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Demedication without demedicalization? Redefining the medical and economic boundaries of veterinary professional jurisdiction

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ABSTRACT

Veterinarians' professional jurisdiction is nowadays facing major challenges. Regulatory changes in the prescribing and dispensing of medicines, which have historically been at the heart of veterinary jurisdiction, could fragilize the medical power of this professional group. This article analyses the practices and strategies deployed by veterinarians to preserve and readapt their jurisdiction, by discussing recent work in sociology of professions and reflecting on how the case of veterinarians could help rethink the contrasting case of human doctors.

This article is based on two field studies in France (in diverse livestock sectors) made of more than 40 interviews and 70 h of ethnographic observation of veterinary activity. We first show how veterinarians' jurisdiction over medicines was built up and how their professional autonomy is put under pressure by recent injunctions to demedicate livestock and to develop preventive approaches to animal health. We then detail how the economic and medical boundaries of veterinary jurisdiction are being redefined through dynamics of protocolization and contractualization of care which allow veterinarians to impose themselves as health managers. Finally, we demonstrate that this situation favors the emergence of new forms of professional legitimacy based on an "evidence-based veterinary medicine" that their competitors cannot contest, and on the development of economic infrastructures that supports and makes it possible to monetize this new professional expertise.

Finally, this article discusses contemporary processes of medical professionalization. It argues that, unlike human medicine, veterinary medicine has been able to maintain its professional power even if its historical jurisdiction has been reshaped. This has required a redefinition of professional activity both as a medical (*i.e.* approaches to animal health) and economic (*i.e.* business model of veterinary companies) practice.

During the veterinary professionalization process, one of the last dimensions of the professional monopoly to be acquired was jurisdiction over medicines. While veterinarians were initially concerned with epizootic diseases and their implications for national economies in most western European countries, during the second half of the 19th century they also began to be mandated to protect public health, with prerogatives over meat inspections in slaughterhouses and the control of infectious diseases on farms (Jones and Koolmees, 2022). In France, veterinarians continued to face competition from other professionals, included livestock farmers, "empiricists" (*i.e.,* gelders, blacksmiths, and healers) and pharmacists, over the routine management of animal health well into the 20th century. Laws regarding the sale, prescription, and administration of medicines, particularly the 1956 law on the prevention and control of bovine tuberculosis and the 1975 law on veterinary drugs, led to the de-legitimization of these competing professional groups (Hubscher, 1999; Berdah, 2012). Obtaining a monopoly on prescribing and dispensing veterinary drugs thus was a decisive step for the establishment of the professional jurisdiction over the animal health and veterinary medicines markets in France.

Recently, like in many other European countries, this jurisdiction over drugs was called into question for one specific pharmaceutical class: antibiotics. Policies developed to combat antimicrobial resistance (AMR) in the 2010s pointed an accusatory finger at veterinarians, who were considered to have been largely responsible for the excessive use of antibiotics in livestock farming (Fortané, 2019). Although this episode weakened veterinarians' professional autonomy, their monopoly was preserved. The price, however, was the introduction of new standards governing the prescription and delivery of antibiotics in animal health. Regulations now ban the use of certain antibiotics (known as "critical" antibiotics), require bacteriological tests as a condition for prescriptions,

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and limit the profit margins that veterinarians can earn from antibiotic sales. The development of private standards and "antibiotic-free" specifications backed by the agri-food industry also is restricting antibiotic use in livestock production.

This strengthening of state and market regulations on prescriptions raises questions about the continuity of the veterinary professionalization process. In human medicine, studies on contemporary changes in prescription practices and the effects of these changes on medicalization, understood to be the process by which professional medical jurisdiction is extended (Conrad and Schneider, 1992; Fassin, 1998), have highlighted phenomena of disengagement from doctors' knowledge and power. With patients, government regulators and the pharmaceutical industry all playing a role in determining diagnoses, illnesses and treatments (Conrad, 2007), doctors are having to reconsider their "mandate". Freidson identifies a "triple movement of rationalization, commodification and bureaucratization of prescriptions" (Freidson, 2001), echoing many analyses predicting the deprofessionalization of medicine or, in other words, demedicalization (Freidson, 1985; Haug 1988). According to these studies, the standardization of practices (via algorithms, clinical guidelines, monitoring of prescriptions, etc.), a process driven by the managerial considerations pervading contemporary healthcare systems (Timmermans, 2005), is the main reason for the loss of autonomy, and therefore of power, of doctors. Indeed, the guidance and surveillance of medical practice and decision through numerous protocols, which assemblage is often typical of a so-called "evidence-based medicine" (Timmermans and Berg, 2003; Timmermans and Kolker, 2004), weaken the legitimacy of clinical knowledge and empower other forms of expertise, in particular that of non-medical (nurses, pharmacists, lab technicians, etc.) and non-health (data analysts, admin staff, hospital managers, etc.) professionals. Antibiotic use is an interesting example of such dynamics as the growing control over these pharmaceuticals, within the framework of antimicrobial stewardship programmes, contributes to the standardisation and monitoring of medical practices, and the rise of managerial and bureaucratic rationalities over the medical jurisdiction (Broom et al., 2018, 2021).

In veterinary medicine, the tightened regulations on prescribing and dispensing antibiotics and the consequent decrease in antibiotic use suggest signs of "demedication". However, can this situation also be interpreted as one of demedicalization, meaning a loss of professional power of veterinary practitioners, similar to that observed among doctors? It is important here to consider the intrinsic economic characteristics of treating livestock, namely that the prescription, and more broadly the use, of veterinary medicines is both a medical and an economic practice. This is even more apparent and important in veterinarians' professional activity because drug prices are not directly regulated by the government, and drug sales contribute significantly to veterinarians' revenues, contrary to what is observed in human medicine. In this respect, veterinarian medicine dispels the belief that the health, financial and commercial dimensions of drugs should be separate, a belief that legitimizes a moral division of medical work conducive to asserting the authority of a doctor (Hughes, 1971). Moreover, while some of the literature on human medicine addresses economic issues of drug markets (innovation, consumption, industrial strategies), these remain relatively disconnected from issues specific to medical practice (Abraham, 2008; Williams et al., 2008). Medical anthropology, inspired by approaches based on the social life of commodities, has addressed the dual economic and medical dimensions of drug use (Whyte et al., 2003; Hardon and Sanabria, 2017), but has tended to reserve the former for production and distribution actors and the latter for prescribers and users. It is therefore by studying the economic infrastructure of health professionals' expertise that one may understand the foundations of professional power that is exercised through the act of prescribing and delivering medicines. Our article thus proposes to analyze the way in which the boundaries of the veterinarian monopoly on drugs reserved for livestock are being reconfigured, both from a medical and economic perspective.

