

# A great Carolingian panzootic: the probable extent, diagnosis and impact of an early ninth-century cattle pestilence<sup>b</sup>

'A most enormous pestilence of oxen occurred in many places in *Francia* and brought irrecoverable damage.'<sup>1</sup>

This reference to an epizootic in the *Annales Fuldenses* in 870 is one of roughly thirty-five encountered in the extant written sources of Carolingian Europe.<sup>2</sup> In total, mid eighth- through mid tenth-century continental texts illuminate between ten and fourteen livestock plagues, the majority of which affected cattle.<sup>3</sup> In no earlier period of European history does the written record reveal so many epizootics.<sup>4</sup> Cattle pestilences are reported in 801, 809-10, 820, 860, 868-70, 878, 939-42 and, possibly, 842-43 and 849;<sup>5</sup> equine epizootics are recorded in 791 and 896; and in 887 a plague is said to have afflicted both cattle and sheep.<sup>6</sup> Some of these plagues appear to have been panzootic in scope: the pestilences of 809-10 and 939-42 affected large areas of continental Europe, so too, it seems, the plagues of 820 and 868-70. The first of these, and possibly the fourth, spread into the British Isles.<sup>7</sup> The manner in which these outbreaks of disease were documented significantly limits what can be known about them. The brevity and ambiguity characteristic of Carolingian accounts of epizootics prevent us from establishing with much certainty which plagues were the most significant in terms of extent or impact. The scale and mortality of several pestilences may have been far greater than the extant evidence indicates. When and where mid eighth- through mid tenth-century epizootics initially irrupted and fizzled out is often unclear, as are the temporal and spatial extent, and paths of dissemination of all of the aforementioned plagues. Additionally, evidence for epizootics in sources contemporary to the Carolingian period, but composed outside of Carolingian Europe (in England or Ireland for example), does not align well with Carolingian evidence and rarely, consequently, enhances our understanding of mid eighth- through mid tenth-century continental livestock plagues.<sup>8</sup>

Despite these limits, it is essential to make what we can of the available evidence. To this end, the present paper assesses the most thoroughly documented and, as far as can be discerned, spatially significant livestock pestilence of the Carolingian

## Abstract

This paper considers the cattle panzootic of 809-810, the most thoroughly documented and, as far as can be discerned, spatially significant livestock pestilence of the Carolingian period (750-950 CE). It surveys the written evidence for the plague, and examines the pestilence's spatial and temporal parameters, dissemination, diagnosis and impact. It is argued that the plague originated east of Europe, was truly pan-European in scope, and represented a significant if primarily short-term shock to the Carolingian agrarian economy. Cattle in southern and northern Europe, including the British Isles, were affected. In all probability, several hundreds of thousands of domestic bovines died, adversely impacting food production and distribution, and human health. A diagnosis of the rinderpest virus (RPV) is tentatively advanced.

period, the cattle panzootic of 809-10. While this plague has not been altogether ignored in the historical or veterinary sciences, a detailed assessment of the evidence for the pestilence is wanting, and the plague's temporal and spatial contours, dissemination, diagnosis and impact have yet to receive much attention.<sup>9</sup> The paper surveys the sources for the panzootic before it explores the plague's extent, diagnosis and impact on human economy and health. The paper argues that the plague originated east of Europe and was truly pan-European in scope: cattle in southern and northern Europe, including the British Isles, were affected. Of the pathogens known to modern science it is suggested that the rinderpest virus (RPV) and contagious bovine pleuropneumonia (CBPP) are the best fit. Of the two, RPV is thought the most likely cause.<sup>10</sup> This RPV identification, however, remains highly speculative without corresponding palaeomicrobiological evidence and in light of recent molecular clock analyses of the virus' evolution which suggest that it did not exist as we know it in or before the early ninth century. Still, a rinderpest diagnosis is employed cautiously as a tool in the interpretation of the panzootic's spread and mortality. Once mapped in time and space, the outbreak is briefly set into its socio-economic, veterinary and political contexts, and the ramifications of other medieval European cattle pestilences, notably the panzootic of the early fourteenth century, are considered, in order to deduce the probable impact of the 809-10 plague. The paper suggests that this early ninth-century panzootic represented a significant if primarily short-term shock to the Carolingian agrarian economy. In all probability, several hundreds of thousands of domestic bovines died across Europe, adversely affecting food production and distribution, and human health.

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b This paper builds on my PhD thesis, *The contours of disease and hunger in Carolingian and early Ottonian Europe (c.750-c.950 CE)* (McGill University 2011). I would like to thank my supervisor Faith Wallis as well as Philip Slavin who read and commented upon earlier drafts of this paper. Remaining errors are mine. The Social Sciences and Humanities Research Council of Canada supported the research and analysis presented here.

## Sources

Cattle deaths are reported in 809 in the *Chronicon Moissiacense* (CM) and the Saxon Poet's *Annales de gestis Caroli*

*magni imperatoris*. Though found at Moissac in southwestern France, the former is thought to have been compiled from earlier sources in the tenth century at Ripoll in Catalonia. The text contains a considerable amount of material found in 'minor' and 'major' Carolingian annals, but it also provides unique references to events in Carolingian Spain. The short reference to the panzootic in the text, that 'a great mortality of animals came from the east and crossed over all the way to the west,' is almost certainly a contemporary witness to bovine mortalities in the Carolingian southwest.<sup>11</sup> The Saxon Poet's account of the cattle pestilence is far more verbose and colorful, and though non-contemporary his *Annales* provides details of the plague not found elsewhere. The poet composed his account of Charlemagne's life around 890 and is known to have relied heavily on earlier texts, namely the revised *Annales regni Francorum* and Einhard's *Vita Karoli magni*. Neither of these texts, however, document the cattle mortality.<sup>12</sup> It is possible that the poet's account of cattle deaths in 809 was taken in part or in whole from no longer extant sources for the pestilence available to him at Corvey where he appears to have penned his text. His dating of the pestilence to 809 and account of the plague's mortality and human response to the outbreak, as well as his notice of poor grape yields on the heels of bovine deaths, are unique and suggest that he did not rely on the sources collected here. Yet the poet may have also drawn upon his own experiences with stock mortalities in the 860s, '70s and '80s or reports of other cattle pestilences.

'Everywhere the peace of the present year made all the limits of the empire happy, but certain sad things happened in many lands: for an unspeakable pestilence of cattle, more fierce than every enemy, killed the entire species. When shepherds left their happy herd and led flocks out in the morning to green meadows, in the evening scarcely the smallest portion returned home [and they were] sick, bearing the signs of the dreadful pestilence and imminent death through their emaciation. But a larger number were lying dead over the expanses of the field, where they [had] exhaled [their] soft spirits into green grasses. And now pastures were stinking with cattle strewn, and when [they were] taken away, stalls [were] cleaned with much labor, then those who seeing that an animal was about to die chose to lay it low with a knife, immediately it [the knife] dripping with putrid matter from the wound brought forth the poison that had collected in the body. Noricus [Noricum] bay is said to have suffered these things in particular, together with the neighboring regions to it.'<sup>13</sup>

Several other texts document cattle mortalities in 810. The most notable of these is the *Annales regni Francorum* (*ARF*), which reports a cattle pestilence in the context of Danish incursions into Frisia and Charlemagne's northeastern campaign of 810. These annals were written at, or in close relation to, the Carolingian court, and in the early ninth century they were likely composed on an annual basis. This passage was probably written at Aachen in 810 or shortly thereafter. The annalists of the *ARF* were well informed on matters from across Carolingian Europe, their proximity to the royal court ensures us of this. The report of the mortality in the text is indepen-

dent and contemporary, and the annalist's emphasis on the plague's great spatial extent should not be hastily disregarded.

'On this campaign [Charlemagne's of 810] such a severe pestilence of oxen irrupted that almost none remained for such a large army, since all perished to the last head. The mortality of the animals of this kind was most enormous not only there but in all provinces subject to the emperor.'<sup>14</sup>

Three other Carolingian annals document animal mortalities in 810. The *Annales Laurissenses minores* (*ALM*), composed at Lorsch in the early ninth century, reports 'the greatest mortality of oxen as well as of many people in almost all of Europe',<sup>15</sup> the *Annales Sancti Emmerammi Ratisponensis* (*ASER*), probably written at Regensburg, records that 'there was a great mortality of animals',<sup>16</sup> and the *Annales Xantenses* (*AX*) documents that 'there was a great mortality of oxen and other animals in the same year and the winter was very hard.'<sup>17</sup> The reference to human mortalities in the *ALM* and to deaths of 'other animals' and a difficult 810 winter in the *AX* are unique and suggest that these entries may be independent. Though the latter only provides a continuous contemporary account of events from the early 830s and incorporates an abridged version of the *ARF* from 797 to 811, it does in some instances prior to the 830s supply information not found in other texts. The *AX* may have been compiled at Lorsch prior to the 830s and may here provide an additional reference to bovine deaths in west-central Germany.<sup>18</sup> Though the entry from the *ASER* is possibly dependent on the *ALM* or the *ARF*, its use of *animalia* rather than *boves* implies that it may too be independent of these texts and furnish an independent reference of cattle deaths in southeastern Germany.

