



*Cheiron: The International Journal of
Equine and Equestrian History*
Vol. 3, Issue 1/2023
© The Authors 2023
Available online at
<http://trivent-publishing.eu/>

‘Pain et vin.’ Equine Rations of Bread and Wine at Persepolis in their Broader Historical Context

D. T. Potts

Abstract

In the early fifth century BC rations of bread and wine were issued to small numbers of horses at Persepolis, the Achaemenid Persian capital located in what is today the southwest Iranian province of Fars. Although considered puzzling by many students of ancient Persian history, ample evidence exists in the historical and equine veterinary literature of medieval through early twentieth century date attesting to the widespread practice of giving bread and wine to horses for both nutritional and therapeutic reasons. This evidence is reviewed in order to contextualize the Persepolis evidence within the broader framework of equine management across space and time.

Keywords

Horsebread; wine; rations; equine medicine; veterinary history; Persian Empire; Achaemenids.

DOI: 10.22618/TP.Cheiron.20233.1.106002

CHEIRON is published by Trivent Publishing



This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC-BY-NC-ND 4.0) license, which permits others to copy or share the article, provided original work is properly cited and that this is not done for commercial purposes. Users may not remix, transform, or build upon the material and may not distribute the modified material (<http://creativecommons.org/licenses/by-nc/4.0/>)

‘Pain et vin.’ Equine Rations of Bread and Wine at Persepolis in their Broader Historical Context

D. T. Potts*

Abstract

In the early fifth century BC rations of bread and wine were issued to small numbers of horses at Persepolis, the Achaemenid Persian capital located in what is today the southwest Iranian province of Fars. Although considered puzzling by many students of ancient Persian history, ample evidence exists in the historical and equine veterinary literature of medieval through early twentieth century date attesting to the widespread practice of giving bread and wine to horses for both nutritional and therapeutic reasons. This evidence is reviewed in order to contextualize the Persepolis evidence within the broader framework of equine management across space and time.

Keywords

Horsebread; wine; rations; equine medicine; veterinary history; Persian Empire; Achaemenids

I. Introduction

In March, 1933, during excavations on behalf of the Oriental Institute (Chicago) at the Achaemenid Persian capital of Persepolis, Ernst Herzfeld discovered an archive of c. 20,000-25,000 clay tablets, the majority of which were written in Elamite, an ancient, non-Semitic and non-Indo-European language belonging to no known language family; and Aramaic, a Semitic language that was spoken and written in many parts of the ancient Near East.¹ These texts are administrative records, whether of individual transactions, e.g. the receipt of a commodity or the dispatch of a message from an official to a subordinate, or multiple transactions executed over a

* Institute for the Study of the Ancient World, New York University, United States, daniel.potts@nyu.edu.

¹ The difficulty of determining the number of texts actually found is caused by the difficulty of arriving at an absolute number when both fragmentary and complete tablets are involved. The topic has been discussed extensively. See e.g. Charles E. Jones and Matthew W. Stolper, “How many Persepolis Fortification Tablets are there?,” in *The Oxford Handbook of Ancient Iran*, ed. D.T. Potts (Paris: Persika 12, 2008), 42; Mark B. Garrison, *The Ritual Landscape at Persepolis: Glyptic Imagery from the Persepolis Fortification and Treasury Archives* (Chicago: Studies in Ancient Oriental Civilization 72, 2017), 28-30; Wouter F.M. Henkelman, “Persia,” in *A Companion to the Achaemenid Persian Empire*, vol. 2, ed. B. Jacobs and R. Rollinger (Malden: John Wiley & Sons, 2021), 881-884.

specific period of time. They date to the years 509-493 BC, during the reign of Darius I, when Persepolis and the first monumental buildings on its impressive terrace (455 x 300 m.), later burned to the ground by Alexander the Great, were being constructed. Far from encapsulating the economy and management of the entire Persian empire, however, the Persepolis Fortification Archive (hereafter PFA) tablets originated in “the branch of regional administration that organized and controlled the intake, storage, and notably the redistribution of locally produced food commodities within the Persepolis economy.”² Most of the transactions recorded in the PFA were disbursements of wages, offerings, fodder and rations of various kinds. A handful of them concern rations of bread and wine for horses and are discussed here in light of data on bread and wine given to equids in Europe and the Near East from the medieval era to the early twentieth century.³

II. Bread rations for equids at Persepolis

Two tablets in particular from the PFA stand out in this context. According to PFAT 0025,⁴ written in Aramaic, four donkeys received 4 [units of?] bread in the 22nd year of Darius I's reign (500/499 BC).⁵ PF 1769, a text written in Elamite from the year Darius 28 (494/3 BC),⁶ records an allocation of 3 BAR⁷ of barley loaves to one Ziššuka for 90 horses.⁸

These texts have attracted little attention. Richard T. Hallock, the original editor of PF 1769, made no comment on the allocation of bread rations to horses. Christopher Tuplin noted only that the equine rations at Persepolis “plainly do not constitute an entire diet and so admit of little useful further speculation.”⁹ Beyond that, he merely observed that the “relative rarity of equine travel-rations is doubtless due to the relevant horses having got much of their sustenance from grazing.”¹⁰ Marcel Gabrielli was the first scholar to pay any attention to these sources. Noting that PF 1769 was unique, he suggested that it referred to bread baked for human

² Wouter F.M. Henkelman, “Administrative realities: The Persepolis Archives and the Archaeology of the Achaemenid Heartland,” in *The Oxford Handbook of Ancient Iran*, ed. D.T. Potts (New York: Oxford University Press, 2013), 530.

³ My sincere thanks to several colleagues who kindly read an earlier draft of this study and offered valuable comments, particularly Rhyne King (NYU), Wouter Henkelman (EPHE, Paris) and Miriam Bibby (Glasgow). Thanks also to the comments of an anonymous reviewer.

⁴ PFAT denotes Persepolis Fortification Aramaic Text, in contrast to PF, which is used for the Elamite and other texts from the PFA.

⁵ Annalisa Azzoni and Elspeth Dusinberre, “Persepolis Fortification Aramaic Tablet Seal 0002 and the Keeping of Horses,” in *Extraction & Control: Studies in honor of Matthew W. Stolper*, ed. M. Kozuh et al. (Chicago: Studies in Ancient Oriental Civilization 68, 2014), Table 1.1. This may be an error, however. Wouter Henkelman pers. Comm.

⁶ For the date conversion see Richard A. Parker and Waldo H. Dubberstein, *Babylonian Chronology, 626 B.C.–A.D. 75* (Providence: Brown University Press, 1956), 31. The year began on 16 April 494 BC.

⁷ 1 BAR = 10 QA; 1 QA ≈ 1 quart. See Richard T. Hallock, *Persepolis Fortification Tablets* (Chicago: Oriental Institute Publication 92, 1969), 72.

⁸ Hallock, *Persepolis Fortification Tablets*, 482.

⁹ Christopher Tuplin, “All the King's horse: In search of Achaemenid Persian cavalry,” in *New Perspectives on Ancient Warfare*, ed. G.G. Fagan and M. Trundle (Leiden/Boston: Brill, 2010), 130.

¹⁰ Tuplin, “All the King's horse,” 131, n. 124.

consumption which was fed to horses, either because it was surplus or because it was no longer edible. He also cited Edmond Lavalard (1839-1916) who observed that, in wartime, horses were sometimes given biscuit or bread rations from storage magazines, that was intended for soldiers, provided it had not become moldy.¹¹ Gabrielli did not, however, cite Lavalard's earlier work on horsebread baked both for horses on military campaigns and those used, e.g. to pull stagecoaches through the Alps, or his chemical analyses of different sorts of horsebread. In any case, the large body of literature on horsebread makes clear that, for nutritional and physiological reasons, bread baked for horses is very different from bread baked for human consumption, as clearly demonstrated in the works cited below.

III. Horsebread in the Medieval and Early Modern periods

Horsebread is well-attested in the historical literature on medieval through early twentieth century Britain and continental Europe and has been the subject of renewed interest in recent years.¹² We begin with evidence from the fourteenth and fifteenth centuries. When John Wyllyot and John Hothom rode from Oxford to Ponteland, just north of Newcastle, in 1337 or 1338, and again in 1340, their itemized expenses included horsebread, as well as hay and oats, on nearly every day of the seven or eight day journey.¹³ Other travellers, like Nicholas Harewode and the Aragonese ambassadors who travelled between Southampton, Windsor, Winchester, London and Canterbury, between late July and mid-September, 1415, incurred similar expenses for horsebread.¹⁴ As Shaw noted, "Horsebread, a baked loaf consisting most typically of 'clene beans,' might even have been a distinctively English food at the time. Origins aside, by the fourteenth century part of the English baking industry worked to facilitate equine travel networks. By the late fourteenth century at least, government legislation was controlling horsebread: striking proof of the role it had attained, its convenience, and its advantageousness."¹⁵ This is clearly demonstrated by statute 13 of Richard II, from 1389, which states "that no Hosteller make Horse-bread in his hostry or without, but Bakers shall make it; and the Assize thereof shall be kept, and the weight be reasonable after the price of the Corn in the

¹¹ Edmond Lavalard, *L'Alimentation du Cheval* (Paris: Librairie Agricole de la Maison Rustique, 1912). Marcel Gabrielli, *Le Cheval dans l'Empire achéménide / Horse in the Achaemenid Empire* (Istanbul: Studia ad Orientem Antiquum Pertinentia 1, 2006), 43 wrote, "Il est vraisemblable que l'on a ici la témoignage d'une utilisation de surplus ou, plutôt, d'un produit devenu impropre à la consommation humaine."

