

Part Three

PATHOGENS

Chapter 5

ARMY HEALTH

Armies as a Hazard to Public Health

On July 5, 1847 the French *Chambre des députés* became the scene of an important parliamentary debate, concerning peacetime mortality in the French armed forces. Representative Desjobert started the discussion by arguing that the death-rate in the military in peacetime significantly exceeded that of comparable age-groups in the general population. The Minister of War and another general denied the claim. The debate eventually ended inconclusively but serves as a powerful symbol that contemporaries were well aware that armed forces lost far more men to environmental factors, mainly diseases, than to enemy action.¹

A consensus exists among historians that warfare not only caused important health issues, including the spread of epidemics, but also stimulated significant changes in medical practices, from wound treatment to inoculation. Because of this perceived dialectic relationship, the narrative of progress, the slow ascendancy of “modernity,” is particularly strong in studies about the history of military medicine.² It notably builds on the assumption that medieval armies did not take basic measures of disease prevention and lacked well-educated medical practitioners.³ The Parisian anecdote above reveals that nineteenth-century armies still had to cope with serious health issues.

The study of military health has a long history since it is rooted in the writings of army doctors themselves, who examined as early as the eighteenth and nineteenth century past occurrences of epidemics. By the First World War the connection between warfare and epidemics had become firmly established.⁴ Exchanges between medical and environmental history, however, are a far more recent phenomenon. Historians have traditionally placed their main emphasis on European troops in tropical contexts, environments to which they proved particularly vulnerable, and ship crews on long sea voyages. Hospitals and wounds have also benefited from far more attention than mechanisms of disease prevention.⁵ The findings of battlefield excavations have in fact become increasingly important for the study of military medicine in historical contexts during the last decades.⁶

1 *Discours prononcés par M. Desjobert.*

2 Gabriel and Metz, *A History*; Garrison, *Notes*; Hargreaves, “The Long Road”; Smallman-Raynor and Cliff, *War Epidemics*, 32–40.

3 Gabriel and Metz, *A History*, 1:205–10, 2:143–54; Garrison, *Notes*, 85–97; Vollmuth, *Die sanitätsdienstliche Versorgung*, 117–18. For a different view, see Geltner, “In the Camp and on the March.”

4 Heizmann, “Military Sanitation”; Hirsch, *Geographical and Historical Pathology*; Prinzing, *Epidemics*.

5 Lenihan, *Fluxes, Fevers, and Fighting Men*; McNeill, *Mosquito Empires*; Mitchell, *Medicine*; Mounier-Kuhn, *Chirurgie de guerre*; van Meerbeeck, “Service sanitaire”; Wagner, *Die Seuchen*.

6 See for instance Meller, ed., *Schlachtfeldarchäologie*.

The current chapter questions this idea of progress by considering the changes in the ways members of an army sought to preserve their health within a larger spectrum of ecological interactions. The term “pathogens,” disease-producing microorganisms or materials, refers to the lowest level in ecological systems, that between species and individual organisms. Rather than assume that medieval armies remained apathetic towards epidemics and that soldiers became increasingly aware of the importance of prophylactic or preventative healthcare during the Renaissance or subsequent centuries, it considers whether changes in the organization of armies themselves made them more vulnerable to ecological pressures. Significant medical developments eventually occurred, but these changes might have been more evolutionary than revolutionary and could furthermore have been brought about by a steady deterioration of military health over time.

The main theoretical framework underpinning military health practices throughout the 1250–1850 period remained in effect that of Hippocrates and Galen. The Greek physician Hippocrates (who lived in the fifth to fourth centuries BCE) is traditionally credited with formulating the idea that pestilential or corrupt air (miasmas) produced disease for the first time in a European context. The Roman doctor Galen (from the second century CE) considerably expanded this theory and connected susceptibility to “bad air” to the balance of humours in the body. The four humours are black bile, yellow bile, phlegm, and blood. According to humoral theory any imbalance in these four substances can cause disease. In order to remain healthy, one had to maintain equilibrium between the six non-naturals (air, motion and exercise, sleeping and waking, food and drink, excretion, and passions/emotions) for these influenced the four humours.⁷

Furthermore, there remained a strong continuity in the functions attributed to various kinds of medical practitioners. From the Central Middle Ages until the early nineteenth century strict divisions existed between physicians on the one hand and surgeons on the other. Physicians were mainly concerned with disease, or their patients’ interior health, and followed a university education. Surgeons by contrast set bones and dressed wounds, a trade most of them learned as apprentices. Aside from physicians and surgeons, there were also barbers or barber-surgeons, skilled in shaving and bloodletting. This provided them with a basic knowledge of the treatment of wounds. Attaching medical practitioners, invariably surgeons or barber-surgeons, to specific military units only became general practice during the sixteenth century. We know that physicians, university-educated surgeons, and pharmacists, all served as members of a ruler’s or commander’s household (an army’s “general staff”) during the Middle Ages. They continued to do so during the early modern period but were from the sixteenth century onwards also attached to military hospitals. The majority of medical practitioners actually present with armed forces in the field were therefore surgeons and barber-surgeons.⁸

The maintenance of army health on the most basic level did not involve either medical practitioners or miasmas, but simply resolved around defence against environmen-

⁷ Jouanna, *Greek Medicine*, 119–36.

⁸ Howard, *Napoleon’s Doctors*, 5–18; Kerkhoff, “Over de geneeskundige verzorging,” 49–59; Vollmuth, *Die sanitätsdienstliche Versorgung*.

tal pressures. Reading the “ego documents” left by army members, particularly those written by private soldiers, provides a stringent reminder of the omnipresence of inclement weather and climate. These ecological impacts had a major, but in historical studies somewhat neglected, effect on military health. Hendrik Conscience, a seventeen-year-old volunteer with the Belgian army in 1831, still vividly remembered in 1858 how he spent his first night in the open field and that he immediately fell sick.⁹ While earlier centuries might lack the prevalence of such personal testimonies, they are by no means absent. As early as the fourteenth century, the poet Eustache Deschamps, who participated in the French invasion of Guelders (1388), recorded his experiences (see chap. 1). An anonymous gunner from Utrecht who fought with the imperial army during the 1554 campaign in the Meuse valley mentioned in his journal that on the night of October 26 three soldiers froze to death when standing guard. The French engineer de Vauban included a note in his account of the 1692 siege of Namur that the trenches were constantly full of water because of the incessant rain.¹⁰

Chronicles and fiscal accounts can be very informative as well and provide a more detached perspective. Melis Stoke's chronicle, dating to the early fourteenth century, records for instance that Haarlem lost its warship in the Meuse estuary during a storm. The prior of St.-Jakob's hospital in Tongres/Tongeren, on the other hand, corroborated the observations of the aforementioned gunner when he noted that imperial troops passed by in 1552 “with running noses and with chattering teeth, and many were very sick and died like dogs.”¹¹ In November 1585 the town of Weert had to accommodate twenty-six Spanish soldiers arriving from the Bommelerwaard with frozen feet. For several of these men help came too late.¹²

While armed forces certainly took seasonal fluctuations, and general weather circumstances, seriously (there being examples of medieval mounted raids being cancelled because of heavy rain), one should not go so far as to assume that they never campaigned before late spring and always stopped fighting in late fall.¹³ In some cases continuing military action, despite such environmental constraints, could bring a commander significant advantages. In 1386 the presence of a strong west wind encouraged the urban militia of Brussels to lead an assault on Grave. One chronicle claims that they thought incendiary missiles would be more effective, another asserts that dust clouds

9 Conscience, *De omwenteling*, 54–57.

10 Deschamps, *Oeuvres*, 1:123–24, 3:24–26, 5:121–22; de Vauban, *Journal*, 139, 153; Macaré, ed., “Dagverhaal,” 284, 303–4. See also de Rabutin, *Commentaires*, 1:164; d'Haynin, *Mémoires*, 1:131, 1:145, 1:158, 1:217, 1:221, and 2:85; Duyck, *Journal*; Hexham, *A Journal*; Jacquet-Ladrier, “Les mésaventures,” 85; Laukhard, *Leben und Schicksale*, 3:106, 3:110, 3:122, 3:123, 3:130, 3:140, 3:141; Vallée and Pariset, eds., *Carnet*, 7, 57; Peters, ed., *Peter Hagendorf*, 62; von Adlersfels-Ballestrem, ed., *Memoiren*, 12.

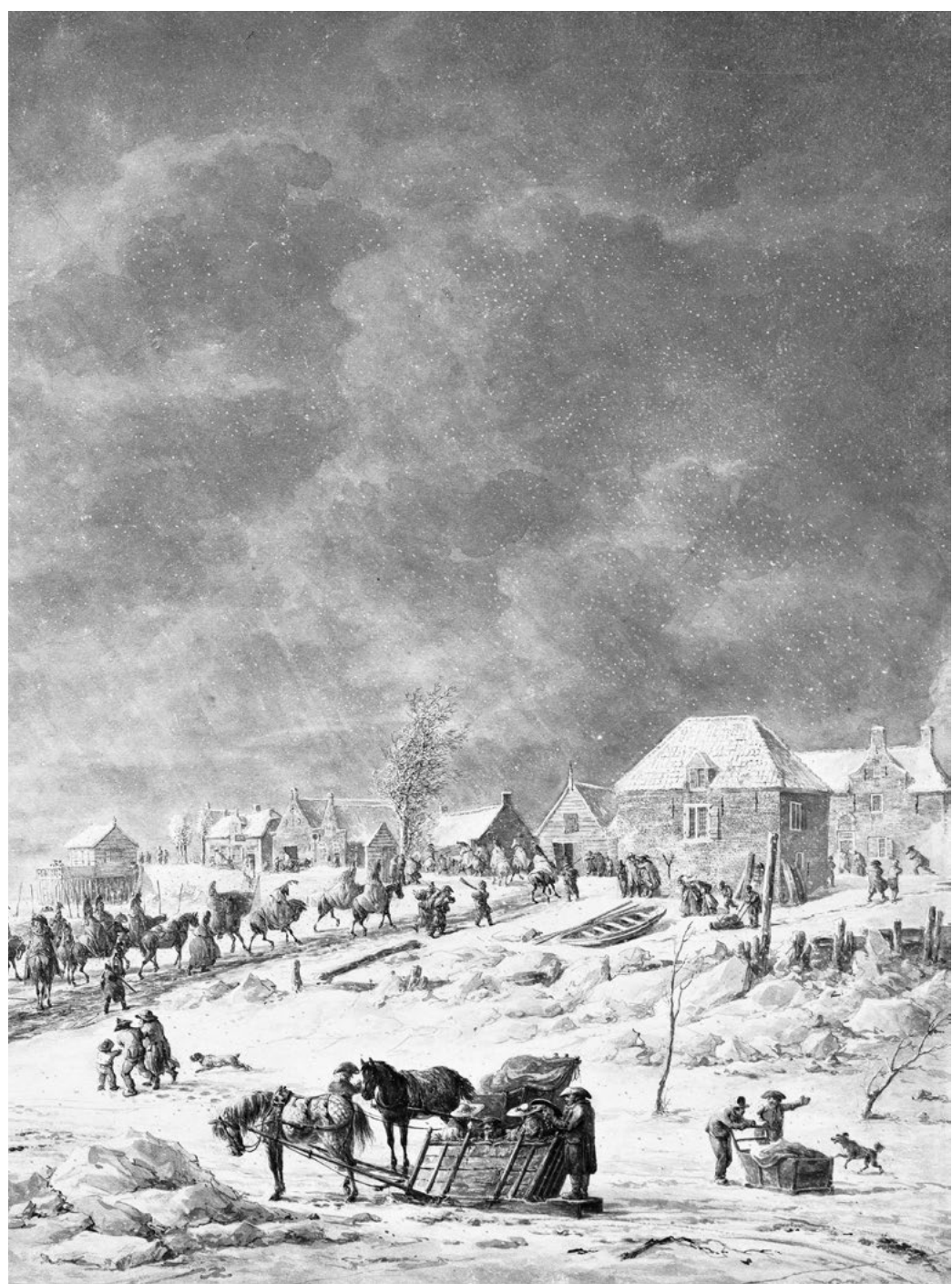
11 Stoke, *Rijmkroniek*, vv. 590–608 (<http://resources.huygens.knaw.nl/rijmkroniek>); Vandewal, “De kroniek,” 235, 241. See also de Stavelot, *Chronique*, 112; Kraus, *Regesten*, vol. 6, no. 827.

12 This would have shortly before Dutch troops breached the dikes and isolated the Spanish infantry on an island in the Meuse (see fig. 22 above). Klaversma, *Weert tussen 1062 en 1602*, 217.

13 van Boendale, *Brabantsche yeesten*, 2:348 (bk. 6, vv. 10110–10114 and 10125–10128); Buisman, *Duizend jaar wind, weer en water 1300–1450*, 577.

Figure 30. The French army crosses the frozen Meuse during the winter of 1794–1795. Painting by Dirk van Langendijk, an eyewitness. The soldiers in the foreground are marching on a dike (Rotterdam, Atlas van Stolk, inv. no. 3224). Reproduced with permission of the Atlas van Stolk.





would blind the defenders (possibly referring to the river dunes and drift sands near the city). Whatever the advantages the gale might have brought, their attack ultimately failed.¹⁴ The French *Armée du Nord* was more fortunate during the winter of 1794–1795. The freezing of the Meuse and other major rivers nullified the defensive value of the Hollandic Water Line and allowed the French army to invade the republic's heartland (see figure 30). It is noteworthy that H. A. Sabron, captain in the Dutch general staff, published tables with mean temperatures as early as 1893 to demonstrate that extremely cold temperatures hampered the republic's defensive efforts.¹⁵

The rapid collapse of the Dutch defence in 1795 confirms Dagomar Degroot's conclusion that climate changes were "a catalyst for, but rarely a cause of, military victories and defeats."¹⁶ It is the combination of environmental pressures and a society's range of adaptive strategies, which are based on earlier experiences and existing developments, that really matters (see also chap. 3). We know that the Dutch army suffered from a range of structural problems in the late eighteenth century, which prevented it from responding adequately to its French enemies. The Dutch traditionally relied on large numbers of foreign soldiers, for example, which worked well during the Eighty Years War but caused significant difficulties during the eighteenth century, because they gradually lost access to their traditional recruiting grounds.¹⁷ The renewed interest in weather and climate does have the merit, however, of placing armies' well-known vulnerability to disease in perspective. It shows that military health concerns cannot be limited to hygiene awareness.

The ways that armies sought to protect themselves from the elements might seem rudimentary, but they fulfilled a key role in health preservation. The construction of huts, made from straw and wood, sometimes with linen and possibly added with moss, remained common on campaign up to the nineteenth century. Such huts appear on late medieval miniatures, seventeenth-century sketches or paintings, and photographs of the camp of Beverlo.¹⁸ Tents were of course preferable but were also quite expensive. During the Middle Ages they were consequently mainly restricted to noble retinues and urban militias. According to the accounts of Dordrecht from 1283–1287 the tents of the urban militia were washed and then stored in a church after they returned from a military campaign.¹⁹ It is only towards the end of the seventeenth century that using tents became the norm for all armed forces. The Prussian marshal von Natzmer, who served in the Dutch army in the

14 de Dynter, *Chronique*, 3:113–14; van Boendale, *Brabantsche yeeften*, 2:280–83 (bk. 6, vv. 8127–8215).

15 Sabron, *De oorlog*, 2; the tables are published on pages 32–33 of the attachments (*bijlagen*).

16 Degroot, *The Frigid Golden Age*, 195. See also more generally chap. 3 on disturbances.

17 *Essai sur l'armée hollandaise*, van Nimwegen, *De Republiek*.

18 Desbrière, *Chronique critique*, 50; de Solemne, *La Charge du Mareschal des Logis*, 21; Martin and Russon, *Vivre sous la tente*, 196–200; Richer, *Abrégé chronologique*, 212; Spaans, "Legerkampen," 171–73; Weuts, *Honderdvijftig jaar kamp van Beverlo*, 18–20.

19 Bolsée, ed., *La grande enquête*, 87–88, 279; Burgers and Dijkhof, eds., *De oudste stadsrekeningen*, 10, 23, 24, 44–46, 55, 57, 63, 72; Martin and Russon, *Vivre sous la tente*, 184–96.

1670s, recalled in his memoirs that he still had to construct such huts and that they needed to be of uniform appearance, even though they were broken down again the very next day.²⁰

The issuing and repairing of clothing and shoes should be seen in a similar light. The accounts of Aachen specify that it paid a shoemaker to repair the footwear of citizens taking part in military expeditions during the fourteenth century.²¹ More than four centuries later (1788) a list of recruits of the Royal Liégeois regiment, assembled in Liège before their march to their new garrison in Givet, reveals that several of these men not only received a money bounty but also a new pair of shoes.²² The most common measure taken to preserve the wellbeing of horses was likewise the repairing or reshodding of horseshoes. In 1378 the prévôt of Chiny rewarded a village farrier for shoeing the horses of his followers, mobilized fiefholders. This force, sufficiently large since this task took eight days, apparently did not include a farrier. From the sixteenth century onwards farriers appear regularly on muster rolls, which suggests that their enlistment became standard practice around this time.²³

Guards and sentries were even more vulnerable to the elements, as suggested by the accounts of the high bailiff of Montfort from 1397–1398. These mention that the fortress's sentries received wool or fur trimmed cloaks. Urban accounts likewise include references to the construction or repairing of guardhouses, later made famous in the paintings of the Dutch Golden Age.²⁴ The accounts from the town of Geldern (1387/88) mention the making of arrow slits in one of these. They must have been common in fortresses as well, for the chronicler Petrus Treckpoel claimed that a gunner shot down the guardhouse from the main tower during the siege of the fortress of Reydt near Mönchengladbach (1464), so that the feathers of the sentinel's bed "flew around as if it has snowed."²⁵ Eighteenth-century garrison regulations were more specific and ruled that a soldier only had to stand guard for two hours at a time, or one hour during the winter months.²⁶

20 Dibbetz, *Het Groot Militair Woordenboek*, 300, 613; Melder, *Korte en klare instructie*, 72–73; von Adlersfels-Ballestrem, ed., *Memoiren*, 12.

