

Review

The changing role of veterinary expertise in the food chain

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This paper analyses how the changing governance of animal health has impacted upon veterinary expertise and its role in providing public health benefits. It argues that the social sciences can play an important role in understanding the nature of these changes, but also that their ideas and methods are, in part, responsible for them. The paper begins by examining how veterinary expertise came to be crucial to the regulation of the food chain in the twentieth century. The relationship between the veterinary profession and the state proved mutually beneficial, allowing the state to address the problems of animal health, and the veterinary profession to become identified as central to public health and food supply. However, this relationship has been gradually eroded by the application of neoliberal management techniques to the governance of animal health. This paper traces the impact of these techniques that have caused widespread unease within and beyond the veterinary profession about the consequences for its role in maintaining the public good of animal health. In conclusion, this paper suggests that the development of the social sciences in relation to animal health could contribute more helpfully to further changes in veterinary expertise.

Keywords: veterinary expertise; neoliberalism; animal disease; governance; regulation

1. INTRODUCTION

Governance of the food chain is a complex process. It is founded in nested frameworks developed and implemented at different spatial scales and governmental levels. International trade rules and European directives provide the regulatory backdrop; national governments create policies and the institutions to implement them; while at a local level, public agencies, local authorities and private companies are responsible for ensuring that food is safe for human consumption on a day-to-day basis.

Within this complex regulatory landscape, preventing animal disease is a central concern, and the benefits are most appreciated when the costs of the system failing are starkly apparent. Food safety scares, such as bovine spongiform encephalopathy (BSE), *Escherichia coli* and *Salmonella* outbreaks, demonstrate the inseparable links between public and animal health, while the (mis)management of animal health has the potential to create much broader

social and economic repercussions. For example, at the height of the BSE crisis, its annual cost to the UK taxpayer was £1.5 billion [1]; the cost of the 2001 foot and mouth disease (FMD) outbreak was estimated at £8 billion [2]; while other incalculable social and psychological impacts of animal disease crises have been recorded among farmers, vets and rural residents [3]. Not surprisingly, considerable resources are devoted to avoiding such eventualities. Indeed, the smooth operation of the food chain has come to depend on systems of animal health regulation, inspection, standardization and certification, designed to safeguard public health and to ensure that animal disease does not interfere with the global movement of food and animals [4]. The OIE (*Office International des Epizooties* or World Animal Health Organization) sets standards for veterinary services and disease surveillance among its 179 members. These are collected in the *Terrestrial Animal Health Code* and the *Aquatic Animal Health Code*, each of which has an accompanying manual of diagnostics and vaccines for the diseases specified within them. The OIE is also a reference body for the World Trade Organization's (WTO) *Sanitary and Phytosanitary Agreement*, which sets out the relationship between trade and animal health.

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In the formulation and implementation of all of this, the expertise of veterinarians is crucial. At a global level veterinary knowledge helps set the standards and certifications required for international trade in food. At the national level, vets play a significant role in implementing the substance of these codes. In the UK, this occurs largely through the administration of European Union legislation on border checks for animals and animal products and on disease reporting. UK level policy and delivery is based on the Animal Health Act (1981 and subsequent amendments), which has around 140 statutory instruments under its auspices, governing every aspect of animal health. Government vets are thus charged with combating livestock disease, regulating livestock keepers and food producers, and overseeing border inspection posts. Vets in private practice also contribute to the surveillance of notifiable diseases and may be called into government service in the event of a major disease outbreak. In short, veterinary expertise has become a key component in ensuring food supply.

But veterinary expertise has not always occupied such a position—nor might it continue to do so. In the UK, there is widespread unease within and beyond the veterinary profession about its continuing role in maintaining the public good of animal health. A recurrent concern, first expressed in the 1960s, is that vets face prospective redundancy due to a shrinking of government work and economic pressures on agriculture [5]. Recent rapid change in the management of animal health has reawakened and heightened such concerns. In his official review of the UK's governance of animal health, David Eves [6] concluded that the efficient delivery of veterinary regulation had been beset by a complex division of responsibility; but that the reorganization of the traditional relationship between the state and the veterinary profession had left many vets working at a 'point of crisis' with 'little clear idea of who was in control'.

Another report concluded that there had been a 'secular decline in the relative standing of farming and food animal veterinary practice both within the profession and within government' [7]. Vets in the private sector conducting regulatory and preventative work on behalf of government have grown increasingly agitated about their treatment and what they see as their marginalization from the public management of animal disease, leading some to contemplate formally withdrawing from such work. An 'erosion of goodwill' between the government and the veterinary profession has led others to wonder about the future quality and viability of public veterinary services [8–10]. At the same time, the visibility of the profession in matters of public and animal health also appears to be diminishing. While vets may see themselves as 'the principal and leading source of trusted advice on animal welfare in society' [11], government documents such as the *Animal welfare delivery strategy* overlook their contribution [12].

These worries can be put into perspective through sociological explication of how expertise is constituted. Professional expertise cannot simply be asserted. It is

underpinned by legal and administrative structures, by scientific and technical advance and by shifting public, commercial and governmental pressures. The maintenance of expert authority is a precarious accomplishment which calls for recurrent attention to the building of alliances between a variety of different actors. The production and application of expert knowledge is thus steeped in and reflective of the social environment in which it is generated [13]. Therefore, to understand the changing nature and status of veterinary expertise, we must consider the conditions in which it is produced, tracing the ways in which veterinary expertise interacts with other actors.

