Title: Scientific conviction amidst scientific controversy in the transatlantic livestock and meat trade

This article is based on a paper presented by Dr. Kastner to scholars assembled for the 'Diagnosis, Disorders and Disease' session of the British Society for the History of Science annual conference (25 June 2004, Liverpool Hope University College). *Please list authors in this order: Justin Kastner, Douglas Powell, Terry Crowley, and Karen Huff.* The 3141-word article (including a **bolded** 100-word summary) follows on the next page. References and notes, and further reading appear on the final two pages.

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Summary (100 words)

A century before bovine spongiform encephalopathy, Great Britain and North America grappled with an equally maddening disease in cattle: pleuro-pneumonia. The subject of a decades-long trade dispute in the nineteenth-century transatlantic region, pleuro-pneumonia attracted the attention of livestock farmers, diplomats, shipping moguls, veterinarians, public health regulators, and journalists. Scientific controversy aggravated the dispute; veterinary officials elaborated scientific opinions and regulatory orders amidst a prevailing confusion about microbiology and disease diagnostics. In this context emerged William Williams, an Edinburgh-based professor whose convictions spawned repeated disagreements with the British government's diagnoses of pleuro-pneumonia in cattle from the United States and Canada.

In the autumn of 1890 Robert Wallace, professor of agriculture and rural economy at the University of Edinburgh, delivered a lecture to students gathered to learn about the transatlantic livestock and meat trade. Steering his comments to what he termed 'the burning question of the moment,' Professor Wallace addressed whether or not United States (US) cattle should be freely admitted 'not only as butchers' cattle, but as stores to be finally finished for the fat market' [1]. At issue was the continuation of an eleven-year-old disease-control policy requiring, upon debarkation at ports of entry, the immediate slaughter of US cattle. The Privy Council had adopted an immediate-slaughter order in 1879 after government inspectors diagnosed US cattle landed at Liverpool with pleuro-pneumonia, an insidious lung disease that for decades had plagued British livestock raisers with losses numbering in the millions of pounds [2][3]. Proceeding with his lecture, Professor Wallace acknowledged disagreement regarding the Privy Council veterinary authorities' diagnoses and, by

extension, doubts that the policy was truly necessary—a question raised by American interests as well as Scottish livestock farmers eager to import US 'store cattle' for inland finishing, sale, and slaughter. 'I am quite aware,' Professor Wallace told his students, 'that there is an impression in America that our inspectors have mistaken the appearances of pleuro-pneumonia for those present in the lungs of cattle suffering from a sporadic inflammation' [1]. This very impression had been embraced by not only American veterinary scientists but, significantly, one of Wallace's contemporaries in Edinburgh. For more than a decade, Professor William Williams, Principal of the New Veterinary College in Edinburgh, had vehemently disagreed with the Privy Council Veterinary Department inspectors' diagnoses of pleuro-pneumonia in American cattle. Williams's involvement in transatlantic squabbling over pleuro-pneumonia began at the genesis of the dispute itself—in January 1879 at the Liverpool docks.

Birth of the dispute at Merseyside in January 1879

Early in January 1879, the steamship *Ontario*, loaded with over 200 North American cattle, departed from Portland, Maine. The shipment—originally sourced from markets as far afield as Chicago, Buffalo, and Toronto—featured mostly US animals [4]. As the *Ontario* trekked eastward in cold Atlantic waters, veterinary authorities in London and Liverpool were busily stepping up enforcement of a new Foreign Animals Order. Promulgated under the Contagious Diseases (Animals) Act of 1878, the order stipulated that as a general rule, with certain exceptions, livestock imports were to be slaughtered immediately upon arrival (by rule, within 10 days). Significant for the approaching *Ontario* shipment, the new order conditionally exempted US and Canadian livestock imports; North American animals were to be permitted inland alive provided that upon importation they were inspected and certified as disease-free [3]. Within the British, American, and