21 Laurent, *Aachener Stadtrechnungen*, 278, 279, 281.

22 Brussels, CDMRA, Ancien Régime, inv. no. II/20.

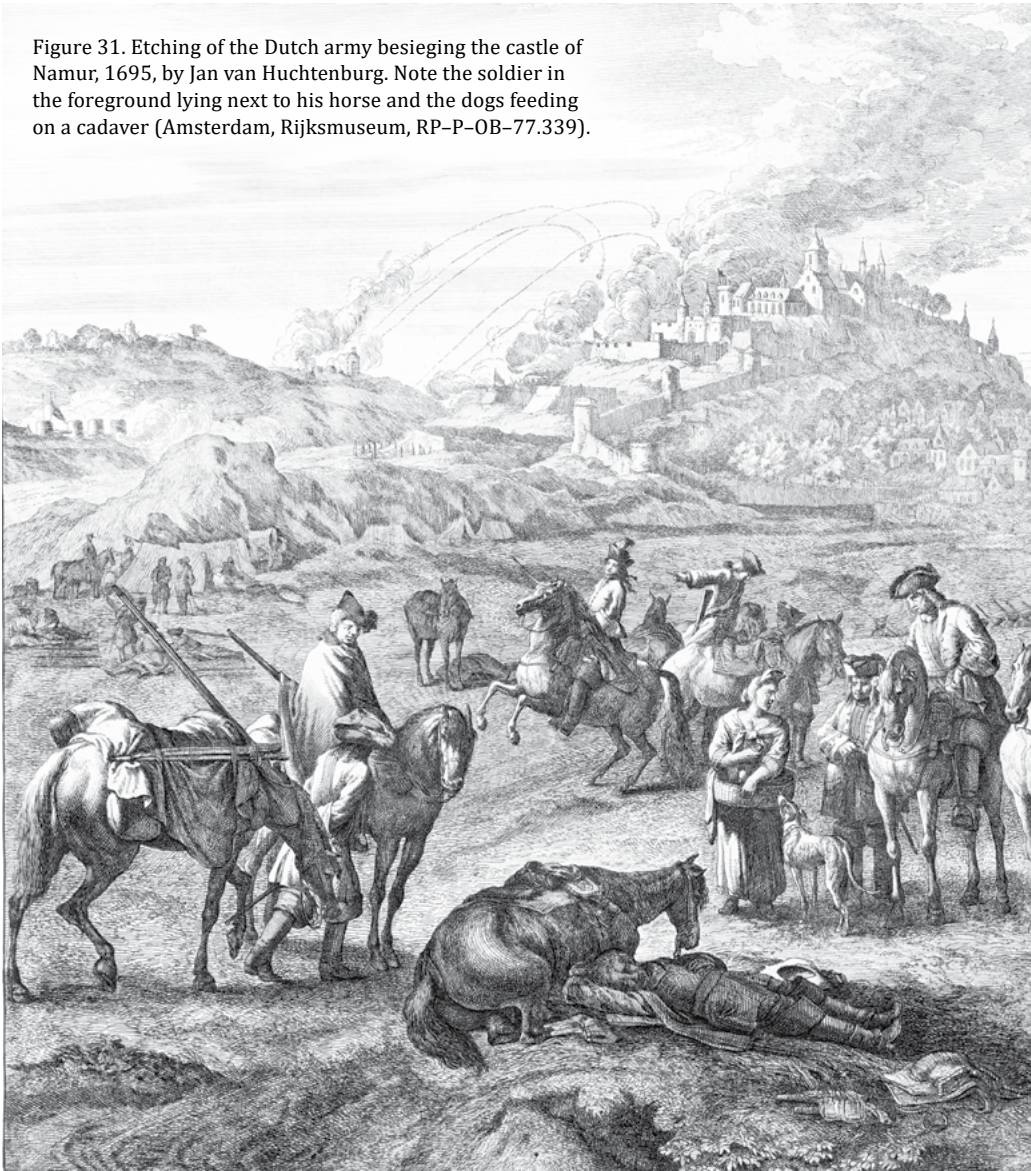
23 Liège, AEL, Etats, inv. no. 2965: Muster roll of two hundred horsemen led by captain de Cortenbach, 1552; Liégeois, "Compte de la recette de Chiny," 158, 162. See also Boffa, *Warfare*, 164; de Keralio, Lacuée, and Servan, *Encyclopédie méthodique. Art militaire*, 1:589–97; Laurent, *Aachener Stadtrechnungen*, 292.

24 Archiv Haus Welbergen, inv. no. 754: Accounts city of Goch, 1626–1677, fol. 63; Grave, SLG, Archief Gemeente Grave, inv. no. 217, fols. 7v, 46r, 122r, 133r, 193v, 227r, and inv. no. 218, fols. 15v, 52r, 72v–73v (transcripts Rien van den Brand); Gentenaar and Hupperetz, "Personeel en werkzaamheden," 202; Renes and Wessels, "Loen ende Werck," 113; Rosen, *Soldiers at Leisure*.

25 Koppers, ed., "De stadsrekeningen," 9, 11, 14, 22, 28; Paquay, "Kroniek der Luiksche Oorlogen," 207.

26 The Hague, NA, Raad van State, inv. no. 2079: Orders November 31, 1715, December 22, 1716; inv. no. 2081: January 8, 1739; Vincennes, SHD, GR, 2Xy09: Germain Vincent dit Parisien; *Reglement en orders Maastricht (1786)*, art. 36; Bovy, *Promenades*, 1:76–77.

Figure 31. Etching of the Dutch army besieging the castle of Namur, 1695, by Jan van Huchtenburg. Note the soldier in the foreground lying next to his horse and the dogs feeding on a cadaver (Amsterdam, Rijksmuseum, RP-P-OB-77.339).



The emphasis on environmental pressures is imperative because it provides an ecological context for the spread of actual epidemics. Given the traditional image of medieval armies as being too ill-equipped to enforce basic hygiene standards, one would expect references to the latter to be bountiful. In practice relatively few sources explicitly comment on epidemics, or fear thereof, in a military context before the late fifteenth or sixteenth centuries. Emond de Dynter's description of Duke Antoine of Brabant's failed attempt to besiege Dordrecht in 1418 does not remark on anyone falling ill, but he



did admit, nonetheless, that citizens from Dordrecht took members of the ducal household prisoner when they returned by boat because of sickness.²⁷ A claim for compensation made by Engelbert of Nassau, lord of Breda, regarding losses suffered in ducal service, reveals that the Brabant army had to conduct a desperate fighting retreat on foot towards Geertruidenberg, and that fifteen of his own followers, of a contingent total-

27 De Dynter, *Chronique*, 3:806–8.

ling about fifty-five horsemen, were taken prisoner. The account also notes that most of them were captured when the ship carrying his retinue's equipment was overwhelmed. It is unclear, however, whether all of these men were also sick, for at least three of them were not combatants (a cook, clerk, and surgeon).²⁸

Medieval fiscal accounts, which give evidence about all kinds of expenses made during military campaigns, only mention the purchase of medicine for individual horses and provide no indication that massive numbers of men or animals were struck down by disease.²⁹ A major inquest from 1389 lists seventy-five cases of individuals or groups of men fined by officials of Duchess Johanna of Brabant, because they left the army prematurely during one of the sieges of Grave (in 1386 and 1388). Thirteen of these provided an excuse: seven claimed poverty or lack of pay, two were wounded, and four were sick. Of the latter only one gave a detailed statement: he was a man-at-arms who fell ill in 1386 when he reached Bladel near Eindhoven, that is before he had even left the duchy, and sent his bastard brother to serve in his place in 1388, because he had still not recovered. His illness might therefore have had nothing to do with camp life. Several other people also claimed exemption from military service because of sickness.³⁰

Historical research regarding medieval military medicine has neglected to point out that unambiguous references to epidemics or epizootics come from very specific circumstances, unrepresentative for warfare in general: sieges and extended campaigns in different environmental contexts (such as the crusades or the imperial campaigns in Italy).³¹ The poet Jan van Heelen, for instance, did not comment on the presence of disease during Jan I of Brabant's campaigns between the Meuse and Rhine in the 1280s, but devoted several lines to nine prominent knights killed by an epidemic during the Aragonese Crusade (1284–1285); apparently even the duke himself had to fear for his life.³² This inclusion of the Aragon campaign is significant because Jean de Meun's famous criticism that the armies of Latin Christendom lacked the basic hygiene of their Byzantine, Muslim, and Mongolian counterparts in his 1284 translation of Vegetius, also originates in such experiences.³³

Many historians of medicine thus assume that since armies in recent centuries suffered from epidemics, these must have been at least as commonplace in medieval times. Such a belief does not take changes in armies or warfare into account, or the fact that some diseases may have evolved significantly over time. This issue is further complicated by the difficult identification of specific illnesses in a historical context. Sixteenth- and seventeenth-century chronicles or ego documents that comment on epidemics in

28 Juten, "Engelbrecht I van Nassau," 27–33.

29 Brussels, ARA, 137.01, inv. no. 12991; van Doorninck, ed., *De tocht van Jan van Blois 1371–1372*, 32, 62, 63, 76–77, 87.

30 Bolsée, ed., *La grande enquête*, 26, 95, 220, 324.

31 Bradbury, *The Medieval Siege*, 83; Decourt, "Paludisme"; Martin and Russon, *Vivre sous la tente*, 226–28; Mitchell, Stern, and Tepper, "Dysentery"; Prinzing, *Epidemics*, 12–15; Wagner, *Die Seuchen*.

32 Boffa, "Les soutiens militaires," 17–18; van Helen, *Rymkronyk*, 102–4.

33 Richardot, *Végèce et la culture militaire*, 167–68.

a military context often refer to any epidemic disease as “plague.”³⁴ Sick soldiers do appear regularly in prints and paintings, but these images rarely allow an identification of specific diseases (see figure 31). A detailed breakdown of mortality causes for 4232 soldiers from the Jemappes department (in the Belgian Hainaut) in 1798–1814, based on billets for hospital admittance, shows that 64.4 percent died from “fevers,” without further specification.³⁵ These are just afflictions that caused someone’s death.

The association between venereal disease and soldiers became well established during the major outbreak of syphilis in the 1490s. It reached the Meuse Region by 1497–1498 at the latest. Up to the nineteenth century exact distinctions between syphilis and other venereal diseases remain vague, however.³⁶ According to overviews of hospital admittance for Napoleonic soldiers in the “Belgian” departments more than one in five patients was admitted because of a venereal disease. Statistics of “syphilis” published around the middle of the nineteenth century indicate that it affected more than ten percent of the French, Dutch, and Belgian armies. In the Dutch navy approximately a quarter of the personnel suffered from such ailments.³⁷

What the sources do show is that the vulnerability of army members to diseases was not a simple reflection of their awareness of hygiene, or a lack thereof. Insects have a very important role in disease transmission within military contexts: lice spread typhus, mosquitos malaria, and house flies dysentery, trachoma, and typhoid. The house fly prefers horse manure for breeding, an environment that could be found in large quantities near armed forces and it causes disease by transferring bacteria from its breeding place to human food. It is also worth noting that the insects themselves are not responsible for epidemic outbreaks, they simply act as vectors for the bacteria that actually produce disease in humans or animals. This means that epidemics or epizootics mainly occur in very specific environmental circumstances: when the presence of both pathogens and vectors is combined with human and animal bodies that have been weakened by stress, lack of proper food, and insufficient shelter.

The fear of marshes and “marsh fevers,” for example, is expressed as early as the fifth century CE in Vegetius’s famous treatise on military matters, which served as the main military handbook throughout the Middle Ages.³⁸ These “marsh fevers” might refer to one or several diseases, but it is likely that they included malaria, spread by mosquitos of the *Anopheles* genus. The parasites of the *Plasmodium* genus, which cause malaria, are not native to the North Sea area, but became established there in Antiquity or the Early Middle Ages. It is possible that Roman or Frankish armies played a role in their trans-

34 Burschel, *Söldner*, 258–68; de Graaf, *Oorlog*, 498–500; Leboutte, “D’Austerlitz à Liège,” 442–45; Mitchell, *Medicine*, 209–19; Mitchell, “Retrospective Diagnosis.”

35 Darquenne, *La conscription*, 244–68.

36 Burschel, *Söldner*, 260; Garrison, *Notes*, 108–9; Schmitz-Cliever, “Pest und pestilenzialische Krankheiten,” 135.

37 Darquenne, *La conscription*, 244–46; Haneveld and van Royen, *Vrij van zichtbare gebreken*, 184–85; Hirsch, *Geographical and Historical Pathology*, 2:70.

38 Vegetius, *De re militari*, bk. 3; Allmand, *The De Re Militari of Vegetius*.

mission.³⁹ Pliny the Elder, who might have been involved in the construction of a canal between the Meuse and Rhine while serving as an officer on the Roman Rhine frontier in the first century CE, records that a spring in the lands of the Tungri, possibly near Tongres/Tongeren, cured tertian fevers. Malaria remained endemic in the northern part of the Meuse Region, the Meuse–Rhine estuary and the Campine/Kempen, until the late nineteenth or even twentieth century.⁴⁰

Local inhabitants would have been to some degree immune to the disease, given its prevalence, but this did not apply to soldiers originating from elsewhere. The death of massive numbers of British soldiers who campaigned in the Campine/Kempen during the Austrian War of Succession (1740–1748) led to two major publications on army health by John Pringle and Jacob Grainger. Both connected epidemics of intermittent fevers among British soldiers to the marshes or inundations near Heusden and 's-Hertogenbosch.⁴¹ These floodings were just a temporary phenomenon, but since military defence in the shape of individual fortifications and the Hollandic Water Line necessitated that large stretches of land remained waterlogged they also preserved an ideal habitat for mosquitos over a long-term period. The government of Charleroi did in fact note in 1795 the difficulty of removing stagnant water from the fields inundated by the garrison.⁴² Fifty years later the infamous “fevers of Beverlo” kept medical circles in Belgium occupied. The publications of these doctors connected the “miasmas” coming from marshes near the camp with summer heat, in other words circumstances that allowed members of the *Anopheles* genus to thrive. In this case assembling soldiers from all over the country to train in a wilderness had unintended results.⁴³

The relative scarcity of information on epidemics in a medieval military context is therefore not just related to the nature of the sources, but also to army members' growing vulnerability to disease. Armies grew in size (with forces of tens of thousands of people becoming more common), which caused major logistical difficulties, their members were drawn from a larger area than before, and they were more likely to move into different disease environments. It is hardly a coincidence that references to epidemics spread by armed forces increase from the late fifteenth century onwards. Because soldiers regularly switched garrisons they kept getting exposed to different pathogens. Imperial troops coming back from the Hungarian front in 1566–1567 brought the “Hungarian Disease” or typhus to Western Europe. The Danube region served as a reservoir for spreading typhus during subsequent centuries as well.⁴⁴

39 Hoffmann, *An Environmental History*, 299–302; Newfield, “Malaria.”

40 Pliny the Elder, *Naturalis Historia*, bk. 31, chap. 8; Devos, “Malaria,” 205–8; Haneveld and van Royen, *Vrij van zichtbare gebreken*, 107, 218–20; Kort and Raczynski-Henck, “The Fossa Corbulonis”; van Nispen, *Willemstad*, 67.

41 Grainger, *Historia febris anomala Batavae*, 20; Hirsch, *Geographical and Historical Pathology*, 1:218; Kerkhoff, “Over de geneeskundige verzorging,” 67; Pringle, *Observations*, 53, 62–67, 101, 170–77; Wittmann, “Verhandeling,” 105–10.

42 Parmentier, *Pays de Charleroi*, 92; van Mastrigt, *Willemstad Prinsheerlijk*, 197.

43 Delameillieure, “Het kamp van Beverlo,” 92–93; Devos, “Malaria,” 210–14, 218.

44 Agoston, “Rivers, Forests and Forts,” 77–78; Garrison, *Notes*, 130–31; Prinzing, *Epidemics*,

Another illuminating example of this internationalization is the spread of ophthalmia or trachoma in the early nineteenth century. Blindness was not unknown in military contexts, but chronicles rarely specify why a certain individual became blind. Jacques de Hemricourt, for example, mentioned the participation of two blind noblemen at the battle of Donmartin (1325), one of whom was even knighted before the battle.⁴⁵ In 1799–1801, however, trachoma, a disease endemic in many parts of Egypt, infected invading French soldiers on a massive scale. This bacterial infection was highly contagious and is traditionally seen as the main cause for ophthalmic epidemics that affected European armies in subsequent decades, but it became especially virulent in the Netherlands and Belgian military. In 1826 almost ten percent of the soldiers in the Netherlands army suffered from this ailment.⁴⁶ We may infer that morbidity rates in medieval armed forces might have been far lower than traditionally assumed, while a relative growth in army size made their early modern counterparts more vulnerable to disease.