¹² See e.g. William Rubel, "English Horse-bread, 1590-1800," *Gastronomica* 6/3 (2006): 40-51; Katrin Boniface, "Bread for My Horses," in *The Horse in Premodern European Culture*, ed. A. Ropa and T. Dawson (Berlin/Boston: De Gruyter, 2019), 161-173.

¹³ Trevor H. Aston, "The External Administration and Resources of Merton College to circa 1348," in *The History of the University of Oxford*, vol. 1, ed. J.I. Catto (Oxford: Clarendon Press, 1984), Maps 7a-7b.

¹⁴ Frederick J. Furnivall and Richard E.G. Kirk, *Analogues of Chaucer's Canterbury Pilgrimage (April 1386) and His Putting-up Joust-Scaffolds, etc. in West-Smithfield (May 1390) being the Expenses of the Aragonese Ambassadors for 58 Days in England, 21 July to 16 Sept. 1415, including their 4-days' Journey from London to Canterbury and back, 31 July—3 Aug. 1415...* (London: Kegan Paul, Trench, Trübner & Co., Ltd, 1903), 2-18.

¹⁵ David G. Shaw, "Horses and Actor-Networks: Manufacturing Travel in Later Medieval England," in *The Historical Animal*, ed. S. Nance (Syracuse: Syracuse University Press, 2015), 145.

Market.”¹⁶ A further statute passed in 1402, during the reign of Henry IV, decreed a “penalty of treble value of the bread made” by a hostler.¹⁷ On 15 November, 1482, during the reign of Edward IV, the price of a three-pound loaf of “horsebrede,” based on the price of beans being 4 shillings (for an unspecified weight) at York, was 1 penny. If the price of beans fell below 4 shillings, however, the bakers were to bake four-pound loaves, and sell these likewise for 1 penny, for “as long as it (shall) plees the mair and his bredyr and the counsell of this cite for the tym beyng.”¹⁸ A year later, in response to a petition “praying that certain ordinances for the better regulation of the” Mystery of “Inholders,” presented to Richard III on 31 July, 1483, the following ordinances were approved: “That the Wardens of the Craft have the right of search for horsebread ‘deceivably medled,’ baked, or made, being accompanied by an officer of the Mayor when searching without their Fellowship....That no brown-bread baker, baking horsebread or any other bread, keep any inn or horse to livery, on pain of forfeiting 40s; That no innkeeper suffer any foreign horsebread to be brought into his house or ‘colour’ it by any of his guests.”¹⁹

The enforcement of such ordinances is illustrated by the conviction, in 1533, of John Knyght, allegedly for selling under-weight horsebread. As a result, he was barred from baking until further notice.²⁰ In 1540, however, during the reign of Henry VIII, a modification was introduced whereby hostlers and inkeepers were permitted to make horsebread but, like proper bakers, they were subject to inspection should it not be made “sufficient, lawfull, and of due assise,” and liable to punishments including fines, imprisonment for one month without bail, standing in the pillory and/or being prevented from keeping an inn ever again.²¹ According to the *Booke of Assise*, “three horse loues [loaves] bee solde from the bakers for a peny...And that euery [every] one lofe [loaf], shall weigh the full weight of the peny white lofe, at what price soever the quarter of wheate be solde at.”²² Toulmin Smith noted that, “In Elizabeth’s time the bakers are to “sell and deliver unto innholders and victuallers in horsebread, but three loaves for a penny, and 13 pennyworth for 12d., every one of the same three horse loaves weighing the full weight of a penny white loaf, whether

¹⁶ Joseph S. Fry, *Letters on the Corn-Trade...* (Bristol: Philip Rose, 1816), 32.

¹⁷ John P. Hore, *The History of Newmarket, and The Annals of the Turf*, vol. 1 (London: A.H. Baily and Co., 1886), 120.

¹⁸ Lorraine C. Attreed, *The York House Books, 1461-1490*, vol. 1. (Stroud: Alan Sutton Publishing Ltd for the Richard III and Yorkist History Trust, 1991), 270. My sincere thanks to Miriam Bibby for bringing this reference to my attention. A further ordinance from 22 December 1483, i.e. in the first year of the reign of Richard III (p. 299) confirms the same prices.

¹⁹ Reginald R. Sharpe, *Calendar of Letter-Books preserved among the Archives of the Corporation of the City of London at the Guildhall. Letter-Book L. Temp. Edward IV.— Henry VII* (London: John Edward Francis, 1912), 209. Cf. Shaw, “Horses and Actor-Networks,” 145.

²⁰ “And in horsebrede it was to light in an obolus [halfpenny] the Wight of iii ounces the wiche the Bailly with divers of his brethren brought to Wynchester at the Assisis holden before my lorde Chief Justice and Sir William Shelley knyght at the Feast of mary magdelyn last past,” i.e. 22 July 1533. See Isaac S. Leadam, *Select Cases before the King’s Council in the Star Chamber commonly called the Court of Star Chamber Volume II A.D. 1509-1544* (London: Bernard Quaritch, 1911), 208.

²¹ Robert Powell, *A Treatise of the Antiquity, Authority, Uses and Iurisdiction of the Ancient Courts of Leet...* (London: Richard Badger, 1642), 113-114.

²² Powell, *A Treatise*, unpaginated.

wheat be good, cheap, or dear.”²³ All of these laws were repealed in 1624 by Act 21 of James I, with the proviso that innkeepers should only make bread in villages which had no baker of their own.²⁴ These testimonies to the importance of horsebread in England could be multiplied but it may suffice to simply quote John Powell’s *Book of Assise* from 1595 where we read, “horse bread hath had his continuance for so long a time, and the use thereof so profitable a necessary for the common wealth: that it standeth rightly with the lawe, to have his continuance, and the assise thereof hath been, and so must continue.”²⁵

By the sixteenth century horsebread had found a place in popular culture. This is shown by the fact that someone of short stature was described in a proverb of John Heywood’s from 1562 as being “as high as two horse-loaves.”²⁶ Similarly, in the “Seventh Dialogue” of Ulpian Fulwell’s *Ars adulandi, The Arte of Flatterie*, published in 1579, Diogenes asks Ulpianus why he is so fearful of “fortunes frownes” when he had acted boldly since the time when he was no more than “three horseloaves high.”²⁷ The human consumption of horsebread is also mentioned as a sign of extreme poverty and destitution in a number of English poetic and dramatic works from the fourteenth century onwards.²⁸

Perhaps no work of this period extolled the virtues of horsebread more than Gervase Markham’s *Cavalatrice*, in which horsebread, for which a recipe was included, is mentioned over fifty times.²⁹ According to Markham, “Horse Bread which is made of clean Beans, clean Pease, or clean Fitches, feedeth exceedingly.”³⁰ He specifically recommended it as a means of fattening a lean horse³¹ and in a number of remedies for horses with diverse ailments. Horsebread also figured prominently in Markham’s earlier work on the complete jockey which included a recipe for bread to be given to racehorses that called for three pecks of horse beans (*Vicia faba*) ground up with one peck [8 dry quarts] “of the best Wheat you can get,” baked “exceeding well in an

²³ Joshua Toulmin Smith, *English Guilds. The Original Ordinances of more than one hundred Early English Guilds...* (London: N. Trübner & Co., 1870), 366.

²⁴ Hore, *The History of Newmarket*, 121.

²⁵ Powell, *A Treatise*, unpaginated.

²⁶ John S. Farmer, *The Proverbs, Epigrams, and Miscellanies of John Heywood...* (London: Early English Drama Society, 1906), 24, Proverbs Part 1, Ch. 10, “As high as two horse-loaves her person is.”

²⁷ Ulpian Fulwell, *The First Parte, of The Eyghth liberall Science: Entitled, Ars adulandi, The Arte of Flatterie...* (London: Richard Jones, 1579), unpaginated, “Hast thou such feare of fortunes frownes or of her whirling wheelles/ Who since thou were three horseloaves high hast tumbled at her heeles.” Cf. Vincent S. Lean, *Collectanea: Proverbs (English & Foreign), Folk Lore, and Superstitions, also Compilations towards Dictionaries of Proverbial Phrases and Words, old and disused*, vol. 2/2 (Bristol: J.W. Arrowsmith, 1903), 841.

²⁸ Rubel, “English Horse-bread,” 42.

²⁹ I have used the second edition. For the recipe, in *The Thirde Booke*, Chap.7, “Of Hunting bread, both ordinarie (as for trayning of Horses) and extraordinary for matches,” see Gervase Markham, *Cavalatrice, or The Arte and knowledge belonging to the Horse-ryder: how horses are to be handled, ridden, or made perfect, either for service or pleasure* (London: Edw. Allde for Edward White, 1616), 35-38. On the significance of Markham’s discussion of horsebread see e.g. Rubel, “English Horse-bread” and Boniface, “Bread for My Horses.”

³⁰ Gervase Markham, *Markham’s Master-Piece Revived Containing all Knowledge belonging to the Smith, Farrier, or Horse-Leach, touching the Curing All Diseases in Horses* (London: John Wright., 1681). 138.