Andrew Abbott has argued that processes of professionalization are processes of autonomization whereby the legitimacy and authority of certain social groups (and, consequently, the establishment of their professional jurisdiction) are recognized by the state, the public and other competing groups (Abbott, 1988, 2005). However, Abbott also argues that "boundaries come first, then entities" (Abbott, 1995), emphasizing the relational nature of boundary-work and the fluidity between professional characteristics and jurisdictional frontiers. The contemporary reconfiguration of the boundaries of veterinarians' jurisdiction thus is the process by which their forms of labor, their knowledge and practices, their economic organization, and their relationships with competing professional groups are currently being redefined. Nevertheless, inspired by Eyal's work on the sociology of expertise (2013), we argue that the veterinary jurisdiction is now being delimited (and extended) not only through autonomization, but also through processes of heteronomization that are nonetheless not corollaries of deprofessionalization. In other words, the ongoing transformations of veterinary activity are related to the emergence of norms standards and frameworks that initially were external to the professional group (like technical and economic standards supported by the livestock industry or the public authorities) and intended to control its (prescription) practices. However, this heteronomization did not lead to a loss of power (*i.e.*, demedicalization) as veterinarians managed to reassert their professional authority and reinforce their jurisdiction over animal health and medicines in a renewed way. This was achieved through medical and economic practices that were claimed and disseminated by a certain segment of the profession, and presented as being part of preventive animal health approaches.

We first review the implications of the development of this "preventive" medicine, which has been branded as a new approach (although one with ancient roots) ensuring the diversification of veterinary expertise and the demedication of animal health management. Based on the myth of reducing drug use in livestock production, preventive approaches in reality rely on other forms of animal medications, which allow practitioners to maintain their power in a jurisdiction that has expanded through diversification. We then study how veterinarians have managed to redefine the basis of their legitimacy through a standardization of their prescriptions and a protocolization of their care practices. Preventive approaches materialize through a process of heteronomization that encourages collaboration with farmers and livestock technicians, but also establishes veterinarians in a supervisory and managerial role. Finally, we look at the establishment of new niches of knowledge and practices which ultimately ensure veterinarians a professional territory that cannot be challenged by their competitors. These are based on a "state-of-the-art medicine" establishing veterinary authority over a renewed jurisdiction of animal health. Put together, we show the mechanisms underlying the "demedication without demedicalization" process currently characterizing the veterinarian profession.

1. Presentation of the study and the fieldwork

This research was undertaken within the framework of two collective projects on antimicrobial use in livestock, one in Europe (ROADMAP), and the other in France (AMAGRI). ROADMAP focussed on the practices, tools and knowledge of veterinarians with regard to animal health, while AMAGRI delved more deeply into organisational and professional issues related to veterinary drug regulation. The French project also covered a longer period of time, which allowed a perspective on the dynamics involved. Our analysis is based on two field studies conducted in 2020–2021 with French livestock veterinarians (this segment represents about 20% of the profession - 3500 individuals). In the first study, 32 interviews and approximately 20 h of ethnographic observation were conducted with veterinarians working in industrial sectors (pig and poultry) in northwest France, which has a high concentration of farms. In the second study, 18 interviews and about 50 h of ethnographic observation were conducted with veterinarians working on dairy farms in northwest and eastern France. The study subjects were selected

through a snowball sampling methodology, and each study combined the interview guidelines of the two projects to understand the different dimensions of the veterinarians' professional activity. Transcripts have been anonymised, and data collection followed ethical protocols approved by the European Commission within the framework of the ROADMAP project. Thematic and comprehensive analyses were performed with the collected data, using the diversity of experiences and points of view to reconstruct the "worlds" (and their dynamics) that are analyzed in this paper.

Veterinarians in integrated sectors (pigs and poultry), who are commonly called "industrial vets", work under various statutes. "Independent vets" can be either partners or salaried employees of private veterinary practices, while "coop vets" are salaried employees (often part-time) of producers' organizations, integrators and industrial companies. Independent veterinarians working in private practices are called to act as subcontractors or to complement the services of their colleagues working for cooperatives or industrial groups. Meanwhile, veterinarians in the dairy sector are usually called "rural vets". They are usually independent veterinarians working for veterinary practices located in rural areas that most often have a "canine" activity (pets, mainly dogs and cats) in addition to an activity with ruminant livestock (mainly dairy cows, but also suckling cows, sheep, goats). Over the last twenty years, networks of private veterinary practices, grouped together in the form of corporate groups, have developed. This consolidation movement is well advanced in practices specialized in industrial sectors, and is gradually extending to rural practices.

Industrial and rural veterinarians also differ in terms of how they manage animal health and organize their daily work. Rural veterinarians perform emergency procedures on a daily basis, involving minor surgery as well as the administration of drug treatments. These activities, which require the establishment of on-call systems, strongly influence the organization of work in rural practices. Treatments occur mainly at the individual level. In contrast, industrial veterinarians rarely perform direct interventions on animals. These are carried out by livestock farmers themselves. In addition, due to the conditions of livestock farming (large number of animals), animal health management is approached in a collective manner via overall housing, feeding conditions, and drug treatments administered to flocks or batches of animals.