The chronological changes observed within armies themselves were mirrored in their relations with society at large. From the late sixteenth century onwards, chronicles and parish records increasingly referred to a general perception that armies spread disease. In 1553 the mayor of Bouvignes wrote to his counterpart in Namur: “Where the Spanish infantry has stayed, people die quickly.” The parish records from Burtscheid near Aachen likewise specified in 1629 that someone died from the “Hungarian or military disease” (typhus).⁴⁷ The expressions “camp fever” and “army fever” are also significant in themselves.⁴⁸ The medieval evidence by contrast is far more ambiguous, the lasting connection between syphilis and soldiers being the major exception.⁴⁹

In order to evaluate the perceived association between armies and the spread of disease, a distinction has to be made between the direct and indirect impact of armed forces. The former will be studied first. The people and animals that composed an army could simply spread disease by transporting pathogens in their bodies over hundreds or even thousands of kilometres: from one theatre of war to the next. A councillor’s act

22–24; Schmitz-Cliever, “Pest und pestilenzialische Krankheiten,” 132–35, 139–40; Zinsser, *Rats, Lice and History*, 266–77.

⁴⁵ Bellwald, “Das Augenleiden”; Masson, “La guerre,” 435, 437.

⁴⁶ Haneveld and van Royen, *Vrij van zichtbare gebreken*, 212–14; Howard, *Napoleon’s Doctors*, 209–10; Vandendriessche, “Ophthalmia,” 49, 54–55; Vleminckx and van Mons, *Essai sur l’ophtalmie*, 7–8, 15.

⁴⁷ Jacquet-Ladrier, “Les épidémies de peste,” 125; Schmitz-Cliever, “Pest und pestilenzialische Krankheiten,” 150–51.

⁴⁸ *La vie quotidienne dans les Ardennes*, 30; Corvisier, *L’Armée française*, 2:670–71; Gutmann, *War and Rural Life*, 164–66; Jacob, *Bruyères*, 53–56; Martin, *Une guerre de trente ans*, 211–15; Miart, “La population,” 130, 137–38; Richer, *Abrégé chronologique*, 150, 195–96; Verschure, *Overleven*, 232–33, 286.

⁴⁹ The infamous Black Death certainly made assembling armies and waging warfare more difficult, for example by the relative impoverishment of families living nobly, but armies did not have a significant role in its spread through the Meuse Region. Hans Ditrich has in fact recently suggested that the role of the siege of Caffa (1346) in the spread of *Yersinia pestis* to Europe, is overstated. Ditrich, “The Transmission.” See also Newfield, “Early Medieval Epizootics,” 98–100.

from Couvin, dating to 1598, indicates that the citizens prepared to resist with force of arms the entrance of troops suspected of bringing disease. The town of Tilburg similarly paid a soldier suspected of carrying “the plague” in 1603 so he would move on to a neighbouring village.⁵⁰ Troops led by Ernst von Mansfeld (a bastard son of the count mentioned in chap. 3) and Johann von Werth brought respectively typhus and the plague to the Meuse Region in 1622 and 1636.⁵¹

Especially devastating were those instances where epidemics and epizootics struck more or less simultaneously. Winand Mengels, a farmer living near Maastricht, wrote in his chronicle that the French army started to suffer from a disease with symptoms that resemble those of dysentery in 1747–1748. The villagers attributed the unknown disease to eating unripe fruit, but then they started to suffer from it too.⁵² To make matters worse, the invaders also brought a cattle disease with them. The French army was more reliant on oxen and mules as draught animals than its opponents because horses were more difficult to procure (see chap. 4). A similar epizootic struck the Prince-Bishopric of Liège in 1711–1714, and it is quite possible that in this case too warfare was the crucial factor. The parish priest of Sibret, in the Duchy of Luxemburg, likewise declared in 1656 that an epizootic struck flocks of sheep in 1636, the very year that Imperial troops invaded the area, so that almost no sheep were left.⁵³

The relative growth in the size of armed forces facilitated this spread of epidemics and epizootics. In the Middle Ages soldiers often lodged in inns or taverns, as shown by fourteenth-century accounts. The *Roman of Heinric and Margriete van Limborch*, from the same period, tells us that one of the protagonists had difficulty finding a room because the town where he was staying was filled with soldiers.⁵⁴ From the sixteenth century onwards individual soldiers had to be billeted in private houses due to lack of space. Seventeenth-century court records from Namur reveal that some inhabitants even kept a room for exactly this purpose.⁵⁵ Massive building programmes during the eighteenth and nineteenth centuries eventually ensured that soldiers lived in barracks and received care in military hospitals, but this only applied to garrison towns. In 1779 imperial soldiers returning to the Austrian Netherlands from the Bohemian front during the Bavarian War of Succession (1778–1779) spread dysentery along the routes of their marches. The aforementioned ophthalmia quickly spread to Belgium’s civilian popula-

50 Couvin, 1976 (transcript Généamag); Verschure, *Overleven*, 286.

51 Adriaenssen, *Staatsvormend geweld*, 274–75; Engelen, “Stokkem,” 45–46, 84–85; Gutmann, *War and Rural Life*, 152–56; Kayser, “Le phénomène épidémique,” 76–77; Klinkenberg, “Dye quade siecte,” 274–75; Mertens, “Oorlog, epidemie en emigratie,” 129–32; Miart, “La population,” 144, 146–53; Schmitz-Cliever, “Pest und pestilenzialische Krankheiten,” 141–44.

52 De Harzé, “Manuscrit,” 275; Mengels, *Chronyk*, 46–47, 55–62.

53 Boonen, *Ziekten en genezers*, 89; Daenen, “Bijgelovig volk en ziek vee”; de Saxe, *Mes Rêveries*, 153–54; Jakob, *Bruyères*, 117; Rouche, “Journal de l’entrée,” note 24.

54 Gaier, “L’approvisionnement,” 565; van Aken, *Roman van Heinric en Margriete van Limborch*, (bk. 5, vv. 967–968).

55 de Graaf, *Oorlog*, 364; Douxchamps-Lefèvre, *Inventaire*, 4:86; Gutmann, *War and Rural Life*, 37–38; van Ryckenroy, *Kroniek*, 197.

tion in the 1830s because military doctors sent infected soldiers home, expecting they would recover faster that way.⁵⁶

The caring for sick or wounded soldiers remained in fact to a large degree the responsibility of the general population, especially those of large urban environments, which had the infrastructure to organize hospitals or could provide access to existing ones.⁵⁷ Huy obtained permission in 1690 and 1691 to assemble sick soldiers in a hospital located far way from the town centre. Apparently, some citizens had already died as a result of contamination, and the soldiers' waste increased the chance that epidemics would spread. During the siege of 1695 the Carmelites of Namur likewise cared for wounded soldiers and buried the deceased in their garden (a practice attested archaeologically at Tongres/Tongerren).⁵⁸

The indirect role of armies in spreading disease was more ambiguous but at least as significant. In ecological terms an army of several thousand people functioned as a town on the move, a town that proved to be particularly demanding in terms of food and shelter and infringed on other people's entitlements. The spread of epidemics would at the very least have been stimulated by the destruction or confiscation of crops and general impoverishment.⁵⁹ On September 28, 1794, for instance, the governor of Grave instructed its citizens to procure provisions for two months or leave the city, in preparation for the coming siege. By December 12 many citizens had ran out of food and asked the governor to distribute some from the military depots. The governor argued that the two-month limit only applied to the actual investment of the city, which had started on October 20, and refused to accede to their demands. The freezing of the water in the moats finally forced him to surrender on December 30.⁶⁰

Fear in itself further deteriorated the health of those unfortunate enough to be living in warfare-affected areas (see chap. 3). The accounts from 1636 of the *prévôt* of La Marche, in the Duchy of Bar, speak of villagers dying in the woods where they had sought refuge. In that same invasion year, the high bailiff of Stokkem gathered testimonies from villagers and the parish priest from Opoeteren who had hidden for weeks in ditches, hedges, woods, marshes, stables, and barns after the taking of their *schans* (fort). The city council of 's-Hertogenbosch had to warn its citizens in 1794 not to stay in their cellars for days on end, for fear of bombardments, because of the resulting stench.⁶¹ Quen-

56 Bruneel, "L'épidémie," 208–13; Vandendriessche, "Ophthalmia," 49.

57 de Cauwer, *Tranen van bloed*, 183–84; Engelen, "Stokkem," 228–29; Kerkhoff, "Over de geneeskundige verzorging."

58 Creemers and Vanderhoeven, "Archeologische Kroniek," 317; Jacquet-Ladrier, "Vivre à Namur en temps de guerre," 176, 187; Rorive, *Les misères de la guerre*, 117–22.

59 Adriaenssen, *Staatsvormend geweld*, 274–75; Colombier, *Préceptes*, 368–80; de Cauwer, *Tranen van bloed*, 234–35; Felsenhart, "L'invasion," 349; Gutmann, *War and Rural Life*, 36–39, 166–68; Outram, "The Socio-Economic Relations," 164–74; Patist, *Het beleg van de stad Grave*, 39, 82; van der Heijden and Sanders, eds., *De levensloop*, 226; van Ryckenroy, *Kroniek*, 137, 148, 155–57, 159, 164–65, 172–73.

60 Sabron, *De oorlog*, 2:61, 2:67, 2:74.

61 Cuppens, "Opoeteren," 85–96; Jakob, *Bruyères*, 105; Marchal, *Inventaire*, 348; Mommers, "De

tin Outram has in fact argued that the worst wartime crises in mortality happened when relations between armies and societies at large deteriorated into violence with flows of distress migration resulting.⁶²

The perceived relationship between armies and epidemics was, however, not clear-cut. Armies did not inevitably bring disease and epidemics occurred in peace- as well as wartime. Historical studies have repeatedly emphasized the role of weather and climate as significant factors in explaining patterns of disease. The aforementioned Imperial forces led by von Mansfeld and von Werth did not come from just anywhere, but respectively Bohemia and the Palatinate, areas especially heavily affected during the Thirty Years War.⁶³ The Prussian invasion of France in 1792 serves as a reminder of how a combination of adverse weather (incessant rainfall) and terrain (the Argonne) could break even an army famous for its *Reinlichkeit* ("cleanliness"), with dysentery outbreaks and lice–flea infections as a result. We are fortunate to have access to two eyewitness accounts written by common soldiers, one by the Prussian infantryman Laukhard, the other by the French dragoon Marquant. Both provide vivid descriptions of the disorderly Prussian retreat after the battle of Valmy, which left a trail of abandoned cannons, wagons, and horse cadavers behind.⁶⁴

Up till this point we have assessed the vulnerability of armies to the weather, epidemics, and their involuntary spread of pathogens. Still, armies could also deliberately seek to affect their opponent's health without the use of arms. Biological warfare is defined here as the use of pathogens or toxins of biological origin to affect human, animal, or plant health during conflicts. The study of biological warfare in a historical context is far from unproblematic because it has a strong connotation of being an unethical, or at least unconventional, way to fight. It presents a methodological problem insofar as the very success of these tactics often depends on secrecy. Most of the sources examined here therefore indicate a fear of biological warfare, rather than unambiguous evidence of intention.⁶⁵

One of the most common examples presented in historical studies of biological warfare is the throwing of human or animal corpses into a besieged fortress. This was a gruesome, but probably relatively rare, alternative to a far more common tactic: throwing excrement. The chronicles of de Dynter and Froissart both mention that a besieging force led by the duke of Brabant threw cadavers into Grave during the siege of 1388.⁶⁶ Urban militias from Liège besieging Argenteau in 1347 by contrast threw stones, earthen pots with melted iron, and burning metal into the fortress and when this did

gezondheidstoestand," 74; Ritter, "Verhandeling," 15; Schoetter, "Etat du Duché de Luxembourg," 341–42.

62 Outram, "The Socio-Economic Relations," 180–84.

63 Gutmann, *War and Rural Life*, 156–63; Jakob, *Bruyères*, 119; Outram, "The Socio-Economic Relations," 162–64.

64 Laukhard, *Leben und Schicksale*, vol. 3; Vallée and Pariset, eds., *Carnet*, 147, 150, 162, 168–70, 174–77.

65 Frischknecht, "The History"; Mayor, *Biological and Chemical Warfare*, 28–29.

66 de Dynter, *Chronique*, 3:124, 3:625–26; Froissart, *Chroniques*, 13:160–61.

not have the desired effect, brought the contents of cesspits from Liège to pollute the defenders' water. The chronicle of Jean de Stavelot also remarks that when troops from Liège besieged Bouillon between December 1406 and January 1407 they defecated into barrels in order to throw these into the fortress and soil its cisterns and water supply.⁶⁷ Fortifications located on a hill were very vulnerable to such tactics because they rarely had direct access to a stream.⁶⁸

A chronicler from 's-Hertogenbosch on the other hand wrote that many citizens believed that the defenders of Tiel had fired poisoned projectiles during the storming of that city in 1528 because many of their injured died.⁶⁹ The militiamen had brought the wounded to religious houses and hospitals where numerous women helped to take care of them. Whether the defenders really used poison is unclear, but this remark does reveal something about the quality of healthcare at that time and the chances of recovery. Poisoned projectiles were certainly used in medieval Europe, but the available evidence mainly concerns hunting rather than warfare. Many sixteenth-century surgeons also believed that gunpowder wounds were poisonous, but this chronicle does not say so explicitly.⁷⁰

Sudden and apparently inexplicable deaths could easily be attributed to poison. Reginald Möhner, for instance, a chaplain of an imperial regiment serving in support of the Spanish crown in 1651, left an account of his experiences, marching from Austria to the Spanish Netherlands, before invading the kingdom of France and eventually turning back. According to his testimony the regiment entered a village near the Sambre, where one soldier found milk in an abandoned house, drank it, and immediately fell dead. His wife and comrades discovered, or assumed, that the milk was poisoned and the commander gave the order to burn all abandoned houses from then on.⁷¹ In 1831 Dutch soldiers were likewise anxious that their Belgian opponents had poisoned the food and water supplies. Poisoned herbs were effectively used in wolf hunting, and it must have been relatively easy to apply such knowledge to warfare as well.⁷² In May 1714 the commander of Namur even received complaints that officers and soldiers threw drugs or poison in the Meuse to kill the fish.⁷³

Meanwhile, gunpowder continued to be associated with poison well into the seventeenth century. Many artillery manuals gave practical information to their readers on how to make "poisonous" or "stink" bombs, but it is unclear to what extent gunners actually applied this advice.⁷⁴ During the siege of 's-Hertogenbosch in 1629 a soldier of

67 *Ly myreur des histours in Chronique de Jean des Preis dit d'Outremeuse*, ed. Borgnet and Bormans, 6:179; de Hocsem, *La chronique*, 358–59; de Stavelot, *Chronique*, 101–2, 254.

68 Bragard et al., *La termitière*, 54–56; Burger, "Wasserversorgung," 229–30.

69 Hoeckx et al., eds., *Kroniek van Molijs*, 270–71.

70 Bisset, "Arrow and Dart Poisons," 4–5; Gabriel and Metz, *A History*, 2:56; Garrison, *Notes*, 110–11; Schreiber, "Plant Poisons."

71 Brunner, ed., *Reise des P. Reginald Möhner*, 88.

72 Englmann, *Der Zauber der Macht*, 116; Teunisse, *Onderdaan in Oranje's oorlog*, 80.

73 The Hague, NA, Raad van State, inv. no. 2079: Order May 27, 1715.

74 Martinetz, *Vom Giftpfeil zum Chemiewaffenverbot*, 35–49.

the garrison claimed that the besieging Dutch troops shot bombs that spread a terrible smell. Others spoke of bombs filled with antimony. The governor was worried enough to order the inspection of unexploded projectiles. Nothing unusual was found, but several citizens still claimed to have noticed a strong scent of camphor. Camphor was sometimes mixed into gunpowder, especially for fireworks or incendiary bombs, and could very well have given these projectiles a different appearance. Its use in itself was not new. Fiscal accounts of the duke of Brabant mention the purchase of camphor for the making of gunpowder as early as 1411.⁷⁵

The French engineer de Vauban, who would certainly have mentioned the use of poisoned projectiles, was visibly more concerned with traditional miasmas. He wrote in his journal of the siege of Namur in 1692 that ten or twelve dead horses, lying near the front of the covered way, hindered the final attack on the castle more than the fire of the besieged did. However, every time the wind turned they had their share of stench. He clearly implied that the garrison wanted to disrupt the besiegers, but other issues might have played a role as well.⁷⁶ The chronicle of the Sint-Geertruiklooster in 's-Hertogenbosch recorded that during the siege of 1629, after horses taken as booty started to eat tree leaves for lack of fodder, the gunners drove them into the moat towards the enemy lines; some drowned in the process. Simply slaughtering and eating the horses could have been an alternative, but in Western Europe strong taboos existed against the eating of horse-meat, which effectively ensured that this became a very exceptional measure.⁷⁷ Even though the sources rarely provide definite proof of intention, it is clear that premodern armed forces were well aware that their enemies might try to spread disease among them.

Vulnerable Bodies

Military vulnerability to disease cannot be understood without taking changing notions about human and animal bodies into account. Army commanders perceived some bodies as being more suitable for military service than others. These views, and changes therein, had a major influence on army members' susceptibility or resistance to pathogens. In 1818, doctor Georg Heinrich Ritter summarized a notion prevalent among officers as follows: "a soldier must be as strong as iron, and be able to withstand anything, without experiencing any negative consequence."⁷⁸ In practical terms this means looking into selection criteria for combatants, and their horses, rather than armies at large. As argued in the previous chapter, there is little information available about so-called camp followers because of the unofficial nature of their presence. The requirements listed by Vegetius in his *De re militari* (written in 383–450) will be taken as a start-

⁷⁵ De Cauwer, *Tranen van bloed*, 225; van Werveke, *Die Erwerbung*, 11.

⁷⁶ The covered way refers to the space between the glacis, the open terrain near a fortress, and the moat. Vauban, *Journal*, 161.

⁷⁷ Felsenhart, "L'invasion," 349; Patist, *Het beleg van de stad Grave*, 46–47, 49, 64; van Bavel et al., *De kroniek*, 343; Wittmann, "Verhandeling," 118.