³¹ Markham, *Markham’s Master-Piece*, 77-78.

Oven,” and fed to the horse after the bread had sat for three days. If, by any chance, the bread became moist and was liable to stick in the horse’s mouth, making it difficult to swallow, it was to be cut into thin slices, dried in the sun, in a stove or by a fire, and crumbled into a portion of oats.³²

Horsebread continued to be popular in the eighteenth century. In 1725 Bradley published the *Dictionnaire oeconomique: or, The Family Dictionary*. Ostensibly a translation of a work first published in 1709 by Noël Chomel,³³ it in fact contained a good deal of material written “for an English audience,”³⁴ including a long entry entitled “Bread for horses,” noting that “horses are sometimes fed with bread, to hearten and strengthen them.” For either purpose, two recipes were recommended. The first called for finely ground wheatmeal, oatmeal and beans; various spices; eggwhites, “and as much strong ale as will knead it up.” The loaves were to be made like normal bread, “well baked, but not burnt,” and fed, “not too new,” on “five or six mornings together, without any provender.” The second recipe was similar, although ryemeal was substituted for oatmeal and white wine for ale. This was to be fed, after the crust had been removed, when two or three days old. Three additional recipes specific to racehorses, none of which called for ale or wine, were also noted.³⁵

When Monseigneur François Xavier de Belsunce de Castelmoron (1671-1755), the long-serving bishop of Marseille (1709-1755), travelled to Paris in 1730 one of his itemized expenses, on the stage from Palice to Varenne, was for “pain et vin pour les chevaux,” i.e. bread and wine for the horses.³⁶ Writing on the “Aliment des chevaux” in 1742, Trichtern noted that horses in England were fed coarsely baked bread.³⁷ In 1775, despite centuries of experience in horsebread baking dating back at least to the fourteenth century, Johann Georg Krünitz attributed the “invention” of horsebread as a substitute for oats to a Swede identified only as Herr Assessor C.G. B., citing a paper published in the proceedings of the Royal Swedish Academy of Science in 1753.³⁸ The rationale behind C.G. B.’s “invention” was purely economical and the aim was to cut costs by not relying on oats. Based on oat prices at the time,

³² Gervase Markham, *The Complete Jockey or the most exact Rules and Methods to be observed for the training up of Race-Horses* (London [no publisher named], 1680), 12-13.

³³ Noël Chomel, *Dictionnaire oeconomique, contenant divers Moyens d’augmenter et conserver son Bien, et même sa Santé*, 2 vols. (Lyon: Pierre Thened, 1709).

³⁴ Karen Harvey, *The Little Republic: Masculinity and Domestic Authority in Eighteenth-Century Britain* (Oxford: Oxford University Press, 2012), 37.

³⁵ Richard Bradley, *Dictionnaire oeconomique: or, The Family Dictionary*, vol. 1 (London: D. Midwinter, 1725), unpaginated. Reprinted almost verbatim in Anonymous, *The Sportsman’s Dictionary; or, the Gentleman’s Companion: for Town and Country* (London: Fielding and Walker, 1778), unpaginated.

³⁶ Marius Chaillan, “Le Voyage de Marseille à Paris de Monseigneur de Belsunce (1730),” *Bulletin de Géographie historique et descriptive* 1906 (1906): 374.

³⁷ Valentin Trichter, *Curioses Reit-Jagd-Fecht-Tanz- oder Ritter Exercitien-Lexicon* (Leipzig: Johann Friedrich Gleditsch, 1742), 35, “Die Verpflegung der Pferde, wird schier bey ieder Nation verändert....In Engelland grob gebacken Brot.”

³⁸ Johann G. Krünitz, *Oeconomische Encyclopädie, oder allgemeines System der Land- Haus- und Staats-Wirtschaft*, vol. 1 (Berlin: Joachim Pauli, 1775), 755. There the page numbers for the Swedish study were given incorrectly as 292-295 and the volume as 15, presumably based on the re-publication of the text in a German newspaper in 1757. They should be 287-291, volume 14. See C.G. B., “Forsök at med besparing föda Hästar med särskildt dertil bakadt bröd, i stället för Hafra.” *Kongelige Svenska Vetenskaps Academiens Handlingar för År 1753* 14 (1753): 287-291. The identity of the writer, C.G. B., is unfortunately unknown.

both G.C. B. and Krünitz published calculations which proved that significant savings could be achieved over the course of a year by feeding horses on horsebread, rather than oats. Krünitz also noted that the hardness of horsebread helped keep a horse's teeth and gums healthy. Moreover, on long journeys where no inns or stables were to be found, such as in Spain and Russia, or on long marches in times of war, horsebread proved to be a wonderful alternative to traditional fodder.³⁹ The wartime use of horsebread was demonstrated during the American Revolution (1775-1784). The Polish Colonel Michael Kovats, of the Pulaski Cavalry Legion, who had previously commanded irregular cavalry in northern Europe, described how he and his men had made horsebread on campaign there, and noted that General Casimir Pulaski (1745-1779) had a warhorse that preferred horsebread to any other kind of fodder.⁴⁰

By the early nineteenth century horsebread was becoming less common in Britain.⁴¹ Yet in France research continued unabated. Articles by Nicolas Jean Félix Rollet⁴² and Marc-Antoine Puvis⁴³ report on a formidable number of nutritional experiments that had taken place, with varying results, often by postmasters concerned with the conditioning and nutrition of the horses used to draw postal wagons. At the same time, Stewart acknowledged that horsebread was still "in common use over different parts of Germany," and, he reflected, "I cannot learn any particulars as to the mode of making, nor of the quantity given, nor of the horses' condition. In France, many attempts have been made to produce a bread that would wholly or partially supersede oats, which seem to be comparatively precious on the Continent. Buckwheat, rye, barley, wheat, and potatoes have been tried in varying

³⁹ Krünitz, *Oeconomische Encyclopädie*, 758.

⁴⁰ Richard Peters, "On coarse Flour, brown Bread, and the Force of Habit, as it relates to Esculents," *Memoirs of the Philadelphia Society for Promoting Agriculture* 1 (1808): 235-236, "Colonel Kowatch, who, in our service, commanded the infantry of *Pulaski's* legion, had been an old partizan officer, in the north of *Europe*, and had commanded a large corps of irregular horse, — either *Cossacks*, *Croats*, or *Pandours*. He fled hither, after the troubles of *Poland*. He told me, that they often *baked* the chopped or ground grain, for their horses; having previously formed it into portable cakes. It was fermented, or raised, in an expeditious and simple way, by a kind of *leven*. With this, they sometimes used *oil cakes*. He said *baked* provender went twice as far as raw meal, or grain. The saccharine quality was, no doubt, produced by this process; and its alimentary properties increased. General *Pulaski* had a favorite charger, to whom he often gave *bread*: which the animal seemed to enjoy far beyond any other food. In *Holland* it is a common practice to give horses rye *bread*, or baked provender.— The late sheriff [Jonathan] *Penrose*, who had a fine team of working horses, was in the habit of buying condemned *ship bread*, as the most nutritious, and cheapest horse feed. He said that others knew, and profited by its advantages."

⁴¹ John Stewart, *Stable Economy: A Treatise on the Management of Horses, in relation to Stabling, Grooming, Feeding, Watering, and Working*, 3rd ed. (Edinburgh: William Blackwood and Sons and London: Thomas Cadell, 1840), 210 wrote, "It is not many years since a bread, composed of wheat, oats, barley, and beans, ground and mixed in varying proportions, was used in the racing-stables. The bread was well baked, and given when sufficiently old to crumble down and mingle with the corn. Eggs and some spices were sometimes introduced in making it. Nothing of the kind, so far as I know, is now used in this country."

⁴² Nicolas Jean Félix Rollet, "Mémoire sur un nouveau Mode d'Alimentation des Chevaux," *Mémoires de la Société Royale d'Agriculture et des Arts du Département de Seine-et-Oise* 36 (1836): 77-96.

⁴³ Marc-Antoine Puvis, *Du Remplacement de l'Avoine par le Seigle cuit dans l'Alimentation des Chevaux* (Paris: Chez M^{me} Huzard, 1839); Edmond Lavalard, *Le Cheval dans ses Rapports avec l'Économie rurale et les Industries de Transport*, vol. 1 (Paris: Librairie de Firmin-Didot et C^{ie}, 1888) repeats much of the content of the papers published 50 years earlier by Rollet and Puvis.

proportion, and, according to several accounts, with success. But it does not appear very distinctly why these articles should be converted into bread, which is a costly process, rather than given raw or boiled. It is indeed alleged that some of the constituent principles are not digestible until they have undergone fermentation; and it may be so, but no proof is shown that I have seen.”⁴⁴

In 1840 Dominique Legros and Louis Pallandre published a pamphlet on horsebread,⁴⁵ the aim of which was to argue the merits of substituting bread for oats. In it the authors maintained that, in those regions where the best horses were bred, such as Arabia and Spain, oats were not part of the equine diet, whereas barley was.⁴⁶ Horsebread offered the same nutritional value as oats, they contended. Noting that, given the history of the horse as a species, a diet of hay, straw and oats could never be considered “natural,” they saw no reason why horsebread should be considered any more unnatural than those staples. Yet their main argument was economic. In Lyon the authors knew horse owners with stables of 50 horses, who stood to save 4-5 francs/day by feeding them horsebread instead of oats. Their calculations were based on a price of 1 franc 50 centimes for six pounds of horsebread vs 2 francs 25 centimes for a bushel of oats.⁴⁷ Whatever the price of oats and flour, they suggested, horsebread would always be more economical as horse fodder than oats. In the same year, Achille comte de Montendre (1782-1847), a noted French racehorse breeder of the day,⁴⁸ began an article on horsebread by noting that “everyone” knew that a type of rye bread, containing fewer nutrients than wheat but more roughage (“parties lestantes”), and hence providing a good substitute for herbaceous fodder and oats, had become a major part of equine diet in Germany where it was eaten with “avidity.” The same experiment was tried on many occasions in France, he noted, but always using bread made expressly for the purpose, of an inferior quality and with the goal of substituting bread for the entirety of a horse’s fodder intake in order to cut costs. These efforts, however, had failed and it had always been necessary to revert to hay, oats and straw. As a result, renewed attempts, using higher quality bread, were made but, instead of using it as the animal’s sole foodstuff, horsebread was only given as part of a horse’s normal diet when other forms of food became difficult to acquire or were too expensive. With these changes in place, the experiment was a resounding success, equally suitable for horses employed in hard work, e.g. as draught animals,

⁴⁴ Stewart, *Stable Economy*, 210-211.