A lengthier contemporary and independent report is encountered in Agobard of Lyons' *De grandine et tonitruis*. In the diocese of Lyons, in the mid 810s, Agobard composed this polemic against the common conviction held there that humans could bring about hail and thunder. At the end of his treatise the bishop reports,

'A few years ago, a certain foolish story spread. Since at that time there was a mortality of oxen, people said that Duke Grimoald of Benevento had sent people with a dust, which they were to spread on the fields and mountains, meadows and rivers, and that it was because of the dust that they spread that oxen died. He did this [they said] because he was an enemy of our most Christian Emperor Charles. For this reason we heard and saw that many people were captured and some killed. Most of them, with plaques attached, were cast into the river and drowned. And, what is truly remarkable, those [that were] captured gave testimony against themselves and admitted that they had such dust and had spread it. For the Devil, by the secret and just judgment of God, having received power over them, was so able to succeed over them so that they gave false witnesses against themselves and died. Neither learning, nor torture, nor death itself deterred them from daring to give false witnesses against themselves. This story was so widely believed that there were very few to whom it seemed absurd. They did not rationally consider how such dust could be made, how it

could kill only oxen and not other animals, [or] how it could be carried and spread over such a vast territory by humans. Nor did they consider whether there were enough Beneventan men and women, old and young, to go out from their region in wheeled carts loaded down with dust.<sup>19</sup> An account of a cattle pestilence c.810 is also found in Notker Balbulus' *Gesta Karoli magni imperatoris*. A monk at St. Gall, the Stammerer wrote his biography of Charlemagne for Charles the Fat in the mid 880s.

'The unconquered Charles came back and tried to invade their territory by the land route, although it was very tight and without roads. But either the providence of God stopped him, as according to the Scriptures, "these served to put Israel to the test," or our sins got in the way, but every one of his attempts failed. For example, one night, to the disadvantage of the whole army, fifty pairs of oxen belonging to one abbot were struck dead by a sudden disease. Therefore Charles, the wisest of men, gave up what he had begun, lest he disobey Scripture: "Do not try to rush against a flowing stream."<sup>20</sup>

Though undated, this passage succeeds notice of Danes causing 'a great disturbance for the Franks and Gauls' and precedes a report of the murder of the Danish leader Godfrid, which confirms that Notker is here referring to the animal mortalities reported in other texts in 809 and 810.<sup>21</sup> His reference to the Danes and his use of *boves* suggests that Notker relied on the *ARF*, which documents the cattle pestilence in conjunction with the Danes' incursion into Frisia and Godfrid's death and speaks specifically of deaths of oxen. Considering the differences between Notker's account and that found in the *ARF*, however, it is not improbable that Notker also employed non-extant evidence at St. Gall for cattle deaths c.810. Though the *Gesta Karoli* is generally considered to be of little historical value for Charlemagne's reign,<sup>22</sup> Notker, like the Saxon Poet, may have drawn on experiences and reports of stock plagues that occurred closer in time to the period in which he wrote. Notker does also note, however, that his *Gesta* was informed by three individuals, all likely monks at St. Gall, and it is possible that his description of the pestilence, notably his unique reference to an abbot losing a hundred oxen to a virulent disease, owes something to them.<sup>23</sup> The only other known Carolingian text possibly of interest here is a sermon attributed to Arno of Salzburg and dated to 806-811. Prepared for a Bavarian synod, the sermon refers vaguely to an 'animal mortality' and 'pestilence', presumably in Austria and southeastern Germany.<sup>24</sup> The Carolingian capitularies do not mention a bovine mortality and, as noted, Charlemagne's courtier and biographer, Einhard, overlooks the pestilence in his *Vita Karoli magni*. Two sources from outside of Carolingian Europe do, however, refer specifically to cattle deaths in 810. The *Annales Cambriae* (*AC*), thought to have been composed on a year-by-year basis at St. David's (Wales) in the late eighth and early ninth centuries, reports 'a mortality of cattle across Britain' in its short entry for 810.<sup>25</sup> Though particularly succinct and vague, this account of cattle deaths is contemporary and independent of Carolingian sources. The three principal versions of the *Brut y Tywysogion*, all being Welsh translations of the non-extant *Cronica/Historia Principium Britanniae/Wallie*, also document 'a mortality upon the animals in all the island of Britain' in the same year.<sup>26</sup> This passage, however, is possibly dependent

on the *Annales Cambriae*: the *Cronica/Historia*, compiled no earlier than 1286 at Strata Florida (roughly 120 km north of St. David's), is a conflation of multiple sets of local Welsh annals, notably the lost *Annals of Strata Florida*, which until c.1100 seems to have relied primarily on a text from St. David's.

Evidence for cattle mortalities c.810 in other regions of Europe has not been found. The Irish annals and the *Anglo-Saxon Chronicle* (*ASC*) do not document the plague. It is not unreasonable to suspect, however, that the mortality documented in the *AC* was not limited to Wales and that England and Ireland were affected.<sup>27</sup> Though they report multiple epizootics in the early Middle Ages, the Irish annals do not observe a livestock plague in the ninth century and the *ASC* only documents two livestock pestilences before 1000, one in the mid 890s and another in the mid 980s. The absence of a cattle plague in these texts c.810 may be a product of the purview of contemporary annalists. The *AC* and the *Brut* do after all stress that the cattle mortality was widespread in Britain (England and Wales).<sup>28</sup> It is also possible that the passage of the *Bóshlechtae*, a law prohibiting the stealing and killing of cattle, in Munster in 810, Connacht in 812 and the Uí Néill lands in 813, indicates a heightened concern for cattle on account of a sizable cattle mortality in Ireland c.810.<sup>29</sup> Moreover, the account of a cattle pestilence in England in 800 found only in the *Historia regum*, often attributed to twelfth-century Simeon of Durham, may be misdated and, in fact, refer to cattle mortalities in northern England c.810.<sup>30</sup> While hardly certain, it is also not beyond reason that fourteenth-century Ranulph Higden made use of non-extant sources when writing in his *Polychronicon* that 'the greatest mortality of oxen devastated all Europe, but especially Britain' in 810.<sup>31</sup> Additionally, other early medieval insular cattle pestilences were not limited to Wales: the cattle mortalities of 699-701 and 986-87 affected England, Wales and Ireland.<sup>32</sup> No evidence for the plague is yet known in Byzantine sources.<sup>33</sup>

## Temporal and Spatial Extent

The temporal and spatial extent of a cattle panzootic c.809-10 can be reconstructed from the texts surveyed here. Before addressing the pestilence's contours, however, it must be stressed that the sources collected do indeed address a single outbreak of disease. The existence of such a relatively large collection of references to cattle mortalities c.810 itself indicates that we are dealing with one great outbreak of disease, especially considering how infrequently epizootics were recorded in the early Middle Ages, particularly before 850, and the interest early medieval authors took in the spectacular. Most of the texts also emphasize the vast spatial extent of the mortalities they document: the *CM*, *ARF*, *ASER* and *AX* all emphasize the great scale of the bovine losses,<sup>34</sup> and the *ARF* reports that 'all provinces subject to Charlemagne' were afflicted, the *ALM* that the disease spread across 'almost all of Europe', and Agobard observes that the mortality spread through a 'vast territory' and that cattle were dying across 'fields and mountains, meadows and rivers'. The Saxon Poet also asserts that the plague affected 'many lands' and 'the entire species' of cattle. The observation in the *CM* that the great mortality it documents spread westward across Europe further signals that we are not here dealing with concurrent cattle mortalities. The cattle mortali-

ties reported in Britain, in Welsh and possibly English sources, too must be related to continental deaths. Not only is it unlikely that notable outbreaks of disease would irrupt simultaneously in cattle on the continent and in Britain, but it is improbable that a large outbreak of a disease virulent in British bovines would have originated in Britain. If the disease was particularly acute and communicable, as the sources suggest, it was quite possibly new or unknown to both continental and insular cattle populations. The mortality would have neither been great nor expansive had the disease been familiar to ninth-century cattle. The pestilence may have, like the early fourteenth-century panzootic, and later eighteenth-century panzootics, come from regions east of Europe.<sup>35</sup> It is also certain, as has been stressed all along, that the cattle mortalities documented above stemmed from disease, not weather or hunger. Some texts refer specifically to an outbreak of disease (*lues, pestilentia* and *pestis*) and it is no stretch to translate *mortalitas*, employed by several authors, as pestilence. Furthermore, weather-related livestock deaths are often reported as such in Carolingian sources,<sup>36</sup> and there is no written or palaeoscientific evidence to indicate that weather, non-pestilential disease or a food shortage would have caused large losses of bovines in 809 or 810.<sup>37</sup> The vast majority of the cattle that died in 809-10 succumbed in a single outbreak of disease.