The purpose of this paper is, therefore, to analyse the changing status of veterinary expertise, and the complex sets of relations that are re-ordering its basic premises. As social scientists we do this by looking at how social relations, and social scientific knowledge, have contributed to the making and remaking of veterinary expertise. In particular, this paper focuses on the connection between the historical relationship of the state and veterinary expertise, and broader shifts in the form and functioning of government associated with neoliberalism.

This paper focuses on veterinary expertise in the food chain. It begins by looking at how the relationship between the veterinary profession and modern government developed through the nineteenth and twentieth centuries, before discussing how contemporary processes are redefining this relationship and then outlining the implications for the nature of veterinary expertise. The intention is to provide a programmatic overview drawing on a variety of existing research relating to the veterinary profession in its agricultural and public health roles, and focusing on those aspects where the relationship between government and veterinary expertise is in transition under the influence of neoliberalism. In conclusion, we consider whether the social sciences have other models to offer that could help guide the choice of alternative veterinary futures.

2. THE GOVERNANCE OF ANIMAL HEALTH IN THE FOOD CHAIN

We begin this section by posing two fundamental questions: how did animal health become an object of government? And how was it that veterinary expertise became central to the government of animal health? The answers to these questions are important, for they are central in explaining the current crisis within veterinary expertise.

The emergence of animal disease as a problem requiring attention, and of veterinary expertise to deal with it, is tied to the relationship between agriculture and the state. Vets have long sought to influence the development of policy and intervention with regard to animal disease, while successive governments have used vets as a means of developing and regulating agriculture. This mutually beneficial, co-constitutive relationship is characteristic of the forms of liberal government that were emerging in the mid- to

late-nineteenth century in opposition to a totally administered society [14].

Liberalism sought to place firm limits on the legitimate exercise of political power while simultaneously looking to government to foster the self-organizing capacities of a free society. The solution to this balancing act lay in forging relationships between governments and experts [15–17]. Experts could provide knowledge and understanding of the private worlds of individuals, families and firms, and specify behavioural norms. By rendering these worlds visible and pliable to policy-makers, experts could legitimize state intervention in social problems, while simultaneously legitimizing their own expertise [18]. Government and expertise developed hand-in-hand, each reinforcing the other through the exchange of knowledge and resources.

Veterinary expertise was therefore not ‘out-there’ waiting to be discovered: like other forms of knowledge it was co-produced through social relations [19]. The very existence of veterinary expertise had to be worked for and achieved. And just like other forms of knowledge, so was its achievement a careful but precarious process [13]. The work that veterinarians put in for these achievements began in the mid-nineteenth century. Although the basic principles of dealing with epidemics such as cattle plague (rinderpest) had been worked out in the eighteenth century [20,21], animal disease had not become a systematic object of government. Those who pressed for animal health legislation received little support [22], certainly from farmers—for whom living with FMD was the most economical option—or from the meat trade who feared for their livelihoods [22,23]. The veterinary profession itself had limited experience or understanding of common diseases of livestock or their implications for public health. Instead their expertise lay largely in equine medicine, and cattle work was less paid and not a significant part of veterinary training.

However, the mid 1860s saw a serious outbreak of cattle plague that brought veterinary expertise and government closer. The inability to control the disease through ‘veterinary treatments’ of individual animals highlighted the poor understanding of disease control and the lack of organization required for eradication planning. Nevertheless, some prominent vets saw an opportunity to realign the profession with a wider public health agenda by asserting vets’ credentials to speak on matters of animal health. Veterinary leaders, therefore, sought to expand their range of employment competencies and ‘establish the scientific and social worthiness of their profession’ [24]. They were assisted by agriculturalists and influential members of parliament who had calculated the economic impact from cattle disease and pressed for government intervention.

It was in this context that animal disease became a concern of government, and veterinary expertise became vital for the management of public and animal health, in both urban and rural settings [25]. A framework for animal disease control gradually emerged. A Veterinary Department of the Privy Council was established in 1865, initially as a temporary unit set up at the height of the cattle plague, but it remained in being and was the forerunner of the

Agriculture Department of the Privy Council which became successively the Board of Agriculture and then the Ministry of Agriculture. The veterinary profession was consolidated in a public role through legislation and support for research and educational institutions. When the Ministry of Agriculture was established in 1919, it had veterinary expertise at its core in its new Diseases of Animal Division. A governmental infrastructure of veterinary testing and research services was created attached to the Ministry, firstly in Whitehall in 1894, then at Pirbright in 1915, New Haw—now the Veterinary Laboratories Agency (VLA)—in 1917 and Compton in 1934. When the OIE was established in 1924 to provide international coordination to animal disease control, the strength of veterinary expertise in the UK enabled it to exercise significant influence over the setting of international standards for animal disease monitoring, testing requirements and recognition of country-by-country health status for trade.