Canadian veterinary communities, scientists speculated for how long US cattle imports would enjoy exemption from the compulsory-slaughter policy. George Fleming, who not infrequently wrote on behalf of the British veterinary elite [5], had six months earlier urged the immediate slaughter of US cattle imports, referring to the prevalence of pleuro-pneumonia there [6]. In a widely-referenced report James Law, a professor at New York's Cornell University, had confirmed the existence of pleuro-pneumonia in several locales along the US eastern seaboard [7][4]. Meanwhile, a Canadian scientist carrying out investigations in the eastern US shared his pleuro-pneumonia discoveries with British authorities [4]. Such reports did not bode well for those invested in the lucrative trade in American store cattle. Those involved in the 'store' trade at Liverpool and other British ports responsible for receiving North American cattle feared the immediate-slaughter spectre. American and British businessmen alike believed that ending live importation would reduce Britain's supply of meat and raise prices. Others feared that in over-stocked markets compulsory slaughter within 10 days would impair their ability to hold animals until prices recovered [8].

On Sunday, 26 January 1879, the *Ontario* arrived into port at Liverpool. Slightly less than 200 cattle, two of which were dead, were landed. The Veterinary Inspector for the Local Authority of Liverpool examined the lungs of one of the dead animals and suspected pleuro-pneumonia. Consistent with Privy Council orders, the inspector excised and forwarded portions of the lungs to the Veterinary Department of the Privy Council in London. The London-based authorities confirmed the diagnosis. Professor George Brown, head of the Department, ordered the detainment of the remaining animals from the *Ontario* shipment [9]. The Duke of Richmond, Lord President of the Privy Council, directed Professor Brown to send one of his inspectors to Liverpool to oversee the slaughter and inspection of the entire *Ontario* cargo [9][10].

To accommodate the slaughter and inspection of such a large number of cattle, the *Ontario* animals were transferred on Wednesday, 29 January, to a nearby abattoir. After slaughter, the Privy Council veterinary authorities noticed that a considerable number of the cattle had respiratory inflammations in consequence of exposure to cold weather. The inspectors also found 'the distinctive appearances of pleuro-pneumonia' in the lungs of 12 animals [9]. The next day the British Foreign Secretary, Lord Salisbury, announced by telegram that on account of detecting pleuro-pneumonia among the *Ontario* shipment, the British government was reconsidering its exemption of US cattle from compulsory slaughter [4]. On Saturday, 1 February, *The New York Times* reported 'alarm and anxiety' in the transatlantic livestock-trading community [11]. US regulatory authorities haphazardly endeavoured to rescue embarrassed livestock exporters; US Treasury Secretary John Sherman quickly elaborated the semblance of an inspection-and-certification program, and US Commissioner of Agriculture William G. Le Duc sent two of his correspondents to conduct inspection and certification activities at New York ports and Chicago stockyards [12]. Not only had Secretary Sherman and Commissioner Le Duc acted without consulting each other, they had acted too late. Even though shipments of American cattle would arrive into Liverpool in healthy condition over the next several days [4], the diagnosis of pleuro-pneumonia in the *Ontario* shipment had all but guaranteed that US cattle would soon be subject to immediate slaughter. Continued exemption of US cattle would require especially compelling arguments. US exporters and diplomats offered one, with Professor William Williams supplying a supportive scientific opinion.