Geographically speaking, the cattle pestilence of 809-10 was massive. The assertion in the *ARF* that cattle died in all the provinces subject to Charlemagne, implies that the pestilence spread across much of the continent, from the Mediterranean to the North Sea and English Channel, and from the Spanish March and the Atlantic Ocean to the Elbe and Saale rivers, affecting what is now Austria, Belgium, France, Germany, northern and central Italy, Luxembourg, the Netherlands, northeastern Spain and Switzerland. In addition to speaking generally of widespread mortalities, the *CM*, *ALM*, *ASER* and *AX* also presumably refer to cattle mortalities in the regions in which they were composed: Ripoll, Lorsch and Regensburg. It may as well be presumed that cattle were dying in the vicinity of Aachen on account of the reference to the plague in the *ARF*. Agobard also undoubtedly refers to cattle mortalities in his own diocese of Lyons and the sermon attributed to Arno to deaths in the region of Salzburg. Further, the report of the pestilence in the *ARF* in the midst of Charlemagne's campaign of 810 allows us to place the pestilence in the northeastern reaches of Carolingian Europe. The annalist notes that Charlemagne left Aachen in late spring or early summer with the intention of pushing Godfrid and the Danes from Frisia. He crossed the Rhine at Lippeham (near Wesel) and pressed forward to the meeting of the Aller and Weser rivers (near Verden). There he heard of Godfrid's death, the retreat of the Danes and the loss of an envoy with a Saxon stronghold at Hohbuoki (Höhbeck) on the Elbe. He then redirected his army into Saxony, presumably to repair the losses on the Elbe. After he 'settled affairs' there he returned to Aachen. It is probable that Charlemagne sustained losses of cattle after crossing the Rhine at Lippeham and before reaching the Aller and Weser rivers, given that he continued from Lippeham to the Aller and Weser meeting and made no attempt once there to pursue the Danes.<sup>38</sup> That said, with the Danish retreat the situation at Höhbeck may have been more

pressing and Charlemagne's short and seemingly ineffective stay in Saxony may signify that losses of cattle were sustained after reaching the Aller and Weser rivers.<sup>39</sup> In any case, it is clear that cattle were dying in northern Germany.<sup>40</sup>

The Saxon Poet's emphasis on Noricum, a region covering most of modern Austria and parts of southern Germany and northern Slovenia, may have been borrowed from Virgil's description in his *Georgics* of an animal plague there. In fact, several aspects of the poet's account of the 809-10 pestilence may have been taken from Virgil. Like Virgil, the poet writes of shepherds looking after cattle, the slaughtering of sick stock with knives, rank pastures covered with dead bovines, and death claiming 'the entire species' of cattle.<sup>41</sup> Of course, it should not be presumed that cattle did not die in Austria, southern Germany or northern Slovenia on account of the Poet's use of Virgil, as both Arno's sermon and the *ARF* indicate. The plague should not, however, be located in the region of St. Gall on the basis of Notker. More sound is the placement of the cattle pestilence in the vicinity of St. David's in Wales on the basis of the reference to mortalities in the *AC*. Northern and central Italy, as far south as the Duchy of Benevento, may have been affected as well, as the *ARF* asserts and Agobard may imply.<sup>42</sup>

#### Settlements and regions mentioned in the text and the extent of the Carolingian Empire c.810



- |               |                               |                    |
|---------------|-------------------------------|--------------------|
| 1. Ripoll     | 8. Wesel                      | 14. St. David's    |
| 2. Lyons      | 9. Corvey                     | 15. Strata Florida |
| 3. St. Gall   | 10. Verden                    | 16. Durham         |
| 4. Salzburg   | 11. Höhbeck                   | 17. Munster        |
| 5. Regensburg | 12. Roman Province of Noricum | 18. Connacht       |
| 6. Lorsch     | 13. Duchy of Benevento        | 19. Uí Néill lands |
| 7. Aachen     |                               |                    |

The temporal extent of the plague is less clear. The pestilence may have irrupted in the eastern regions of Charlemagne's empire in 809 and then spread westward, as the *CM* stresses. While it disseminated across much of continental Europe and into the British Isles in 809 and 810, it is not impossible that cattle were affected in some areas of Europe before 809 and after 810. The majority of mortalities may have occurred in these two years, but it should not be presumed that the pestilence altogether fizzled out in 810 on the basis of the evidence available, as Carolingian authors very infrequently report outbreaks of disease, in livestock or human populations, in successive years, and other pre-modern cattle pestilences, such as the panzootic of 1314-21, appear to have lingered for one or more years in most regions and upwards of five years in those densely populated with bovines.<sup>43</sup>

That the disease was still affecting cattle in northern Germany in 810, as the *ARF* reports, despite having already reached Ripoll, possibly St. David's, and, as the *ARF* itself emphasizes, many other regions of continental Europe, indicates that the pestilence did linger. Though it is probable that the 809-10 plague would have been less persistent than the early fourteenth-century panzootic, as cattle populations were not in all probability equally dense in the ninth and early fourteenth centuries,<sup>44</sup> the disease likely remained for upwards of a year in most affected areas. Agobard, for instance, wrote his text as late as 817, and observes that the mortality occurred in his diocese 'a few years ago', indicating, if vaguely, that the pestilence irrupted there after 810. If the disease did irrupt in Ireland we may suggest that it did so in 810, on the basis of the passage of the *Bóshlechte*. Of course, not all herds in an affected area would have been devastated. manorial accounts demonstrate that several English herds were spared in the early fourteenth-century panzootic and the great eighteenth-century panzootics hardly affected all European cattle.

## Diagnosis

In order to comment on the 809-10 panzootic's diagnosis it is necessary to consider both the plague's symptoms and epizootiology. While the scant and ambiguous nature of the extant evidence necessitates such an approach, diagnoses of pre-modern pestilences advanced following consideration of both symptoms and epizootiology are firmer than those advanced following consideration of symptoms alone.<sup>45</sup> The diagnosis given here, however, remains quite tentative, as disease-causing microorganisms are not static, the pathogen behind the panzootic may be unknown to modern science, and our poor understanding of the symptoms and epizootiology of the 809-10 panzootic significantly limits our ability to compare this early medieval disease/outbreak to diseases/outbreaks known to modern science. For these reasons, the identity of the plague is considered here for heuristic purposes alone.<sup>46</sup>

Of symptoms, we know very little. The Saxon Poet reports that cattle were emaciated and implies that at least some animals underwent a period of sickness and exhibited symptoms when writing that cattle were 'bearing the signs of the dreadful pestilence', though these details may have been borrowed

from Virgil. Other sources confirm none of this, but it should not be supposed that the disease was asymptomatic on account of the fact that other texts do not record symptoms, as the vast majority of Carolingian epizootics and epidemics were documented without mention of symptoms.<sup>47</sup> More can be said of the plague's epizootiology, specifically the species susceptible to the disease, and the pathogen's communicability, morbidity, mortality and virulence.

The majority of the sources indicate that the disease primarily affected the domestic bovine.<sup>48</sup> While the *CM* and the *ASER* speak vaguely of deaths of 'animals', all other continental and insular texts specifically refer only to 'oxen' or 'cattle', and Agobard stresses that the disease affected cattle alone.<sup>49</sup> The generalness of the mortality stressed in several texts and the large toll of the plague on animals involved in Charlemagne's campaign also indicate that the plague was non-opportunistic and affected all cattle, young and old, healthy and sick.<sup>50</sup> That the plague did not occur in the midst of a food shortage, which could have caused severe malnutrition and inhibited immune response in livestock, supports this observation. On account of our vague understanding of the panzootic's dissemination and spatial and temporal extent, little can be said about the disease's communicability other than that the disease was clearly quite communicable. Agobard and the *CM*'s emphasis on the spread of the disease across regions indicates that the disease did not simultaneously irrupt throughout Europe, as if enzootic to much of the continent. The vast expanse of the pestilence itself signifies that the disease was highly communicable and neither soil- nor arthropod-borne.<sup>51</sup> The rapidity with which the pathogen spread, afflicting bovines in distant regions of Europe within a period of two years, further underscores that it was highly communicable. While the disease may have been primarily transmitted between cattle, the movement of other domesticated or undomesticated animal populations (possibly not susceptible to the disease), not to mention people, grain and other traded goods, may have facilitated its spread.

The pathogen's high communicability also indicates, of course, that it achieved high rates of morbidity, as does the emphasis, in most texts, on the pestilence's high mortality. From dead animals we can infer sick animals. The stress in several texts, such as the *ARF*, on the 'great' nature of the mortality may be taken as an indication both of the plague's vast spatial extent and high mortality. Certainly, medieval textual accounts of 'great' mortalities of animals should not be hastily dismissed as exaggerated. Early fourteenth-century annalists and chroniclers speak of a great mortality of cattle and manorial accounts confirm that bovine deaths were then indeed great. Some herds were totally wiped out and the average herd mortality was roughly 63 per cent.<sup>52</sup> The 809-10 pathogen was very likely quite virulent. Though it is unknown how often, or if, sick animals recovered, the emphasis on the greatness of the mortality indicates that the disease was acute. The Saxon Poet's remark that all cattle died may have been borrowed from Virgil, but the contemporary *ARF* too stresses that all animals 'perished to the last head' and that the mortality was 'enormous' and the disease 'severe'. Though non-contemporary, Notker provides another indication that

the pathogen was especially virulent when he specifies that animals died rapidly. The dearth of symptoms in the sources may itself indicate that death came quickly.<sup>53</sup>

It appears, then, that the disease solely, or primarily, affected cattle, was non-Darwinian and cut through the bovine population, achieved high rates of morbidity and mortality, and was likely very virulent, highly communicable and principally spread between cattle but possibly by other means as well. The pathogen was quite plausibly foreign to Europe, and possibly, based on the *CM*'s brief account of the plague and the paths of later pre-industrial cattle panzootics, introduced to European cattle from regions east of Europe.<sup>54</sup> Only two pathogens known to modern science fit this description, the rinderpest virus and contagious bovine pleuropneumonia. For a number of reasons, 'modern' anthrax, foot-and-mouth disease and bluetongue are a poor match.<sup>55</sup> RPV and CBPP are the two diseases of cattle often held responsible for the great African, Asian and European panzootics of the eighteenth, nineteenth and twentieth centuries.<sup>56</sup> They are also thought to have afflicted animals in antiquity,<sup>57</sup> and it has been suggested that the early fourteenth-century panzootic may have been RPV.<sup>58</sup> Rinderpest is a highly communicable disease of cattle capable of high morbidity and mortality rates (upwards of 100 per cent). Spread primarily via direct contact between susceptible species via virus-rich aerosol droplets and secretions, it is thought to have been foreign to Europe in the pre-modern and modern periods, and is known to be especially virulent in European cattle. Modern outbreaks have followed in the wake of the introduction of live, sick cattle into healthy populations. The virus may also be spread indirectly through contact with infected bedding, blood, fodder, semen, tears, waste and water, though it generally survives poorly outside a host. After an incubation period of about five days, in acute strains, like those seen among virgin populations, infected animals experience fever, restlessness, depression, anorexia, shallow and rapid breathing, and plentiful nasal secretions and salivation. Some may present with profuse diarrhea, a reluctance to move, dehydration and emaciation. The pregnant often abort. Peracute variants of the virus may cause death within two days of the appearance of fever.<sup>59</sup>