⁷⁸ Ritter, "Verhandeling," 32.

ing point because this work remained an authoritative military manual throughout the Middle Ages and subsequent centuries.⁷⁹

Vegetius specified that recruits had to be enlisted as adolescents, that they had to be tall and strong, and had to come from the countryside. Rural dwellers were in his opinion accustomed to all kinds of weather and used to hard labour.⁸⁰ There is another criterion, so obvious that neither Vegetius nor most other military writers bothered to comment on it: a combatant had to be male. While traditional gender divisions in an army context are well known, this criterion is not as evident as it might seem. Only service as a paid, and thus officially recognized, combatant, was strictly forbidden. Women who served as soldiers invariably did so as “men.” This makes their identification difficult, but not impossible. Jan van Ryckenroy from Roermond for example wrote in his chronicle that in 1589, after the taking of the castle of Bleijenbeek, a girl was discovered among the enemy dead, and John Stedman, a captain in the eighteenth-century Dutch army, noted in his diary that a Swiss regiment in Maastricht chased away two soldiers: man and wife. The identity of the latter was only discovered because she became pregnant. The enlistment of women as soldiers might have been facilitated by the absence of a thorough medical check-up.⁸¹

Not only is the nature of the examination of recruits unclear, there are actually relatively few sources that provide unambiguous evidence about a combatant's background. Rulers compiled lists of soldiers as early as the late thirteenth century, but before the late seventeenth or early eighteenth centuries few of these muster lists mention anything other than the soldier's name and function. Some of these names, or rather nicknames, do however give some indication of the soldiers' backgrounds. Muster lists of infantry units raised for the bishop of Liège in the 1550s show for instance that many soldiers adopted nicknames such as *Jonck Bloet* (“Youngblood”), *'t Kint* (“The Child”), *Jonck Hart* (“Youngheart”) and variations (e.g., *Verlorenkint*—“Lostchild”) which suggests young unmarried males, possibly teenagers.⁸²

Military personnel records became more detailed over time, and by the eighteenth century typically wrote down information such as a soldier's birthplace, age, height, trade, and features in order to reduce fraud. These eighteenth-century lists confirm that most soldiers enlisted in their late teens or early twenties.⁸³ It is quite possible, however, and indeed suggested by the study of skeletal remains and the age of a handful of Burgundian soldiers written down in a court record from 1469, that medieval combatants

⁷⁹ Allmand, *The De Re Militari of Vegetius*; Richardot, *Végèce et la culture militaire*.

⁸⁰ Vegetius, *De re militari*, bk. 1.

⁸¹ Thompson, ed., *Journal*, 103–4; van Ryckenroy, *Kroniek*, 239. See also Dekker and van de Pol, *Vrouwen in mannenkleren*, 24–25, 33–35, 105–7; Desbrière, *Chronique critique*, 140; Gaier, *Art et organisation*, 175; Leestmans, *Soldats*, 180–81; Lynn, *Giant of the Grand Siècle*, 343–46.

⁸² Liège, AEL, Etats, inv. no. 2965: Muster lists of infantry companies raised in 1552. See also Contamine, *Guerre, état et société*; Bell et al., *The Soldier*.

⁸³ Bois, *Les anciens soldats*, 133–40; Corvisier, *L'Armée française*, 2:615–37; Leestmans, *Soldats*, 22; Ruwet, *Soldats*, 64–66.

were on average somewhat older because they had to provide their own equipment.⁸⁴ Still, the majority served when in their twenties or thirties. This reflects a basic biological reality that most males are fully-grown around the age of twenty. From the age of thirty, muscle strength tends to decrease. These indications should be treated with caution, however, since different ways of army organization entailed a different type of recruit. Furthermore, as military personnel records make clear, it was an individual's capability to serve that really mattered, not official instructions about age.⁸⁵

Similar remarks could be made about horses used by the army. Given that a horse is only fully grown after four years, military regulations from the eighteenth and nineteenth centuries specified that units could only take horses between the ages of four and seven. Reviews from Dutch cavalry regiments from the early 1780s mention that eleven, twelve, and fourteen-year-old horses were replaced because they were "sick" or otherwise unable to perform their duties.⁸⁶ A mass grave of at least sixty-five horse skeletons, found at Borgharen and dating to the French siege of Maastricht in 1794, contains the remains of animals which were between three and sixteen years old when they died, the majority being between four and twelve. Even though one horse had not yet reached the age of four, it was as one of the largest individuals found.⁸⁷

The height of this horse is significant, because it relates to Vegetius's criterion that recruits had to be tall, although this was less important than strength. Jacques de Hemricourt, who wrote a treatise on the nobility from Hesbaye in the fourteenth century, called Godefroid, lord of Harduemont, "the smallest knight in the Prince-Bishopric of Liège, but a brave knight, and a great and strong captain." The phrasing of this sentence suggests that de Hemricourt considered men of small stature to be generally unsuitable for military service.⁸⁸ Detailed estimates of height only become available from the eighteenth century onwards, when personal records started to note a soldier's height more or less accurately. A systematic comparison between these eighteenth-century soldiers and Napoleonic conscripts proves that these men were significantly taller than the average male, even though many enlisted when not fully grown. The reduction of average heights in nineteenth-century conscript forces was primarily aimed at incorporating as many men as possible into the army, but also reflected more pressing health and tactical issues.⁸⁹

A larger physique needs more nutrients to keep functioning, or in other words: has less stamina. Medieval commanders might already have favoured taller combatants, but eighteenth-century notions about the ideal military body had evolved to such an extent that height in itself, rather than strength or another ability, became the primary

84 DeVries, "Teenagers"; Poncelet, "Le combat," 278–93.

85 Colombier, *Préceptes*, 149–52.

86 The Hague, NA, 1. 01.19, inv. nos. 1945, 1946: Reviews and reports of Dutch cavalry regiments, 1780s; Geisweit van der Netten, *Algemeen Samenstel*, 114–15.

87 Loonen and van de Graaf, "Het massapaardengraf van Borgharen," 31–38.

88 de Hemricourt, *Le Miroir des Nobles*, 1:117.

89 Bois, *Les anciens soldats*, 140–42; Govaerts, "Fire-Eaters," 19–21; Leestmans, *Soldats*, 189; Lynn, *The Bayonets of the Republic*, 46–47.

criterion for admission into elite units. Despite the fact that practically minded officers gradually became more assertive in voicing their criticism towards the end of the century, prejudices died hard.⁹⁰

Officers did not just select recruits because of their height, but also because of their background. It is unclear to what extent medieval captains heeded Vegetius's preference for rural dwellers. Urban militias became in fact more important during the Central Middle Ages because they were better organized and better armed than their rural counterparts.⁹¹ Many so-called men-at-arms, heavy cavalymen with two or more horses, cannot be considered as rural combatants either, since they switched regularly between urban and rural settings, often by owning houses in a town as well as the countryside.⁹² The aforementioned muster lists of the bishop of Liège's army in the sixteenth century indicate a predominance of urban recruits, but most came from relatively small settlements such as Tongres/Tongeren or Valkenburg rather than Liège itself.⁹³

Eighteenth-century personnel records likewise reveal an overrepresentation of soldiers from an urban background, especially from garrison and/or larger towns, but it is significant that elite units (cavalry, artillery, and miners) counted a larger number of rural dwellers in their ranks or were primarily composed of men born in the countryside.⁹⁴ These records thus suggest that high-status units, who could pick their members, did adhere to the criteria recommended by Vegetius. The arguments of the Belgian colonel de Thierry in 1835 confirm this. He published a small report in response to claims about excessive loss of horses in the army, declaring that his men had little affinity with horses and did not know how to take proper care of them. The colonel therefore strongly advised refraining from admitting certain recruits to the cavalry in the future: urban dwellers top the list. The preference for recruits from rural backgrounds was therefore not limited to physical stature as such but included a whole range of skills that officers associated with this origin.⁹⁵

In ideal circumstances new arrivals were actually not recruits at all, but veteran combatants.⁹⁶ During the parliamentary debate mentioned at the beginning of this chapter, the general responded to the alleged high mortality of the French armed forces by arguing that recruits drove up the death rates. Hans Jakob von Grimmelshausen, the author of the famous novel *Abentheuerliche Simplicissimus Teutsch*, wrote of recruits of the Walloon regiment de Merode in the Thirty Years War of whom large numbers could be seen resting below hedges alongside the road. He also noted that the verb marauding (*marode*)

90 *Essai sur l'armée hollandaise*, 30–32; Corvisier, *L'Armée française*, 2:637–54.

91 Bachrach, "Urban Military Forces"; Hosler, *John of Salisbury*, 66–68; Verbruggen, "Flemish Urban Militias."

92 Govaerts, "'Mannen van wapenen,'" 312.

93 Liège, AEL, Etats, inv. no. 2965.

94 Corvisier, *L'Armée française*, 1:387–448; Ruwet, *Soldats*, 41–50; Zwitzer, *De militie van den staat*, 48–50.

95 de Thierry, *Mémoire*, 5–15.

96 Parrott, *The Business of War*, 163–67.



Figure 32. Medieval men-at-arms, miniature from the early fourteenth century, made in Liège or Maastricht. Note that the miniaturist has taken care to identify the horse as a stallion (London, BL, Stowe MS 17, fol. 244r). Reproduced with permission of the British Library Board.

in German derived from the name Merode.⁹⁷ His observation is etymologically incorrect, the word deriving from the French *maraude*, but is significant from the perspective of health preservation because it associated pillaging with novice troops who could not keep up. The French doctor Jean Colombier (1736–1789), who wrote an authoritative treatise on military health in the late eighteenth century, argued that there was nothing worse than enlisting children. They were useless to the army and almost all died.⁹⁸

Notions of an ideal military physique went further than the selection of specific types of recruits. They also encompassed intrusions into the chosen human and animal

⁹⁷ von Grimmelshausen, *Der Abentheurliche Simplicissimus Teutsch*, bk. 4, chap. 13.

⁹⁸ The data published by André Corvisier on the basis of personnel records indicate that mortality among recruits was actually higher than among veterans. Colombier, *Préceptes*, 124, 148; Corvisier, *L'Armée française*, 2:686–89.

bodies themselves. These measures originated both in the need to construct and maintain a specific “military” identity, distinct from that of other social groups, as well as issues of discipline and control. They are of major importance within the context of this chapter because of their potential detrimental effects on military health.

Medieval fiscal accounts provide quite detailed information on the horses lost by combatants, as argued in chapter five, but do not indicate whether the owners made deliberate changes to the horses’ appearance. They mention for instance horses with a “long” or “short” tail. Eighteenth- and early nineteenth-century military forces often docked their horses’ tails for aesthetic reasons, but medieval soldiers had rather different opinions on what an ideal horse should look like. One fiefholder of the duchess of Brabant shaved his horse’s manes and tail to make it “as ugly as possible,” so the bailiff would not want to take it with him on campaign to Guelders in 1388. His plan worked, but he did have to pay a fine. In a similar manner, if medieval accounts indicate gender, it is invariably “stallion” (*hengst*). This should not be taken to imply that the unnamed horses were geldings or mares. The medieval word *hengst* had a more general meaning than its modern equivalent and might have been used as a synonym for “warhorse” or “*destrier*.”⁹⁹

Medieval noblemen in fact expressed a strong preference for stallions, and even considered riding a mare humiliating (see figure 32). The French poet Eustache Deschamps lamented the loss of his horse in the 1388 Ardennes campaign and wrote that if the duke of Bar did not provide him with another one he would have to stay home or ride a mare, jack, or jenny.¹⁰⁰ Albertus Magnus, who wrote an authoritative encyclopedia on animals in the thirteenth century, stated that a warhorse had to be a stallion because he is more aggressive than a gelding.¹⁰¹ Despite this widespread belief, the use of geldings did become more common from the fourteenth century onwards, possibly due to the influence of armed forces from Eastern Europe (the French and German words for a gelding are respectively *hongre*—Hungarian, and *Wallach*—Wallachian). The oldest explicit reference to a gelding (*hongre*) in a military context comes from a 1347 account from Namur regarding a group of noblemen who were wounded near Calais. The horse in question belonged to a servant.¹⁰²

By the late seventeenth century the use of geldings and mares had become the norm in cavalry and dragoon regiments. A review of a dragoon company headed by captain de Thiribi, part of the army raised by the bishop of Liège in 1692, gives an exceptional

99 Brussels, ARA, 137.01, inv. nos. 12990, 12991; Arnhem, GA, Hertogelijk Archief, inv. no. 1580, fol. 9v; Arkenbout, *Frank van Borselen*, 199; Bolsée, ed., *La grande enquête*, 31; Herborn and Mattheier, ed., *Die älteste Rechnung*, 62–64; Martens van Sevenhoven, “Een betalingsordonnantieboek”; Miller, “‘Tails’ of Masculinity”; Renes and Wessels, “Loen ende Werck,” 127–28; Smit, *De rekeningen*, 2:54–56; van Doorninck, ed., *De tocht van Jan van Blois 1362*, 124, 125, 127, 133; van Wissekerke, *Van kwade droes tot erger*, 344–47.

100 Contamine, “Le cheval noble,” 1705; Deschamps, *Oeuvres*, 5:121–22.

101 Albertus Magnus, *De animalibus*, 2:1378.

102 Rotterdam, SAR, ONA, inv. no. 332, no. 32: January 28, 1644, no. 238: September 17, 1644; inv. no. 417, no. 32: May 20, 1638; Balon, “Un train sanitaire,” 285; Davis, *The Medieval Warhorse*, 135–36; Fugger, *Gestüt*, 44–47; van Schevichaven and Kleijntjens, *Rekeningen*, 389.

description of both soldiers and their horses: of the animals for which gender is provided, seven were geldings and eighteen mares. A note at the end of the list specifies, however, that the animals denoted as “horse” were all geldings, which brings the total number of geldings to twenty-one.¹⁰³ During the eighteenth century the French army went a step further and even issued prohibitions against the use of stallions. The archetypical army horse remained without doubt male, as at least seventy percent of the horses found at the 1794 mass grave of Borgharen could be identified as such, but the gelding had replaced the stallion.¹⁰⁴

This development is noteworthy because it implies that military forces preferred the discipline and obedience that castrating implied above a stallion’s natural aggression. The choice in favour of geldings is a very practical one: a stallion will fight other, unfamiliar, stallions for dominance of “the herd,” especially if mares are present. A troop of geldings and mares is easier to control, a trait that could make a great difference during warfare. Still, not everyone agreed with this reasoning. The Dutch officer Geisweit van der Netten, who wrote several influential books on horses and cavalry service in the early nineteenth century, was a strong opponent of gelding. He argued that it affected the horses’ health and energy.¹⁰⁵

The soldier’s physique similarly became subject to aesthetic criteria, the height preference having been mentioned earlier. For eighteenth-century Dutch military courts the cutting of one’s hair served as proof that the defendant had planned his desertion. The infantry regulations of 1772 stipulated that a soldier had to wear his hair in a tail of no less than sixty centimetres (two feet). If his own hair was not long enough, he had to use extensions made from horsehair.¹⁰⁶ The French doctor Colombier criticized these practices because they caused health issues on campaign, by increasing the chances of retaining parasites such as lice and ensuring that the hair remained permanently wet after a rainy day. Soldiers of the French republican army simply abolished the practice and cut their hair short in the 1790s. Other armed forces followed suit.¹⁰⁷

The second main element in the forging of a military identity was corporal punishment. Medieval commanders did use the death penalty in exceptional circumstances, but normally punished malefactors through fines, which is a more indirect form of corporal punishment, because it affected someone’s economic well-being.¹⁰⁸ The general adoption of more direct forms of corporal punishment, notably caning, took place in the first decades of the sixteenth century, and was not limited to armies as such. Corporal punishment became an inseparable element of a military identity, however, not only because military forces continued to employ it long after it had been abandoned

103 Liège, AEL, Etats, inv. no. 2966: Liste de la compagnie capitaine de Thiribi du régiment monsieur général mayor de Jaymaert. See also Driessen, *Emundt van Oeteren*, 691.

104 Loonen and van de Graaf, “Het massapaardengraf van Borgharen,” 35.

105 van Wissekerke, *Van kwade droes tot erger*, 95, 342–44.

106 *Reglement en generaele ordres voor de regimenten infanterie van den staat*, 198; Dorreboom, “‘Gelijk hij gecondemneert word mits deezen,’” 253, 258, 259.

107 Colombier, *Préceptes*, 41.

108 Geltner, *Flogging Others*, 21–23.

elsewhere in society, but also because they gave their own interpretation to these punishments. Soldiers retained a strong connection to nobility throughout the medieval and early modern period, and perceived being touched by an executioner or his assistants as dishonourable. For this reason, soldiers carried out punishments themselves, unless the offender was considered unworthy to continue serving.¹⁰⁹ This evolution can be illustrated through a comparison between two punishments for the same offence: one medieval, the other early modern. The *prévôt* of Bouconville in the Duchy of Bar condemned in 1411 a sentinel who had fallen asleep while guarding this fortress to a fine of sixty *sous*. Three hundred years later, in 1717, the commander of Namur sentenced two soldiers to running the gauntlet up and down twice: one had left his guard post, the other had fallen asleep.¹¹⁰

These notions caused a major divergence between the military, as an organization, and other types of armies that continued to function. When the governor of Roermond found a citizen absent from his guard post in 1656, he punished him in the proper military way: with a beating. The latter responded by taking his gun and threatening to shoot him. The city council resolved the situation by imprisoning the guard for a few days, but asked the governor to refrain in future from beating its citizens. When French troops started to expand the fortifications of Dinant in 1690–1691, the governor issued a proclamation that soldiers who entered the parapets or banquettes of the walls and/or soiled them risked corporal punishment. Citizens on the other hand only risked a fine.¹¹¹

The taking of an offender's freedom, which increasingly replaced caning from the eighteenth century onwards, was an important development within the context of army health because of the nature of the places in which he was confined. In medieval contexts this was typically a tower, gate, or the basement of the town hall, for the simple reason that these were enclosed spaces with someone present as a guard, typically a sentinel or gatekeeper. Imprisonment mainly served to hold people temporarily and oblige them to pay. The amount of comfort depended on a prisoner's wealth, given that one had to pay one's own costs of imprisonment.¹¹² Still, the stereotypical image of the medieval dungeon might have some factual basis. On August 18, 1465 the city council of Dinant wrote to its colleagues in Liège about one of their citizens who was held prisoner in Bouvignes. The Burgundians not only had refused to release him, but also threatened to put him in a hole filled with "worms" and wild beasts (*vermines et bestes sauvages*). Philippe de Vigneulles, a citizen of Metz who was held captive in the fortress of Chauvency near

109 Dorreboom, "“Gelijk hij gecondemneert word mits deezen,” 126–27, 132, 190–96, 208, 236–37; Geltner, *Flogging Others*, 63–65.