⁴⁵ Dominique Legros and Louis Pallandre, *Mémoire sur l’Horse Braed [sic], ou Pain de Cheval, destiné à remplacer l’Avoine donnée habituellement aux Chevaux* (Lyon: Imprimerie Typographique et Lithographique de Louis Perrin, 1840).

⁴⁶ Cf. Rollet, “Mémoire sur un nouveau Mode d’Alimentation des Chevaux,” 78-79, “En Espagne, les chevaux n’ont d’autre nourriture que de la paille hachée et un peu d’orge: se portent-ils moins bien que les nôtres?”

⁴⁷ Not everyone was persuaded. Gabriel René Mennessier de La Lance, *Essai de Bibliographie hippique donnant la Description détaillée des Ouvrages publiés ou traduits en Latin et en Français sur le Cheval et la Cavalerie*, vol. 2 (Paris: Lucien Dorbon, 1917), 86 wrote, “Les auteurs ne donnent pas la composition de leur pain de cheval et disent seulement que “six livres d’Horse braed estimées 1 fr. 50 remplacent avantageusement un boisseau d’avenne estimé 2 fr. 25.”

⁴⁸ He was also the author of an authoritative, two volume work on the stud farms of Europe. See Achille de Montendre, *Des Institutions hippiques et de l’Élève du Cheval dans les principaux États de l’Europe*, 2 vols. (Paris: Bureau du Journal des Haras, 1839-1840).

or for personal use. Experience showed that 3 kgs. of horsebread provided the nutritional value of 5 kgs. of hay and hence was highly economical given prices at the time. A number of bakeries in Paris had even begun baking bread expressly for horses.⁴⁹

Nor was horsebread entirely a thing of the past in Britain. In 1865 Robert Hineson (1821-1881), of Liverpool, received a patent for the invention of "Improvements in Food for Horses, and in the Preparation of the Same." This involved grinding wheat or another grain into flour or meal; adding 1 lb of water to every 7 lbs of meal; kneading it into dough, rolling it out and forming "thin sheets or cakes of any desired outline," which were then baked "to a dryness similar to or the same as ship biscuit." Having been formed with indentations the biscuit-like bread could easily be broken "by machinery or otherwise to the size of beans, more or less...The food reduced to the size named can be mixed with oats, chopped hay, beans, or other cereals."⁵⁰ Meanwhile, the Franco-Prussian War (1870-1871) exposed the difficulty of maintaining fodder supply for cavalry horses and led to the creation of a Special Commission and a laboratory run by Gustav Warnecke for the purpose of experimenting with horsebread and biscuits (*Pferdekuchen, Pferdebiscuit*) of various sorts.⁵¹ A ten month-long trial was conducted in which, during the course of ten day periods, 50 horses were fed exclusively with some form of biscuit, while another 50 were given hay and oats. Those fed on biscuit were "full of vigour and spirit," and exhibited 75% less sickness than those fed on hay and oats. This resulted in the establishment of three factories in Germany for the production of horse biscuit, a development that was imitated in Russia and used to great effect during the Russo-Turkish War (1877-1878) when some 20,000,000 horse biscuit rations were consumed. These were 3.5 in. in diameter and .75 in. thick, and were strung through the center on a length of wire or string attached to each cavalryman's saddle.⁵² In Britain advertisements aimed at "hunting men" appeared, proclaiming that six or eight Spratt's Patent Forage Biscuits, would "take the place of a mid-day feed for a horse, and even two or three taken taken with the rider on a long journey will sustain him until he returns at night, and even one taken with the rider on a long day's hunting, and given when opportunity occurs, will frequently cause an otherwise bad feeder to take his food at once on arriving at home."⁵³ In Germany, where research

⁴⁹ Montendre, *Des Institutions hippiques*.

⁵⁰ Anonymous, *English Patents of Inventions, Specifications, A.D. 1865, Nos. 1801-1889* (London: H.M. Stationery Office, 1866), 1-3, patent no. 1826, 'Food for Horses.' Also discussed in Johann Jakob Wörz, *Die Gesundheitspflege des Pferdes, oder die Lehre von der Ernährung, Fütterung, Stallung, Pflege, Wartung und sonstige Behandlung desselben* (Ulm: Druck und Verlag der J. Ebner'schen Buchhandlung, 1874), 52.

⁵¹ George Fleming, "Forage for Military Purposes," *Journal of the Royal United Service Institution* 33 (1889): 478-479.

⁵² Fleming, "Forage for Military Purposes," 480 noted, "During the passage of the Balkans and the subsequent advance into the neighbourhood of Constantinople, all the horses of the cavalry and artillery of the Russian Guard were fed entirely upon the biscuit for twenty-six days, and are reported to have kept in excellent condition all the time, although hard worked and exposed to inclement weather. The only disadvantage found in their use was that the soldiers stole them to eat."

⁵³ Edward Pennell-Elmhirst, *The Hunting Countries of England, Facilities, Character and Requirements. A Guide to Hunting Men*, part 3 (London: The "Field" Office, 1882), unpaginated full page advertisement. As

into the nutritive qualities of horsebread, as opposed to biscuit, continued to be actively pursued in the late nineteenth century, it was shown that 6 lbs of horse ryebread contained as many nutrients as 8 lbs of oats.⁵⁴ Spurred on by the German experience, other countries, including Austria, Italy, and Great Britain, continued with experimentation and trials in the quest to perfect dry, portable, longlasting forms of horsebread and/or biscuit⁵⁵ and with good reason. A 1908 report from Amsterdam noted that the “intrinsic worth” in minerals and nutrients of horsebread was more than twice that of hay and oats.⁵⁶

IV. Bread vs ZÍD.DA

The fact that bread rations appear only once in a Persepolis Fortification horse ration text, and once in a donkey ration text, might suggest that its use as equine fodder was an aberration. What it probably suggests, however, is that state-run bakeries did not regularly produce horsebread. On the other hand, there are four published texts recording allocations of ZÍD.DA^{MEŠ}⁵⁷ which was apportioned to KASKAL^{MEŠ} *tuk-ki-na*, “horses traveling the road,” i.e. those presumably ridden by couriers.⁵⁸ Although ZÍD.DA^{MEŠ} is conventionally translated as “flour,” it is impossible to say how finely or coarsely the cereal used to make it was milled. Assuming it was allocated to horses as a coarse meal, Gabrielli suggested that it may have been used to produce grain mash, stew or some kind of soup for exhausted, sick or convalescing horses.⁵⁹ However, there is no reason to think that such was the case and in this regard it is interesting to note that in 1835 Auguste Guénier, postmaster of Saint-Bris (Department of Yonne), southeast of Paris, began feeding his horses bread which involved stewing 175 l. of rye and 25 l. of barley in a cauldron containing 150 l. of water, and then baking the mixture. The resultant product had a total volume of c. 500 l. which was then apportioned at the rate of 75 l. per set of five post-horses, supplemented by 10 l. of oats per set, or 100 l. of the horsebread alone, without oats, for horses doing fast work. The confection “maintained the horses in good condition.”⁶⁰ The benefits of cooking the grain prior to baking are clear for, as Boniface has recently stressed, “cooking acts as pre-digestion. In addition, horsebreads can absorb more liquid than a regular grain mash, which increases the safety of the calorie-dense meal.”⁶¹ Thus, the allocation of ZÍD.DA^{MEŠ}, as opposed

Lavalard, *Le Cheval*, 108 noted, “La cuisson de ces biscuits en écarte l’humidité, et dans ces conditions ils peuvent être conservés pendant très longtemps.”

⁵⁴ Wörz, *Die Gesundheitspflege des Pferdes*, 52.

⁵⁵ Fleming, “Forage for Military Purposes,” 481-497.

⁵⁶ Anonymous, “Patent Horsebread,” *Monthly Consular and Trade Reports* 338 (November, 1908): 126.

⁵⁷ MEŠ here indicates that the term so marked is a loanword.