A vision emerged of animal disease as a national problem demanding state intervention as an integral part of government’s growing responsibility for agriculture and food production. For the sake of both public health and farming productivity, it became a joint ambition of government and the farming industry to eliminate major endemic diseases of livestock and, more generally, to improve the health of the nation’s farm animals [26]. The Permanent Secretary of the Ministry of Agriculture declared: ‘The control and extirpation of the diseases of farm livestock must always be the primary duty of the Department of State responsible for the welfare of the agricultural industry’ [25]. With the development of a more interventionist agricultural policy in the 1930s and the build up of advisory services for farmers, there was a growth in the field of veterinary services which culminated in a national State Veterinary Service (SVS) established in 1938 under the Chief Veterinary Officer [27].

The Second World War boosted further the standing of vets and bound them even closer to the state, as agents of the vital campaign to expand food production on the home front. The strongly interventionist stance on agriculture carried through into the post-war years. Under the so-called ‘productivist’ paradigm, the state guaranteed farmers financial security and led a drive to modernize agriculture [25]. Vets were in the forefront of this drive, developing and applying their expertise to increase livestock productivity and improve animal health.

Government came to act as dominant sponsor for both the veterinary profession and its then main customer, the agricultural industry. Government took on continuing responsibility for the funding of veterinary education in the late 1940s, following the publication of the Loveday Report of 1944 and its implementation through the Veterinary Surgeons Act of 1948 [27]. Government was therefore able to take the lead in formulating future demand (both public and private) for veterinary services on the basis of which it could then plan the long-term supply of veterinarians. In addition, through both its direct client role and its sponsorship of the agricultural industry, it could also generate much of the necessary medium-term demand. It

thus sought systematically to orchestrate future veterinary supply and demand [28–31]. In many respects too, the Chief Veterinary Officer came to be seen as the leader of the profession, and not just within government.

Vets prospered in this hierarchical relationship: in government they were employed in relatively large numbers and their expertise became institutionalized within the growing SVS. In private practice, vets were provided with regular work and financially supported as part of government-led disease eradication programmes. Together, vets enjoyed respect by clearly contributing to the public good—maintaining public and animal health. Their authority was seen to lie in the increasingly scientific discipline of veterinary medicine, which flourished under state sponsorship [32].

Together, the state and the veterinary profession had situated veterinary expertise as crucial in the maintenance of the food chain. The very idea of liberalism as a means of governing was, therefore, highly productive: it defined what veterinary expertise was for and how it was to be deployed. Thus, the focus on specific diseases and their classification as ‘notifiable’ diseases—such as brucellosis, bovine tuberculosis and FMD—reflects not only the relationship between agricultural interests, vets and the state but also the objects of veterinary expertise. Within this way of governing, animal diseases commanded veterinary attention for economic (FMD) or public health (brucellosis, bovine tuberculosis) reasons [33–35], while others were deemed less significant (e.g. mastitis and infertility [36]).

The build up of the state–veterinary relationship over animal health and agricultural productivity eclipsed the direct public health role of veterinary expertise. Although the veterinary profession had been slow to embrace public health positions [35], by 1937 just over 900 vets were employed within local government to control animal diseases (such as bovine tuberculosis) and to supervise milk and meat supplies. However, the following year most of these local vets were swept up into the creation of the centralized SVS. This severed the link between animal disease control and food inspection on which a public health-oriented veterinary service might have been built. To the chagrin of some veterinary leaders, the SVS dispensed with any direct responsibility for human health, to focus solely on animal disease control.

This narrowing scope did serve to assert the independent status of veterinary expertise, as against human medicine. Even so, an enduring notion from the inter-war period is that a fundamental purpose of veterinary expertise is the protection of public health in the food supply, a notion sustained in the post-war years by popular culture and its portrayal of practising vets [37]. What this history also reveals is the constructed and provisional nature of veterinary expertise, emerging as it did from the relationships that constituted liberal government.

3. THE EMERGENCE OF NEOLIBERALISM

In §4, we begin to take this relational account a step further by examining the connections between social science and the nature of veterinary expertise, as

revealed by the contemporary effects of neoliberalism. Like forms of veterinary knowledge, the social sciences are embedded in and produced by social relations [38]. The circulation of their ideas and their methods are also productive in that they contribute towards bringing about the realities they describe [39]; including, for example, the very notion of modern agriculture which was realized in part through the development of such instruments as the agricultural census [19].

Perhaps nowhere more so than in relation to the concept of neoliberalism have methods and ideas from social science produced new social realities. Neoliberalism emerged as a political philosophy in the late 1940s but rose to prominence as a mode of government in the 1980s and subsequently. It was a response to the tendency of liberal government to place too much power in the hands of unaccountable experts, which had resulted in professional enclosures, excessive bureaucracy and inertia [16,40]. The territorial disputes between the veterinary and medical professions in the public health domain exemplify the efforts of experts to draw exclusive boundaries around governmental activities [35].

Neoliberalism has addressed these concerns through a renewed emphasis on notions of individual freedom and organizing social behaviour around the principles of the market. This is the central tenet of neoliberalism: that markets can coordinate affairs much better than government-led planning [41]. In essence, the role of the state is ‘to legislate in such a manner that the logical or mathematical model of the perfectly functioning market would be, as far as possible, realized in practice. The end result would be greater individual liberty—liberty not bounded by arbitrary rules of nation-states but by competition in the market place’ [4]. Individuals are therefore to be active in their own government, making their own free choices about their own interests [37]. The role of the state is to empower this self-responsibility and entrepreneurialism, relying on experts to provide information for people to use to evaluate and conduct themselves in the most appropriate direction [17].