110 The Hague, NA, Raad van State, inv. no. 2079: Orders February 25, 1717; Marchal, *Inventaire*, 201.

111 Bormans, Lahaye, and Brouwers, ed., *Cartulaire de Dinant*, 6:251–52; van Beurden, *De handelungen*, 125.

112 Fruin, *De oudste rechten*, 1:184; Geltner, *The Medieval Prison*; Gentenaar and Hupperetz, "Personeel en werkzaamheden," 188; Koreman, *De stadsrekening*, 148; Laurent, *Aachener Stadtrechnungen*, 236; Moreau, *Bolwerk der Nederlanden*, 12, 16; Villa-Séblin Nicole, *La sénéchaussée*, 138–39.

Montmédy in 1490–1491, recorded in his chronicle that, after an attempted escape, his guards put him in the basement of a tower, where mice, rats, and other animals stole his bread.¹¹³

Even though these medieval fortifications lost much of their defensive value in subsequent centuries, they often continued to serve as prisons. More importantly, imprisonment became a punishment in itself.¹¹⁴ The order book of the Dutch “hunter” unit de Sternbach noted that a sergeant was put into “the hole” for neglecting his patrol duty in 1785. The garrison orders of Namur also referred to a certain prison as “the hole.” Colombier again provides a valuable perspective when he observed that there is no good reason to use an underground space as a *cachot*, since it is detrimental for the prisoners’ health.¹¹⁵ The regulations of the French non-commissioned officer from 1811 did in fact make a distinction between three different forms of confinement, from simply imprisonment in one’s own room to the *cachot*, where a soldier had to sleep on a straw covered floor and only received water and bread. A prisoner could not be kept in the *cachot* for more than four days.¹¹⁶

The third and final element in the forging of a military identity was the building of barracks. The building of large houses to accommodate soldiers dates back to the sixteenth century. At that point, however, it was very much for lack of any other suitable housing. From the late seventeenth and especially the eighteenth century onwards governments all over the Meuse Region initiated building programmes to provide garrison towns with barracks.¹¹⁷ This was primarily a control issue: housing soldiers in barracks made desertion far more difficult. Only seven percent of the soldiers from the Dutch-speaking part of the Prince-Bishopric of Liège who deserted from the Dutch army between 1770 and 1795 ran away from their barracks, compared to thirty-five percent quartered in private households.¹¹⁸

Complaints about the health hazards of barracks were commonplace, both in publications of military physicians and reports of military engineers (see figure 33). Consistent with prevailing medical theories most criticized the humidity and lack of air circulation.¹¹⁹ The French engineer de Vauban planned the construction of what could

I 13 The Latin word *vermis*, from which our word “vermin” derives, literally means “worm,” but during the Middle Ages it was used as a general term for a wide range of invertebrates, including non-flying insects, moths, snails, spiders, and leeches. Bormans, Lahaye, and Brouwers, ed., *Cartulaire de Dinant*, 2:116–17; Lamort and Huguenin, *Les Chroniques*, 536.

I 14 Leestmans, *Soldats*, 82; Lefebvre, “Bastogne,” 357; Marchal, *Inventaire*, 348; Monbrun, *Considérations*, 7; Muller, “Bouillon,” 56.

I 15 The Hague, NA, Raad van State, inv. no. 2057: Garnisoensorderboek, February 20, 1786; Colombier, *Préceptes*, 87–88.

I 16 *Le guide des sous-officiers*, 277–86.

I 17 Leestmans, *Soldats*, 19; Milot, “Les garnisons,” 731; Parker, *The Army of Flanders*, 140–41; Rooms, *De organisatie*, 246–50.

I 18 Based on a database of a hundred and ninety-nine deserters, originating from the Dutch-speaking part of the Prince-Bishopric of Liège who served in the Dutch army between 1770 and 1795. Govaerts, “Fire-Eaters.”

I 19 Colombier, *Préceptes*, 158–65; Huvet, “Topographie médicale”; Kerckhoffs, *Hygiène militaire*,

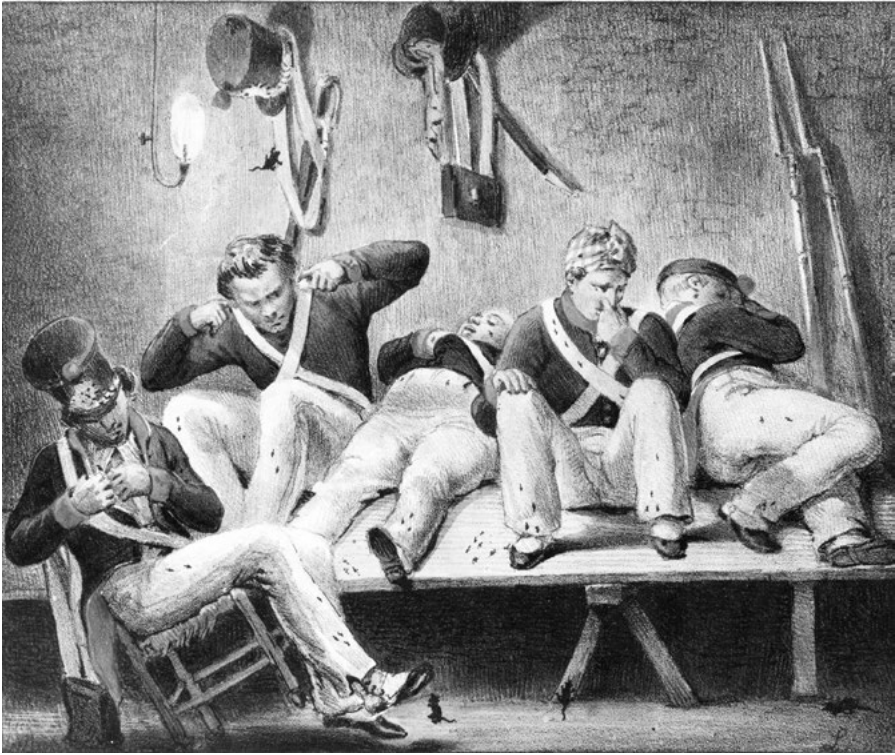


Figure 33. Dutch militiamen (*schutters*) in their mouse- and flea-infested barracks, 1830s (Soesterberg, NMM, inv. no. 00104106). Reproduced with permission of the Nationaal Militair Museum, Soesterberg.

be considered one of the longest barracks in Europe at that time, in Givet alongside the Meuse in 1680 (almost 430 metres). After an inspection in 1691 he noted that it was difficult to pass through the area because he encountered manure everywhere. He thus gave instructions to ensure that from then on they were regularly cleaned.¹²⁰ The fact that the commander of Namur likewise instructed his officers in 1716 to keep the barracks dirt-free suggests that this had not yet become standard practice. One hundred years later the worst problems occurred in barracks not located near a stream, such as those of Rocroi. The latrines built next to the main wall in 1832 apparently produced such strong “memphitic and pestilential vapours” during the summer months that the neighbours claimed that it was impossible to live there, even when all the doors and windows remained locked.¹²¹ So, the need to forge a specific military identity came at the cost of the soldiers’ own health.

65–67; Milot, “Les garnisons,” 725–26.

¹²⁰ Guénoun, “Deux edifices,” 80–81.

¹²¹ The Hague, NA, Raad van State, inv. no. 2079: Orders October 12, 1716; inv. no. 2081: Generale

As significant as the selection of army members and further physical intrusions were, the most important aspect of military physique remained proper nourishment. This derived of course from the widespread adoption of Galenic theory, which classified food and drink as one of the six non-naturals. Medieval fiscal accounts are surprisingly detailed and, in many ways, even more informative than sources from subsequent centuries. The accounts kept by the city of Aachen regarding its expenses during the siege of the fortress of Dyck in 1383, for instance, allow a reconstruction of the food eaten on a particular day of the week. The basic food was bread, beer, and meat, mostly poultry, with fish (herring and to a lesser extent salmon and river fish), eggs, and/or cheese mostly reserved for days of fasting. Parsley, garlic, beans, mustard, garden vegetables (*moes*), oil, wine, milk, and game, the latter as gifts from the bishop of Cologne, are also mentioned.¹²²

Medieval accounts in fact provide clear patterns as far as nutrition is concerned: cooks prepared food in large cauldrons, alcoholic beverages (beer and/or wine) were the norm, and the food was quite rich in meat (poultry, cattle, sheep, pig, game), fish (herring, cod, pike, carp, salmon), dairy products (cheese and butter), eggs, bread, and herbs or spices (mostly parsley and to a lesser extent mustard). Fruit and vegetables were relatively rare: cooked peas, and almonds, onions, garlic, and *moes* being the most common. Calculating the exact nutrient intake of an average combatant is difficult because the quantities specified in accounts have to be converted into modern measures, which involves all sorts of assumptions and estimates, but it does seem to have been quite generous.¹²³

The diet of early modern soldiers pales by comparison: provision of meat and bread (or its alternatives: biscuits and rice) could more or less be guaranteed, but fish, eggs, and dairy products became much rarer or disappear from the menu. This might be related to changing religious beliefs, since many soldiers no longer respected days of fasting from the sixteenth century onwards, but the French doctor Colombier explicitly stated in 1775 that most privates did not have enough money to buy fish or eggs.¹²⁴ Furthermore, because armies grew larger over time, and the number of wagons each unit

Orders, art. 14; inv. no. 2081: November 8, 1738, April 5, 1741, October 15, 1741; *Orders en reglementen Maastricht (1749)*, art. 21; *Reglement en ordres 's-Hertogenbosch (1770)*, art 9; Barbe, "Rocroy, ville de garnison," 107, 115–16.

122 Laurent, *Aachener Stadtrechnungen*, 276–86. Remarkably enough, honey is mentioned rarely, except in the context of horse medicine. Krug, "The Wounded Soldier."

123 Bar-le-Duc, ADM, B 1853, fols. 10–16, 18; Grave, SLC, Archief Gemeente Grave, inv. no. 218, fol. 135v; Boffa, "Le ravitaillement," 204–7; Collin, "Le travail," 26–28; Contamine, *Guerre, état, société*, 646–54; de Groot, *Stadsrekeningen*, 1396, fols. 32–35, 1402, fol. 19, 1403, fols. 25–26, 1405, fols. 14–15, 1407, fols. 18, 21–23, 27–28, 1412, fols. 16–20, 42–44; Gaier, "L'approvisionnement," 557–61; Harari, "Strategy and Supply," 302–4; Herborn and Mattheier, ed., *Die älteste Rechnung*, 70; Hosler, *John of Salisbury*, 76–79; Kuppers, ed., "De stadsrekeningen," 39, 148, 160; Liégeois, "Compte de la recette de Chiny," 141, 163; Marchal, *Inventaire*, 74–76; Rogers, *Soldiers' Lives*, 11; Servais, *Annales historiques du Barrois*, 2:316–17; van den Brandeler, ed., "Rekening der onkosten," 180–84; van Schevichaven and Kleijntjens, *Rekeningen*, 278–79; van Werveke, *Die Erwerbung*, 7–13, 34–38.

124 Colombier, *Préceptes*, 62, 130; Grauwels, ed., *Dagboek*, 43, 159, 168–69.

brought with it had to be reduced in order to preserve some mobility, provision of even the most basic food could become problematic: from the late sixteenth century onwards soldiers were issued a specific form of bread, the so-called commission or munition bread, which was rather coarse and made of a mixture of rye (two-thirds) and wheat (one-third), but could be supplied by contractors at relatively short notice.¹²⁵

Drinking water also became relatively more important. Hendrik Conscience and Jan Teunisse, antagonists in the Ten Day's Campaign (1831), both recounted that because of the scarcity of water in the Campine/Kempen they were reduced to drinking dew and muddy water from wagon tracks. The latter claimed it affected the soldiers' eyesight.¹²⁶ The increasing importance of water could explain why dysentery became one of the most important scourges of armies. Seventeenth-century soldiers responded to this threat by mixing vinegar or olive oil with water before drinking or cooking. This method is still attested during the Napoleonic Wars, which suggests that it was a widespread and ongoing practice.¹²⁷ The medical qualities of wine were already well known in the Middle Ages and it is quite possible that combatants drank wine and beer rather than water for health reasons as well as taste.¹²⁸

Since regulations rather than fiscal accounts constitute the main evidence for the food supply of early modern forces, it is possible that differences with medieval armies were in practice much less pronounced. There was also a significant distinction between life in garrisons or quarters and in the field, but even when on campaign the diet of soldiers might have been richer than the regulations indicate. So-called sutlers or *vivandier(e)s* had an important role in military supply and many paintings depict them selling various items, including food, to soldiers. Plundering was a much-used alternative when official supplies did not suffice.¹²⁹ A councillor's act from Sautour (1643) lists the possessions of a cavalryman from the garrison of Givet killed in a skirmish with the local militia. These include a loaf of bread, an apple, a pear, and a small axe (presumably to cut wood). The fact that the councillors went to such trouble to record the deceased's possessions suggests that they feared retaliations by the soldier's comrades.¹³⁰

125 de Cauwer, *Tranen van bloed*, 174, 182–83; de Graaf, *Oorlog*, 362; de Keralio, Lacuée, and Servan, *Encyclopédie méthodique. Art militaire*, 3:573–91; Duyck, *Journal*, 3:399–400; Iung, "L'organisation," 271, 295–98; Kroener, *Les routes*, 89; Perjés, "Army Provisioning," 11–14; Rooms, *De organisatie*, 205; van Laere, "Montmédy," 87, 164–201.

126 Conscience, *De omwenteling*, 110–11; Teunisse, *Onderdaan in Oranje's oorlog*, 78.

127 Burschel, *Söldner*, 259; de Brack, *Avant-Postes*, 366; Haneveld and van Royen, *Vrij van zichtbare gebreken*, 180–84; Monbrun, *Considérations*, 12; Ritter, "Handeling," 28, 63–65; Rogers, *Soldiers' Lives*, 94–95.

128 Rogers, *Soldiers' Lives*, 94–95.

129 Burschel, *Söldner*, 231–41; De Cauwer, *Tranen van bloed*, 175; de Graaf, *Oorlog*, 361; Leestmans, *Soldats*, 195; Lynn, *Giant of the Grand Siècle*, 108–14, 122–24; Redlich, "Der Marketender"; Rooms, *De organisatie*, 209–10; Rorive, *La guerre de siège*, 228–38; Sabron, *De oorlog*, 2:77; Spaans, "Legerkampen," 176; Teunisse, *Onderdaan in Oranje's oorlog*, 62; van Bavel et al., *De kroniek*, 335; van Ryckenroy, *Kroniek*, 85–86, 135–36, 142, 150, 152, 159; Viltart, "S'alimenter," 266–73.

130 Sautour, 6933: Act January 3, 1643 (transcript Généamag).

The information provided by medieval fiscal accounts can also be quite difficult to interpret, for these documents rarely mention exactly what food was supplied to specific members of an army. During the 1411 campaign in Luxemburg, for instance, a merchant from Namur supplied the duke of Brabant's army with three barrels of tuna fish, and two of seal.¹³¹ These were undoubtedly intended for the duke's own table, as were eight barrels of river fish. The "many people of arms" who stayed at Virton on the other hand received only one barrel of river fish, but large quantities of cod. The high bailiff of 's-Hertogenbosch did not include eight barrels of old herring, destined for the defenders of the fortress of Middelaar, in his 1387–1388 accounts because when one of the barrels was opened the herring turned out to be so rotten that nobody would eat from it, nor could it be sold. It was thrown into the Meuse instead.¹³² In this way, one might argue that our comparison between the diet of medieval and (early) modern armies is baseless because evidence for the latter is biased towards the subordinate ranks, non-commissioned officers, and privates.

Still, combatants of high social status, such as men-at-arms, were far more common in medieval armies than commissioned officers in early modern military forces. In other words: the diet of the average combatant changed markedly from the fifteenth and/or sixteenth century onwards because the social status of soldiers declined significantly in the same period (see chap. 4). The chronicler Lodewijk van Velthem described the "Meuse lords" (*Maselanders here*) who served the count of Flanders in 1297 as being so fond of wine and good food that no one could satisfy their wants.¹³³ The master hunter of the duke of Bar stayed more than a month in the lordship of Souilly near Verdun in 1402 so he could supply his master's army, which was besieging the fortress of Dudelange, on the Bar–Luxemburg frontier, with game. Four years later the *prévôt* of this fortress supplied wine for the flasks of the duke's horsemen.¹³⁴ These actions derive logically from the noble status of men-at-arms. Noblemen expected to eat the same food they consumed when staying in their own households. The similarity of the evidence regarding the consumption of meat and fish in fiscal accounts of military expeditions with the animal bones found during the excavations of medieval castles is striking.¹³⁵

In this context the outbreak of scurvy, a disease generally associated with crews on long sea voyages and armies under siege, in the garrison of Givet in 1847 deserves particular attention.¹³⁶ It occurred after the garrison had been weakened by typhoid and affected the military hospital most. Aside from the traditional emphasis on miasmas

131 Seals were classified as fish in the Middle Ages and could therefore be eaten on days of fasting.

132 Brussels, ARA, 137.01, inv. no. 2784 (transcript Henk Beijers Archiefcollectie); van Werveke, *Die Erwerbung*, 8. See also Boffa, *Warfare*, 54.