In *The New York Times*, shipping mogul Timothy Eastman conceded that pleuro-pneumonia existed in certain locales along the American east coast, but he doubted the diagnosis of pleuro-pneumonia in the *Ontario* shipment. Eastman insisted that pleuro-pneumonia was entirely confined

to eastern dairies and did not threaten export cattle, which (based on his experience) were sourced from the western states [13][11]. Commissioner Le Duc and veterinary leaders in the US perceived the fragility of Eastman's argument [14]. Nevertheless, as allegations emerged that the British veterinary authorities had erred in their diagnosis, US officials embraced Eastman's line of thinking. Moreover, additional reports—one citing the Liverpool Cattle Trade Association—seemed to bear out Eastman's suggestion that the animals aboard the *Ontario* had simply 'caught cold' [11]; conventional bronchitis, not pleuro-pneumonia, appeared to be the problem aboard the *Ontario* [14]. As Eastman intimated that the Privy Council inspectorate was wrong, Liverpuldian importers called in 'veterinary surgeons of high repute, to act as a check upon the Privy Council Inspectors' [11]. The consultants were the principals of the three veterinary colleges in Scotland: James McCall of the Glasgow Veterinary College, Thomas Walley of Edinburgh's Royal (Dick) Veterinary College, and William Williams of Edinburgh's New Veterinary College. Walley, who was accompanied by McCall, observed several of the detained *Ontario* cattle coughing and, after viewing the lungs of two slaughtered animals, saw 'without a doubt' the lesions of pleuro-pneumonia. Williams also saw the animals before and after slaughter, but he diagnosed the suspect animals with conventional bronchitis, not pleuro-pneumonia [9][10].

In early February the inevitable occurred: on the basis of its Veterinary Department's diagnoses, the Privy Council ordered that effective 3 March, US cattle would no longer be exempted from compulsory slaughter [4]. The transatlantic veterinary community was immediately engrossed in a heated debate. In March 1879, writing from his veterinary college at Gayfield House, Williams penned a letter to a colleague in New York. In the letter, which weeks later surfaced in *The New York Times*, Williams reported that he found merely bronchitis after examining 'the lungs said by Privy Council Inspectors to have pleuro-pneumonia.' Referring to lung specimens

from the implicated animals, he concluded, ‘I have the specimens most carefully preserved, and am ready to show them to the whole world, and his wife, if necessary’ [15].

Conviction and Controversy

Professor Williams widely displayed his opinions as well as his collected lung specimens. Williams, who in May 1879 assumed the presidency of the Royal College of Veterinary Surgeons [5], was fast becoming an internationally sought-after scientific consultant [16]. Coloured plates of Williams’s specimens appeared in his internationally acclaimed textbook, *The Principles and Practice of Veterinary Medicine.* The preface to his second edition, originally authored in September 1879 but reprinted in subsequent editions, was devoted to the pleuro-pneumonia dispute:

> The existence and characteristics of Pleuro-Pneumonia Contagiosa and Bronchitis ...were lately the subject of differences of opinion between the Veterinary Officers of the Privy Council and the Author, in connection with the alleged existence of Pleuro against American Cattle imported into this country, and slaughtered at Liverpool to prevent contagion...The Author does not deny the existence of Pleuro in some of the Eastern States of America, but it has not yet been proved that this contagious malady prevails in the Western States, from whence cattle are brought to this country. Of this, however, he is confident, that in none of the diseased lungs of the cattle referred to did he find the characteristics of Contagious Pleuro; but, in all, those of Bronchitis [17].

A Member of Parliament would give public voice to Williams's insistence that the British authorities had made a ‘gross mistake’ in diagnosing American cattle with pleuro-pneumonia [18]. Many in America doubted the British authorities’ diagnoses, and Professor Williams clearly offered them an invaluable, British voice in the debate.

In January 1880, US Commissioner of Agriculture William Le Duc hired Dr. Charles Lyman of Harvard University to re-evaluate the prevalence of pleuro-pneumonia in the US. When Lyman reported to Le Duc in April, he confirmed that pleuro-pneumonia still persisted in several

eastern states, but he emphasized that the west had yet avoided the scourge. Lyman explained that after examining hundreds of lungs from western cattle he had detected no signs of pleuro-pneumonia [9]. Dr. Lyman's report cemented his favour with Commissioner Le Duc, and American zeal grew for the 'disease-free west' argument—that is, the contention that American cattle sourced west of the Allegheny Mountains were of no pleuro-pneumonia threat to Britain. In June, Le Duc instructed Lyman to head to Britain and to inspect for himself the US cattle being landed at Liverpool and London [9].