2. Autonomy under dependence. The veterinary capture of animal health

The veterinary profession has established its jurisdiction over animal health in such a way that its autonomy has remained dependent on other professional groups' recognition and validation. The treatment of disease, which relies heavily on drug prescriptions and therefore lies at the heart of veterinary activity, is one of several intertwined areas of farm management that affect animal health, such as nutrition, genetics, housing, etc (usually referred to as zootechnics). However, French veterinarians have historically struggled to gain recognition in these areas (Hubscher, 1999), although there have been very specific moments and spaces where some veterinarians (in particular in industrialized livestock sectors) have managed to get a toehold in these contested jurisdictions, which are more (zoo)technical than clinical (Fortané, 2021). Recent claims about preventive approaches are pretending to change this situation by giving veterinarians the legitimacy to provide extended (and demedicated) services and, more importantly, to monetize these services. This trend is both a narrative aimed at re-establishing professional authority on grounds that are less dependent on drug prescription and sales, and a dynamic trying to establish the hegemony of the medical and economic practices of a certain segment of the veterinary profession, namely independent industrial veterinarians. Preventive and supposedly demedicated approaches to animal health are certainly not entirely new, but thanks to how the AMR public health problem currently is framed, they are (once again) at the heart of an important attempt to redefine the veterinary jurisdiction.

2.1. A captive market swayed by the claim of prevention

The French 1975 law on veterinary drugs confirmed the veterinarian profession's dual monopoly over prescribing and dispensing (Hubscher, 1999), and created the conditions for a "captive market". The prescription and sale of medicines, subject to a strict marketing authorization protocol following the creation of a national veterinary drug agency in 1975, became the almost exclusive source of income for veterinarians and, consequently, one of the key elements of their professional jurisdiction. Meanwhile other professional activities, such as surgical procedures and autopsies, continued to be practiced but appeared less and less financially profitable (Buffetaut and Gourlet-Fleury, 2001). In the 1990s and 2000s, when this professional and economic model was at its peak, revenue generated by the sale of drugs was used to cover the cost of various services (travel, diagnosis, advice) which were provided to build customer loyalty in a context of significant competition within and outside the profession, particularly in areas with high livestock densities (Fortané, 2021).

However, this conquest of the drug market was a form of dependent autonomy. For many veterinarians, their professional power was restricted to a fairly limited area of health management in livestock farming, namely disease treatment. Veterinarians were only called upon when other professional groups specialized in zootechnics needed their clinical expertise. In the industrial livestock sector, in 1980s and 1990s, agricultural cooperatives helped to further limit the intervention of veterinarians working in private practices (until they regain power later on). Not only did the law give cooperatives the right to stock and sell drugs on a "positive list" (drugs for preventive or zootechnical purposes, including vaccines, hormones and antiparasitic drugs), these cooperatives also had long employed veterinarians in order to obtain the right to sell curative drugs (Dahan et al., 2013).

The economic and medical compromise underlying this equilibrium was weakened by the public policies to fight AMR that have been set up since the 2010s. The regulations limiting the use, prescription and sale of antibiotics effectively jeopardized the business model of veterinary practices based on sales volumes, prompting the profession to reconsider the economic value of its technical expertise. This is what we were told by industrial veterinarians whom we met, such as this pig farming specialist who has been working in a private practice for nearly 30 years: "*This economic model was outdated. The fact that there is a regular, minimal but regular, billing for services partly compensates for the loss of revenue*" (industrial vet 20). However, this means that veterinarians must establish themselves as knowledge holders in domains where they do not have autonomous power. On the one hand, reduced antibiotic use effectively relies on the development of alternatives to drugs for which veterinarians do not have a monopoly on the prescription or sale (phyto and aromatherapy, hygiene and nutrition products, etc.). On the other hand, it involves the generalization of a holistic approach to animal health where zootechnical parameters, such as nutrition, biosecurity and building management, are decisive but are also shared with other actors (farmers, livestock technicians, nutritionists, technical advisory organizations). This ongoing shift regarding the boundaries of veterinary jurisdiction is commonly described by the vast majority of actors (either from the field or from more political spheres) as a move towards preventive medicine. Definitions can vary, but they usually associate the idea of an extension of veterinary expertise (and therefore of veterinary services) with a vision of more contractualized relationships between farmers and veterinarians, where the latter would not be limited to disease treatment and emergency intervention (Fortané, 2021). As a bovine veterinarian told us, "*livestock disease prevention mostly consists in trying to arrive at a situation where vets don't have to intervene*" (rural vet 19). In many of our interviews, veterinarians conceive prevention as the opposite of, and fundamentally different from, treatment and emergency intervention.

2.2. Old wine in new bottles: prevention and the myth of demedication

The problem of AMR and the need to reduce antimicrobial use in livestock recently have boosted the idea of preventive veterinary medicine (Fortané, 2019; Helliwell et al., 2022), although the latter has a much longer history. In the first EcoAntibio plan (2012–2017), preventive approaches were associated with agroecological transitions aiming to diminish all pharmaceutical inputs and support technical changes in farming systems (Arrignon, 2020). However, this myth of demedication did not last very long in the field as many "alternative to antibiotics" medicines quickly prospered and helped veterinarians to maintain their claim on being the guardians of animal health. This form of prevention, one which allows various modes of medication while at the same time valorizing a diversified technical (rather than clinical) expertise, echoes the practices and economic organization of a very small segment of the profession in the 1980s and 1990s (namely independent pig and poultry veterinarians, as opposed to those employed by producers' organizations and to dairy vets – Fortané, 2021). These approaches, which were once quite marginal, or at least contested within the profession, are now gaining ground across the entire profession (yet still with some resistance), supported by the success of the businesses and the entrepreneurial culture of the pioneers.

Three main "alternatives to antibiotics" can be observed in the field, which suggests that, as we were told by an independent poultry veterinarian, demedication is just a "de-antibiotication": "*Now the context has changed since we are in a phase of demedication. We fight against AMR and that's a good thing. So we demedicate, which means reducing the use of antibiotics*" (industrial vet 25). The first alternative to antibiotic use is vaccination. Vaccination programmes have become systematic in all sectors, supported by the roll-out of a substantial number of products by pharmaceutical companies that have invested heavily in research and development in this product range (live attenuated vaccines, adjuvanted inactivated vaccines, recombinant vaccines, auto-vaccines). The vast majority of the practitioners whom we met present vaccine solutions as the first prevention measure, emphasizing the variety of "*viral, bacterial and even parasitic vaccines*" available today. This substitution of curative antibiotic treatments by vaccines is heavily promoted among livestock farmers, as during a farm visit where the referring veterinarian sought to win over the client by calling the vaccination plan a "*blitz*" in reference to the method's effectiveness and speed (industrial vet 7). The second alternative, consisting of phyto/aroma-therapy, is developing in all sectors and production systems. This is a disputed market since veterinarians do not have a prescription or sales monopoly on these so-called "alternative medicines". However, interest is now spreading beyond the organic sector, where knowledge about phyto/aromatherapy products and their use in veterinary practices first began (Hellec et al., 2021). Large industrial and dairy sector corporate groups have integrated phyto/aromatherapy into their range of services. The third alternative to antibiotic use takes the form of veterinary prescriptions that now extend far beyond the scope of pharmaceuticals to include a vast array of substances. In all sectors, there are wide ranges of food supplements, mainly based on vitamins, minerals, trace elements and pre and probiotics, in various galenic forms (powders, pills, etc.), as well as products for hygiene, water treatment and building disinfection.