133 van Velthem, *Spiegel Historiae*, pt. 5, bk. 3, vv. 3553–3558.

134 Marchal, *Inventaire*, 186; Servais, *Annales historiques du Barrois*, 2:340–41, 2:391. See also Deloffre, "Guerres et brigandages," 280; Dinstühler, ed., *Die Jülicher Landrentmeister-Rechnung*, 91–124.

135 Eryvnc, "Medieval Castles"; Eryvnc and Woollett, "Top-Predator or Survivor"; Gautier, Hoffsummer, and Vanguetaine, "Faune médiévale"; Gautier and Fiers, "Restes animaux."

136 McCord, "Scurvy and the Nations' Men-of-War"; McCord, "Scurvy and the World's Armies."

and the corresponding measure of transporting sick soldiers from the hospital or their barracks, both adjacent to the Meuse, to the fortress of Charlemont, located on higher ground, the official report emphasized discrepancies between different units. Apparently, the cuirassiers counted only a single sick soldier even though they occupied the same barracks as their infantry comrades. Doctor Scoutetten, the author of the report, therefore suggested that the higher pay of these men, the direct descendants of medieval men-at-arms from a tactical if not social viewpoint, shielded them from a sudden rise in food prices, as military pay remained constant. This case is not only noteworthy because it confirms the importance of socio-economic status for discrepancies within armed forces, but also because it demonstrates that scurvy struck a nineteenth-century army in peacetime, which supposedly should have benefited from three hundred years of medical progress.¹³⁷ Rather than gradual improvement military health, as exemplified by the soldiers' food intake, seems to have declined over time.

Disease Prevention

We have seen that armed forces' vulnerability to disease should be seen in conjunction to evolving notions about military physique, the body, and how it should be fed, so we can now turn to more explicit mechanisms of disease prevention in an army context. Fortifications constitute a logical start given their central role in long-term interactions between armies and ecosystems. The traditional image of the polluted medieval city has come under increasing criticism in the last decade with a growing number of historical studies demonstrating that waste disposal and hygiene standards were of major concern to medieval urban authorities. Despite this recent emphasis on the relative cleanliness of the medieval city its organization came at the cost of its periphery.¹³⁸

Because comparatively few people lived there, fortifications became the place par excellence for waste disposal.¹³⁹ In 1439, for instance, one of the towers protecting Wijck (Maastricht) was apparently so filthy that no one would stand guard there.¹⁴⁰ Fortifications were hardly unique in this regard since every abandoned building or uninhabited structure was susceptible to be used in such a way. The restrictive nature of the fortifications at the edges of a settlement reinforced such practices, however, as archaeologists found two cesspits from the sixteenth century in the arches of the city wall of 's-Hertogenbosch. When Maaseik was struck by an epidemic in 1575 the council likewise ordered its two gravediggers to work only at night and remain in a tower during the day. In eighteenth-century Sedan public slaughterhouses, latrines, and collection

137 Scoutetten, "Note sur une épidémie de scorbut."

138 Coomans, "In Pursuit of a Healthy City"; Creighton and Higham, *Medieval Town Walls*, 45, 235; Geltner, "Public Health"; Thomas, "Hygiène," 287–304.

139 Grave, SLC, Archief Gemeente Grave, inv. no. 218, fol. 204v; Boonen, "De Maaseiker wallen," 63; Bormans, "Extraits des cris du péron," 189–90; Bormans, "Table des registres," 12:27; Bormans, Lahaye, and Brouwers, ed., *Cartulaire de Dinant*, 3:155, 3:162–63; Jacquet-Ladrier, "Les épidémies," 134; Parmentier, *Pays de Charleroi*, 68, 82; van Zuijlen, *Inventaris*, 2:903.

140 Moreau, *Bolwerk der Nederlanden*, 95, 106, 123.

points for waste disposal were all located alongside the walls to keep them away from the town's centre.¹⁴¹

This pollution not only encouraged the growth of ruderal plants such as nettles or thistles (see chap. 2), but also had a major influence on the introduction of domesticated carp (*Cyprinus carpio f. domestica*) in Western Europe from the late thirteenth century onwards. Their presence is already attested in 1289 Namur. Carp are able to survive in slow or stagnant, oxygen-poor water with much vegetation, such as moats or ponds. They swim to the surface to breathe and feed on bottom- or plant-dwelling animals. This made them a valuable alternative for native river fish, which were becoming increasingly rare at that time as a result of pollution, overfishing, and the use of smaller streams for milling and other activities (as we see with the disappearance of catfish and salmonids).¹⁴²

Still, even carp would not have survived long in polluted water so the maintenance of basic hygiene standards in the fortifications became a vital issue. Significantly, these efforts retained a close link with the conservation of the fortifications themselves (see chap. 2). The city council of Aachen, for example, rewarded watchmen in 1385 for removing manure and their colleagues in Dordrecht commanded citizens to clean the moats in 1509 in order to prevent fires and the bad air that could cause the plague. The city council of Rotterdam also supplied two chamber pots to the members of shooting guilds who guarded the walls in 1556–1557.¹⁴³

Military organizations were, because of their close connection to fortifications, particularly concerned with standards of hygiene. Eighteenth-century garrison regulations emphasized that sentries had to keep their post clean and prevent anyone from relieving himself or otherwise soiling its surroundings. These directives were enforced with very practical measures: the guard's officer simply did not let a soldier off guard duty until his post was dirt-free. Citizens who transgressed either risked losing their hats or having to clean up their mess themselves. A respectable person wore a hat when going outside, which made its taking a symbolic punishment (aside from the obvious economic cost).¹⁴⁴ In 1811 a military engineer stationed in Sedan warned the town council about the water in the fortress's moat, which had become stagnant. The citizens had to close

141 Boonen, *Ziekten en genezers*, 8–9, 76–77, 87; Dardart, “La rue à Sedan,” 85, 185–86, 188–89, 191–92; van Haaster, *Archeobotanica*, 22–23.

142 de Groot, *Stadsrekeningen*, 1415, fol. 48; Deligne, “Carp in the City,” 285–95; Hoffmann, “Environmental Change”; Piérard, ed., *Les plus anciens comptes*, 1:201–2, 1:230, 1:241; Thomas, “Hygiène,” 270–79.

143 Fruin, *De oudste rechten*, 1:347–48; Laurent, *Aachener Stadtrechnungen*, 299; Pick, “Verpflichtungsurkunden,” 236–38; Unger and Bezemer, *Oudste stadsrekeningen*, 239.

144 Archiv Haus Welbergen, inv. no. 754: Accounts city of Goch 1626–1677, fol. 81; The Hague, NA, Raad van State, inv. no. 2078: Orders Castle of Namur, art. 12, Orders for the guards, arts. 8, 20, 21; inv. no. 2079: Orders April 4, 1714, September 1, 1715, February 12, October 12, and October 24, 1716, January 22, 1717; inv. no. 2081: Orders August 19, November 10, 1738; inv. no. 2087: Orders August 27, 1761; *Ordonnance du roi (June 25, 1750)*, art. 172, 281; *Reglement en ordres 's-Hertogenbosch (1770)*, arts. 8, 47; *Reglement en ordres Maastricht (1786)*, arts. 34, 35, 39; Bormans, Lahaye, and Brouwers, ed., *Cartulaire de Dinant*, 6:251–52;

off their access to the moat, in the form of latrines, sewers, etc., or the military would carry out the necessary adjustments themselves.¹⁴⁵

Armed forces had the advantage that they could always resort to violence, or threats, if other measures failed. This link to violence, however, questions the very character of military control, for soldiers themselves also contributed to the range of (semi) illegal activities associated with fortifications by organizing duels.¹⁴⁶ One might in fact wonder how effective military regulations actually were. The water in the moats was considered less than healthy: de Vauban specified in his journal of the siege of Namur that on June 25, 1692, towards the end of the siege, the defenders cooked water drawn from a cistern in the castle moat before using it to make bread. The castle's wells had become unusable at this point, one due to a direct hit by artillery fire and the other because a soldier had fallen into it and drowned. This pond dates back to at least the fifteenth century and served to collect rainwater running down from the plateau.¹⁴⁷ The eighteenth-century garrison of Rocroi, on the other hand, had a special ramp leading to the moat so that horses could drink there. This also increased the chances of the water becoming polluted.¹⁴⁸

Ultimately even military commanders could not escape the fact that fortifications remained the most obvious place for disposing waste, particularly for the very men who guarded the fortifications. The medieval accounts of Grave from the late fifteenth century mention payments for the repair of privies in front of, or near, the gates and at the guardhouses, and those of Venlo from 1409 refer to a privy on one of the towers.¹⁴⁹ The fact that archaeologists regularly recover hundreds of animal bones from fortress moats is revealing in itself. The French governor of Maaseik also ordered the construction of latrines on the city walls in 1673 as prevention against disease, and in 1794 gravediggers at 's-Hertogenbosch buried the garrison's dead in one of the bastions or outlying forts for lack of other space. Dead horses were interred in the drill square near the citadel.¹⁵⁰ Armed forces had a significant role in efforts to improve general hygiene in and near the fortifications because of their close connection to these spaces, but their attempts never fully succeeded.

Disease prevention did not stop with maintaining fortifications, however. Commanders also put considerable effort into making sure their subordinates upheld certain standards of cleanliness. While historical studies about military medicine place much emphasis on the fact that medical treatises, starting with Arnald of Villanova's famous regimen on military camps, the *Regimen Almarie*, discuss hygiene precautions such

145 Dardart, "La rue à Sedan," 92, 191–92, 196–97, 201.

146 Liège, AEL, Echevins de Liège, inv. nos. 286, 750; Biemans, *August von Bonstetten*, 55; van der Heijden and Sanders, eds., *De levensloop*, 85.

147 Bragard et al., *La termitière*, 54–56; de Vauban, *Journal*, 151.

148 Barbe, "Rocroy, ville de garnison," 90.

149 Grave, SLC, Archief Gemeente Grave, inv. no. 218, fols. 73v, 82v, 117, 159v, 172r, 173r; de Groot, *Stadsrekeningen*, 1409, fol. 29.

150 Boonen, "De Maaseiker wallen," 82–83; Mommers, "De gezondheidstoestand," 75.

as examining the quality of the water or burying the dead properly, it is quite unclear whether this reflects an increasing awareness of preventative health.¹⁵¹

As far as the Meuse Region is concerned, we are fortunate to have access to an exceptional eyewitness testimony of army life in the Central Middle Ages. The abbot of Sint Truiden/Saint-Trond (in the Prince-Bishopric of Liège) accompanied a mounted army of about two thousand horsemen marching down the Meuse valley in 1107 to join the emperor at Verdun, and left an account of his experiences in his abbey's chronicle. The monk apparently thought that he would be able to lodge in a house every night and was absolutely horrified to see his new travel companions pitch camp in the open field. He complained that the stench of the excreta left by the horses and men "who did not remove themselves from them—his servant and himself—to relieve themselves" tormented him daily and made him vomit repeatedly. He also grumbled about the swarms of flies that harassed him by day and the mosquitos that stung him at night. At first glance this evidence fits into the traditional image of a medieval army which neglects to take even the most elementary health precautions. Yet the abbot also mentioned that the *milites* and squires set up tents for the nobles, constructed huts for themselves and their horses, and camped in a well-shaded environment near a stream. In other words: they followed health precautions also prescribed in Vegetius's *De re militari*.¹⁵²

The role played by the Aachen urban militia in the sieges of the fortresses of Dyck and Reifferscheid in 1383 and 1385 provides another excellent example because the richness of the city's accounts can be complemented by six letters the contingent's commanders wrote during the latter siege to the rest of the city council. None speak of the presence of disease, but they do mention essential health precautions such as payments to clean the tunics of moths, for the making of tents, and the repairing of shoes. It is also clear that one physician and two surgeons, with attendants, were present. The accounts indicate that the 1385 contingent totalled more than one hundred men, perhaps even close to two hundred, since they do not include servants and other support personnel. The urban militia lost a few combatants, but to enemy action rather than disease.¹⁵³

This is hardly the only evidence regarding the existence of basic hygiene in medieval army camps. Honoré Bonet's *L'Arbre des batailles*, dating from the 1380s, a prescriptive work on the conduct of war, stipulated that an army's marshal had to look after the sick and wounded and make sure they got better. He also had to take care that no one bathed in the drinking water of the horses because that affected the latter's eyesight.¹⁵⁴ The fiscal accounts of Albert of Bavaria, Count of Holland, specify that a certain Haestgen vander Vuyr received a payment of one *schild* on July 8, 1393 because he supplied soap

151 Garrison, *Notes*, 94–95; McVaugh, ed., *Regimen Almarie*, 167–72, 197–200.

152 *Foetor enim fimi equorum et hominum, non longe a nobis ad secessum declinantium, paene me cotidie encubat, crebro perurgens ad vomitum.* The term *miles* (plural *milites*) refers here to a mounted warrior who was of subordinate status, compared to actual nobles. The transformation of these groups into "knights" is still the subject of major debates: de Borman, *Chronique de l'abbaye de Saint-Trond*, 1:102–3.

153 Laurent, *Aachener Stadtrechnungen*, 61, 89–95, 277, 278, 279, 281, 292, 296.

154 Bonet, *L'Arbre des batailles*, 96–97.



Figure 34. Fifteenth-century miniature, made in the Burgundian Netherlands, representing the siege of Narbonne by Charlemagne's army. Note the horseman charging at the quintaine on the left, and the foot soldier in the middle, who seems to be digging a drainage ditch next to the imperial tent (Brussels, KBR, MS 9068: *Les Croniques et conquests de Charlemaigne*, fol. 73). Reproduced with permission of the Bibliothèque Royale de Belgique/Koninklijke Bibliotheek van België.

"that one needed in the army" (*diemen inden heer behoefde*). His troops besieged the house (castle) of Altena at that time.¹⁵⁵ One of the versions of the English military ordinances, dating to the early fifteenth century when English soldiers overran the southern half of the Meuse Region, likewise commanded that offal from slaughtered animals in camps had to be buried to prevent infections.¹⁵⁶ These were health precautions essentially similar to those taken by seventeenth- and eighteenth-century armed forces.¹⁵⁷

Archaeological research might be far more informative in this regard. Excavations in Bouge, a village next to Namur on the east bank of the Meuse, found remains of fire-

155 A *schild* is a golden coin minted in the County of Holland. The amount of soap bought cannot have been large, for the count also paid two men who brought him cherries on multiple occasions one *schild* each. De Boer, Faber, and van Gent, eds., *De rekeningen, 1393–1396*, lx–lxii, 124.

156 Curry, "The Military Ordinances"; Hargreaves, "The Long Road," 440, 442.

157 Colombier, *Préceptes*, 245–64; de Keralio, Lacuée, and Servan, *Encyclopédie méthodique. Art militaire*, 2:408–12; Hexham, *The Second Part of the Principles of Art Military*, 23–24; Lenihan, *Fluxes, Fevers, and Fighting Men*, 89–90; Stevin, *Castrametatio*, 41.

places, left by three separate army encampments. The oldest of these camps dates to the late fifteenth or early sixteenth century, and included a shallow ditch measuring thirty metres in length, three metres in width, and about one metre in depth to the east of the location of the hearths. The authors of the report suggested that it might have served as the camp's boundary. Another, and far more intriguing option could be that this ditch had a role in the camp's waste disposal system or water drainage, possibly serving as (one of) the camp's latrine(s). A second excavation, at Frameries near Mons, discovered the remains of shallow ditches, about five and a half metres long, in an army camp from the early modern period (late sixteenth to eighteenth centuries). These might have prevented rainwater from flowing into the tents (see figure 34), but they also contained food waste and charcoal. A final interesting detail from Bouge is the discovery of a post-fifteenth-century skeleton buried rather hastily in a ditch rather than a proper grave.¹⁵⁸

Burying corpses remained a responsibility largely left to local inhabitants or the family and friends of the deceased rather than army members in general; sometimes the numbers might be counted.¹⁵⁹ This created major problems when large numbers of bodies were involved. According to the chronicler Jean de Stavelot, the miasmas of the dead at the battlefield of Othée (1408) forced the Burgundian army to relocate to adjacent villages. The soldiers did, however, retrieve the bodies of leading noblemen, and brought those to Maastricht to be interred.¹⁶⁰ It is possible that the corpses, initially buried in mass graves, were reinterred in 1410, when a chapel was constructed on the battlefield with a large cemetery around it. It is worth noting that the village might have suffered from an epidemic in the immediate aftermath of the battle.¹⁶¹

Subsequent centuries saw no significant change in this regard. Ambroise Paré wrote in his treatise on military surgery that he wanted to leave the battlefield of Saint-Quentin (1557) due to the stench of the wounded and dead. He also remembered numerous flies swarming as a result of the humidity of the bodies and the heat of the sun, blocking the sunlight, and spreading the plague wherever they settled.¹⁶² His experiences were not that different from the farmer, Winand Mengels, who visited the battlefield of Lafelt (1747) after the fighting had ended. He was particularly horrified to see his fellow villagers robbing the dead and wounded instead of helping them. The corpses, deprived of all their belongings, were eventually buried in mass graves.¹⁶³ The Dutch army might have passed a regulation in 1673 that all filth, carcasses, and other foul-smelling matter had to be removed from the roads on which the soldiers marched, but it is quite unclear

158 Authom and Denis, "Exploration"; Denis, "Frameries"; Siebrand and Collette, "Namur/Bouge," 276–277.

159 Devillers, "Documents relatifs," 97–98; Gagné, "Counting the Dead," 800–803; Gaier, *Art et organisation militaires*, 69–70.