Like RPV, CBPP primarily affects cattle and is spread principally via the inhalation of droplets from sick animals. The transmission of this bacterial disease generally requires, like RPV, close contact between healthy and sick cattle. Infected cattle present with a moderate fever, coughing and heavy respiration. As with acute variants of RPV, death may occur suddenly prior to the onset of symptoms. While in acute strains, or in virgin populations, CBPP may achieve a high incidence and cause many deaths, it is less contagious and virulent than RPV and results in lower morbidity and mortality rates (in the range of 50 per cent). It is primarily for these reasons that RPV, of 'modern' diseases, is the best fit with the 809-10 panzootic.<sup>60</sup> We should not assume, however, that RPV and CBPP existed in the ninth century as they are known to modern science. Recent molecular clock analyses of the measles virus (a member of the same genus of RPV, in the family *Paramyxoviridae*) may complicate a speculative RPV diagnosis of the early ninth-century panzootic. Though these analyses have yet to be independently verified and one takes issue with the other's methods, they suggest that measles and

rinderpest only diverged in the ninth, eleventh and twelfth century CE, and, consequently, that RPV may not have existed in the early ninth century as it has in the modern era.<sup>61</sup>

If the early ninth-century panzootic was rinderpest, it may be suspected that the disease was spread primarily via contact between healthy and sick cattle, that a wide prevalence of the infection was established and that the majority of infected cattle died. Certainly, if RPV was the cause, mortalities would not have been limited to the vicinity of Aachen, Lorsch, Lyons, Regensberg, Ripoll and St. David's where our sources were composed. Large regions would have been affected, as the sources stress. By several means, the disease could have spread, via movements of cattle, across Europe. Though outbreaks of RPV have long been associated to warfare, and though it has been suggested that Charlemagne's 'pacification' wars facilitated the dissemination of livestock disease,<sup>62</sup> there is little evidence in the primary sources to support the notion that conflict played a major role in the 809-10 panzootic's dissemination. Charlemagne's campaign of 810 may have aided the pathogen's dissemination, but the movement of cattle between pastures, and to and from markets would have also been capable of spreading the disease. The raiding of cattle on the Carolingian frontiers, by Vikings and Slavs, may have fostered the pathogen's propagation, as would have trade in livestock, which is known to have been carried out across some stretches of the eastern Carolingian frontier.<sup>63</sup> Trade in cattle was also likely taking place at many of the *emporia* spread along the North and Baltic Sea coastlines,<sup>64</sup> and though horses were increasingly relied upon as pack animals in Frankish Europe, much overland trade in bulk goods within Carolingian Europe would have entailed two- and four-wheeled oxen drawn carts.<sup>65</sup> A context existed for the wide dissemination of cattle diseases, such as RPV, in Carolingian Europe. Where contacts between animals were more frequent and regular, and in regions densely populated with bovines, mortalities would have been greatest.

In addition to a wide prevalence, we may suspect, if the panzootic was RPV, that the disease would have persisted in regions until it burnt itself out. The panzootic's high mortality, and the likelihood that it was a virgin-soil pestilence, indicates strongly that cattle would not have possessed immunity to the disease, whether or not RPV, and that cattle would have been unable themselves to sustain an outbreak for an extended period of time. If the rinderpest virus was the cause, European bison and deer populations, which are susceptible to RPV, may have facilitated the spread of the disease and allowed it to persist longer than it would have otherwise.<sup>66</sup> Neither RPV nor CBPP, however, can account for the death of Charlemagne's elephant on campaign in 810.<sup>67</sup> That culls and quarantines are very unlikely to have been carried out on a wide scale, and that charms and contemporary veterinary medicine would have been of little effect, supports the idea that the disease would have persisted until the chain of infection ran out.<sup>68</sup>

## Impact

The primary sources reveal very little about the impact of the panzootic. A considerable excess mortality of cattle is stressed

or implied by all sources. The speculative RPV diagnosis also suggests that the mortality was significant. Notker asserts that the pestilence caused the premature conclusion of Charlemagne's 810 campaign and the *ARF* implies the same in observing the plague in the context of the campaign. The near silence in the sources on the pestilence's ramifications for human populations should not be thought indicative of its triviality. Evidence for epizootics, as well as epidemics, extreme weather and food shortages, in the Carolingian period is characteristically succinct and very rarely includes any comment on the impact of these phenomena.<sup>69</sup> The probable impact of the 809-10 panzootic becomes clear once the outbreak is considered in the socio-economic, veterinary and political contexts in which it occurred, and alongside better-documented pre-modern cattle pestilences.

A sudden, vast and dramatic mortality would have undoubtedly had a number of negative consequences for human economy and health. In Carolingian Europe, oxen were the principal suppliers of traction (for ploughing and carting) and manure necessary for the production of grain on which the vast majority of the population was dependent.<sup>70</sup> Without a large supply of equines on hand to fill the void in draught power or alternative sources of fertilizer,<sup>71</sup> a mass mortality of domestic bovines would have undoubtedly caused a decline in arable agriculture.<sup>72</sup> The emphasis in several texts on *bos* (oxen) as opposed to *pecora/pecuda* (cattle) may signify that the mortality was most felt in arable agriculture and traction. Poorer yields, on account of a decline in available manure, and a reduction of land brought into cultivation, on account of a decline in available traction power, may be suspected. Though the pestilence may not have produced a famine,<sup>73</sup> the aggregate quantity of grain drawn from the land would have fallen and possibly produced, in at least some regions, a lesser food shortage. It is plausible that subsistence crises documented in capitularies in 809 and 813 had something to do with the panzootic.<sup>74</sup>

As restocking is likely to have been a long and arduous task largely dependent on biological reproduction, but also markets and transfers between affected and unaffected farms, the decline in the aggregate production of grain would have quite possibly persisted for a number of years. The slow repair of herds, which may have taken upwards of twenty years, as it did following the early fourteenth-century panzootic, would have compounded the effects of the initial losses.<sup>75</sup> Of course, the non-Darwinian nature of the 809-10 pestilence would have only slowed the replenishing of stock. While the gestation period of a cow today is roughly nine and a half months, it may be suspected that it was longer, and that premature and still births were more common, in the early Middle Ages when many cattle possibly suffered from chronic hunger and a baseline of non-pestilential disease. Moreover, while a cow can be bred fifty days after calving, it rarely delivers more than a single calf and a calf does not reach sexual maturity for more than a year, meaning that it would be of little value as an effective source of traction before twelve months of age. If cattle were generally malnourished and suffering from a baseline of disease, it may also be suspected that they required a longer period of rest between calving and breeding. Wealthier

Carolingian landlords may have managed to restock in two to five years, but most farmers were likely without their herds, full teams of draught animals or regular supplies of manure for a longer period of time.<sup>76</sup>



*Cattle from the Utrecht Psalter, pen and ink, 816-835 or c.850 CE, Reims. Utrecht, Universiteitsbibliotheek, MS Bibl. Rhenotraiectinae I Nr 32.*

All of this would have reduced the calories available for the human diet. The panzootic would have also resulted in a decline in protein consumption, as the mortality would have seen to a loss of dairy and meat. Though peasants appear to have consumed animals that died in the early fourteenth-century panzootic and there is some indication in the Carolingian *Capitulare de Villis* that some segments of the population regularly ate diseased animals,<sup>77</sup> the Saxon Poet's reference to the slaughtering of sick animals, while possibly borrowed from Virgil, suggests that animals that succumbed to disease may not have been widely consumed.<sup>78</sup> More generally a loss of cattle meant a loss of available capital and moveable wealth, and, consequently, a loss of purchasing power and entitlement to food. As livestock reproduce themselves, the panzootic would have seen not only a loss of existing capital but the means by which one could generate capital. The price of oxen, cows, bulls and calves would have presumably climbed, if not immediately for fear of purchasing sick animals, as would have the price of meat and dairy.<sup>79</sup> The price of grain too may have inflated where arable production contracted and imports of grain, on oxen-drawn carts, were delayed. Cattle also supplied a range of by-products – bones, hides and sinew for instance – that may not have been harvested from animals that died of disease. The price of these may have inflated as well. Considering the role of cattle on campaign as baggage animals and supplies of fresh meat,<sup>80</sup> we may also suspect that the panzootic limited Charlemagne's military might in the final years of his life. Carolingian armies

pressed beyond the Elbe, and into Pannonia and Brittany in 811, and beyond the Elbe again in 812, but none of these were major campaigns.<sup>81</sup> As Einhard stressed, Charlemagne's last major campaign was that of 810.<sup>82</sup> It should not, however, be thought that contemporaries were altogether helpless in the face of this disaster. Many may have attempted to absorb bovine losses by expanding the stocking densities of other domesticates (cheaper animals such as pigs and sheep) and some sick cattle may have been slaughtered, or healthy animals culled, on a local scale in order to preserve their value, as appears to have occurred in the early fourteenth century.<sup>83</sup> Some animals may have also been 'pre-emptively' sold before they had a chance to fall sick.<sup>84</sup> Those with healthy bovines post plague would have profited from the disaster, renting out oxen and selling cattle at high prices. Many peasants and elites, however, may have stood by and watched their animals die, believing that the disease emanated from decomposing animals or a 'certain dust', as Agobard tells us, or that the outbreak was the result of human sin.<sup>85</sup> In general, contemporary medicine and administration would have been unable to combat the pestilence and production losses would have been the norm. Like the epizootic of 868-70, the 809-10 panzootic would have undoubtedly brought 'irrecoverable damage' if primarily in the short-term.