All in all, everyone in the field seems to recognize that demedication is a myth associated with the first stages of the AMR narrative (early 2010s), a period when the veterinary profession, and the livestock sector in general, was still trying to reframe the public problem to its own benefit (Fortané, 2019). For example, the result of a consultation of the main veterinary business groups and the union of industrial veterinarians claimed in 2019 that "*rational medication should be promoted, rather than demedication*". If the current moment is put into some historical perspective, one should recognize that prevention was never really regarded as a drug-free zone by the main actors of animal health. The EcoAntibio plan (2012–2017) officially promoted vaccination as one of the main levers to reduce antimicrobial use (*i.e.*, the "vaccin'acteurs" campaign in 2016), and launched important work for the development and authorization of "alternatives to antibiotics", conceived as a large range of prescriptible products, including phyto- and aroma-therapeutics as well as probiotics and minerals (Anses, 2018). Looking back to other moments when holistic approaches have been promoted by the profession, for example, in the 1950s and 1960s in the UK (Woods, 2013), or the 1970s and 1980s in France (Fortané, 2021), systematic antibiotic use (for post-weaning piglets or young chicks) was even included in the "preventive" toolbox and was, as such, also articulated with other methods and forms of intervention rooted in zootechnical knowledge like nutrition, housing and husbandry (Woods, 2019). In the end, economic rather than medical concerns are driving the myth that demedication is a pillar of preventive veterinary medicine.

This diversification of veterinary expertise is indeed subject to jurisdictional struggles. By moving away from a clinical and infectious approach to animal diseases, veterinarians are exposing themselves to increased competition from actors who already offer the services they wish to provide on behalf of "demedicated" interventions, such as hygiene and nutrition, or even alternative medicines. For instance, technicians working for feed manufacturers may succeed in selling nutritional solutions to farmers who have ignored products recommended by their veterinarian. This was noted by a veterinarian practicing in the pig sector who also serves as the director of a company federating four veterinary clinics specializing in all types of livestock production: "*Sometimes we prescribe something, and then [technicians] return after … some entries in our treatment logs can be a little embarrassing. For example, when it comes to selenium vitamins or antioxidant complexes, we have all the right stuff. But then the feed manufacturer shows up and downplays them all*" (industrial vet 23).

The extension of the veterinary jurisdiction, correlated with the development of preventive approaches to health across the profession, is thus a complex process that touches the foundations of veterinarians' power. If their expertise on curative treatments and emergency interventions no longer represents the heart of their professional activity, they have to find another means to secure their core business. Although the preventive toolbox and the associated labor organization (in particular relationships with other professional groups) is not entirely new, their generalization is supported by an important renewal of the technical and economic grounds of veterinary activity. As we will see now, veterinarians are indeed trying to reshape their jurisdiction around preventive medicine to assert their medical power over other actors by becoming the "health managers" of the livestock sector, and finding ways of monetizing this position and its specific services. In the end, it is their business model based on drug sales, not their medical practice, that veterinarians are trying to demedicate.

3. Heteronomy under control. Veterinarians as "health managers"

Specific forms of cooperation are being developed between veterinarians, farmers, and other livestock professionals (technical advisers, upstream or downstream industries) under the banner of preventive medicine that are based on the blurring of technical and health boundaries. The professionalization process in which veterinarians are involved is thus taking the shape of the "network of expertise" described by Eyal (2013). Eyal proposes to reconceptualize professional power and suggests that it should be decorrelated from notions of autonomy and monopoly. He considers that power is linked to "generosity" and "co-production", and that it lies not in the hands of experts but within a network of expertise, conceived as a heterogeneous assemblage of multiple actors, knowledge, practices, tools and so on. We here suggest apprehending those dynamics as a process of "professionalization by heteronomization", based on forms of what Eyal calls "collaboration" (ability for a profession to elicit cooperation with competitors) and "liaison" (involvement of clients/patients in the definition of goals and the development of specialized knowledge). The strength of this

medicalization through heteronomy lies in the control that veterinarians retain over the definition of their jurisdiction: although areas of veterinary jurisdiction become open to non-veterinary professionals (such as diagnosis of routine diseases), this openness generates a network of expertise that serves to expand the boundaries of veterinary jurisdiction. In other words, two dynamics must be comprehended relationally: the relative relinquishment by veterinarians of their autonomy on drug prescription (and more broadly, medical expertise) on one side, and the growing coordination role of the overall management of animal health, conceived holistically by preventive approaches, on the other side. The renewed claim over preventive approaches shaped by the current AMR narratives sounds like an attempt to establish veterinary (heteronomous) power though the figure of "health manager", which relies then on two essential and original phenomena: protocolization and contractualization of care practices.