160 de Stavelot, *Chronique*, 119.

161 Domken, "Histoire," 49–50, 207–9.

162 Packard, ed., *Ambroise Paré*, 242–43. Original French text in Paré, *La bataille de Saint-Quentin*, 8.

163 Mengels, *Chronyk*, 39–46.

if this regulation was ever enforced.¹⁶⁴ The above-mentioned mass grave of horses near Maastricht, buried in a siege trench, as well as a skeleton of a soldier who died at one of the sieges of Namur indicates that many bodies were interred in existing ditches or wherever they fell.¹⁶⁵

The large numbers of horses many armies brought with them could aggravate these problems, given the amount of waste produced by a horse. The newly established journal of French military medicine, for example, attributed an epidemic affecting the garrison of Sedan in 1776–1777 to the location of the barracks' wells. These had to be built next to a depository for horse manure in order not to hinder military exercises.¹⁶⁶ Most contemporaries, however, perceived horse waste as an asset rather than a problem, for it had a key role as fertilizer in agricultural societies. French regulations from 1750 stated that the *majors des place*, staff officers in a military garrison, could dispose of the manure from cavalry regiments as well as the contents of the latrines providing that they ensured that the buildings were not damaged.¹⁶⁷

As for soldiers, maintenance of basic hygiene quickly became reduced to simply taking care of one's equipment. The famous military manual of Johann Jakob von Wallhausen, published in 1615, already mentioned that the *Kapitän d'armes*, a non-commissioned officer responsible for a company's arms, had to take care of his unit's sick. The regulations issued to his men in 1757 by the colonel of the Horion regiment, a unit raised in Liège for French service, indicate a focus on cleanliness, but also show that the colonel was mainly concerned with the image his men presented to the general public. The soldiers had to wash their hands and faces regularly and powder their hair. Sixty years later captain von Bonstetten wrote in his diary about inspections of his men's laundry, food, feet, and underwear. At that point basic hygiene had clearly become incorporated into the military's range of mechanisms for discipline.¹⁶⁸

The role of military discipline becomes far more ambiguous if one considers prohibitions regarding swimming or bathing. The governors of the eighteenth-century garrison of Namur forbade their soldiers from swimming or bathing in the Sambre or the Meuse alongside the city from the training grounds near the Bulet gate until beyond the training grounds of the Saint-Nicolas gate. In 1760 the commander even instituted special patrols to ensure that his orders were respected. The garrison regulations of Maastricht mention similar prohibitions for the Meuse between Maastricht and Wijk.¹⁶⁹ The inclusion of specific places near these cities' centres is of major significance. Mili-

164 Kerkhoff, "Over de geneeskundige verzorging," 73.

165 Dijkman, "Archeologische testimonia," 263; Loonen and van de Graaf, "Het massapaardengraf van Borgharen," 30; Tillière, "Histoire de Jamoigne," 20; Tilmant, "Découverte fortuite."

166 Rambaud, "Observations sur la fièvre putride et maligne."

167 *Ordonnance du roi (June 25, 1750)*, art. 672, 673; Barbe, "Rocroi, ville de garnison," 103, 119–20; Douxchamps-Lefèvre, *Inventaire*, 3:270; Driessen, *Emundt van Oeteren*, 674; Illaire et al., eds., *Les cahiers de doléances*, 589; Le Moigne, "Le rôle économique," 204, 215–16.

168 Biemans, *August von Bonstetten*, 146, 151, 156–57; Leconte, "Notes sur les régiments liégeois," section B; von Wallhausen, *Kriegskunst zu Fuss*, 29.

169 The Hague, NA, Raad van State, inv. no. 2078: Orders for the commander of the guards on the

tary commanders might have recognized the value of these activities, but they did not want naked soldiers splashing around where citizens could see them. Officers banned smoking for similar reasons not only near gunpowder storages, but also on the street or when on guard duty. The ashes had to be deposited in ashtrays.¹⁷⁰

In specific circumstances the military might actually have spread basic health standards among society at large. The mutineers of the Spanish Habsburg army who occupied Weert in 1601–1602, for instance, ordered the mayors to remove filth from the streets and repair the gutters under the city walls. The town council also had to make sure that the guardhouses were regularly cleaned.¹⁷¹ The military concern with keeping the immediate environment of guard posts dirt-free in fact not only benefited fortifications but also urban centres, since soldiers guarded important locations, such as the town hall or markets. A letter from a civilian recruiter for the French Royal Liégeois regiment in Maaseik (1789) even specifies that he bought a recruit new spats and had his linen washed before sending him to the officer in charge of recruiting. Conversely, the garrison commander of Namur had to remind his men in 1760 to respect the city's regulations to keep the streets clean. In this way the legislation passed by military and urban authorities was complementary rather than conflicting.¹⁷²

Women present with the army also played important, and generally gender-specific, roles. Medieval and sixteenth-century armies had special officials tasked with both organizing the camp followers and maintaining basic hygiene: the king of the “ribauds” and the “whores’ sergeant” (*Hurenweybel*). The former performed all sorts of menial tasks for rulers or urban councils and also supported armies on campaign. The latter had to ensure that the *Tross* or camp followers, did their duty, which included cleaning the camp's latrines.¹⁷³ The regulations of the eighteenth-century garrison of Namur stipulated that soldiers' wives had to clean the barracks on Wednesdays and Saturdays, once drummers had beaten the order around one p.m., while *cantinières* were still expected to help treat the wounded in the nineteenth-century French army.¹⁷⁴

Military quarantine measures were far more far-reaching, however, than the traditional association of women with prostitution. A soldier serving in the Spanish garrison of Namur testified before the provincial court that he had spontaneously offered his help to carry sick soldiers who had arrived in the city in 1689. When his officers

Medianée, arts. 4, 5; inv. no. 2081: Generale Orders, arts. 14, 24; inv. no. 2087: June 14, 1759, June 10, 1760; *Reglement en orders Maastricht (1786)*, art. 35.

170 Biemans, *August von Bonstetten*, 111; Kerckhoffs, *Hygiène militaire*, 174–75; Poswick, *Histoire*, 197, 199.

171 Klaversma, *Weert tussen 1062 en 1602*, 271–79.

172 Liège, AEL, Conseil Privé, 2634: Letter of Servaes Hauben, Maaseik, May 27, 1789; The Hague, NA, Raad van State, inv. no. 2079: Orders June 27, 1717; inv. no. 2087: Orders July 23, 1760.

173 Balon, “Un train sanitaire,” 275, 290; Burschel, *Söldner*, 244; Coomans, “The King of Dirt”; Hacker, “Women and Military Institutions,” 653; van Werveke, *Die Erwerbung*, 43; Viltart, “Le roi des ribauds”; Vollmuth, *Die sanitätsdienstliche Versorgung*, 144–45, 150–51.

174 The Hague, NA, Raad van State, inv. no. 2081: Generale Orders, arts. 12, 13; Cardoza, *Intrepid Women*, 79–82, 123–25.



Figure 35. Soldiers gathering forage, late seventeenth century (Guérard, *L'Art militaire*).

learned about this, they beat him and forbade him from approaching the same sick soldiers again.¹⁷⁵ The eighteenth-century Dutch navy on the other hand controlled incoming ships suspected of bringing epidemic disease. The Admiralty of the Maze (Meuse) established a special harbour near Hellevoetsluis where ships arriving from the East Indies had to remain in quarantine from seven to forty days. This suggests that the historical concept of a frontier included health aspects as well. Guards stationed at fortress gates likewise had to turn away people suspected of spreading disease.¹⁷⁶

Yet maintaining military health was not solely a top-down process. Common soldiers were also quite capable of constructing shelters and seeking food themselves if the need arose. The disruptive activity traditionally denoted as “foraging,” for instance, encompassed a wide range of actions, ranging from thousands of soldiers collecting forage to individual men and women stealing a cow or gathering wood (see figure 35). Armed forces were very vulnerable to an enemy attack when foraging, which meant that such activities should ideally only be carried out under the commander’s supervision. The chronicle of Emond de Dynter records for example that during the siege of Grave in 1388 a considerable part of the Brabant forces went foraging on their own, despite instructions only to do so under the marshal’s command. In a subsequent Guelders counter-

¹⁷⁵ Jacquet-Ladrier, “Vivre à Namur en temps de guerre,” 166.

¹⁷⁶ Denys, *Police et sécurité*, 244–45; Leuftink, *Harde heelmeesters*, 186–88; van Wissekerke, *Van kwade droes tot erger*, 309–22.

attack many were killed, which demoralized the army.¹⁷⁷ It comes as no surprise, therefore that seventeenth- and eighteenth-century armies included “foraging” in the range of activities employed at military training camps (see chap. 1).

Commanders obviously wanted to control the movement of combatants, but there is far more at stake here than responding adequately to enemy action. The pertinent question was whether individual army members were deemed capable of managing to maintain their own good health. Conflicts about foraging also relate to tensions between formal versus informal knowledge.¹⁷⁸ The French military doctor Colombier suggested that experienced soldiers should guide newer members when looking for vegetables or herbs on campaign, so they did not bring anything poisonous or useless, and his Dutch colleague Joseph Kerckhoffs (1789–1867), the medical officer in charge of the Roermond garrison, argued in 1815 that soldiers should be prevented from gathering plants with which they were unfamiliar.¹⁷⁹

These perceptions were hardly unique. In 1747 the French commandant at Huy ordered the guards at the gates to ensure that no plums entered the city because they caused dysentery. The commanders of Namur gave similar instructions to their subordinates in 1740, 1741, and 1760. These officers shared a general assumption that the eating of unripe or rotten fruit was a major cause of dysentery and saw it as their responsibility to prevent lower-ranking soldiers, who in their view did not have the necessary knowledge, from doing something that damaged their health. Jean Colombier, who did recognise the benefits of eating fresh fruit, vehemently criticized this practice in his 1775 handbook.¹⁸⁰

Even though physicians and surgeons regularly, if not invariably, accompanied armies from at least the Central Middle Ages, it is quite unclear to what extent they could control medicinal practices within their armies. The Freiherr von Natzmer recounted in his memoirs that as a young ensign in the Dutch army he became ill from a “camp disease” (*Lagerkrankheit*), in the aftermath of the failed siege of Maastricht in 1676. His comrades put him on a wagon with other sick soldiers, after which he started to suffer from dysentery. He then drank *lapis prunellae*, a mixture of saltpeter, sulphur, and barley water, felt better, left the wagon, and arranged to stay at an inn. He relapsed later and had to go to a local doctor. Of special interest here is that he learned about this concoction from the count of Dohna, a Prussian general whom he served as a page before entering the army. This recipe must have been, or have become, quite widespread, since Samuel Hahnemann mentioned it as an ineffective treatment in his famous eighteenth-century *Apothekerlexikon*. Still, during the Napoleonic Wars many soldiers continued to trust in the healing properties of gunpowder.¹⁸¹

177 de Dynter, *Chronique*, 3:124, 3:625–626; Hosler, *John of Salisbury*, 79–81.

178 Shively Meier, *Nature's Civil War*, 134–51.

179 Colombier, *Préceptes*, 244; Kerckhoffs, *Hygiène militaire*, 91–92.

180 The Hague, NA, Raad van State, inv. no. 2081: August 25, 1740, September 18, 1740, October 3, 1741; inv. no. 2087: August 6, 1760; Colombier, *Préceptes*, 71–72; Pringle, *Observations*, 88–90; Rouche, “Journal de l'entrée.”

181 Hahnemann, *Apothekerlexikon*, 2:104–12; Howard, *Napoleon's Doctors*, 205; von Adlersfels-

Medicinal use of gunpowder is not only indicative of soldiers helping themselves, but might actually be rooted in specific medical theories. Colombier argued for example that the smoke of tobacco and gunpowder drove miasmas away. The perceived importance of miasmas was such that the burning of aromatic herbs became standard practice in spaces where wounded or sick combatants were kept. A fiscal account relating to the care given to wounded horsemen from Namur in 1347 accordingly notes the purchase of herbs for the room where the wounded lay.¹⁸² The regulations for “the prevention and curing of diseases” of the Dutch army (1673) required the burning of herbs in hospitals or other places where sick soldiers stayed. These hospitals also adopted the medieval practice of keeping gardens so they could grow their own herbs.¹⁸³

The emphasis on gardens is crucial because they existed everywhere soldiers stayed for extended periods of time: fortifications, army camps, and hospitals. This implies at the very least that some soldiers had acquired basic botanical knowledge. Doctor Jean Pierre Paul Bovy, who grew up in the citadel of Liège in the late eighteenth century, still recalled the magnificent gardens of the garrison’s officers when writing his memoirs in the late 1830s. Many plant species found in nineteenth-century fortifications in fact originated in nearby gardens. It is only uncertain who maintained these (see chap. 2).¹⁸⁴

Natural knowledge within an army context went beyond the formal medical practitioners. In the fourteenth century Guy de Chauliac (ca. 1300–1368), a university-educated surgeon, made a list of people who he thought should not be allowed to practise medicine. He mentioned among others “men-at-arms or Teutonic knights and others who serve in war,” who “with conjurations and concoctions, oil, wool, and leaves of cabbages dress all wounds, and base on this that God has put his virtue in words, herbs and stones.”¹⁸⁵ The notebook of the Swiss soldier Michael Andrist, who served in the garrisons of ‘s-Hertogenbosch and Maastricht in the 1780s, included several basic treatments against drunkenness, tremors in the hands and feet, infections of the fingers (*panaritium*), nose bleeds, and bad breath. It is conceivable that knowledge of the plants employed in such recipes (wild arum, rosemary, lavender, marjory, St. John’s wort, stinging nettles, betony, creeping cinquefoil, and similar) was widespread among common soldiers.¹⁸⁶

The close connection between army life and travel brought men of war into contact with unfamiliar creatures, but soldiers did not have to explore other continents to encounter exotic species. In 1467–1468, for example, a wild animal (*schamper Tier*) was captured near the *Landwehr* of Aachen, and then shown to the city council. The city’s

Ballestrem, ed., *Memoiren*, 5–6, 25–26.

182 Balon, “Un train sanitaire,” 275, 283; Colombier, *Préceptes*, 84, 165.

183 Corvisier, *L’Armée française*, 2:659; Kerkhoff, “Over de geneeskundige verzorging,” 73; Ritter, “Verhandeling,” 93.

184 Bovy, *Promenades*, 1:67–69, 1:71–72, 1:79; Lhoist-Colmon and Gabriel, “La colline,” 73; Ritter, “Verhandeling,” 38; van der Heijden and Sanders, eds., *De levensloop*, 248.

185 Mounier-Kuhn, *Chirurgie de guerre*, 68, 85–97.

186 Soesterberg, NMM, inv. no. 00216132: Notebook of soldier Michael Andrist, fols. 19r–21v. See also Peters, ed., *Peter Hagendorf*, 59, 60.

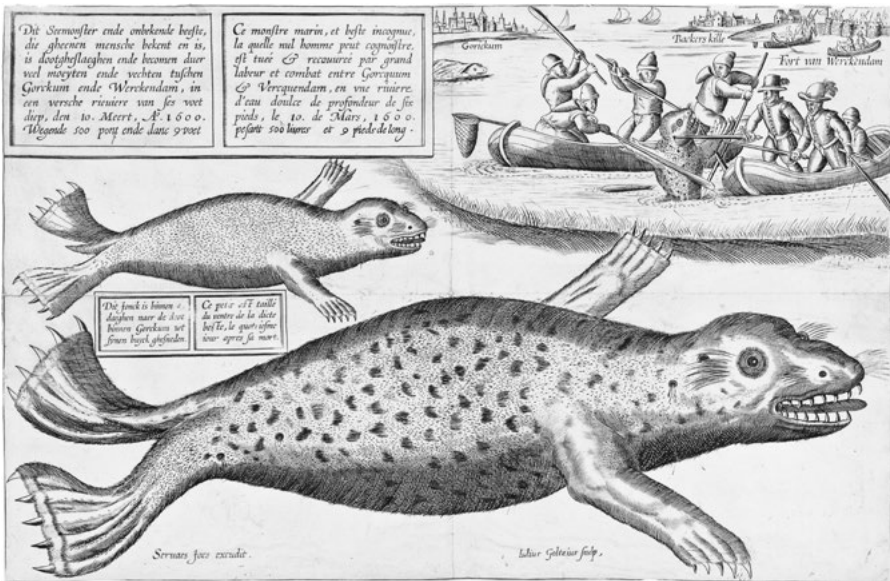


Figure 36. Engraving of the killing of a hooded seal in the Meuse/Merwede, by Julius Goltzius, 1600 (HVG, Collectie Atlas van Gijn, VG864: Julius Goltzius, Een zeehond in de Merwede, 1600). Reproduced with permission of the Huis van Ghijn.

accounts do not identify the species, but since it was put on display, it is reasonable to suggest that it was considered rare for some reason. It might have been a lynx, given that this is an animal that is native to the area, but very rarely seen.¹⁸⁷ In 1600, on the other hand, soldiers and fishermen killed a “sea monster” in the Meuse estuary near the fort (*schans*) of Werkendam, which turned out to be a pregnant hooded seal. This species is significantly larger than a harbour seal, and normally lives around the North Pole.¹⁸⁸ A French dragoon named Marquant, a native of Commercy, stayed for some time in Malmö during the 1792 invasion of the Southern Netherlands, and recorded a description of a black grouse in his notebook, because he had never seen such an animal before. This bird requires a very specific habitat and may have disappeared from most of the Meuse Region by the eighteenth century (see also chap. 3). Today, the Hohes Venn is one of its last refuges in Western Europe.¹⁸⁹

Armies therefore contributed in several ways to the preservation and spread of zoological and botanical knowledge. The accounts of the Count of Blois from 1362 mention that his farrier went to Dordrecht to buy horse medicine (theriac, laurel oil, dialtea, turpentine, dragon’s blood, olive oil, *sagimen vitri*) for his forthcoming military expedition to Guelders. He also took care to compile a book on this matter (*boec van medicinen van*

¹⁸⁷ Kraus, *Die Aachener Stadtrechnungen*, 426.