## Conclusion

This paper has surveyed a range of sources that document widespread cattle mortalities in early ninth-century Europe. It has purposed that these texts reveal a single outbreak of disease, a cattle panzootic of vast extent. The symptoms of the disease and the epizootiology of the pestilence have been considered and a speculative RPV diagnosis has been advanced. An attempt has also been made to illuminate the probable impact of the mortality on human economy and health. In sum, a devastating disease of domestic bovines, almost certainly foreign to Europe, appears to have spread across much of the European continent and into Britain in 809 and 810. The mortality, in all probability, was extensive, as several sources indicate, and would have carried severe, if chiefly short-term, repercussions for contemporaries, who were unable to curb the pestilence or cure the sick.

This livestock plague appears to have been one of the more spectacular of the early Middle Ages, but others warrant attention. Early medieval Europeans were highly dependent on the well-being of their livestock, and dramatic fluctuations in domestic bovine populations could have had considerable ramifications for human populations. For these reasons, plagues, like the one considered here, require study and should be incorporated into our assessments of the early medieval past.



## Endnotes

- 1 'Boum quoque pestilentia in nonnullis Franciae locis inmanissime grassando multis inreperabile intulit damnum.' *Annales Fuldenses* (ed.), Friderich Kurze *MGH SRG VII* (Hanover 1891) 72.
- 2 Many of these references are contemporary to the plagues they describe and independent. Most are found in annals.
- 3 The ambiguity with which Carolingians reported the spatial and temporal contours of plagues prevents us from establishing an exact tally of epizootics. It is possible that the stock deaths attributed to disease in 868-70 were the result of multiple concurrent or near-concurrent outbreaks of disease. The deaths of cattle and sheep reported in 887 may have stemmed from two unrelated plagues and a pestilence may not have occurred over the winter of 842-43 or in 849 (see n. 5). It should also not be presumed that all epizootics were recorded. Indeed, the record for stock disease in the Carolingian period is not complete. What exists represents the bare minimum occurrence. It is clear nonetheless that most outbreaks affected the domestic bovine. More than 50 per cent of the references to non-human mortalities found in Carolingian sources specifically refer to cattle. Considering the importance of cattle in the early medieval agrarian economy and how often infectious disease seems to have irrupted in cattle in pre-industrial Europe in comparison to other domesticates, it is quite probable that most of the more ambiguous reports of 'animal' plagues, which account for 40 per cent of all collected references to non-human pestilences in Carolingian Europe, also refer to deaths of cattle. Sources for the plagues of 809-10, 868-70 and 939-42 demonstrate that at least some reports of wide-spread deaths in 'animals' can be accepted as evidence for outbreaks of disease in cattle.
- 4 This need not necessarily mean that livestock plagues occurred less frequently in earlier centuries. Whether the sizable body of Carolingian evidence for livestock disease reflects an actual increase in the number of animal plagues or the higher rates of source composition and survival that characterize the period is uncertain.
- 5 For instance, see for 801: *Annales Lobienenses* (ed.), W. Wattenbach *MGH SS XIII* (Hanover 1881) 230; for 820: *Annales regni Francorum* (ed.), F. Kurze *MGH SRG VI* (Hanover 1895) 154, *Annales Fuldenses* (n. 1) 22, *Hludowici et Hlotharii epistola generalis* (ed.), Victor Krause *MGH CAP II* (Hanover 1897) 4, Astronomer, *Vita Hludowici pii* (ed.), Ernst Tremp *MGH SRG LXIV* (Hanover 1995) 420, 422; for 860: *Annales Alamannicorum continuatio Sangallensis prima* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 50, *Annales Weingartenses*, ed. Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 66, *Annales Sangallenses* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 76; for 868-70: *Annales Alamannicorum continuatio Sangallensis prima* (n. 5) 51, *Annales Weingartenses* (n. 5) 66, *Annales Sangallenses* (n. 5) 76, *Annales Fuldenses* (n. 1) 72; for 878: *Annales Fuldenses* (n. 1) 92, *Folcwini gesta* (ed.), O. Holder-Egger *MGH SS XIII* (Hanover 1881) 622, *Petri bibliothecarii historia francorum abbreviate* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 418; for 939-42: *Annales Colonienenses* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 98, *Annales capituli Cracoviensis* (ed.), Georg Heinrich Pertz *MGH SRG XI* (Hanover 1866) 15, *Cronicon Suevicum universale* (ed.), H. Bresslau *MGH SS XIII* (Hanover 1881) 67, *Herimanni Augiensis chronicon* (ed.), Georg Heinrich Pertz *MGH SS V* (Hanover 1844) 113, *Widukind of Corvey, Res gestae Saxonicae* (eds.), H.-E. Lohmann and Paul Hirsch *MGH SRG LX* (Hanover 1935) 94, *Annales Sangallenses* (n. 5) 78, Adalbert of Magdeburg *Chronicon*, (ed.), Friderich Kurze *MGH SRG L* (Hanover 1890) 162, Flodoard of Reims, *Annales* (ed.), Georg Heinrich Pertz *MGH SS III* (Hanover 1839) 389. It is uncertain whether Nithard refers to a cattle pestilence or weather-related bovine deaths in the early 840s. He observes that the winter of 842/43 was 'full of diseases' and 'harmful to cattle': *Historiarum libri iiiii* (ed.), Ernst Muller *MGH SRG XLIV* (Hannover 1907) 49. A later Danish text records a mortality of animals in 849. For a variety of reasons, however, this passage must be treated most cautiously. It is possible that it is misdated and derived from one of the passages collected here. The text reads that there was "... a food shortage, mortality of humans and pestilence of animals." / "... fames et mortalitas hominum et pestis animalium." *Annales Rerum Danicarum Esromenses a Nato Christo ad Annum 1307*, ed. Jacob Langebek, *Scriptores Rerum Danicarum Medii Aevi I* (1969), p. 229.
- 6 For 791: *Annales qui dicuntur Einhardi* (ed.), F. Kurze *MGH SRG VI* (Hanover 1895) 89, 91 and Saxon Poet, *Annales de gestis Caroli magni imperatoris* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 248; for 896: *Annales Fuldenses* (n. 1) 127; for 887: *Annales Fuldenses* (n. 1) 105.
- 7 The so-called *East Anglian Chronicle* refers to a cattle pestilence in 869. However, these annals are highly derivative. This entry may come from the continental *Rouen Annals* and, consequently, refer to livestock deaths in Normandy. Byrhtferth, *East Anglian Chronicle* (ed.), Cyril Hart (Lewiston 2006) 89.
- 8 In fact, few non-Carolingian sources of mid eighth- through mid tenth-century Europe document livestock pestilences. The main exceptions, the Irish annals, document livestock mortalities when Carolingian sources do not: in the late 770s, early 900s and mid 910s. The *Anglo-Saxon Chronicle* reports disease



among stock in the mid 890s. The *Annals of Ulster* and *Chronicon Scotorum* were consulted on The Corpus of Electronic Texts (CELT): <http://celt.ucc.ie/publishd.html> (15 and 16 March 2011). *The Anglo-Saxon Chronicle* (trans.), G. N. Garmonsway (London 1975) 90. Byzantine, Italian, Spanish and Welsh texts of the first millennium CE refer very infrequently to outbreaks of livestock disease and contemporary written sources are not available for Eastern Europe, Scandinavia or Scotland.