⁵⁸ Hallock, *Persepolis Fortification Tablets*, 47; Gabrielli, *Le Cheval*, 49; Daniel T. Potts, “Medes in the desert: Thoughts on the mounted archer near Taymā,” in *Klänge der Archäologie: Festschrift für Ricardo Eichmann*, ed. C. Bührig et al. (Wiesbaden: Harrassowitz, 2021), 339-340.

⁵⁹ Gabrielli, *Le Cheval*, 42.

⁶⁰ James W. Winter, *The Horse, in Health and Disease...* (London: Longman, Brown, Green, and Longmans, 1846), 188.

⁶¹ Boniface, “Bread for My Horses,” 162. Cf. Ann Hyland, *The Horse in the Ancient World* (Stroud: Sutton, 2003), 122-123 on the form of the barley rations at Persepolis: “We do not know if crushed or whole

to readymade horsebread, might imply that the actual work of preparation and baking was the responsibility of the recipient.

Before leaving the subject of horsebread at Persepolis several texts, e.g. PF 0077⁶² and PF 0136, containing the Elamite term *aššana*, should be noted. This word has been understood as a genitive form related to Old Persian *asa*, “horse,” with the meaning “of/related to horses.”⁶³ In PF 0136 *aššana* appears as a qualifier for a type of *abbebe*, a noun variously translated as “bread,” “baked goods,” or “loaves”⁶⁴ issued to an individual named Šullakera who delivered it to a pair of recipients, Parru and Appima, at the city of Susa. Hallock tentatively interpreted *aššana* and three other commodities mentioned alongside it — *hamarram*, *kudakena*, and *šiprim* — as types of bread. If correct, this would suggest we have here yet another reference to horsebread rations at Persepolis.

V. Wine rations for equids at Persepolis

In his *editio princeps* of the Persepolis Fortification texts, Hallock wrote, “Of the twenty-three texts (PF 1757-79, category S 2)⁶⁵ providing special rations for animals, eleven supply small amounts of wine for horses. The purpose may be suggested by some news about a present-day race horse: ‘Sherluck, prepping at Hialeah for the \$100,000 Widener, is the nearest thing to a thoroughbred wine lover. Each morning he gets a blood tonic orally administered, smacks his lips and licks the cup to enjoy every last drop. The tonic has the aroma of fine wine.’ Also the letters PF 1833-34 require wine for horses, while PF 1845 requires wine for camels.”⁶⁶

Since Hallock’s volume appeared there has been little discussion of these rations. In 2003 Ann Hyland wrote, “It could well have been used as a fortifier, and probably diluted, as wines in the ancient world were often cut with water. If so it would be much like the drink of stout given as a pick-me-up to some hunters after a hard

barley was fed, but it is likely that it would have been crushed, or milled in some way, as whole barley is extremely hard and difficult for a horse to masticate efficiently, and a large percentage would have passed through undigested.”

⁶² The text records a delivery of animal hides, two of which are described as *aššana*, i.e. presumably horse hides. See Daniel T. Potts and Wouter F.M. Henkelman, “On animal hides and (pre-)tanning in the Persepolis Fortification archive,” in *Achemenet. Vingt ans après: Études offertes à Pierre Briant à l’occasion des vingt ans du Programme Achemenet*, ed. D. Agut-Labordère et al. (Paris: Persika 21, 2021), 282, n. 6.

⁶³ Walther Hinz and Heidemarie Koch, *Elamisches Wörterbuch*, vol. 1 (Berlin: Archäologische Mitteilungen aus Iran Ergänzungsband 17, 1987), 90, s.v. āš-šá-na.

⁶⁴ Hallock, *Persepolis Fortification Tablets*, 20, 112. PF 0135, 0390 and NN 3049 [unpublished] also mention *aššana* on its own, possibly a kind of shorthand usage “of/for horses,” where the actual noun standing for grain or bread was omitted because it was understood in that context and didn’t need to be stated explicitly. My thanks to Rhyne King for bringing these interesting texts and the term *aššana* to my attention. Wouter Henkelman, however, informs me that these connotations may be unwarranted and he prefers “barley-based food” or more generally “grain-based food” which could include “bread, or horsebread, but porridge, mash, and such things are equally possible.”

⁶⁵ Among the unpublished Persepolis Fortification Archive texts are a further seventeen mentioning wine rations for horses (R. King, pers. comm.).

⁶⁶ Hallock, *Persepolis Fortification Tablets*, 7 and n. 13, quoting “Dick Hackenberg in the *Chicago Sun-Times*, Jan. 21, 1962, p. 65.”

day.”⁶⁷ Later, Thomas Donaghy echoed Hyland’s views.⁶⁸ Only Marcel Gabrielli, however, has dealt with wine allocations to horses at any length. After noting Hallock’s observation, he observed that wine was an ingredient in remedies for colic in ancient Greek and even earlier cuneiform medical texts from Assur, Ras Shamra and Sultantepe.⁶⁹ There is, however, far more to say about the therapeutic use of wine for horses. Even the renowned equine veterinarian Bracy Clark, who was skeptical of the use of wine and other stimulants,⁷⁰ noted that, for stomach pains, a “useful Cordial Drink” could be made of 1 lb. of pimento berry, ground or powdered; 2 lbs. of sifted barley meal; honey or treacle, “to which Spirits, Brandy, Wine, Ale, or Porter can be added, if thought requisite, instead of water.”⁷¹

In fact, the hippiatric literature abounds in equine therapies containing wine as an ingredient. What follows makes no pretence to completeness. Rather, it is merely meant to highlight the extraordinarily broad use of wine in cures for a wide variety of equine ailments since late Antiquity. The principal early sources cited below are the fourth century Roman writer Vegetius; the thirteenth century “knight-farrier” at the court of Frederick II on Sicily, Jordanus Ruffus (d. 1256);⁷² the Italian Dominican bishop Theodoricus Borgognoni or Cerviensis (1205-1298); the fourteenth century equine veterinarian and stable master Abū Bakr Ibn al-Mundhir (d. 1340); and a number of principally French and English equine specialists from the seventeenth through the early nineteenth century. The material is arranged alphabetically, by ailment, rather than chronologically by source. Naturally, the efficacy or otherwise of these treatments is not the issue here, rather, the frequent prescription of wine in all manner of equine therapeutic remedies.

VI. Therapeutic uses of wine for horses in Europe

Colic

The French cavalry officer Antoine Fortuné de Brack (1789-1850) recommended warm wine mixed with honey.⁷³

⁶⁷ Hyland, *The Horse in the Ancient World*, 124.

⁶⁸ Thomas Donaghy, “Feeding the ancient horse,” *Journal of the Veterinary History Society* 16/3 (2012): 310.

⁶⁹ Gabrielli, *Le Cheval*, 40-41, n. 140 with refs.

⁷⁰ Bracy Clark, *A Series of Original Experiments on the Foot of the living Horse, exhibiting the Changes produced by Shoeing, and the Causes of the Apparent Mystery of this Art* (London: Sherwood, Neely, and Jones, 1809), 20, wrote, “Our notions respecting these stimulants are wholly derived from the feelings of our own stomachs, and what is aromatic and spicy to us, we conceive as spicy to them, and this may not be very untrue, though there is less analogy between the stomach of the horse and the human perhaps than almost any two stomachs among animals; the stimulus of Spirits, of Wine, or of Opium, is not in many respects the same to them as to us, nor is oats or barley so exhilarating and stimulant to us as to them, so that our conclusions may not be perfectly correct in this respect.”

⁷¹ Clark, *A Series of Original Experiments*, 21.

⁷² For his life and hippological treatise *De medicina equorum* see Sunny Harrison, *Jordanus Ruffus and the late-medieval hippiatric tradition: Animal-care practitioners and the horse* (Unpubl. PhD diss. The University of Leeds, 2018).

⁷³ Antoine Fortuné de Brack, *Avant-postes de Cavalerie légère. Souvenirs* (Paris: Chez Anselin, 1831), 428, “Si elle est produite par de l’eau froide introduite dans l’estomac, il faut ranimer la transpiration, et on y parvient par le bouchonnement, et les breuvages de vin chaud composés d’une bouteille de vin avec quatre onces de miel par breuvage.”

Cough

Theodoricus Cerviensis prescribed a concoction of “old wine” mixed with herbs.⁷⁴ In his *Kāmil al-Ṣinā' atain al-Baiṭara wal-Zarṭaka*, often called *al-Nāṣiri* in honor of his patron Sulṭān al-Nāṣir b. Ḳalāūn, Abū Bakr Ibn al-Mundhir recommended a mixture of wine, herbs and dried grapes for a cough brought on by cold weather.⁷⁵

Dysentery

Abū Bakr Ibn al-Mundhir recommended pouring wine and natron into a horse's nostrils, as well as a tonic made of natron, water, oil and honey.⁷⁶

Eye, drops

For eye problems Abū Bakr Ibn al-Mundhir recommended myrrh, rosemary and verdigris mixed with wine.⁷⁷ The eighteenth century French veterinarian Joseph Robinet prescribed a mixture of herbs, wine and rosewater.⁷⁸

Farcy

For the inflammation of the lymph glands, Abū Bakr Ibn al-Mundhir recommended an admixture calling for cucumber, natron, honey and wine.⁷⁹ Robinet, on the other

⁷⁴ Martina Schwarzenberger, *Theodoricus Cerviensis: Mulomedicina. Libri I-II, Band 2: Übersetzung und Kommentar* (Hildesheim: Georg Olms Verlag, 2022), 124 (Theod. Cerv. 11.20.1), “Du sollst die Wurzel von echtem Alant sammeln und im Schatten trocknen; danach sollst du sie zu einem Pulver verarbeiten, indem du sie zerreibst, von welchem du am Vortag (der Behandlung) drei größere Löffel einzeln in je einen Sextarius alten Wen hineinschütten sollst, und du sollst es, wenn du es gut verrührt hast, verschließen, damit der Duft des heilenden Krauts nicht entweicht. Den beschriebenen Trank sollst du an drei Tagen, oder an wie vielen (Tagen) du willst, durchs Maul eingeben.”