This shift to neoliberalism has not been a neat and conclusive affair: forms of liberal and neoliberal government exist side by side, developing at different rates and to varying degrees in different policy areas. Nor is neoliberalism without its own contradictions or different interpretations [42,43]. Importantly, though, what seems to have brought neoliberalism to fruition are sets of social and technological relations. Not only did the post-Second World War social and political environment help to make the idea of neoliberalism acceptable, but so too was it realized through a complex mix of social technologies, which fitted neoliberal goals and assumptions. These included activities such as audit, accounting and performance management which promoted self-regulation and entrepreneurial mindsets [4,44,45]. Other strategies sought to transform the landscape of government into a series of markets, disaggregated organizations and performance information—what became known as the New Public Management [46]. Thus, for the food system, the creation of free markets has been facilitated by global organizations (such as

the WTO) that have formulated the rules of free trade through product and process standardization, certifications and accreditations. This has provided both a context and demand for veterinary expertise to facilitate trade, by developing measures to analyse and manage disease risks in trading and by formulating global disease controls for animals and animal products. A variety of social sciences—economics, psychology, political science, management studies and rural sociology—have played their part in the creation and circulation of the ideas, objects and methods of neoliberalism.

4. RESHAPING VETERINARY EXPERTISE

What has neoliberalism meant for the nature of veterinary expertise? How, if at all, has the veterinary profession come to enact the ideas of neoliberalism? To be sure, their influence was both immediate and sporadic. Neoliberal ideas had already seeped into the framework of animal health and agricultural policy before their 1980s/1990s ascendancy, as the government's financial support for veterinary services fluctuated, and debate played out concerning where responsibility should lie for the management of particular animal diseases [34,36].

A broader framing movement has been the playing out of neoliberalism in the relationship between the state and agriculture. The state has gradually withdrawn from the previous protectionist regime with its highly regulated system of production subsidies and controls, strong market intervention and guaranteed prices. Agriculture has been increasingly exposed to market forces and market mechanisms. From the 1990s, restructuring of the European Union's Common Agricultural Policy has not only opened up agriculture to international competition but has also transformed the basis on which agriculture is publicly supported. A crucial requirement has been to bring agricultural trade into the WTO framework. Indirect supports, through the control and management of markets, have been transformed into direct payments to farmers. These have been subjected to financial limits, divorced from production, and partly reoriented to discretionary incentives supporting environmental protection, rural development and farming competitiveness. Over the same period, livestock producers have been subjected to tougher environmental, welfare and food assurance regulations and standards.

The result has been relentless structural adjustments in the agricultural industry, with fluctuations in farm incomes, a growing sense of insecurity and farmers leaving agriculture [47]. The reforms have markedly reduced the number of farms and farmed animals. In the 20 years from 1989 to 2009, the UK cattle population fell by 17 per cent, the sheep population by 26 per cent and the pig population by 38 per cent [40]. In some sectors, including cattle, there has been an increasing concentration of livestock in fewer farms. The proportion of dairy herds with 100 or more breeding cows has increased from 45 per cent in 1995 to 70 per cent in 2008 [40].

The gross demand for veterinary services has been greatly affected by these developments. Fewer livestock

and fewer enterprises mean there is less call for vets. In addition, the remaining producers are even more conscious of their production costs and how to reduce them, including their veterinary bills. Increasingly, vets have sought alternative forms of income and employment. In the mid 1960s, 90 per cent of practice income was accounted for by farm animal services, but by 2006 it had declined to 10 per cent [48] as had the time spent on farm animal work (figure 1). Similarly, whereas in 1966, 14 per cent of vets worked in government and public research (there were 8143 registered vets at the time), this was down to just 4 per cent in 2006 (when there were 21 799 registered vets). Over the same period, the proportion of vets in private practice rose from 69 to 88 per cent [7]. The large majority of vets these days work on pets. This is true for both rural and urban areas. This remarkable change in the complexion of the profession over a 30 year period represents a large-scale diversification in veterinary practice, with a consequent major shift in the nature of expertise on offer, in response not only to changing socio-economic demands but also a switch from a largely publically regulated source of demand to a market-mediated source of demand (from pet owners).

Neoliberalism has thus transformed the relationship between vets and government, the organization of veterinarians within society and the very nature of their expertise—what it is and how it is done. While this is most apparent in the private pet care sector, it has also pervaded the agricultural and food sectors. The most direct and recent examples have been attempts by the state to fundamentally redistribute the costs and responsibilities of animal health. This agenda was prompted by the spiralling costs of dealing with disease outbreaks, not least the 2001 FMD outbreak. The European Union [50] has pressed for a rebalancing of responsibilities for the management and prevention of livestock disease, towards the private producers. This is in keeping with the UK's 2004 Animal Health and Welfare Strategy, which lays primary responsibility firmly on the livestock keeper (or pet owner). The strategy signalled a major shift away from government taking the lead except where it had legal responsibilities for disease control, food assurance and animal welfare. The strategy also urged the veterinary profession to be more market-oriented. Farm animal vets should be prepared to respond to the requirements of their farmer clients by developing their own skills and services. Vets were encouraged to shift their focus towards disease prevention, farm health planning and providing specialized consultancy advice for their clients [51].