On 4 July 1880, Lyman arrived at Liverpool and proceeded directly to Gayfield House in Edinburgh to confer with Professor Williams. Williams explained to Lyman that he had travelled to Liverpool on several occasions, beginning with the Privy Council's initial condemnation of American cattle aboard the *Ontario* in January 1879. Williams also recounted how, in the six months following, he had acquired and examined lung samples from three-fourths of the American cattle diagnosed in Liverpool as having had pleuro-pneumonia. Williams, who still had several of these samples, showed them to Lyman, explaining that they did not indicate pleuro-pneumonia but rather conventional bronchitis [9]. Lyman, seeking to secure a range of opinions, left Gayfield House and paid visit to Thomas Walley, Principal of Edinburgh's Royal (Dick) Veterinary College and another of the three veterinarians who had been called down to Liverpool in the aftermath of the *Ontario* incident. Walley himself had recently published a book on cattle diseases, including pleuro-pneumonia. In the post-script to his book, Walley had voiced support for the immediate-slaughter treatment of American cattle, although he remained open to the 'disease-free west' argument [19]. During Lyman's visit, Walley reiterated his concurrence with the Privy Council Veterinary Department's diagnosis of pleuro-pneumonia in the *Ontario* shipment. However,

Walley shared that he had in fact seen other samples, also taken from American cattle condemned at Liverpool, that were not pleuro-pneumonia [9].

Dr. Lyman continued his mission. Satisfied with the information gleaned from Williams and Walley in Edinburgh, he proceeded to London and the Veterinary Department of the Privy Council. There Lyman met with both Professor George Brown, head of the Department, and Mr. A.C. Cope, the chief inspector. Dr. Lyman put the 'disease-free west' argument to Professor Brown, who flatly replied that the US did not have the regulatory infrastructure to guarantee such a claim. Lyman insisted that the various state and railroad authorities could ensure safe passage and that federal inspection at the ports was adequate. Brown was unmoved. While at the Veterinary Department, Lyman was also shown several lung samples of 'American pleuro'. Preserved in fluid, the specimens exhibited the signs of contagious pleuro-pneumonia but were, according to Lyman, very different from those he had seen in Williams's collection. Aware of Lyman's scepticism, Cope encouraged Lyman to visit the ports of Liverpool and Deptford, where Privy Council authorities could show him more samples. Dr. Lyman spent July and August 1880 at these locales, accompanying Privy Council veterinary inspectors in their supervision of US cattle imports. During Lyman's time in Liverpool, Privy Council inspectors examined 10,670 animals, six of which were found to have pleuro-pneumonia [9]. Lyman doubted that the disease was in fact pleuro-pneumonia, but he refused to accuse the British authorities of deliberate intrigue. Yet Lyman and others in Washington continued to point to William Williams's contentions that the Privy Council was mistaking pleuro-pneumonia for bronchitis. One of Lyman's reports was followed by a six-page chapter, authored by Professor Williams, for the US *Annual Report of the Commissioner of Agriculture* [20].

Professor Williams's never-ending disagreement with the British government's diagnosis was but one episode in a larger context in which microbiological science was still unfolding. Disputation over pleuro-pneumonia was exacerbated by the infancy in which modern microbiological science found itself. Spontaneous-generation explanations of disease had largely been discarded on the basis of Louis Pasteur's experiments (1861) and Robert Koch's validation of the germ theory of disease (1876), but Pasteur's and Koch's ideas were nonetheless new. While Pasteur's experiments are most celebrated, the spontaneous-generation theory was finally discredited in 1876 and 1877 by Tyndall's and Cohn's experiments, which described bacterial and spore heat resistance. Although he used the principles in his 1876 anthrax experiments, not until 1884 and his etiological study of tuberculosis would Koch formally elaborate his famous 'Koch's Postulates' [21][22]. The novelty of Koch's and Pasteur's discoveries was evident in the American and British veterinary community during the 1870s; late in the decade, both Thomas Walley and James Law took the time to refute spontaneous-generation arguments [19][4].