⁷⁵ Nicolas Perron, *Le Nâierî. La Perfection des deux Arts ou Traité complet d'Hippologie et d'Hippiatrie arabes*, vol. 1 (Paris: Imprimerie et Librairie d'Agriculture et d'Horticulture de M^{me} V^e Bouchard-Huzard, 1852), 108-109, “Pour le traitement de la toux occasionnée par le froid, on emploie la préparation suivante: ail, raisin sec, semence de cresson de fontaine (*ḥabb el-reḥād*, *sisymbrium nasturtium*), noix de sabine (*abboul*, *juniperus sabina*), cumin, menthe ou autre plante analogue, de chacun parties égales. On fait bouillir le tout dans cinq roṭl de vin. Quand vous voulez administrer cette préparation, privez l'animal de toute nourriture à partir du milieu de la nuit jusqu'au matin. Et, de bonne heure, faites-lui avaler, de ce médicament, un demi-roṭl mêlé à trois roṭl de vin. La guérison s'ensuit. Cette médication a la sanction de l'expérience.”

⁷⁶ Perron, *Le Nâierî*, 288, “on fait avaler au cheval du natron mêlé à de l'eau, de l'huile et du miel, pour resserrer l'animal et arrêter le flux. On passe aussi dans les narines du vin et du natron.”

⁷⁷ Perron, *Le Nâierî*, 75-76, “pulvérisez deux onces de myrrhe, deux onces de romarin officinal, et une once de verdet ou vert-de-gris. Versez sur la masse en poudre deux cuillerées de vin. Applique avec persistance en collyre. Le résultat est des plus favorables.”

⁷⁸ Joseph Robinet, *Dictionnaire d'Hippiatrique pratique, ou Traité complet de la Médecine des Chevaux* (Brussels/Nancy: Chez Babin, 1777), 99-100, “Collyre dessicatif & détersif. Prenez aloës & sarcocolle, de chaque deux gros; camphre & safran, de chaque un gros: faites bouillir durant un quart d'heure, dans un vaisseau fermé; ajoutez à la colature douze onces de vin blanc, & autant d'eau de roses. Ce collyre convient dans les cas d'inflammation & de taches aux yeux.”

⁷⁹ Perron, *Le Nâierî*, 24, “On a soin aussi de tenir le ventre libre, au moyen du médicament suivant: *kyâr iblîs* ou concombre du diable (long concombre fortement arqué, à côtes prononcées, un peu creux à l'intérieur, analogue au *cucumis anguinus*); *momordica elaterium*; natron; de chacun parties égales. On écrase le tout, on le mêle dans du vin ou de l'eau miellée, et on en donne à boire, au cheval d'âge complet ou parfait, cinq roṭl et demi; au jeune poulain, un roṭl et deux tiers.”

hand, suggested a sudorific (sweat inducing) drink made with a number of different herbs, including galega (goat's rue) cumin, coriander and anise, mixed with wine.⁸⁰

Fever

Abū Bakr Ibn al-Mundhir recommended a drink consisting of various vegetal ingredients in leek water and wine.⁸¹

Heat exhaustion

Vegetius suggested giving horses exhausted by the heat a drink of wine and oil, as well as washing their mouths out with vinegar and water.⁸² Theodoricus Cerviensis preserved essentially the same instructions.⁸³

Indigestion

The royal equerry Alexandre Garsault (1691-1776) recommended a tonic to be given twice a day over three days, which called for theriac, Saffran of Mars apéritif⁸⁴ and wine.⁸⁵ Robinet suggested a mixture of water, wine and theriac every two hours,⁸⁶ while Brack advocated aloe dissolved in wine.⁸⁷ In the specific case of a horse that had ingested chicken excrement Abū Bakr Ibn al-Mundhir prescribed a combination of dried dates, barley bouillon and red wine, boiled together.⁸⁸

⁸⁰ Robinet, *Dictionnaire d'Hippiatrique*, 178, "on lui fera avaler un breuvage sudorifique, composé de poudre de petit galéga, d'anis, de cumin & de coriandre, à la dose d'une once chacune pour un cheval ordinaire, & d'une once & demi si c'est un fort cheval: on mêle ces poudres dans une bouteille de vin; on laisse jeûner le cheval pendant douze heures avant le breuvage, & on ne lui donne à manger que sept ou huit heures après. On laisse passer deux jours, ensuite on lui donne le même breuvage, ce qui se répétera trois ou quatre fois de suite de la même manière."

⁸¹ Perron, *Le Nâcéri*, 287, "on donne à boire la préparation que voici: gaine de lin; ache ou céleri de montagne; parties égales. On pile. On administre en boisson dans de l'eau de poireau et du vin."

⁸² Anton Barański, "Die Thierzucht im Alterthume," *Oesterreichische Vierteljahresschrift für wissenschaftliche Veterinärkunde* 63 (1885): 60, "wenn in Folge der grossen Hitze die Thiere schwitzen, soll ihnen das Maul mit Essig und Wasser gewaschen werden, im Winter aber mit einem gesalzenen Fisch oder Fleischbrühe. Auch kann man ihnen einen Schluck Wein und Oel durchs Horn hineingiessen."

⁸³ Schwarzenberger, *Theodoricus Cerviensis*, 89 (Theod. Cerv. 1.16.9), "im Sommer ist es angemessen das Maul nach schweißtreibender Tätigkeit mit einem Gemisch aus Essig und Wasser zu spülen; im Winter mit Salzbrühe. Es wird nötig sein, mit einem Horn Wein und Öl in den Schlund zu gießen (im Sommer kalt, im Winter lauwarm), so dass man im Winter einen halben Sextarius (Wein) und drei Unzen Öl, im Sommer aber nur zwei Unzen Öl miteinander vermischt."

⁸⁴ The collection of rust from iron implements left out in the dew. "Elle est excellente pour les obstructions du foye, du pancreas, de la rate & du mesentere." See Nicolas Lemery, *Cours de Chymie, contenant la Maniere de faire les operations qui sont en usage dans la Medevine, par une methode facile*, 7th ed. (Paris: Estienne Mechallet, 1690), 167.

⁸⁵ François Alexandre de Garsault, *Le nouveau parfait Maréchal, ou la Connoissance générale et universelle du Cheval, divisé en sept Traités*, 3rd ed. (Paris: Chez Ganeau, 1755), 247.

⁸⁶ Robinet, *Dictionnaire d'Hippiatrique*, 262, "on lui donnera une once de thériaque délayée dans un demi-fetier de vin: on lui fera avaler ensuite six ou sept pintes d'eau tiede dans l'espace de deux heures." The composition of theriac varied. See e.g. Demetrios Karaberopoulos, Marianna Karamanou and George Androutsos, "The theriac in antiquity," *The Lancet* 379 (May 26, 2012): 1942-1943.

⁸⁷ Brack, *Avant-postes de Cavalerie légère*, 434, "On emploie l'aloës avec avantage à la dose d'une once et demie ou deux onces en pilules, on délayé dans deux litres de vin."

⁸⁸ Perron, *Le Nâcéri*, 309, "il faut, disent les écrits des anciens, prendre du *savîk* d'orge ou bouillie claire d'orge concassée, malaxer des dattes sèches dans du vin rouge, mêler le tout, et faire boire."

Labor

For a mare encountering difficulties in foaling, the French Royal stablemaster of Louis XIV, François Delcampe (fl. 1662), recommended a mixture of herbs and spices cooked in red wine, to be drunk lukewarm.⁸⁹ To induce a stillborn foal out of the womb, Delcampe prescribed a mixture that included borax and myrrh in white wine.⁹⁰

Lacrimon fistula

To treat this disorder of the canals joining the eye and nose, Robinet recommended that the area be washed with hot wine following a minor surgical procedure.⁹¹

Lacrimation

If a horse's tear ducts were unwell, Theodoricus Cerviensis recommended that the eyes be washed with white wine three times a day.⁹²

Lameness, shoulder

According to the Indian hippological treatise by Rangīn, a horse suddenly affected with lameness in its shoulder should be ridden so as to cause it to sweat profusely, then rubbed down and warmly covered, and then given wine to again induce sweating.⁹³

Malnutrition

In the summer months, Theodoricus Cerviensis recommended fortified wine or rosé, or failing that, any wine, mixed with saffron and oil, to bring a horse back to its proper weight.⁹⁴ In the early seventeenth century Gervase Markham recommended

⁸⁹ Jean-Baptiste Delcampe, *La Connoissance parfaite des Chevaux...* (Paris: La Compagnie des Libraires, 1741), 189, "Breuvage pour une cavale en travail. Prenez trois demi-septiers de vin rouge, ajoutez-y des semences de carui, de daucus, de cumin, d'anis & de fenouïl, environ une demi-once de chacune, broyez-les bien, & les mêlez ensemble. Cela fait, mettez bouillir le tout devant le feu, laissez le réduire aux tiers, ensuite retirez le breuvage, laissez-le réfrigir, & quand il est tiède, donnez-le à boire à la Jument."