Thus, when a new exotic disease—the bluetongue virus—threatened to disrupt the livestock industry in 2008, the UK government did not launch into old style direct intervention. Rather, it responded by making vaccine available for farmers to buy and brokering a strategic collaboration between the veterinary profession and farming groups to encourage its uptake. In other cases, the state has fundamentally altered its relationship with farm vets, by withdrawing opportunities for surveillance for existing endemic diseases (e.g. brucellosis) or arguing that they should be subject

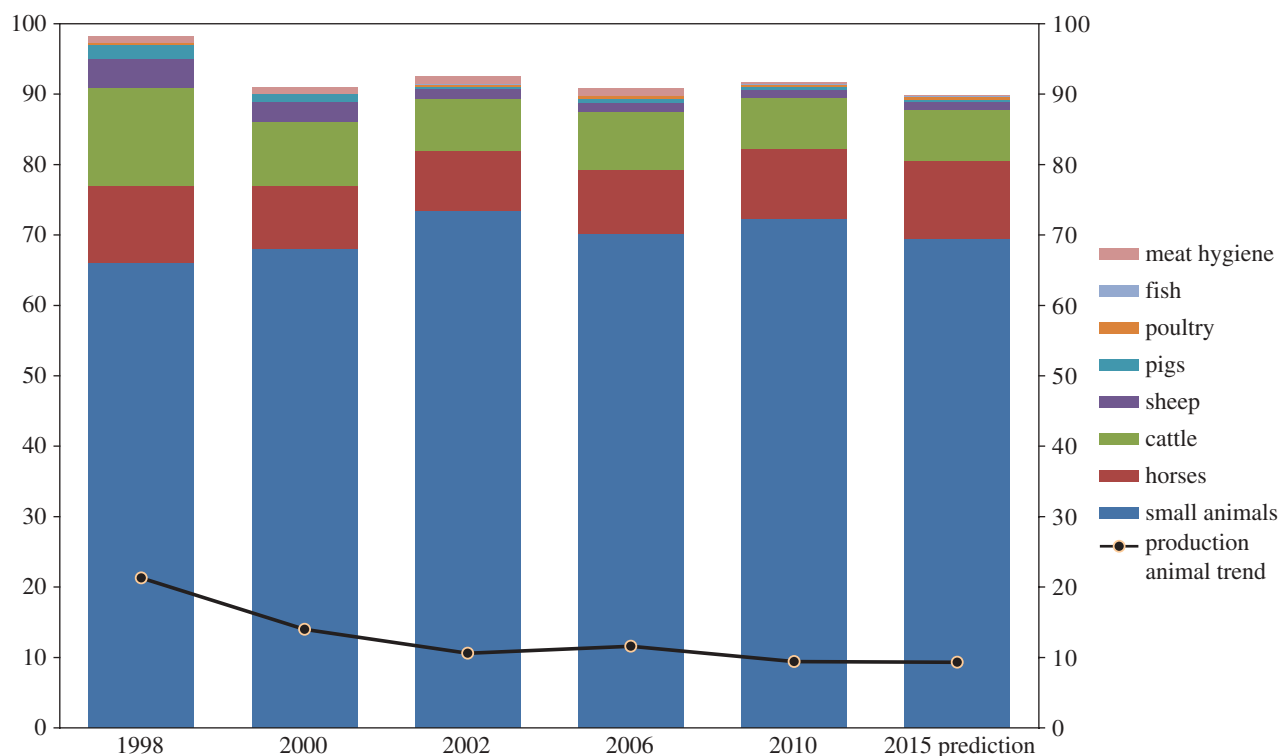


Figure 1. Proportion of time spent by veterinarians in private practice by species type 1998–2010 (with predicted values for 2015). *Source:* IES [49].

to competitive tendering processes rather than a ‘gentlemen’s agreement’ (see §5). At the same time, compensation levels for livestock slaughtered as a result of disease outbreaks have been cut, and linked to levels of farm biosecurity [52]. Here, the aim has been to reverse the perverse incentives of compensation regimes, by rewarding good rather than poor farm practices [53].

The new Animal Health and Welfare Strategy represented a distinct change in the nature of the relationship between the state, agriculture and vets. Instead of delivering task-based services, the strategy shifted the role of vets to providing tailored solutions to individual farms by delivering proactive farm health planning—a system of measuring, monitoring and managing animal health and performance to maximize health and profitability. Prior to this, the state conceptualized veterinary expertise as the provision of specific tasks, rather than engaging the problem-solving capacity of private veterinarians as a network of field-based experts, with extensive first-hand knowledge of the state of livestock and local farming systems. In reconfiguring this relationship, notions of veterinary expertise are realigned to the demands of the market, rather than the requirements of the state. Veterinary expertise therefore becomes associated with the skills of the entrepreneur with vets required to demonstrate their market value to farmers, or be able to successfully navigate rural development funding streams to facilitate the development of these services.