3.1. Establishing protocols: coordinating care to ensure "good health practices"

The process of protocolizing veterinarian activity refers to a dual dynamic of standardizing care practices and rationalizing tools to measure and monitor the health of animals. It has been recently encouraged by the so-called "prescription-dispensing" decree in 2007 (2007-596 decree of April 24th) which requires that a "farm health assessment" (referred to here by its French acronym, BSE) be carried out and that a "care protocol" (referred to here by its French acronym, PS) be established in order to be able to prescribe medication without first clinically examining the animals. The establishment of this BSE-PS system places veterinarians in the position of advisers who delegate to farmers the daily health management of herds (called "flocks" and "batches" in poultry and pig farms, respectively) while regularly supervising health interventions to back up this autonomy. However, veterinarians often describe this important regulation not as a turning point that profoundly changed their practices, but rather as the outcome of years, if not decades, of such arrangements between vets, farmers, and livestock technicians over animal health management. As noted by a local government veterinary inspector in Bretagne, "*the 2007 regulation is the result of a consensus between these professions, but consensus means that it has provided legal cover for a widespread practice, which was that vets signed prescriptions over the counter, which was the actual way they operated. So it provided a legal framework to practices that were already very common*". This regulation also establishes the practices of a certain segment of the profession as legitimate and dominant. The 2007 decree is perceived as a victory for vets working for cooperatives in industrial sectors who relied extensively on farmers' and technicians' observations to prescribe medicines, while independent vets continued to struggle to access integrated pig and poultry farms, and therefore to be able to provide drug prescriptions and, more importantly, drug deliveries. As this vet inspector said, "*I think that in industrial production, there is a little war between the independent businesses and the businesses belonging to producers' organizations. The independents have suffered a lot from this. (…) And 2007 was a little victory for the cooperatives as their practices have been recognized*". As we will see, history may have the last laugh as the generalization of such practices has in the end benefited independent vets, at least those from large corporate groups, who have been able to utilize this now legally recognized porosity of the animal health jurisdiction to extend and monetize their expertise in other areas (while coop vets are more constraints by the professional framework imposed by their working conditions). Fifteen years on, all industrial veterinarians feel that this regulation has legitimized and helped develop their role of "health managers".

A veterinarian specializing in pigs, renowned for her expertise in ventilation systems and the rare woman to have taken over an independent practice from a leading figure in the profession, describes the added value of her advice to farmers: "*We put everything on the table, the health problems for each physiological stage, and clearly specify the care protocol, which farmers can use to administer treatments without needing to call in a veterinarian. We identify common problems that farmers know how to deal with, and explain how to manage them*" (industrial vet 10). In industrial sectors, BSE-PSs are regularly carried out in the presence of technicians from groups and cooperatives, who are seen as health auxiliaries encouraging the application of protocols, and who have a duty to "support *[farmers] in following the guidelines that [the veterinarian] has given them*" (industrial vet 32). By placing other professionals likely to intervene on farms under their authority, and by claiming the role of point person able to prescribe the implementation of care protocols, veterinarians excuse themselves from clinical interventions considered to be basic or "routine", and reaffirm their medical competence by posing as the referent for the exclusive management of "complex cases" (Hughes, 1971). As the veterinarian quoted above indicates, "*They [the other professionals] are 'on the front line' so to speak, while we more or less supervise everything. There's* technical support *for feed, genetics and so on. We also are consulted increasingly about problems that have nothing to do directly with a pathology but where our opinion carries weight*".

The position of health manager leads veterinarians to link their prescriptions to a wide range of expertise services that can range from examining the reproductive conditions of sows to evaluating internal and external biosecurity, and include assessing the quality of vaccinations. Preventive medication can only be prescribed based on such monitoring and surveillance methods, which go far beyond the clinical examination of symptoms or injuries. A similar dynamic is occurring in larger rural practices. For example, a rural practitioner, a partner in the practice in which she works, describes her job as "*something more to do with a computer or paper and pencil [laughs] rather than a stethoscope and thermometer!*" (rural vet 15). In this respect, rural veterinarians are tending to adopt strategies comparable to industrial veterinarians by arguing that they have greater expertise than agricultural actors and by proposing health monitoring focused on specific livestock problems ("milk quality", "reproduction", and "parasitism"), based on regular visits and diagnoses. However, they admit that they are struggling much more than their "industrial" peers to establish themselves in this position as "*there is little demand from farmers. It's up to us to try to create the demand, which makes it really difficult. A guy who asks us to come and do a calving, it's easy, we go. But a guy who doesn't ask for anything in terms of follow-up, we have to offer him follow-up and that's a lot more complicated*" (rural vet 5). As we will see, the protocolization of care in rural medicine is developing in regions with both a high density of cattle farms and larger veterinary practices able to manage their staff in such a way that protocols and their economic corollaries, *i.e.* contractualization), can be developed.

All in all, assuming the figure of health manager is a way to assert a transversal expertise that legitimates a supervisory role which, just like a king in court societies (Elias, 1983), relies on interdependencies with other actors, and therefore remains structurally fragile. As we were told many times, technicians make the job of veterinarians feasible as they alone can perform the work of technical maintenance, fine-tuning or repair (on buildings, ventilation devices, feed distribution systems, etc.) that vets "prescribe" in order to establish optimal conditions for medicines to be effective. Known and documented in human medicine, this protocolization of medical practices through the establishment of guidelines, care reference systems and quality schemes has been interpreted as a symptom of a rationalization of care practices, encumbering doctors' daily work and fragilizing their professional authority by weakening the monopoly of medical knowledge and empowering the skills of non-medical and sometimes non-health professionals, who are becoming able to fulfill tasks and even take decisions without doctors' control (Timmermans, 2005). In contrast, the protocolization of care in veterinary medicine is akin to professionalization through heteronomization, in the sense that the porosity of the boundaries between health and technique allows veterinarians to establish an overall expertise as the "health manager". This enables them to liaise and collaborate with others in a way that secures them the role of network

coordinators (especially in industrial livestock sectors). However, this renewed professional expertise and legitimacy require an economic infrastructure on which to build.

3.2. Contractualization as a new economic model for preventive approaches: from health manager to business entrepreneur

Over the past ten years, the use of contracts between veterinarians and their various clients has been increasing in the industrial sector but also, to a lesser extent, in the dairy sector. Veterinarians view this as the economic model likely to give them "fair" remuneration for high value-added health follow-up that is not based solely on drug prescriptions and sales. Our interviews show that billing systems for consulting vary greatly, both in terms of what they are named (subscriptions, fixed price, contracts, etc.) and their degree of formality (contracts with or without signatures). The architecture of a practice's business model also appears to depend on the employment status of veterinarians. Practitioners in private practice are particularly keen to charge flat rates for services because clarifying and harmonizing their commercial offer is a condition for maintaining customer relations. A veterinarian in his forties, a partner in a network of practices and the manager of one of the corporate group's service companies specializing in livestock operations, talks about the meticulous work carried out within the group to adjust commercial tools to clients' characteristics. As his group is seeking to increase the share of sales of services in its revenue stream, he is making substantial efforts to perfect his commercial engineering and adapt his contracts: "*We spend a lot of time on it. Today, we have a whole range of solutions, and we propose to clients: "I can give you so many half-days over the year and it's up to you to use them"* (industrial vet 27).