Nevertheless, the pleuro-pneumonia dispute was dominated not by debates about spontaneous generation or the germ theory; veterinarians understood pleuro-pneumonia was a contagious disease. Fleming, Williams, and Walley agreed that it was some sort of contagion, but the precise nature of the etiological agent would remain a mystery until 1898 [23]. As a practical matter, microbiological analyses were not routinely used to diagnose pleuro-pneumonia. As Dr. Lyman learned in Liverpool during the summer of 1880, British inspectors would conduct an *ante-mortem* inspection, singling out live American cattle suspicious of pleuro-pneumonia. After passing *ante-mortem* inspection, the entire cargo would be slaughtered according to the compulsory-slaughter order, and a *post-mortem* inspection of the lungs followed. The inspector looked for certain visible lesions and symptoms [9]. As Dr. Lyman discovered from comparing

Williams's specimens in Edinburgh to those at the Privy Council Veterinary Department, such visual inspection left dangerous room for interpretation. Pleuro-pneumonia, a disease with visible symptoms similar to non-contagious and less fatal respiratory diseases, was a likely candidate for disease-diagnosis confusion, particularly in cattle that underwent stressful transoceanic conditions. Given the absence of clear etiological science, it is understandable that Professor Williams and North American officials would so frequently insist that the British government had mistaken pleuro-pneumonia for conventional bronchitis [2]. In addition to diagnosis difficulties, the long incubation period of pleuro-pneumonia sowed further opportunities for confusion by masking actual cases of infection.

Conclusion and Epilogue

Given the disease-diagnosis fog surrounding pleuro-pneumonia, it is indeed possible (although not clear) that Williams was right; Professor Brown and his team of inspectors may have incorrectly diagnosed US cattle with pleuro-pneumonia. In any case, Professor Williams's arguments, while unique in Britain, were not entirely far-fetched and, in retrospect, signal the mettle of a scientist willing to publicise his convictions. In addition to American veterinarians and diplomats, Canadian officials benefited from Williams's convictions; when Canada lost is pleuro-pneumonia-free status in 1892, Professor Williams returned to challenge the British diagnoses. Alongside Williams's contestation of the British authorities' diagnoses stood the US government's 'disease-free west' argument, which the British government continued to reject. Dr. Lyman joined his American colleagues in doubting the correctness of the British authorities' diagnoses, but he understood the larger, more important matter: Britain's immediate-slaughter order for American cattle was based on the absence of a robust US regulatory system. Lyman and other American

public health pioneers urged Congress to rectify this problem. These appeals, coupled with a growing appreciation in America of the risks posed by pleuro-pneumonia, prompted federal action and the eventual eradication of pleuro-pneumonia in 1892. Until the end of the nineteenth century, US diplomats continued to challenge Britain's immediate-slaughter rule. However, changes in the economic landscape soon made the matter less of an American preoccupation. After 1900, increasing demand for beef in the US made British markets less critical for American traders [8]. This new economic reality effectively resolved the dispute.

On 12 November 1900, Professor Williams passed away. In one tribute, Williams was affirmed for the legitimacy of his scientific convictions, held for decades amidst the fires of controversy:

> The principal was a man whom no consideration could cause to swerve from what he considered just and right, and in the matter of public appointments he suffered greatly from the determined position which he took up against the Government veterinary authorities...in regard to the so-called pleuro-pneumonia in...cattle, the Principal holding that the malady in question was not pleuro at all, but was neither more nor less than broncho-pneumonia, which is non-contagious in character [24].

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Further Reading (and watching)

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