This approach, though, is reliant on farmers wanting to act as demanding customers. However, many are only interested in vets attending to sick animals. Farm health planning, for example, has not met with

an enthusiastic reception among farmers. While vets and policymakers see scope for long-term improvements to productivity, profitability and welfare through systematic attention to disease prevention and tackling endemic diseases, many farmers have been slow to recognize how their vet can add value to their farming business [54]. Instead, farmers’ use of veterinary services has been driven more by immediate value-for-money concerns [55]. The profile is dominated by emergency visits, for which around about 80 per cent of farmers in all sectors call on veterinarians. The exception is the specialist pig and poultry sectors in which producers are more likely to use veterinarians on routine planned visits. Larger farms have a tendency to make greater and more intensive use of veterinary services and are more likely to have changed their vet at some time. Dairy farmers, whose percentage veterinary costs are the highest among farming sectors (accounting for more than 5% of total farm spend), are the most likely to shop around: in a 3 year period, 7 per cent of them had changed their veterinarian in search of a higher quality service, a greater range of services or better value [7].

5. THE SHIFTING ORGANIZATION OF VETERINARY EXPERTISE

While the authority of veterinarians has long derived partly from their role as agents of the state, changes to the governance of animal health has meant this role is increasingly complex and organizationally fragmented. Two related neoliberal techniques have played a significant role in this reorganization, notably agencification and privatization. ‘Agencification’ is the process by which the implementation of policy

is hived off into separate units. The initial impetus came from the 1988 'Next Steps' initiative [56] that sought to reduce the bureaucracy of the civil service by breaking it up into more manageable free-standing units with clear delivery rules under accountable management subject to measurable targets and efficiency criteria.

Agencification was supposed to give these public sector units the freedom to manage their activities and thereby improve the efficiency and quality of service delivery using the tools more commonly associated with the private sector. Targets, performance monitoring, audit and standards were written into service level agreements between the agencies and government departments [57]. In the search for efficiencies, the agencies further enacted neoliberal principles through the use of private contractors to deliver their services. One of the first big units to be agencified was the farm extension body, the Agricultural Development and Advisory Service. Subsequently, in 1997, it was privatized, and indeed these new public agencies have been more readily subject to governmental initiatives to privatize, enlarge, abolish and rationalize parts of the government machine.

A number of delivery agencies have been formed that deal with animal health and disease. These include the VLA and the Food and Environment Research Agency (formerly the Central Science Laboratory). The Food Standards Agency was also created as a non-ministerial government department which took over control of the Meat Hygiene Service (MHS). In 2007, the Animal Health agency was formed from the old SVS. Animal Health has responsibility for implementing government policies aimed at preventing or managing outbreaks of serious animal diseases, protecting the welfare of farmed animals and safeguarding public health from animal-borne disease.

An effect of this shift in governance has been to remove the large majority of veterinarians from within central government, where policy is made, and place them in delivery focused roles. This is momentous because, historically, vets have had a central role in the formulation and execution of animal disease policy. But as vets are removed from central government, and their influence over decision-making declines, the complexion of the advisory system for animal disease policy has changed. By taking vets out of central government, agencification has diminished their proximity to policymakers, making it more difficult for them to give advice effectively and easier for their advice to be ignored [58]. Policymakers appear to have fewer opportunities to speak to vets and develop strong communities of policy-making. In Defra, policymakers have become unsure where they should get their expert advice from [59]. Most commonly, they seek veterinary advice on an ad hoc basis [59] or are dependent on friendships and social contacts [60]. Animal disease scientists have argued that Defra's ability to translate scientific findings into policy has been made more difficult by 'Defra's own organizational structures which [...] enforce a separation of policy development and the scientific evidence on which policy should be based' [61].

The specialization of veterinary functions has not been without its consequences. Firstly, the establishment of the MHS in 1995 centralized arrangements for inspecting fresh meat plants to protect against the risks of BSE. The MHS addressed concerns about local authorities not enforcing BSE regulations and the government's lack of legal powers to monitor their enforcement [6]. This has contributed to the establishment of a very specific role for vets within the food chain. The monitoring of slaughterhouse standards is now largely carried out by vets unconnected with local practices. Instead, the majority of vets that fulfil this role are supplied under contract to the MHS by specialist recruitment agencies. These vets work in comparative isolation from the rest of the delivery system with relatively little professional contact with their veterinary colleagues in other agencies. This is compounded by the fact that many of these vets are recruited from abroad and are often working for the first time in an English-speaking environment [6]. While this arrangement may appear to redefine the nature of veterinary public health, returning it to its pre-SVS roots of the 1930s, the effect is to create a kind of veterinary ghetto in which food chain work is the preserve of a small group of largely foreign-trained vets. In other words, it does nothing to unite the ambitions of those veterinarians wishing to contribute to public health, and continues to distance the vast majority of practising vets from a public good role.

Secondly, the relationship between the government and the veterinary profession has been one in which vets have been increasingly relied upon to deliver routine veterinary tasks. Nowhere more so has this been true than in relation to testing for bovine tuberculosis. Historically, private vets have always been relied on to conduct such tasks. Their status as Local Veterinary Inspectors (LVIs, now Official Veterinarians) forms a kind of 'territorial army' [6] through which the state has been able to conduct routine surveillance for notifiable diseases. Some of these duties—notably those seen as higher risk—remained with the SVS, but faced with a rapid increase in bovine tuberculosis during the late 1990s, more and more elements of the testing programme were handed over to private practices. Between 1996 and 2006, for example, the number of tests undertaken annually by LVIs rose from 20 656 to 60 508. By comparison, the number conducted by the SVS remained at about 6000 per annum.