¹⁸⁸ ’t Hart, “Zeehondenjacht,” 100.

¹⁸⁹ Vallée and Pariset, eds., *Carnet*, 220–21.

paerden). This might have been a copy of another work, which the farrier could not bring with him. Farriers continued to have a major role in horse medicine until the founding of veterinary schools in the late eighteenth and early nineteenth centuries.¹⁹⁰ Gédéon Bonivert, a Huguenot from Sedan, served as a lieutenant in the British army in the 1690s, and collected plants, lichens, and fungi in the Low Countries, England, and Ireland. Part of his herbarium has still been preserved.¹⁹¹

One could question the representativity of these examples, given the close connection between medicine and botany, or the fact that these men were relatively well educated. The Dutch militiaman (*schutter*) Jan Teunisse from Amsterdam wrote down how his comrades and he made soup in the Campine/Kempen during the Ten Days' Campaign (1831). He was lucky enough to obtain salt, but those who did not threw some herbs into the cauldron instead. Apparently, it made their soup look like mud and blackened their lips and tongue.¹⁹² The aim here, however, is not to prove that the average soldier had extensive natural knowledge, especially if he came from an urban background, but that armies as organizations played a significant role in the spread of biological knowledge. Basic forms of natural knowledge were almost a prerequisite for military life. As Erik A. Lund has argued, a general had to be able to estimate the amount of grassland needed to produce forage for his men's horses, while the common trooper had to actually gather grass and herbs. The same applies to cutting wood, hunting, fishing, and digging or destroying dams, dikes, or trenches.¹⁹³

Highlighting this informal knowledge also helps us to reconsider traditional gender divisions within armies. Regulations for the Dutch army from 1729 specified that soldiers' wives were allowed to shoe military horses. They presumably obtained the practical know-how from having to fend for themselves during campaigns. The garrison orders of Namur include one peculiar order from July 12, 1742, which says that soldiers could search for wild strawberries in nearby forests, but not bring them into town. Apparently, they peeled the fruits, which ruined them. The fact that soldiers themselves are targeted here, and not their families, who are mentioned elsewhere in the garrison orders, is noteworthy.¹⁹⁴

What these examples make clear is that the role of the Dutch and French military in the discovery of the mosasaur genus, as mentioned in the introduction, relate to much wider practices of armies' spreading and conservation of natural history. Basic forms of biological knowledge were indispensable for army members to preserve their own health as well as that of the animals on which they depended. Medical practitioners, such as Dr. Hoffmann, commemorated in the name of the *mosasaurus hoffmanni*, played

190 van Doorninck, ed., *De tocht van Jan van Blois 1362*, 130–31; van Wissekerke, *Van kwade droes tot erger*, 197–223.

191 Dandy, ed., *The Sloane Herbarium*, 37, 93–94; Wijnands, "Plants."

192 Teunisse, *Onderdaan in Oranje's oorlog*, 77–78.

193 Lund, *War for the Every Day*, 9–16, 65–69, 76–77, 88–92.

194 The Hague, NA, Raad van State, inv. no. 2081: July 12, 1742; Dibbetz, *Groot militair woordenboek*, 612.

a key role in this regard, but at the same time many common soldiers and their families also proved to be quite knowledgeable about plant and animal life.

Conclusion

Armies had a major role in bringing about changes in healthcare, but the grand narrative of progress in which armed forces suddenly became aware of disease prevention during the Renaissance can no longer be maintained. This assumption originates in a misunderstanding of medieval armies and a tendentious reading of the available sources, or an altogether lack of primary source material to begin with. Medieval armies suffered from epidemics during sieges and extended campaigns in different environmental contexts, but such circumstances can hardly be considered typical for the kind of warfare, namely mounted raiding, that went on in the Meuse Region most of the time.

Rather than persisting in such a mistaken teleology, this chapter has argued that epidemics might have become more common towards the end of the fifteenth century, as a result from shifts towards larger and more permanent armed forces, which were also more likely to move into different disease environments. From 1250 to 1850 medical theories first formulated in Antiquity, and frameworks developed during the Central Middle Ages, notably the hiring of physicians and surgeons to accompany armies on campaign, continued to define healthcare within armed forces. Informal medical practitioners, such as soldiers, their families, and farriers, also retained an important role in the preservation of both humans' and animals' physical wellbeing. It was not until the nineteenth century that military doctors, equipped with new medical principles, took full control. Even though some elements support an idea of "progress," as it is traditionally understood, the historical reality is far more complex.

CONCLUSION

The role of military men in the discovery of the mosasaur genus, a major contribution to natural history, was clearly not an isolated event, but should be seen as emblematic for the wide-ranging, and often surprising, spectrum of army–ecosystem interactions. Armies' conscious and concerted protection and conservation of ecosystems did indeed precede the rise of environmentalism by at least several centuries, as demonstrated throughout this study, whose chapters represent the ecosystem concept: frontiers, fortifications, disturbances, policing, and army health.

Fortifications in the Meuse Region enhanced the diversity of the landscape by their use of linear elements such as ditches, hedges, stone walls, and underground galleries. The plant and animal diversity in nineteenth-century fortresses was so extensive that it drew the attention of contemporary naturalists. Armed forces also created or conserved wilderness in the form of woodlands, inundations, and heathlands. Some of these served as defensive elements within frontiers, others developed as a consequence of military training practices. Many have now become nature reserves. Simply maintaining the health of the people and animals that constituted an army led to the construction or preservation of gardens.

This protective role has its limits. Armed forces preserved specific landscapes, biotic communities, and species, but in the long run their contribution remained largely restricted to militarized landscapes, landscapes for which military use was a defining element. Armies played a very significant role in the conservation of unique ecosystems within frontiers and fortifications, but outside these contexts they only interfered when normal regulating forces (such as forest or field guards) proved to be insufficient. Soldiers mainly became involved in policing practices when restricting access to ecosystems or natural resources resolved around attempts to control the movements of people and horses perceived as indispensable for them.

Armies were an essential, but not exclusive, factor in the ecological richness of militarized landscapes along the Meuse. These landscapes came about as a result of complex and constantly changing interactions between several protagonists. Aside from geographical and geological features, other social groups, animals, and plants also proved quite capable of exerting an influence, sometimes in direct competition with soldiers. The use of mining galleries and inundation basins was largely determined by local hydrography and soil structure. The spread of garden plants in fortifications cannot be explained by referring solely to gardens managed by army members, but also needs to take the presence of calcareous materials, gardens cultivated by local inhabitants, and the capacity of plants themselves to colonize new spaces into account.

The ecological richness of these landscapes, then, was to some extent unintended. Armed forces protected specific ecosystems, and promoted landscape diversity, because this diversity had military value, not because they had an interest in the natural world in the same way as environmentalist organizations. Military courts and regulations, referring to the military as an organization, did not consider environmental degradation as a particularly important crime, unless it was considered as a form of insubordination.

When armies did interfere in the protection of ecosystems, they often had to act against their own colleagues or adversaries. The importance of natural history in a military context likewise derived from the need to ensure army members' own wellbeing and simple survival on campaign.

At the other end of the spectrum the role of military disturbances proved to be as ambiguous as protective behaviour in the strict sense of the word. Premodern armies could exert destructive forces similar to natural disasters on ecological systems, even with the relatively primitive tools at their disposal, but the short- and long-term effects of such disasters remains open to debate. Permanent degradation was more an exception rather than the rule, testimony to the surprising resilience of the affected humans, animals, and plants. Despite large-scale cutting down of wood, trampling of agricultural fields, floodings, and burned houses, very few settlements were abandoned permanently as the result of warfare.

Disturbances were also not necessarily detrimental to the survival of ecological systems. Some ecosystems can only exist when processes of ecological succession are slowed down or interrupted. Frontiers and fortifications present a very strong case for long-term interactions, but they could only be conserved through short-term disturbances or interventions: simple maintenance and military training exercises. If peasants, citizens, or paid labourers did not remove vegetation from the walls and ditches at regular intervals, the walls would have crumbled and the ditches became land. The grazing of sheep in military fortifications and the keeping of carp in water-filled ditches were likewise very practical measures to ensure basic maintenance.

The emphasis on human intervention is primordial, because all ecosystems within the Meuse Region were man-made to some extent. Unwanted species, such as wolves, but also weeds and thorn bushes, could therefore profit from the lack of repression during warfare and re-establish themselves. This also draws attention to the agency of animals and plants, for the capability of these species to react quickly to such sudden opportunities is remarkable. Even though this spread of wilderness, or uncontrolled nature, was quickly reversed as soon as peace returned, restoring a community and associated ecosystems to a pre-war state could take several decades.

It is in fact unclear to what extent warfare in itself is an adequate factor to explain permanent ecological changes. The best examples of such long-term effects, such as the deforestation of the banks of the Meuse River and the disappearance of vineyards in the northern half of the Meuse Region during the early modern period, cannot be understood by considering armed conflicts on their own. Deforestation processes originated in a pressing need for wood as fuel and timber. Arms and gunpowder production, as well as shipbuilding, had a far more important role in this regard than sieges, which, while very destructive, were relatively rare and short-term events. In the case of vineyards and herring fisheries, warfare seems to have simply accelerated the impact of climate change.

The continuous role of environmental pressures, weather, and climate, but also geographical and geological features, on the behaviour of armies should therefore not be underestimated. It confirms the value of referring to reciprocal interactions between armies and ecological systems. The often-harmful effects of the weather on fortifications and army members were a constant factor throughout the 1250–1850 period, and in

many ways they still are. While engineers did devise increasingly effective measures to control local hydrography, actual supply of water in times of need, as a defensive line or as drinking water, remained problematic. The Meuse itself continued to be a constant source of problems because it was fed by rainwater. Depending on the season, multiple fords could appear or disappear, river traffic could become impossible, and, worst of all, the Meuse could leave its riverbed and flood the very defences built on its banks.

Military forces responded to these challenges by creating their own artificial wilderness. They made or contributed to the construction of canals, and planted or protected woods on heathlands, near frontiers, and in the outworks of fortresses. This demonstrates the difficult distinction between man-made environments on the one hand, symbolized by gardens, and uncontrolled nature, symbolized by wilderness, on the other. Ideas about wilderness also contained a very practical yet cynical element, for the areas perceived as being outside one's own garden, outside one's main defences, were far more likely to become victims of the disruptive activities of armies, which in turn encouraged the spread of actual wilderness or geographical features and species considered to be undesirable.

Because of this importance of ecological pressures substantial differences could be observed within the Meuse Region. The choice of particular forms of defence, such as water versus woodlands or mining galleries, was largely determined by soil characteristics. Marching armies preferred the banks of the Meuse itself or fertile agricultural lands such as Hesbaye, and avoided large stretches of perceived wilderness, in the shape of the seemingly endless wood- or heathlands of the Argonne, Ardennes, and Hohes Venn whenever possible. These areas still experienced a significant military presence, but it assumed different forms. Such stretches of wilderness served as frontiers, refuges, sources of wood, and military training grounds. In this way, armed forces actually contributed to the apparently unchanging geographical characteristics of these areas.

Political or economic factors were essential as well. Many scholars have overemphasized their importance, however, and neglected ecological impacts. Fortifications built alongside the Meuse River did not just defend river crossings, but also served to collect tolls. The Campine/Kempen saw relatively limited military action until it found itself in the middle of war-making parties during the Eighty Years War. The construction of new village forts (*schansen*), often in the most inaccessible part of a settlement, was a direct response to changing political circumstances. The policy of neutrality of the Prince-Bishop of Liège from the late fifteenth century onwards, which entailed a relative absence of standing armies and fortresses adapted to resist artillery, was of major consequence for army-ecosystem interactions.

Standing armies and artillery fortresses refer to two main, well-known changes within the early modern period. They brought about tensions between the military as an organization and more traditional forms of military service, and contributed to the use of former soldiers as government officials tasked with controlling natural resources. The spread of gunpowder weapons simultaneously encouraged further diversity within a limited number of medieval fortifications and brought about the abandonment of most others. The use of larger armies, which also tended to move regularly between different disease environments, increased morbidity and mortality rates, with early modern

soldiers on average being more likely to succumb to an epidemic than their medieval predecessors.

Despite these developments, major continuity could be observed in the Meuse Region between the Central Middle Ages and the nineteenth century. Key aspects of current armed forces, such as the military–civilian divide, gunpowder weapons, passports, engineers, university-educated doctors, industrialized arms production, and military domains, originated in this era, but at the same time older traditions and structures continued to play a significant role. The garden–wilderness contrast dominated the military perception of frontier landscapes, medieval stone fortifications retained their defensive value, wolves profited from warfare to spread to new areas, distinctions between armed forces and the general population were not drawn too rigidly, and soldiers still had some control over the preservation of their own health.

The years 1250 to 1850 can therefore be seen as an intermediary period in the history of the Meuse Region, during which military attempts to control ecosystems became more intensive, without causing a break with older management practices. Most of the tools army members employed to maintain and improve their own place in ecological systems (axes, spades, shovels, and torches, but also man and animal labour, manure, and herbal remedies) had been around for thousands of years. Human interventions are not necessarily detrimental. They can actually increase biodiversity by creating more variation within landscapes. Armies contributed to this diversity because their needs often opposed those of other social groups. They protected or damaged specific biotic communities to preserve their own health or gain a strategic advantage. Historical armed forces had close and extensive contacts with the other components of ecosystems. Military commanders valued horses and waterways because movement would have become almost impossible without them, while their subordinates had to gather food and forage on the spot, and needed wood for the building of fortifications, the making of weapons, and shielding themselves from the cold.

In modern armed forces, by contrast, soldiers have to devote much less attention to such matters, for military engineers and doctors ensure that environmental constraints on military operations (such as difficult terrain or disease) are reduced as much as possible. Military organizations are not unique in this regard, since humans' general impact on ecological systems has become so intensive and all-encompassing during the last century and a half that many other species are driven to extinction. The nineteenth century can be considered as a main turning point because several key changes occurred in a relatively short time-frame: military forces established their own domains, which civilians were no longer allowed to enter; they adopted on a massive scale new gunpowder weapons (the machine gun, breech-loading rifles, and artillery), fortifications (concrete and barbed wire), means of transport (railways and steamships), and communication (the telegraph and radio), and university-educated doctors introduced innovative medical theories, all of which became especially important in increasingly global and industrialized conflicts.

Any chronological limit is to some extent artificial. The successful German invasion of France in 1940, for instance, was made possible by French generals' misguided perception of the Ardennes as an impassable wilderness, and even though this campaign will

forever be associated with tanks and other mechanized vehicles, the *Wehrmacht* still depended on the labour of tens of thousands of horses. The use of plants in fortifications did not disappear with the introduction of concrete and barbed wire, but remained important in the context of camouflage. Interactions between armies and ecosystems remained as complex as in the Middle Ages. In fact, current debates about the ecological impact of military forces demonstrate that even today these impacts are quite ambiguous and cannot be reduced to environmental destruction or conservationism.

In this way, the military–ecological interactions examined here shed new light on military history in general. Rather than focusing on technology and the beginning of modernity, it demonstrates the continuous importance of frameworks established during the Middle Ages and draws attention to the ecological aspects of state formation. The emphasis on ecosystems rather than political actors contributes to a more global military history in which technology and military doctrines are just two elements among many in the complex interactions between armies and ecological systems. Instead of highlighting the impact of gunpowder and drill, it is worth explaining to what extent European armies could establish themselves on other continents because they managed to adapt to and influence local ecosystems, something that they would not have been able to do without native support and indigenous knowledge.

This emphasis on placing discussions about the ecological impacts of military forces on a sound historical footing is not to ignore the very real changes that have come about in recent decades through the efforts of environmentalist organizations. The spread of chemical and atomic weapons has added a whole new level to problems regarding the “environmental footprint” of the military. Self-congratulatory statements that today’s military forces are doing something unprecedented or are more environmentally conscious than their predecessors are not only simplistic but also counterproductive because they imply that further efforts are unnecessary or at least not urgent. Armies’ destructive capabilities have increased significantly in the last century and a half. It is only logical that conservationist efforts have to be stepped up in parallel. Merely continuing practices that are centuries old and calling them “progressive” and “modern” will not do.

The Meuse Region in the period 1250–1850 provides an excellent case study that challenges traditional interpretations of the relationship of armed forces with their surrounding world partly because of its strategic importance, but also because it is relatively small when seen in a global, or even European context. What the debate really needs therefore is more research regarding historical army–ecosystem interactions, preferably in a long-term and transnational perspective. This will reveal whether the army–ecosystem interactions that can be observed in the basin of the Meuse River are unique or resemble those in other regions. Armies around the world have influenced ecosystems and were influenced by them from the very beginning of human warfare, firm evidence of which dates back at least to the Neolithic period. Despite the praiseworthy efforts of peace organizations it is unlikely that the near future will see the end of warfare. A better understanding of how armies and ecosystems interacted in the past will be indispensable for dealing with the ecological consequences of today’s and future military actions. In this way, we might be able to bring about a real green turn in the present world as well as military history.