⁹⁰ Delcampe, *La Connoissance parfaite des Chevaux*, 191-192, "Pour faire sortir le Poulain mort. Prenez quatre gros de succin blanc, deux gros de borax de Venise, trois gros de myrrhe, un gros de safran, le tout subtilement pulvérisé & mêlé ensemble, faites-en prendre quatre gros à la Cavale dans un demi septier⁹⁰ de vin blanc, il faut que le breuvage soit pris chaudement."

⁹¹ Robinet, *Dictionnaire d'Hippiatrique*, 201, "L'opération faite, on lavera la partie avec du vin chaud."

⁹² Schwarzenberger, *Theodoricus Cerviensis*, 111 (Theod. Cerv. 11.2.4), "Aus welchem Grund auch immer der Tränenfluss verursacht worden ist, sollen die Augen dreimal täglich mit sehr reinem Weißwein gespült werden."

⁹³ Douglas C. Philott, *The Faras-nāma-e Rangīn or The Book of the Horse by "Rangīn"* (London: Bernard Quaritch, 1911), 24, "Should the horse be suddenly affected, take your whip, mount the horse and ride it till it sweats from every pore. Then dismount, clothe it warmly so that not a hair is visible, and either dry by rubbing down outside the clothing; or put the horse to dry in a warm stable free from draughts. After that give it a quart of wine to induce a flow of sweat. Should the horse break out into a sweat owing to the wine, give it another quart. Repeat the remedy for several days, when a cure may be expected."

⁹⁴ Schwarzenberger, *Theodoricus Cerviensis*, 90-91 (Theod. Cerv. 1.16.21-22), "Durch Abmagerung geschwächte Tiere können aber nicht ohne sorgsam Eifer wieder zu Kräften kommen....im Winter soll man gewürzten Wein mit einer halben Unze gemahlener Seleriesamen und mit drei Unzen erhitztem Öl in sein Maul gießen. Im Sommer flöße Wermut oder Rosenwein mit vier Skrupeln Safran und zwei

a mixture of sweet wine and diapente,⁹⁵ followed by a good feed.⁹⁶ Delcampe, on the other hand, advised giving a horse an enema composed of white wine mixed with linseed oil, Venice turpentine and a child's urine.⁹⁷

Pursiness

For a short-winded horse, possibly overweight, Jordanus Ruffus recommended a highly spiced, hot drink made with egg yolks and white wine.⁹⁸

Pustules

Delcampe recommended a diaphoretic potion made from honey, pepper, eggs, wine and olive oil.⁹⁹

Respiratory problems

For breathing difficulties Theodoricus Cerviensis recommended a highly spiced white wine, with the addition of saffron and eggwhite.¹⁰⁰

Unzen kaltem Öl mithilfe eines Horns ins Maul; wenn davon nicht genügend vorhanden ist, soll einfach Wein mit den übrigen (Zutaten) verabreicht werden." Further, Theod. Cerv. 1.24.4, "Außerdem soll ein Trank aus Eigelben, Safran, Veilchenöl und gutem Weißwein geschüttelt, hergestellt werden....Nachdem später alles in ein Horn geben worden ist, soll man dem Pferd zwei- oder dreimal ein volles Horn davon zum Schlucken geben, so wie es im Kapitel über die Dampfigkeit (noch) geschrieben wird." See Schwarzenberger, *Theodoricus Cerviensis*, 104.

⁹⁵ *Diapente* contained five ingredients in equal parts. Stephen Freeman, *The Farrier's Vade Mecum; or, Gentleman's Pocket Companion: A Compendious Treatise on the Practice of Horse Medicine, or the Art of Farriery* (London: J. Wheble, 1772), 127 wrote, "Take Gentian Root, Myrrh, Bayberries, Round Birthwort Root, of each two Ounces; Shavings of Ivory, two Ounces: Beat them into a fine Powder, and it is fit for Use. This is an excellent Medicine in Colds and pestilential Diseases both in Horses and horned Cattle." Cf. Ian K. Steele, "A London Trader and the Atlantic Empire: Joseph Cruttenden, Apothecary, 1710 to 1717," *The William and Mary Quarterly* 34/2 (1977): 288, n. 37.

⁹⁶ Markham, *Markham's Master-Piece*, 77-78, "But the best way of fattening a Horse...is, first to give your Horse three Mornings together a pint of sweet wine and two spoonfull of *Diapente* brewed together: for that drink will take away all infection and sickness from the inward parts: then to feed him well with Provender at least four times a day."

⁹⁷ Delcampe, *La Connoissance parfaite des Chevaux*, 160-161, "Clystere pour un cheval maigre qu'on veut rétablir. Prenez une livre de vin blanc, autant d'urine d'enfant dissoute dans deux onces de terébentine de Venise, deux onces d'huile de lin, mêlez le tout ensemble, faites-le tiédir & le donnez au Cheval."

⁹⁸ Harrison, *Jordanus Ruffus*, 151, "a 'hot draught' made of cloves, ginger, galangal, cardamom, *nuceria charvina*, cumin, hay seeds, white wine and saffron all mixed together with a similar quantity of egg yolks."

⁹⁹ Delcampe, *La Connoissance parfaite des Chevaux*, 170, "Potion diaphoretique pour un Cheval atteint de petites pustules, lorsqu'il prend nouvellement l'herbe. Prenez trois quarterons d'eau de petasites, deux gros de Thériaque: délayez-le tout ensemble, & le donnez à boire au Cheval. Ce remède met la masse du sang en mouvement, en agite les parties, & fait que les glandes de la peau filtrent davantage de sérositez de la masse du sang. Autrement. Ayez une once de miel, autant pesant de poivre, une douzaine d'œufs, deux bons verres de vin & autant d'huile d'olive, faites avaler ce breuvage au Cheval; cela lui fera bien."

¹⁰⁰ Schwarzenberger, *Theodoricus Cerviensis*, 122-123 (Theod. Cerv. 11.19.1, 4-6), "Das Flankenschlagen ist eine Erkrankung, die beim Pferd in der Nähe der Lunge auftritt, wobei sie die Bronchien verstopft, und daher kann das Pferd kaum ausatmen...Es soll daher für das Pferd folgender Trank zubereitet werden: Man nehme zu gleichen Teilen Echte Nelkenwurz, Muskatnuss, Ingwer, Galgant, Kardamom, vom Kümmel (und) vom Fenchelsamen mehr als von dem anderen Zutaten; nachdem alles zu Pulver zermahlen und mit einem guten Weißwein verrührt worden ist, sollen die Zutaten mit einer

Snake bite or scorpion sting

Abū Bakr Ibn al-Mundhir suggested a concoction of white pepper or black cumin (*Nigella sativa*) in wine.¹⁰¹

Sores

Louis Liger (1658-1717) believed that gall (sores) was caused by overheated blood, making it necessary to bleed the horse. After this, the horse was to drink a purgative made of wild cucumber and potassium nitrate steeped in white wine.¹⁰²

Stall-cast horse that cannot get up

Stewart recommended that a horse that had gotten itself into a position up against the wall of its stall, and was unable to stand up, should be given a mixture of sherry and water.¹⁰³

Strangles

This bacterial infection of the lymph glands is caused by *Streptococcus equi*. Robinet recommended giving an afflicted horse a mixture of wine and honey.¹⁰⁴

Tetanus

Rangin recommended a mixture of pounded fowl meat, pepper, kidney beans and brandy or wine, to be administered for a period of 40 days.¹⁰⁵

Tongue, ulcers

In the case of ulcers on the tongue, Theodoricus Cerviensis recommended washing the horse's mouth with lukewarm wine and applying a salve.¹⁰⁶ Similarly, for all other

angemessenen Menge Safran gut gemischt werden, wobei man dazu genau so viele Eigelbe rührt wie der gesamte Trank (ausmacht), nachdem die anderen Zutaten dort hineingegeben wurden, und es reichlich mit den übrigen, oben genannten Zutaten durchgemischt worden ist. Der Trank soll aber so flüssig sein, dass er leicht hinunter geschluckt werden kann."

¹⁰¹ Perron, *Le Nâïéri*, 42, "On pulvérisé trente graines de poivre blanc; à défaut de cette substance on pulvérisé soixante graines de nigelle noire (*nigella sativa*); on mêle à du vin pur et on donne à boire ce liquide à l'animal."

¹⁰² Louis Liger, *Oeconomie generale de la Campagne, ou nouvelle Maison rustique*, 2nd ed., vol. 1 (Amsterdam: Henri Desbordes, 1701), 132, "Après la saignée, il faut ainsi le purger; prenez de la racine de Comcombre sauvage, mise en poudre, mêlée avec du Nitre; le tout infusé à froid pendant trois heures dans une chopine de vin blanc, donnez ce breuvage au cheval, & il s'en trouvera fort-bien."

¹⁰³ Stewart, *Stable Economy*, 151, "If the horse have no sign of fever, give him half a pint of sherry in cold water."

¹⁰⁴ Robinet, *Dictionnaire d'Hippiatrique*, 228, "évitiez les cordiaux & entretenez la transpiration seulement avec une bouteille de vin & trois onces de miel, s'il en est besoin."