Reliance on this type of work, however, has contributed to vets' sense of unease with their continued involvement in food chain work. Framing veterinary expertise as a routine, task-specific exercise has served to create a negative perception of farm animal veterinary practice among vets. Faced with the prospect of conducting such work rather than exercising their problem-solving expertise, many newly qualified vets soon drift away from farm animal work into small animal practice [62]. This is particularly true in areas where veterinary practices have become increasingly reliant on state funding to maintain their business. It is perhaps no surprise, therefore, to see vets subverting the process by which such routine

tasks are meant to be undertaken to allow them to use their 'professional judgement' [63]. By creating a system of regulation in which vets regulate their own clients, and which is culturally distant from the types of work that farm animal vets prefer, the government has unintentionally organized a self-defeating regulatory system.

At the same time, income from official surveillance has proved vital for veterinary practices in some areas of the UK, helping them to build a veterinary team of sufficient size to service customers' needs and ensure adequate out-of-hours emergency cover. But as all state funded veterinary services have become exposed to neoliberalism, so has this system of financial support proved increasingly fragile. Thus, in April 2007 many practices lost a vital source of income when Animal Health decided to withdraw from funding brucellosis testing without warning. Subsequently, it emerged that there was never an official contract between private vets and the government to deliver these or other services. Instead, the agreement and rates of pay were built on a private understanding between the British Veterinary Association and the government. The realization that this breached free-market legislation has meant that veterinary services in future will be procured by government in neoliberal ways—most probably through a process of competitive tendering. For vets, the prospect of some losing a vital source of income has served to further underline their sense that they are increasingly marginal figures in the management of the food chain [10].

A sense of dissatisfaction is not confined to vets in the private sector. Drummond [64] reported how resources within the SVS had become increasingly stretched in the late 1990s such that vital tasks like contingency planning were neglected, with disastrous consequences when FMD broke out in 2001. This effectively sealed its fate. Its successor agency Animal Health has been subject to performance management regimes, targets, efficiency drives and restrictions on recruitment. This has led to low levels of staff satisfaction; high staff turnover; and the use of short-term employment contracts which, while providing workforce flexibility, may also disrupt the bonds of trust that are required between farmers and vets to resolve animal health problems.

The erosion of veterinary authority in central government has opened up disease policy to other types of expertise. A key moment was the SVS losing the confidence of ministers at the height of the 2001 FMD outbreak when disease strategy was wrested from the Ministry of Agriculture's vets and placed under the government's Chief Scientist. This brought to the fore epistemological tensions over the nature of animal disease expertise. On the one side, epidemiological modellers guided the disease strategy; on the other side, veterinary professionals combated the disease in the field. The field vets' epistemology drew on a knowledge of the nature of the disease, intuitive and practical understanding of animal husbandry, and their situated experience of local farming geographies and practices, as well as from their frontline experience of actually implementing culling and surveillance policies. In contrast, the epidemiological

modellers constructed a more distant form of expertise that tested solutions based on standardized data applied against estimated parameters and abstract assumptions. This calculated expertise allowed epidemiological modellers to frame vets 'as being too close to the problem, and too much a part of the culture of those affected by the disease, to the extent that it impaired their scientific judgement, whereas by implication, epidemiological modellers' cultural distance and consequent 'outsider' status afforded them greater objectivity in drawing conclusions and making recommendations for action at a national level' [65]. In taking the side of modellers, the government enacted neoliberal animal disease control, and simultaneously undermined the traditional status of field-based veterinary epidemiological expertise within the management of the food chain.

6. EXPERTISE, EDUCATION AND THE GLOBALIZATION OF VETERINARY LABOUR MARKETS

The availability and character of veterinary expertise have also been shaped by the application of neoliberal principles to veterinary education. These effects are illustrated in concerns that 'the UK (veterinary) graduate is not necessarily well equipped to come into the public sector' [59]. Farmers, experienced veterinary practitioners and graduates themselves have characterized young veterinarians as poorly equipped for many of the day-to-day issues and challenges involved in farming and food-related work. The level of on-the-job support and training available for new graduates has also been identified as poor. Newly qualified veterinarians felt that 'their university experience of farm animal work was not entirely realistic' and 'they were not fully prepared for the economic nature of farming' [62]. The Farm Animal Welfare Council [66] has also observed that 'the content of husbandry and practical skills in undergraduate courses has been reduced over the past decade', such that 'new veterinary graduates appear to be less competent in dealing with livestock husbandry'.

How are these concerns related to neoliberalism and what effects have they had? Firstly, it is possible to trace these developments to a mismatch between the types of expertise required by the public health vet and those possessed by new veterinary graduates. Veterinarians working within vet schools and in small animal practice appear to have different skill-sets to those in farm animal practice and within government [7]. The much greater demand for small animal practitioners is skewing what is taught. UK veterinary schools have a strong scientific and surgical orientation. Attention to animal and public health has been less pronounced than in other countries (such as the USA, Australia and Spain).