However, this approach is not only used by independent veterinarians. Today, all veterinarians, including employees of cooperatives and production organizations, work on the economic valuation of their services. The urgency of this issue, and the variety of possible ways to establish contracts, was described to us by the head of the "monogastric nutrition" and "animal health" divisions of a large cooperative group: "*We think that in 10 years, the current model will be dead because drugs will not generate enough revenue to pay for services. […] We are going for services. I think this will be the model, billing services with collection agreements either to [producer organizations] or to farmers"* (industrial vet 6). This excerpt from an interview with a senior veterinarian and a key player in the health services of agricultural cooperatives indicates that negotiations are currently underway to devise a sustainable system for financing livestock health monitoring. The development of care protocols therefore involves the appropriation of economic practices and knowledge that were initially located on the periphery of veterinary jurisdiction, but which have proven to be indispensable for establishing networks of actors and coordination mechanisms that allow veterinarians to fulfill their role as "health manager".

This requirement to accompany clients, through the formalization of contracts including a set number of audits and follow-up activities, is thus a way to maintain control over care protocols and the revenues that they generate. Although our study showed the substantial development of standard contracts covering herd health monitoring in rural practices, this remains a limited activity compared to emergency interventions and prophylaxis. By establishing contracts, in addition to maintaining a system of loyalty and accountability with farmers, rural veterinarians secure their margins on drugs: "*contractualization limits self-medication (…) as they can call us every time there is a sick animal*" (rural vet 6). Moreover, follow-up visits may in some cases lead to the administration of drugs that would not otherwise have been prescribed. For example, "reproduction" monitoring, which is based on monthly ultrasound scans of cows presumed to be pregnant and those that have recently calved, makes it possible to identify certain fertility problems more precisely and thus leads the veterinarian to suggest hormone treatments. It is thus a certain economic model (the monitoring contract) that allows, on the one hand, professional expertise to extend to areas that are not historically those of veterinarians (reproductive issues being at the crossroads of zootechnical and health performance) and, on the other hand, to maintain the prescription of drugs as a pivotal and profitable activity, even if its share in global veterinary revenues slightly diminishes, as we were told by most of the veterinarians interviewed.

This shows once again that we are observing complex and long-term trends rather than turning points. Prevention, through its contemporary forms of protocolization and contractualization, has not completely changed the medical and economic practices of the veterinary profession, which already relied in the past on diversified services and struggled to monetize them. However, contemporary prevention and its narratives seem to be slowly yet surely redrawing the boundaries, and therefore some parts of the "entity", of veterinary jurisdiction. The figure of health manager and the economic foundation on which it is grounded shape a professional identity structured around a large range of skills and roles, of which it is actually the transversality and plurality that legitimatize veterinary authority. As Abbott probably would say, boundaries shape entities; we could also add that economic infrastructure shapes professional expertise. Indeed, this dynamic also marks the slowly developing hegemony of a specific segment of the profession, *i.e.,* independent vets of industrial sectors, who have managed to impose a particular form of veterinary business particularly suited to support and convey this ongoing evolution of the animal health market. As we will see now, this solid infrastructure, made of networks of various businesses, favors the extension of veterinary jurisdiction as it allows the conservation of forms of autonomy, in other words, of niches where veterinary expertise remains incontestable, unavoidable and, more importantly, monetizable. By claiming a monopoly on cutting-edge medicine, relying on the scientific skills and the technical infrastructure that veterinarians hold and that are adjusted to the economic performance and profitability objectives of modernized farms, the profession renews the (autonomous) basis from which its (heteronomous) power and legitimacy can thrive.

4. Emancipated legitimacy. "State-of-the-art medicine" and the construction of medical and economic niches

It would be a mistake to think that the diversification of veterinarians' professional knowledge completely overshadows their clinical competence, or that the booming sales of inputs, whether these be drugs or hygiene and nutrition products, are ceasing to be the core of veterinary revenues. Veterinarians are retaining control over prescriptions by enriching their activity with scientific legitimacy and, more importantly, by adapting it to the economic and sociotechnical infrastructure in which health problems emerge. "State-of-the-art medicine" based on tailor-made diagnoses, precision tools and personalized advice is thus developing, supported by new forms of veterinary businesses and meeting production-oriented agriculture's growth imperatives.

4.1. Towards a more sophisticated veterinary art

In industrial sectors, against a backdrop of significant competition between veterinary corporate groups and individual private practices, the drug mandate remains essential to the financial sustainability of businesses. However, the legitimacy of prescribing appears to have been renewed. This is not only based on the traditional clinical competence of veterinarians, nor even on the technical skills that they have developed in recent years through preventive approaches. It consists much more of a scientific legitimacy, that of "evidence-based medicine", which makes biological and epidemiological knowledge the foundation of professional authority in the context of state-of-the-art medicine (Timmermans and Kolker, 2004). Applying such a rationalization of medical practices to animal care has often been defended by veterinary scientists, arguing that veterinarian practices should be more research-based (notably in the name of an "evidence-based veterinary medicine" (Vandeweerd et al., 2012; McKenzie, 2014), but its inclusion in the practical and daily

activity of veterinary practitioners, and even more so in their medical and economic relationship with their patients/clients, remains a challenging aspect of contemporary professionalization dynamics.

The development of increasingly precise and efficient analysis tools, as well as the wider range of analyses now possible (parasitology, bacteriology, serology, quality control of cleaning/disinfection procedures, etc.), is thus a way for private veterinarians to stand out within the professional field. They do so on the one hand by basing their prescriptions on highly specialized scientific expertise (necroscopic examinations, immunity checks), and on the other by creating a service that their veterinarian colleagues and clients become dependent on. The possibility of establishing the right therapeutic treatment based on biological risks assessment builds a relationship of dependence on a diagnosis that only specialized veterinary analysis laboratories owned by large corporate groups can deliver, as indicated by a senior veterinarian of one of these groups: "*We now are developing technologies for new emerging diseases. We are therefore going to develop molecular biology techniques, PCR, and sequencing techniques to identify strains*" (industrial vet 15). New types of diagnostics are thus being established, which aim not only at curing sick animals, but also at guaranteeing the optimization of treatments. These essential items in the veterinary toolbox also play an important role in maintaining the captive dimension of the animal health market, as they tie farmers to a given practice which has the means to perform the necessary analysis and deliver the appropriate medication.