- 9 See, for instance, Jean-Pierre Devroey, *Economie rurale et société dans l'Europe franque (VIe-IXe siècles)* (Paris 2003) 66, 76; Clive A. Spinage, *Cattle Plague: A History* (New York 2003) 3, 83, 89; Adriaan Verhulst, *The Carolingian Economy* (Cambridge 2002) 25; Roger Collins, *Charlemagne* (Toronto 1998) 170; Gordon R. Scott, 'The History of Rinderpest in Britain. Part One, 809-1799' *State Veterinary Journal* 6 (1996) 8; Robert H. Dunlop and David J. Williams, *Veterinary Medicine. An Illustrated History* (St. Louis 1996) 209; Gordon R. Scott and Alain Provost, *Global Eradication of Rinderpest* (Rome 1992) 1; Jacob Isidor Mombert, *History of Charles the Great* (New York 1888) 446-47. Early medieval livestock pestilences have been widely overlooked in general. The major exception is Carroll Gillmor, 'The 791 Equine Pestilence and its Impact on Charlemagne's Army' *Journal of Medieval Military History* 3 (2005) 23-45.
- 10 The discussion here, as such, supports (but does not confirm) the suspicions of earlier scholars. See, for instance, Scott (1996) and Scott and Gordon (1992) in n. 9 above.
- 11 '[V]enit mortalitas magna animalium ab oriente et pertransiit usque in occidentem.' *Chronicon Moissiacense* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 309.
- 12 The revised *Annales regni Francorum* concludes in 801. In his account of the 'signs' that preceded Charlemagne's death, Einhard refers to the campaign against the Danes in 810 but not the cattle pestilence. Einhard, *Vita Karoli magni* (ed.), Holder-Egger *MGH SRG XXV* (Hanover 1911). Einhard penned this *vita* sometime between 814 and 829, likely c.820: Rosamond McKittrick, *Charlemagne. The Formation of a European Identity* (Cambridge 2008) 11-14, 27.
- 13 'Undique praesentis pax laetificaverant anni / Cunctos imperii fines, sed tristia quaedam / Multis contigerant terris: nam seior omni / Hoste nefanda lues pecudum genus omne peremit. / Nam cum pastores agerent armenta gregesque / Mane foras laetos in prata virentia, sero / Aegra domum rediit vix pars paucissima, dirae / Signa gerens pestis macie mortisque propinque. / At maior numerus campi per plana iacebat, / Qua dulces animas virides efflavit ad herbas. / Iamque cadaveribus foetebant Pascua stratis, / Extractis etiam, praesepia quaeque labore / Purgari multo poterant, tum qui moriturum / Cernentes animal magis id prosternere ferro / Eligerent, statim stillans e vulnere tabo / Prodiderat toto concretum corpore virus. / Noricus ista sinus fertur specialiter esse / Prepressus steriles hoc factae tempore vites / Praeterea steriles hoc factae tempore vites / Impenso sibimet nulla mercede labori / Respondent, spes est avidi frustrata coloni / Dum vineta carere suo pubentia foetu / Conspicit, et vane silvescit inutilis arbor / Palmite diffuso nullas dum pampinus uvas / Contegit, et fructu vacua stat vinea lata. / Partibus in multis regni sic omine tristi / Bachica non solito perierunt pocula damno. / Tempore nimirum tanto licet ante, per orbem / Augusto, luctum, terris abeunte, futurum / Iam ostendebat Casus tristissimus iste.' Saxon Poet, *Annales* (n. 6) 263-64. The poet's verse has here been rendered in prose, and his last lines, dealing with the poor grape harvest, have not been translated.
- 14 'Tanta fuit in ea expeditione boum pestilentia, ut pene nullus tanto exercitui superesset, quin omnes usque ad unum perirent; et non solum ibi, sed etiam per omnes imperatorii subjectas provincias illius generis animalium mortalitas inmanissime grassata est.' *Annales regni Francorum* (n. 6) 132. This passage is found verbatim or nearly verbatim in later texts such as Regino of Prum's *Chronicon*, composed in the early tenth century, and the annals of so-called *Annalista Saxo*, composed in the mid twelfth century: Regino of Prum, *Chronicon* (ed.), Friderich Kurze *MGH SRG I* (Hanover 1890) 70; *Annalista Saxo* (ed.), G. Waitz *MGH SS VI* (Hanover 1844) 567.
- 15 'Mortalitas bouum maxima pene in tota Europa nec non et hominum plurimorum...' *Annales Laurissenses minores* (ed.), Georg Heinrich Pertz *MGH SS I* (Hanover 1826) 121.
- 16 'Magna mortalitas animalium fuit.' *Annales sancti Emmerami maiores* (ed.), H. Bresslau *MGH SS XXX.2* (Leipzig 1934) 739.
- 17 '[M]agna mortalitas bouum et aliorum animalium erat in ipso anno, et hiemps valde dura.' *Annales Xantenses* (ed.) B. von Simson *MGH SRG XII* (Hanover 1909) 4.
- 18 The *ARF* and *ALM* reference a hard winter in 811 (in the latter: 'hiemps fuit durissima perdurans usque ad finem Martii mensis'). Still, the absence of any remark in the *AX* to the human mortality reported in the *ALM* and its assigning of the hard winter to 810 leaves room to speculate that it does furnish an independent account of the panzootic.
- 19 'Ante hos paucos annos disseminata est quedam, stultitia, cum esset mortalitas bouum, ut dicerent Grimaldum, ducem Beneventorum, transmisisse homines cum pulueribus, quos spargerent per campos et montes, prata et fontes, eo quod esset inimicus christianissimo imperatori Karolo, et de ipso sparso pulvere mori boues. Propter quam causam multos comprehensos audiimus et vidimus, et aliquos occisos, plerosque autem affixos tabulis in flumen proiectos atque necatos. Et, quod mirum valde est, comprehensi ipsi aduersum se dicebant testimonium, habere se talem puluerem, et spargere. Ita namque diabolus, occulto et iusto Dei iudicio, accepta in illos potestate, tantum eis succedere valebat, ut ipsi sibi essent testes fallaces ad mortem. Et neque disciplina, neque tortura, neque ipsa mors deterrebat illos, ut aduersum semetipsos falsum dicere non auderent. Hoc ita ab omnibus credebatur, ut pene pauci essent, quibus absurdissimum videretur. Nec rationabiliter pensabant, unde fieri posset talis puluis, de quo soli boues morentur, non cetera animalia, aut quomodo tantum portari per tam latissimas regions, quas superspargere pulueribus homines non possunt, nec si Beneventani viri et femine, senes et iuuenes, cum ternis carris puluere caricatis egressi de regione fuissent.' Agobard of Lyons, *De grandine et tonitruis* (ed.), L. Van Acker *Agobardi lugdunensis opera omnia* (Brepols 1981) 14-5. This translation is slightly altered from Paul Edward Dutton's: *Carolingian Civilization. A Reader* (Peterborough 2004) 223.
- 20 '[I]nvictissimus Karolus itinere terrestri, quamvis multum angusto et invio, domi eos invadere molitus est. Sed vel Dei providentia prohibente, ut secundum scripturas in his experiretur Israhelem, vel peccatis nostris obsistentibus, cuncta illius temptamenta in irritum deducta sunt in tantum, ut ad incommoda totius exercitus comprobanda de unius abbatis copiis in una nocte quinquaginta bouum paria repentina peste numerarentur extincta. Sapientissimus igitur virorum Karolus, ne scripture inobediens contra iactum fluvii conaretur, destitit ab incepto.' Notker Balbulus, *Gesta Karoli magni imperatoris* (ed.), Hans F. Haefele *MGH SRG ns XII* (Berlin 1959) 75-6. The translation given here is from Thomas F. X. Noble, *Charlemagne and Louis the Pious. Lives by Einhard, Notker, Ermoldus, Thegan and the Astronomer* (University Park Pennsylvania 2009) 107.
- 21 That only one other cattle pestilence in Charlemagne's reign (that of 801) is encountered in extant sources and that it is very poorly documented in comparison to that of 809-10, not addressed in the *ARF*, and was quite possibly regional in scope, also signifies that Notker is here referring to bovine mortalities c.810.
- 22 Instead his text is considered revealing of how Charlemagne was remembered by later Carolingians.
- 23 At least one of these informants, Adalbert (Notker's foster father), was a contemporary to the pestilence and, according to Notker, the primary source for Notker's account of Charlemagne's campaigns, and, thus, this pestilence. Adalbert was present on several of Charlemagne's campaigns. Of course, Adalbert may have conflated his account of the bovine mortalities c.810 with later pestilences, if he did indeed provide Notker with an account. It is uncertain whether the other named informant (Adalbert's son Werinbert, who died in 884) or the third unnamed informant lived through the early ninth-century panzootic.
- 24 Rudolf Pokorny, 'Ein unbekannter Synodalsermo Arns von Salzburg' *Deutsches Archiv für Erforschung des Mittelalters* 39 (1983) 381, 393-399.
- 25 'Mortalitas pecorum in Britannia.' *Annals Cambriae* (ed.), John Williams (London 1965) 11.
- 26 *Brut y Tywysogyon: Peniarth MS. 20 Version* (trans.), Thomas Jones (Cardiff Press, 1952) 3; *Brut y Tywysogyon: Red Book of Hergest Version* (trans.), Thomas Jones (Cardiff 1955) 7. *Brenhinedd y Saesson* (trans.), Thomas Jones (Cardiff 1971) 13.
- 27 The same could be said of the dearth of evidence for livestock plagues in early medieval texts written in Italy. That evidence for stock plagues in early medieval Italian or pre ninth-century English sources is scarce or non-existent does not signal that epizootics did not occur in Italy prior to 1000 or in England prior to 800. The record for livestock disease in the early Middle Ages is not complete. That the *Historia regum reports an early ninth-century stock pestilence in England and the ASC* does not, illustrates that the latter, a chief source for early medieval English history, does not provide a full record of early medieval English epizootics.
- 28 Though the 'Brenhinedd y Saesson' version of the *Brut* speaks only of mortalities in Wales, the 'Red Book' and 'Peniarth MS 20' versions speak generally of an animal mortality throughout Britain. The latter is regarded as the more complete, reliable and literal translation of the *Cronica/Historia*.
- 29 Donnchadh Ó Corráin, 'Ireland c.800. Aspects of Society' in: Dáibhí Ó Cróinín (ed.), *A New History of Ireland I. Prehistoric and Early Ireland* (Oxford 2005) 583-84. The *Bóshlechtae* appears to have been the first of its kind, which may say something about the scale of bovine losses in Ireland. The law was 'reissued' in 826 in Connacht, after an outbreak of human disease and food shortage.
- 30 The passage reads, 'And there was a great destruction of cattle in diverse places.' / 'Facta est et magna pecorum strages in locis diversis.' *Symeonis monachi opera omnia: Historia Regum* (ed.), Thomas Arnold (London 1885) 63. The pre twelfth-century portions of the *Historia regum* are derived from earlier sources