These are aspects of veterinary training that the OIE has pressed internationally to be strengthened, to ensure the upkeep of international standards of animal health [67]. Their relative neglect in the UK can be attributed in part to the application of market principles to veterinary education and research. Thus, universities have sought to expand the 'veterinary school-related business' in referral and specialist

clinical capacity, predominantly in small animal and equine medicine and surgery. In some schools, this yields a critical income stream but also has consequent learning benefits by providing challenging case work for specialists as well as students. The public visibility of 'veterinary-related business' can attract further commercial and charity sector funding as well as high-flying veterinary specialists to the schools to further support research, build facilities and establish state of the art surgical services. The flow of public resources to support research which, typically, is more oriented to public health and international animal health topics, has less impact on the practical training of veterinary graduates because research tends to be carried out by scientists rather than by the clinicians in charge of clinical teaching.

In some veterinary schools, large animal case material for teaching has to be bought in, incurring additional cost or requiring a level of cross-subsidy by other income-generating departments. This has been reflected in the limited ability of the schools to attract and retain teaching staff in veterinary public health, production and reproduction medicine, and large animal specialisms; to build related research capacity; and to provide a vibrant learning environment in these fields. Coincidentally, access has become more constrained to appropriate food animal work experience, whether in clinical or other working environments, such as abattoirs. 'Real world' farm animal practice has the kudos of neither the 'veterinary-related business', nor publicly funded scientific research. No wonder then that it has declined in most university veterinary schools leading to new government sponsored attempts to improve the universities' contribution to science-based animal health policy [7].

Secondly, the boundaries of the veterinary labour market have been enlarged to ensure that gaps in veterinary expertise can be plugged on-demand. In the past 20 years or so, the veterinary labour market has gone from being confined to national borders, to one that is open to vets from across the world. This has been made possible by the opening of labour markets between EU member states and the establishment of reciprocal recognition agreements of veterinary qualifications with other countries. Thus, since 2004, the majority of new veterinary registrations in the UK have been non-UK graduates [59]. The government is leading the way; it is more likely to recruit from non-UK veterinary schools than the private sector. EU graduates from outside the UK and Ireland made up around 15 per cent of the total government veterinary workforce in 2006 [48]. In the Food Standards Agency and the MHS, over 50 per cent of the vets employed graduated outside the UK. One consequence of this mobile labour force has been to facilitate further neoliberal, organizational and managerial reforms. The younger, more diverse, incoming workforce present fewer institutional or cultural barriers to implementing change, enabling radical restructuring of agencies such as the MHS.

These changes mirror the concomitant development of a global regulatory system for animal disease which has been driven by the increasingly international

nature of disease as well as the emergence of global trade agreements and rules (for example, the UK now requires EU permission to impose restrictions on the import of meat products). But it is a strategy not without problems. Reliance on global labour may contribute to the very problem it seeks to resolve; it sustains and deepens the boundaries between different types of veterinary expertise (such as state versus private practice) and establishes different veterinary identities for different veterinary roles. In many ways then, neoliberalism has come to enact a specific version of veterinary expertise.

7. CONCLUSION

This paper has sought to show how veterinary expertise and its relationship to public health have been brought into being, modified and recast. We have shown how liberal forms of government allowed veterinary expertise to emerge in a way that was mutually beneficial to the state and an emergent veterinary profession. The advent of neoliberalism as a driving political force fundamentally altered the terms on which this relationship was founded. As a result, the connections between the veterinary profession and its public good role and the very nature of veterinary expertise have been radically transformed.

The social sciences may play diverse roles in understanding these changes but also contributing to them. This paper has shown this in two ways. Firstly, the social sciences show us that scientists and experts do not just describe the world but also help to bring into being the realities they describe, through various strategies, tactics and alliances [13,38,39]. Veterinary expertise and its contribution to public health have their roots in the relations between agriculture, the state, animal disease, food-borne pathogens and other public health professions. Secondly, as these relationships have changed, so has the nature of veterinary public health expertise. In particular, neoliberal tools and techniques—themselves derived from the social sciences—have contributed to the current changes in the geography, practice and meaning of veterinary expertise.

More broadly, the social sciences are being turned increasingly to help resolve contemporary crises. A paradigm of 'behavioural change' [68] is providing apparent solutions to problems as diverse as climate change and obesity. This paradigm is also seeping into animal health policies [68]. This could prove beneficial for animal health and vets: it may lead to more effective design of knowledge transfer mechanisms, for example, to help improve animal health [69]. But in doing so, the rise of the social sciences may have much to do with unblocking barriers to the neoliberal project, and continuing to sustain it rather than generating markedly different approaches to governance or the nature of expertise [70]. Alternatively, the contribution of the social sciences could lie in highlighting the imperfections of these emergent forms of veterinary expertise and, by developing new interdisciplinary and methodological ways of working, challenge the contribution that neoliberalism is making to the regulation of the food chain [71–73].

Our argument is therefore that veterinary expertise is heavily entangled within social, political, economic and natural relations. The ways and contexts in which neoliberalism has been put to work have ensured the perpetuation of some forms of veterinary expertise, but also the fragmentation and development of other forms which have contributed to the alienation of the veterinary profession from food chain regulation. Arguably, a different political project would have resulted in different forms of veterinary expertise and a different relationship between the veterinary profession and the food chain.

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