This sophistication of veterinary medicine establishes new ways of "sorting" medical situations and of defining the knowledge and practices that are suitable for dealing with them. In the case of non-serious symptoms that may fall within the competence of farmers or technicians, veterinarians only intervene to sign the prescription and deliver the drug. This "deterritorialization" of veterinarians' work, generalized by the 2007 BSE-PS decree and the development of evidence-based medicine, now allows veterinarians to perform their art elsewhere, in particular at the practice rather than on the farm. This is described by a veterinarian who recently joined a practice of a corporate group: "*One day a week, we are at the clinic to answer calls from farmers, calls from technicians, follow-up on autopsies that are brought back to the laboratory*" (industrial vet 29). For industrial sectors, the design of customized products is required when the case is complex, clinical signs persist after a first-line treatment, or germs are proliferating. This is the case of auto-vaccines, whose manufacturing process is based on a quasi-customized expertise, as described by a veterinarian specialized in the follow-up of clinical trials, having acquired a certain reputation thanks to the research he carries out on a major pig pathogen: "*Today, we have a lot of auto-vaccines that have between two and seven strains of streptococci. It makes for more complex products*" (industrial vet 20).

Rural veterinarians also have become equipped to perform rapid testing to refine diagnoses and target treatments to individual animals and pathogens. The aim is to limit the use of drugs, chiefly antibiotics, but also other therapeutic classes such as antiparasitics. However, their equipment is less sophisticated than that of industrial veterinarians. For example, many rural practices now offer coproscopies: requiring a simple microscope, these analyses are usually performed by a single veterinarian who has been trained to assess parasitic infestations in animals. Before prescribing, veterinarians must follow a precise methodological protocol which consists of demonstrating the validity of the treatment they deliver on the basis of scientific tools and knowledge that they alone possess. In other words, they agree to share clinical and technical skills with other actors while retaining the role of point person in this cooperation (heteronomization under control) because they hold exclusive resources allowing them to legitimize this coordination role (an autonomy that is no longer dependent, but rather emancipated). State-of-the-art medicine therefore brings an indisputable legitimacy to veterinarians which grounds their heteronomous professional power on niches of an autonomous expertise. However, the foundation of this expertise is not just medical but also economic. It resonates with the emerging notion of "health performance", indicating that transformations of veterinary jurisdiction remain linked with those of productivity-driven agriculture.

4.2. *"Health performance" serving veterinary capitalism*

Historical studies tracing the development of the link between veterinary knowledge and productivity-driven agriculture have highlighted the importance of preventive approaches to animal health in this alliance (Woods, 2013, 2014). For example, the definition of herd health plans has largely supported intensive livestock farming by compensating for the degraded health of animals subjected to high stocking densities. Contemporary prevention practices have the same objective, that of supporting both the intensification and the economic viability of farms. However, they are supported by a new economic organization of veterinary businesses.

Firstly, there is a professional reflex among veterinarians to assess the economic opportunity of a treatment, *i.e.* to evaluate its cost and compare this with the health benefit provided. The decision to prescribe is not only driven by the medical effectiveness of a therapeutic solution, but also aims to optimize a farm's health expenses, which are sometimes quite high. A pig veterinarian, practicing on behalf of a private company that is part of the most influential cooperative in western France, estimates that: "*We can combine four or five vaccines, plus an auto-vaccine, and end up with 4 to 5 euros-worth of vaccines and auto-vaccines per piglet. If you multiply this by the number of piglets produced per sow per year (30), that's a cost of about €150 per sow. That's how the amounts get pretty high*" (industrial vet 20). The establishment of standards for evaluating and controlling health care costs also is an issue for doctors, whose prescription practices are closely scrutinized by primary health insurance funds, which seek to reduce total amounts (Timmermans and Berg, 2003). In contrast, controlling the cost of drugs prescribed by veterinarians is not the responsibility of public authorities, but rather of clients. This system of client-based economic control creates a situation of direct dependence (risk of losing the client if the objective is not achieved), but above all generates an adhesion to the same value system. In the industrial pig and poultry sectors, the farm visits that we observed indicate that the calculation of the cost of treatment is an integral part of the veterinarian's advisory activity, and that a normative reference framework based on profitability, improvement of technical results and economic performance is shared between farmers and veterinarians. During one of these visits, the veterinarian presented the farm's employees with the annual balance sheet of veterinary expenses. Graphs and charts were used to show an increase in the average expense per sow and to break down the expenses by class of medication. The veterinarian then compared these data to those of other farms in the group, pointing out that they "*perform better*" to encourage the employees to change some of their practices and thus reduce costs. Veterinarians' expertise therefore aims to align technical and economic efficiency with what is now often called "*health performance*", and their advisory role in terms of "*rationale medication*" is conceived in relationships with these two logics.

Secondly, this goal of cost-effective, cutting-edge medical expertise is not just about the economic imperatives of clients; veterinary companies themselves must be able to take advantage of it. The marketing and economic valorization of veterinary services and products are essential in a context of strong inter and intra-professional competition and rapid changes in agricultural production conditions. The mastery of precision tools and scientific equipment allows veterinarians to claim a privileged place on the market of products not subject to marketing authorizations (nutritional, hygiene, phyto- and aromatherapeutic, etc.). Although they do not have a sales monopoly, they can contribute their knowledge in the formulation and manufacture of these products with high technical added value. This was indicated by a veterinarian who is a member of a large group of private practices, trained in phyto-aromatherapy, and who, after having practiced for nearly 15 years in the poultry sector, is now involved in product design and training: "*Our work is all about*

developing original, technical products. We worked on a formulation of a plant-based painkiller to relieve poultry, turkeys that have difficulty walking at the end of the batch period. As these products are at the fringes of the market, we manage to sell them" (industrial vet 22). In rural medicine, the phyto-aromatherapy sector represents important stakes, both as an "alternative" medical solution to antibiotics and as an economic niche. Some rural practices are thus involved in the preparation of treatments based on essential oils for targeted pathologies (mastitis, wounds, etc.). In doing so, rural veterinarians are staking out a position in a booming market that has long been dominated by a small number of specialists, both veterinary and non-veterinary (Hellec et al., 2021).