- and it has been suggested that the late eighth century- and early ninth-century portion of the text, including the early ninth-century cattle mortality which is not referenced in another insular source, was taken from a non-extant set of Northumbrian annals: Antonia Gransden, *Historical Writing in England I: c.550-c.1307* (London 2000) 148-49.
- 31 'Maxima mortalitas boum totam poene vastavit Europam sed maxime Britanniam.' *Polychronicon Ranulphi Higden* vol. VI. (ed.), Joseph Rawson Lumby (Nendeln, 1964) 294.
  - 32 For 699-701 see the *Annals of Ulster*, *Annals of Tigernach* and *Chronicon Scotorum*. For 986-87 see "The Anglo-Saxon Chronicle (C), annals 978-1017," transl. Margaret Ashdown, in *English and Norse Documents Relating to the Reign of Ethelred the Unready* (Cambridge 1930) 40-41; *Brut y Tywysogyon. Peniarth MS. 20 Version* (n. 26) 10; *Brut y Tywysogyon. Red Book of Hergest Version* (n. 26) 17; *Brenhinedd y Saesson* (n. 26) 45; *The Chronicle of John of Worcester* (trans.), Jennifer Bray and P. McGurk (Oxford 1995) 436-437; *Annals of Ulster; Annals of Tigernach; and Chronicon Scotorum*. The Irish annals were consulted on CELT (see n. 8 above).
  - 33 *The Chronographia* of Theophanes, the *Theophanes Continuatus* and John Skylitzes' *Synopsis Historion* were consulted.
  - 34 An individual reference to a 'great' mortality should be accepted cautiously as evidence of a vast mortality, as many of the livestock and human pestilences documented in the Carolingian period are said to be 'great': Newfield, 'Contours of Disease and Hunger' (n. b) 149, 151-52. That multiple independent sources speak to the vastness of the 809-10 pestilence, however, ensures us that the plague did indeed affect animals across a large area of Europe.
  - 35 Timothy P. Newfield, 'A Cattle Panzootic in Early Fourteenth-Century Europe' *Agricultural History Review* 57.2 (2009) 160, 176; Spinage, *Cattle Plague* 53-5, 104-06, 114-20, 146-60.
  - 36 For instance, *Annales regni Francorum* (n. 5) 164.
  - 37 The winter of 810/11 was difficult (see n. 18 above), but too late to account for the deaths reported here. More generally, weather-related livestock deaths rarely appear to have occurred across large regions, let alone in consecutive years.
  - 38 This assumes, of course, that major military ventures were indeed dependent on an adequate supply of live cattle, as the *ARF's* account of the 809-10 panzootic indicates. On the importance of live cattle in early medieval war see Bernard Bachrach, 'Animals and Warfare in Early Medieval Europe' Spoleto. *Settimane di Studio* 31 (1985) 711-18; idem, *Early Carolingian Warfare. Prelude to Empire* (Philadelphia 2001) 237, 240. There would be more reason to believe that animals died at Lippenham, if the death of Charlemagne's elephant there in 810 was result of the same disease that killed cattle (see n. 48 below).
  - 39 His 810 venture into Saxony was seemingly ineffective as Hühbeck was only retaken in 811, not 810, and the Wilzi who took Hühbeck in 810 had to be dealt with again in 812: *Annales regni Francorum* (n. 5) 134-35, 137.
  - 40 Whether the Danish retreat from Frisia was in anyway related to the presence of the pestilence in Denmark or Frisia is uncertain. Considering the role of cattle rearing in southwestern Jutland and western Schleswig, the importance of cattle at North and Baltic Sea *emporía*, and the proximity of Hühbeck and the Aller and Weser meeting to Jutland, we may speculate, however, that Denmark was affected. On *emporía* and cattle see n. 64 below.
  - 41 The Saxon Poet's use of Virgil requires further exploration. The Carolingian poet's use of *macies* too may have been borrowed from Virgil: P. Vergili Maronis Opera. *The Eclogues and Georgics* (ed.), John Conington and Henry Nettleship (Cambridge, Mass 1891) 294, 324-33.
  - 42 The people Agobard writes about seem to have thought that cattle were not affected in Benevento and Agobard may refer to the Alps when noting that the plague spread across mountains.
  - 43 Newfield, 'Cattle Panzootic' (n. 35) 159-71, 175. In regards to eighteenth-century cattle panzootics, Peter Koolmees notes that in the Netherlands the disease 'spread rapidly and killed most animals in the first two years' after its introduction: 'Epizootic Disease in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response' in Karen Brown and Daniel Gilfoyle (eds.), *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine* (Athens, Ohio, 2010), 23.
  - 44 However, some regions of ninth-century Europe, such as Frisia and the area around Trier, were undoubtedly cattle dense: Verhulst, *Carolingian Economy* (n. 9) 66; Renee Doebera, *The Early Middle Ages in the West. Economy and Society* (trans.), W. G. Deakin (Amsterdam 1978), 12.
  - 45 When diagnosing medieval pestilences, historians often overlook the epidemiology/epizootiology of the outbreaks they wish to diagnose and focus strictly on symptoms. The major exception is Samuel K. Cohn Jr., *The Black Death Transformed. Disease and Culture in Early Renaissance Europe* (London 2002).
  - 46 Considering its indefinite nature, the diagnosis suggested here should not be employed to comment upon the history of RPV. On the problems inherent in the practice of retrospective diagnosing see Andrew Cunningham, 'Identifying Disease in the Past: Cutting the Gordian Knot' *Asclepio* 54 (2002) 13-34 and Jon Arrizabalaga, 'Problematizing Retrospective Diagnosis in the History of Disease' *Asclepio* 54 (2002) 51-70.
  - 47 Newfield, 'Contours of Disease and Hunger' (n. b) 149, 152, 159. In his account of the 809-10 plague, the Saxon Poet provides the only reference in a Carolingian text to the symptoms that stock exhibited in epizootics.
  - 48 Possibly of note, however, is the death of Charlemagne's elephant, 'Abulabaz'. A gift from the caliph of Baghdad, Harun al-Rashid, the Asian elephant 'died suddenly' (*subita morte periit*) after Charlemagne reached Lippeham in 810. The *ARF*, which mentions the animal's death, does not, however, connect its passing with the mortality of bovines, and it is uncertain whether the two were related. *Annales regni Francorum* (n. 5) 154.
  - 49 Ambiguous references to 'animals', as such, can be treated as references to cattle mortalities. The '*boum et aliorum animalium*' encountered in the *AX* can also be translated as 'oxen and other cattle'. Cf. Newfield, 'Cattle Panzootic' (n. 35) 182.
  - 50 Though possibly weakened by the march, the cattle on Charlemagne's campaign would have presumably been strong, healthy and mature.
  - 51 That the disease does not appear to have adhered to a particular season or ecological conditions also indicates that it was not vector-borne.
  - 52 Philip Slavin, 'The Fifth Rider of the Apocalypse. The Great Cattle Plague in England and Wales and its Economic Consequences, 1319-1350' *Economic and Biological Interactions in Pre-Industrial Europe from the 13th to the 18th Centuries* (Florence 2010) 170; Newfield, 'Cattle Panzootic' (n. 35) 163-69, 185.
  - 53 Though, as observed, we should not base too much on the lack of recorded symptoms. Cf. Newfield, 'Cattle Panzootic' (n. 35) 181.
  - 54 Newfield, 'A Cattle Panzootic' (n. 35) 160; Philip Slavin, 'Great Cattle Plague' (n. 52) 167-68. More attention should be given to the intended meaning of *oriens* in the *CM*.
  - 55 Cf. the account of the 809-10 panzootic here with the descriptions of these diseases found at [www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/BLUETONGUE\\_FINAL.pdf](http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/BLUETONGUE_FINAL.pdf); [www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/BLUETONGUE\\_FINAL.pdf](http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/BLUETONGUE_FINAL.pdf); [www.fao.org/ag/magazine/0112sp.htm](http://www.fao.org/ag/magazine/0112sp.htm) (all accessed 27 February 2011).
  - 56 For instance, Spinage, *Cattle Plague* (n. 9) 81-216, 447-681; E.A. ter Laak, 'Contagious bovine pleuropneumonia' *The Veterinary Quarterly* 14 (1992) 105-06; John R. Fisher, 'A panzootic of pleuropneumonia, 1840-1860' *Historia medicinae veterinariae* 11 (1986) 26-32.
  - 57 For instance, Jean Blancou, *History of the Surveillance and Control of Transmissible Animal Diseases* (Paris 2003) 133-34, 161-62.
  - 58 Newfield, 'Cattle Panzootic' (n. 35) 158-59, 188-89.
  - 59 On RPV see Thomas Barrett et al (eds.), *Rinderpest and peste des petits ruminants. Virus plagues of large and small ruminants* (Amsterdam 2006) and [www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/RINDERPEST\\_FINAL.pdf](http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/RINDERPEST_FINAL.pdf) (accessed 27 February 2011).
  - 60 William A. Geering and William Amanfu, *Preparation of Contagious Bovine Pleuropneumonia Contingency Plans* (Rome 2002); Anonymous (FAO), *Recognizing Contagious Bovine Pleuropneumonia* (Rome 2002); [www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/CONTAGIOUS\\_BOVINE\\_PLEUROPNEUMONIA\\_FINAL.pdf](http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/CONTAGIOUS_BOVINE_PLEUROPNEUMONIA_FINAL.pdf)
  - 61 Yuki Furuse, Akira Suzuki and Hitoshi Oshitani, 'Origin of Measles Virus: Divergence from Rinderpest Virus between 11th and 12th Centuries' *Virology Journal* 7:52 (2010); Joel O. Wertheim and Sergei L Kosakovsky Pond, 'Purifying selection can obscure the ancient age of viral lineages' *Molecular Biology and Evolution* (2011) forthcoming. RPV and measles were long thought to have diverged "some 10,000 to 15,000 years ago": Peter L. Roeder and William P. Taylor, 'Rinderpest' *Veterinary Clinics of North America: Food Animal Practice* 18 (2002) 516; Thomas Barrett and P. B. Rossiter, 'Rinderpest. The disease and its impact on humans and animals' *Advances in Virus Research* 53 (1999) 100.
  - 62 Dunlop and Williams, *Veterinary Medicine* (n. 9) 209; J. A. Faber, 'Cattle-Plague in the Netherlands during the Eighteenth Century' *Mededelingen van de Landbouwhogeschool te Wageningen Nederland* 62 (1962) 1; Thomas Barrett, 'Vaccination Spells the End for a Devastating Plague' *Microbiology Today* February (2007) 20.
  - 63 Verhulst, *Carolingian Economy* (n. 9) 112.
  - 64 The remains of domestic bovines take up a large percentage of the animal bone assemblages of such sites. On the importance of domestic bovines at *emporía* see Terry O'Connor, 'Livestock and Deadstock in Early Medieval Europe from the North Sea to the Baltic' *Environmental Archaeology* 15 (2010) 1-15; idem, 'On the Interpretation of Animal Bone Assemblages from Wics' in David Hill and Robert Cowie (ed.), *Wics. The Early Medieval Trading Centers of Northern Europe* (Sheffield 2001) 54-60; Stig Jensen, *The Vikings of Ribe* (Ribe 1991) 21, 47.
  - 65 Gregory I. Halfond, 'Transportation, Communication and the Movement of Peoples in the Frankish Kingdom, ca. 500-900' *History Compass* 7 (2009) 1557.
  - 66 Barrett and Rossiter, 'Rinderpest' (n. 61) 100.

