.

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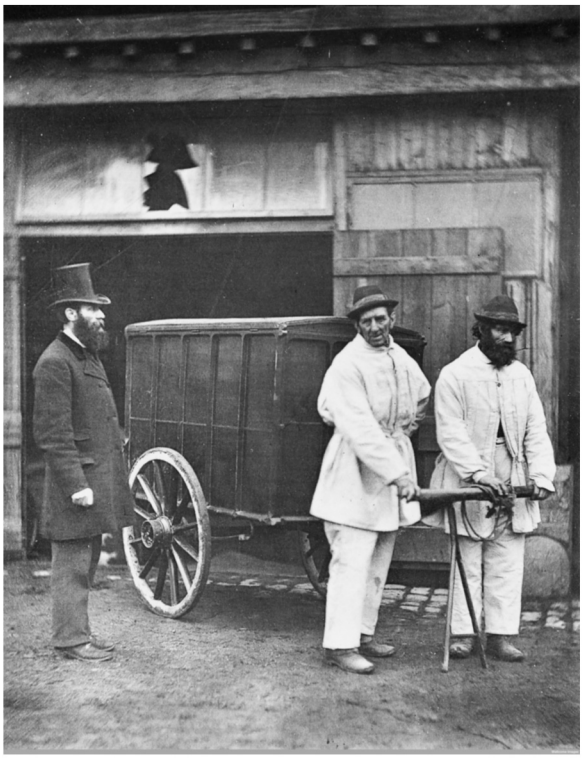

Figure 1. Public disinfectors from the Parish of St. George, Hanover Square, London are shown pulling a portable steam disinfector.

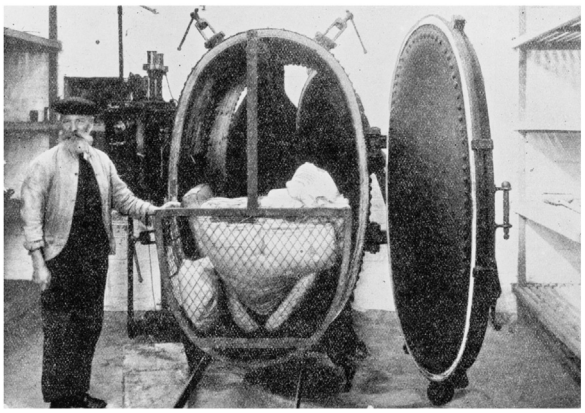

Figure 2. A Washington-Lyon steam disinfector, which local authorities used to disinfect textiles.

linked to developments in bacteriological research. Gradually, a more systematic and 'scientific' understanding of the mechanisms underpinning disinfection emerged. Many contemporaries were confident that this knowledge meant disinfection had become a scientific process and was, consequently, much more effective than in the first half of the century.[b]

Local authorities had undertaken forms of disinfection throughout the nineteenth century; the 1866 Sanitary Act then enhanced their powers. If a certificate issued by a medical practitioner said that 'cleansing or disinfecting of any house or part thereof, or any article therein liable to retain infection, would tend to prevent or check infectious or contagious disease', the local nuisance authority had to give notice in writing requiring the owner or occupier to cleanse and disinfect. If they failed to comply within the time specified they were fined up to 10 shillings for every day of default. The authority could also disinfect the property themselves and claim back the costs. Both the householder and the authority could act to disinfect. This power division was eroded by the 1875 Public Health Act. Crucially, this mandated that the MOH was trusted with the responsibility of deciding what was effective disinfection, although householders could still disinfect their own property. Local authorities took on an increasing range of responsibility; Figure 1 shows disinfectors with a portable piece of equipment.

The 1890s Infectious Diseases Act completed the trajectory by placing responsibility mainly with the authority; whilst householders could still disinfect their property, they had to apply to do so and complete the work to the standards demanded.

This shift in emphasis to the local authority, and in particular the professional authority of the MOH, was reflected in the extent of practical disinfection. Disinfection for endemic 'zymotic' diseases became routine in the 1870s, as part of the system of 'stamping out' disease described by Hardy[2].[c] The process swung in to action when a case of certain diseases was notified, or, less commonly, when the householder volunteered that disinfection was needed. Disinfection processes relied, in many cases, on the actions of chemical substances, known as disinfectants. Clothes and other textile items were normally disinfected by heat or chemical disinfectants (see Figure 1) and rooms were disinfected by chemical fumigation. Local records indicate an expansion in the number and type of households affected by disinfection as the century progressed (Figures 2–4).

As we have seen, the remit of the policy was expanded over the latter half of the century and power increasingly concentrated in the hands of the authority. Indeed, MOsH seem to have bought in to the new germ theory and germicide disinfection, citing these ideas in their work. They, however, remained remarkably conservative in the methods they used. Sulphur fumigation continued in most areas up to 1914, long after it was acknowledged that it was a poor germicide. Carbolic acid also continued to be used despite similar concerns. Why was this? The answer can be sought be examining the gaps between the laboratory and practical applications.

Disinfectant testing: the gap between knowledge and practice

The redefinition of disinfection as germicide had implications for disinfectants, and how disinfectants were judged to be effective. If disinfection meant killing germs, the substances used in disinfection processes needed to

[b] J. T. Ainslie Walker, "The use of disinfectants from an ethical point of view", *The Lancet*, (Feb. 24th 1906): 549.

[c] A. Hardy, *The Epidemic Streets: Infectious Disease and the Rise of Preventative Medicine* (Oxford: Clarendon Press, 1993), 6.