Such a way of monetizing veterinary activity implies adjustments of the organizational and economic infrastructures of the profession. Practices that are able to develop a large set of services and products, either in the industrial or the rural sector, have evolved their business model towards a diversification of their income sources, although they maintain the captive nature of the veterinary jurisdiction/market. The expansion of veterinary services through processes of protocolization and contractualization, as well as state-of-the-art tools and expertise, requires not only devising new ways of billing clients, but also inventing organizational arrangements capable of ensuring the sale of these services. Such companies usually take the form of corporate groups or networks of practices able to concentrate a wide range of economic activities (such as performing audits and laboratory analysis, setting up of clinical trials, selling and sometimes manufacturing hygiene products and food supplements, etc.). This type of veterinary business started to develop in the French industrial livestock sector in the 1990s, and more importantly in the 2000s, and has supported the progressive expansion of independent veterinarians over those employed by agricultural cooperatives (Nouaille, 2015). These companies have played an important role in the growth of services associated with preventive veterinary medicine as they served as the economic infrastructure that enabled the transformation of medical practices or, more precisely, the legitimation, monetization, and generalization of such practices. All in all, through their participation in the economic optimization of industrial food production systems and their inventiveness in developing profitable services for their own companies, veterinarians are reaffirming their professional power through a form of emancipated legitimacy which is in the end enabled by their own clients. This process seems to echo what other authors have called "client" (Salman, 2019) or "corporate professionalization" (Muzio et al., 2011), where the objective of clientele capture and the structure of the market on which a professional group operates constitute key elements of the construction (or redefinition) of its jurisdiction. This form of professionalization is probably the price of a veterinary legitimacy which is less and less guaranteed by the state (Enticott, 2014), and which lies on an articulation of heteronomy and emancipation.

5. Conclusion

The foundations of medical power, and how these are renewed, are classic questions in the sociology of professions and health (Freidson, 1970). Although veterinary medicine is an archetype of the medical professions system, this field has been used little to test these questions empirically. This paper has tried to address some of them and has hopefully produced heuristically interesting results.

First, it confirms that preventive approaches aiming to limit health risks do not lead to demedication from a medical point of view; it is rather a way to refine the legitimacy of veterinary treatments through concepts like rationale or prudent medication (including antibiotics). Demedication actually reflects economic concerns, *i.e.* the intention to make veterinary business models less dependent on drug sales.

Second, this paper offers a better understanding of the joint dynamics between "healthification" and medicalization. By extending its professional jurisdiction and expertise, the veterinary profession is engaging in a medical professionalization process (medicalization) while simultaneously defending an expansion of what is considered health-related (healthification) by blurring the boundaries between animal health and zootechnics. Contrary to situations observed in human health, where "medicalizing the social" does not necessarily involve a "professional conquest" by doctors, and may even facilitate the emergence of non-medical professions (Fassin, 1998), the healthification of livestock farming has effectively extended veterinarians' expertise and enabled them to reaffirm their medical power. However, this dynamic can be better understood when conceiving professionalization mainly as a process of heteronomization, which makes it easier to apprehend the moving, porous and competitive boundaries (both medical and economic) of the veterinary jurisdiction. Animal health is defined through the relationships of several professional groups. The current development of standards, protocols and contracts favors the legitimation of veterinarians' diversified expertise and their role of health managers. Moreover, state of the art tools, equipment and domains of knowledge provide another source of professional authority that cannot be contested by other professional groups. A sort of "evidence-based veterinary medicine" is therefore developing, combining elements of the human evidence-based medicine such as protocolization and standardisation of care, as well as scientific legitimacy (Timmermans and Berg, 2003), but without diminishing the professional power of veterinarians. This process rather renews and reaffirms veterinary legitimacy through mixed forms of heteronomy and autonomy. To paraphrase Eyal (2013), we would argue that the establishment of a professional power consists "not [only] in restriction and exclusion, but [also] in extension and linking".

Third, our presentation of the case of veterinarians is unique in that we view the provision of professional expertise as a practice that is not only medical but also economic, *i.e.* a way to capture clients and structure revenues as well as caring for patients. The development of preventive veterinary medicine has been supported by the evolution of the economic infrastructure of the profession, that is to say, its businesses. Moreover, such practices (again, both medical and economic) were at some point limited to a very specific segment of the profession but have now become more hegemonic. Independent industrial vets have managed to become the new elite of the profession and to impose their particular vision of veterinary medicine by associating the claim over preventive approaches with the narratives of AMR, *i.e.* the necessary "demedication" which has been a way to legitimize certain forms of medication (rationale or prudent) and certain forms of businesses (corporate groups or networks of practices). The emerging notion of "health performance" thus perfectly embodies these contemporary developments in the veterinarian profession, which keeps accompanying the continuous intensification and industrialization of livestock production, but also manages to maintain medicalization in a process of healthification.

There are lessons here for the sociology of other professions, in particular that of human medicine, which is also continuously confronted with the challenge of prevention. On the one hand, one must never forget that a jurisdiction is also a market, and that medical practices are also economic practices. It may be less visible in a healthcare system which is (mostly) publicly funded and where prices of therapeutical products and medical advice are reimbursed, but many studies on pharmaceutical production and circulation remind us that patient-doctor relationships are structured by economic issues. On the other hand, conceptions of human doctors' medical power could be refined by the contrasting case of veterinarians. The deprofessionalization of medicine, that has often been describe as a corollary of processes of standardization, protocolization and managerialization of care, could also be seen as a reconfiguration of professional hierarchies and segmentations (both within the medical profession and in relationship with other health professions) carried out by the emergence of a new professional elite.

Authors contribution

CC and LB have conducted the fieldwork; all authors have analyzed the data; CC and NF have drafted the manuscript and LB and FH have revised it; NF has led the projects funding this research.

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Data availability

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