- 67 On the death of Charlemagne's elephant see nn. 38 and 48 above. RPV is not a clinical disease in elephants, though it has been thought in the past to have claimed elephants in India and Africa: Murray E. Fowler and Susan K. Mikota, *Biology, Medicine and Surgery of Elephants* (Iowa 2006) 144; Herbert H. T. Prins, *Ecology and Behaviour of the African Buffalo* (Bury St. Edmunds 1996) 131, 146, 148; Richard A. Kock, 'Rinderpest and Wildlife' in: Barrett et al (eds.), *Rinderpest and peste des petits ruminants* (n. 59) 148-55; Spina, *Cattle Plague* (n. 9) 29-31, 474, 639-41, 677.
- 68 Indeed, none of the 'elementary zoo-sanitary measures' (W.P. Taylor, 'Epidemiology and Control of Rinderpest' *Scientific and Technical Review (of the OIE)* 5 (1986) 407) required to stamp out RPV or CBPP are likely to have been effectively carried out, as the scale of the pestilence itself indicates. Large systematic culls and quarantines require vast human and financial resources not present in the Carolingian period. On medieval 'cures' of livestock disease see Lynn L. Remly, 'Magic, Myth, and Medicine. The Veterinary Art in the Middle Ages (9th-15th Centuries)' *Fifteenth-Century Studies* 2 (1979) 203-09; William C. Jordan, 'Charms to Ward off Sheep and Pig Murrain' in: Miri Rubin (ed.), *Medieval Christianity in Practice* (Princeton 2009) 67-75.
- 69 Newfield, 'Contours of Disease and Hunger' (n. b) 363-64, 374-75, 385-86.
- 70 Verhulst, *Carolingian Economy* (n. 9) 66.
- 71 The technology required to employ horses in traction may also not have been widely available. We may suspect that the dung of sheep was used as manure, and that legumes and vetches were grown where possible to fertilize the soil.
- 72 As occurred following the early fourteenth-century panzootic: Slavin, 'Great Cattle Plague' (n. 53) 171-72. For a late antique precedent: Dionysius Ch. Stathakopoulos, *Famine and Pestilence in the Late Roman and Early Byzantine Empire. A Systematic Survey of Subsistence Crises and Epidemics* (Aldershot 2004) 162-63.
- 73 It is unlikely that any shortage brought by the plague would have been so severe that it resulted in human deaths. It is improbable that the panzootic, through a shortage, accounts for the human mortality documented in the ALM in 810. In the Carolingian period, famines, as opposed to lesser food shortages, seem to have been triggered by the concurrence of multiple environmental shocks (extreme weather, short-term climatic anomalies, epidemics, epizootics, locust swarms, etc.). Some later Carolingian cattle pestilences (in 820, 860, 868-70 and 939-42) took place alongside other environmental shocks and appear to have contributed to famine. See Newfield, 'Contours of Disease and Hunger' (n. b) 346-60, 382.
- 74 For 809: *Capitulare missorum Aquisgranense primum* (ed.), Alfred Boret *MGH CAPI* (Hanover 1883) 151; Saxon Poet, *Annales* (n. 6) 264. For 813: *Capitula e canonibus excerpta* (ed.), Alfred Boret *MGH CAPI* (Hanover 1883) 174. The dearth of evidence for epidemic hunger in 810, 811 or 812 may be attributed to the purview of contemporary annalists. The chief source for the early Carolingian period, the *ARF*, does not report a food shortage until 820, though other sources (annals in the late eighth century and capitularies in the early ninth century) document shortages in 762-64, 779, 789, 791-94 and 805-07: *Annales regni Francorum* (n. 5) 154; Newfield, 'Contours of Disease and Hunger' (n. b) 300-01, 314-17.
- 75 Slavin has demonstrated that it took over twenty years to fully repair cattle stocks in England after the early fourteenth-century cattle panzootic: 'Great Cattle Plague' (n. 52) 179-81.
- 76 Much progress in restocking may have occurred within a decade given the evidence for widespread bovine mortalities in the early 820s (see n. 5).
- 77 Newfield, 'Cattle Panzootic' (n. 35) 161-62, 164, 183; Dutton, *Carolingian Civilization* (n. 19) 28.
- 78 Of course, if carrion was consumed and biblical prohibitions ignored, meat would have been available on a large scale in the immediate wake of the plague. For biblical bans on the consumption of carrion, see Leviticus 22:8; Exodus 22:31; Deuteronomy 14:21. Several early medieval penitentials also speak against the eating of animals that died a natural death. See Rob Meens, 'Pollution in the Early Middle Ages: the Case of Food Regulations in Penitentials' *Early Medieval Europe* 4 (1995) 3-19.
- 79 As in the early 1300s: Slavin, 'Great Cattle Plague' (n. 52) 174-76.
- 80 Though the *AF* implies that horses were most often, at least at the end of the ninth century, used as pack animals on campaign: *Annales Fuldenses* (n. 1) 127.
- 81 *Annales regni Francorum* (n. 5) 134-35, 137.
- 82 Einhard, *Vita Karoli magni* (n. 11) 36.
- 83 Slavin, 'Great Cattle Plague' (n. 52) 177-79.
- 84 As they were in 1300s: Newfield, 'Cattle Panzootic' (n. 35) 185; Slavin, 'Great Cattle Plague' (n. 52) 171, 181.
- 85 As a range of other Carolingian sources indicate: Newfield, 'Contours of Disease and Hunger' (n. b) 346.

Karen Brown and Daniel Gilfoyle (eds.)

## Healing the herds. Disease, livestock economies and the globalization of veterinary medicine.

Ohio University Press, Athens Ohio, 2010. 299 blz., ill. Prijs \$ 24,95. ISBN-13 978-0-8214-1885-7.

In 2005 vond in het Britse Oxford een international congres plaats over de verbanden tussen veterinaire wetenschap, ziekten en veehouderij in de afgelopen eeuwen. Dit was vrij uniek, want tot dan toe was er weinig aandacht geweest voor de historische relaties tussen diergeneeskunde, maatschappij en economie. Op het congres werden studies naar deze verbanden gepresenteerd vanuit verrassende invalshoeken. Een aantal van deze studies is gebundeld. De bundel *Healing the herds* bevat veertien bijdragen over gebieden over de hele aarde. Na een uitgebreide inleiding door beide redacteuren opent Peter Koolmees de bundel met een overzicht van de belangrijkste epizootiën in Nederland van het begin van de achttiende eeuw tot en met 2002. Deze worden geplaatst in de bredere context van de maatschappelijke ontwikkeling van drie eeuwen. Voor een klein deel past de bijdrage van Koolmees bij die van Dominik Hünninger over de bestrijding van runderpest in het achttiende-eeuwse Sleeswijk-Holstein.

Runderpest staat ook centraal in de bijdrage van Daniel Doeppers over de Filippijnen in de periode 1886-1941. Bron van de besmetting was daar steeds het Aziatische vasteland, waarvandaan runderen werden geïmporteerd om vooral de Europese koloniale bovenlaag in Manilla van rundvlees te kunnen voorzien. Omdat de bij de rijstbouw gebruikte inheemse waterbuffels ook besmet werden, mislukte ook de rijsttoegst en kon een maatschappelijke crisis van grote omvang ontstaan.

Complicerende factor tijdens een van de uitbraken was de revolutionaire strijd tegen de Spaanse kolonisator waardoor het bestuur ernstig ontregeld raakte.

De band tussen kolonie en kolonisator speelt een rol in diverse artikelen. Zo schrijft David Anderson over de veehouderij in Kenia en haar relatie tot het *British Empire* voor de Tweede Wereldoorlog, en is er van Robert John Perris

Edited by Karen Brown and Daniel Gilfoyle

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SERIES IN ECOLOGY AND HISTORY