¹⁰⁵ Phillott, *The Faras-nāma-e Rangin*, 22, "Procure a fowl, remove its beak and shanks, and pound the whole carcase, guts and all, to a soft mass in a mortar; then add 4 lbs. of *mabela* [kidney bean], 4 ozs. of pepper-corns, and a quart of *sharāb* [mod. brandy, formerly perhaps native wine]. Give this quantity every evening for forty days."

¹⁰⁶ Schwarzenberger, *Theodoricus Cerviensis*, 120 (Theod. Cerv. 11.15.6), apply a salve, "nachdem man die Geschwüre vorher mit lauwarmem Wein abgewaschen hat."

mouth and tongue injuries Garsault suggested washing with hot wine and coating the affected areas with honey.¹⁰⁷

Urination

For problems urinating, Abū Bakr Ibn al-Mundhir recommended having the horse drink a mixture of urine and wine.¹⁰⁸ Jordanus Ruffus, on the other hand, suggested pouring the mixture into the horse's nostrils.¹⁰⁹

Worms

Robinet suggested a concoction of red wine infused with a number of herbs, given in three doses.¹¹⁰

External application of wine

Even though the wording of the Persepolis ration texts suggests that the wine allocated to horses was “consumed,” it is worth noting that, historically wine was also put to external uses.¹¹¹ Abū Bakr Ibn al-Mundhir recommended a mixture of wine, herbs, oil and natron to be applied to the horse's back and legs for muscle tightness or stiffness.¹¹² Delcampe suggested a wine-based rub for the horse's legs.¹¹³ Garsault advocated using wine to sanitize external dressings.¹¹⁴ Finally, Robinet prescribed wine mixed with honey applied to an abscess.¹¹⁵ The recipes published by William

¹⁰⁷ Garsault, *Le nouveau parfait Maréchal*, 359, “il faudra la laver avec du vin chaud, & l'enduire de miel.”

¹⁰⁸ Perron, *Le Nâcéri*, 398, “on donne à boire de l'urine et du vin mêlés, à la quantité de trois ou quatre rotl. Le malade urine ensuite et se guérit.”

¹⁰⁹ Harrison, *Jordanus Ruffus*, 57, “Take the urine of whomsoever and mix it with wine and place it in the nostrils and before long it provokes urine.”

¹¹⁰ Robinet, *Dictionnaire d'Hippiatrique*, 55-56, “Breuvage vermifuge. Prenez racines de gentiane & de fougère mâle, de chaque une once; de baies de genievre, une once & demie, feuilles d'absinthe & de tanaïse, de chaque une poignée: mettez infuser à froid durant vingt-quatre-heures, dans six livres de vin rouge: passez: & donnez-en trois doses, dont une pinte chaque fois le matin à jeun, pendant trois jours de suite.”

¹¹¹ Wouter Henkelman kindly informs me that the verb translated as “consumed” can have a more general meaning of “dispensed” which would not rule out external use, even if drinking/consumption would be the normal understanding of the term.

¹¹² Perron, *Le Nâcéri*, 115, “Dans les narines on fait passer de l'huile de rose et de jasmin; ou bien on y fait passer du vin auquel on a mêlé de l'huile et du natron. De ce même dernier mélange, on oint tout le corps de l'animal. Cette médication est admise par l'expérience; elle est d'utilité reconnue.”

¹¹³ Delcampe, *La Connoissance parfaite des Chevaux*, 142-143, “Le bain est très-salutaire pour delasser un Cheval, & il est bon aussi de leur frotter les jambes avec de l'esprit de vin ou de l'eau de vie simplement, ou bien de l'eau de vie mêlée avec de l'huile de noix: ou bien, Prenez de la lie de vin, mettez-la chauffer modérément, mettez-y environ deux livres de miel & de farine de froment; remuez bien le tout sur le feu jusqu'à ce qu'il commence à s'épaissir: ensuite frottez-en les jambes du Cheval tous les vingt-quatre heures, jusqu'à ce qu'il soit délassé.”

¹¹⁴ Garsault, *Le nouveau parfait Maréchal*, 346.

¹¹⁵ Robinet, *Dictionnaire d'Hippiatrique*, 114-115, “Cuisse. (abcès à la) il vient assez communément au plat de la cuisse, une grosseur plus ou moins considérable, qui pour l'ordinaire s'abcede promptement par le moyen du cataplasme maturatif...Quand le pus est très-louable, c'est-à-dire, qu'il est blanc, caséux, des injections de vin miellé suffisent le plus souvent pour la guérison.”

Griffiths in 1784 for external ointments and rubs all contain *aqua vitae* or “spirits of wine,” i.e. purified alcohol,¹¹⁶ rather than wine in the traditional sense.

VII. Conclusion

In one of the trilingual (Elamite, Old Persian, Babylonian) inscriptions carved into the rock face alongside his tomb at Naqsh-e Rostam, near Persepolis, Darius I, writing in the first person, extolled the attributes of the ideal ruler.¹¹⁷ There we read, “As a horseman I am a good horseman. As a bowman I am a good bowman both afoot and on horseback. As a spearman I am a good spearman both afoot and on horseback.”¹¹⁸ Such assertions presuppose a healthy, well-nourished and properly cared for mount. Terse though the indications in the PFA may be, allocations of bread and wine rations to horses undoubtedly reflect hippological knowledge in the domains of nutrition and, possibly, therapeutic remedies for equine ailments, attesting to the sort of treatment one would expect in a society that valued its horses. It is certainly the case that the laconic records in the PFA contain nothing remotely comparable to ancient Greek or Roman hippiatric treatises or their medieval counterparts.¹¹⁹ Nevertheless, as a society famed for its equestrian prowess, Achaemenid Persia would have had a vast reservoir of experience in equine management, experience that was almost certainly transmitted orally.¹²⁰ When viewed against the backdrop of medieval and later European and Near Eastern hippological literature, the brief references to horsebread and wine rations issued to horses offer a welcome window on the equine culture of one of the great empires of Antiquity.

References

- Anonymous. *The Sportsman's Dictionary; or, the Gentleman's Companion: for Town and Country*. London: Fielding and Walker, 1778.
- Anonymous. *English Patents of Inventions, Specifications, A.D. 1865, Nos. 1801-1889*. London: H.M. Stationery Office, 1866.
- Anonymous. “Patent Horsebread.” *Monthly Consular and Trade Reports* 338 (November, 1908): 126.

¹¹⁶ William Griffiths, *A practical Treatise on Farriery; Deduced from the Experience of above Forty Years...* (Wrexham: R. Marsh, 1784).

¹¹⁷ DNB §9 C-G, i.e. Darius' inscription B at Naqsh-e Rostam, near Persepolis. See Rüdiger Schmitt, *Die altpersischen Inschriften der Achaimeniden* (Wiesbaden: Reichert Verlag, 2009), 105.

¹¹⁸ For the English translation see Roland G. Kent, *Old Persian* (New Haven: American Oriental Society, 1950), 140. Note that the paragraph and line numbers there (§8h.42-45) are superseded from those given in Schmitt, *Die altpersischen Inschriften*, 105.

¹¹⁹ For an excellent look at this literature see e.g. Klaus-Dietrich Fischer, “A horse! A horse! my kingdom for a horse! Versions of Greek horse medicine in Medieval Italy,” *Medizinhistorisches Journal* 34/2 (1999): 123-138.

¹²⁰ See e.g. Toyoko Kawase, “The management of horses in the Persepolis royal economy.” *Bulletin of the Society for Near Eastern Studies in Japan* 30/1 (1987): 21-40; Gabrielli, *Le Cbernal*; Tuplin, “All the King's horse;” and Azzoni and Dusinberre, “Persepolis Fortification Aramaic Tablet Seal 0002.”

- Aston, T.H. "The External Administration and Resources of Merton College to *circa* 1348." In *The History of the University of Oxford*, vol. 1, ed. J.I. Catto, 311-368. Oxford: Clarendon Press, 1984.
- Attreed, L.C. *The York House Books, 1461-1490*, vol. 1. Stroud: Alan Sutton Publishing Ltd for the Richard III and Yorkist History Trust, 1991.
- Azzoni, A. and Dusinberre, E. "Persepolis Fortification Aramaic Tablet Seal 0002 and the Keeping of Horses." In *Extraction & Control: Studies in honor of Matthew W. Stolper*, ed. M. Kozuh et al., 1-16. Chicago: Studies in Ancient Oriental Civilization 68, 2014.
- B., C.G. "Forsök at med besparing föda Hästar med särskildt dertil bakadt bröd, i stället för Hafra." *Kongelige Svenska Vetenskaps Academiens Handlingar* 14 (1753): 287-291.
- Barański, A. "Die Thierzucht im Alterthume." *Oesterreichische Vierteljahresschrift für wissenschaftliche Veterinärkunde* 63 (1885): 41-100.
- Boniface, K. "Bread for My Horses." In *The Horse in Premodern European Culture*, ed. A. Ropa and T. Dawson, 161-173. Berlin/Boston: De Gruyter, 2019.
- Brack, A.F. de. *Avant-postes de Cavalerie légère. Souvenirs*. Paris: Chez Anselin, 1831.
- Bradley, R. *Dictionnaire oeconomique: or, The Family Dictionary*, vol. 1. London: D. Midwinter, 1725.
- Chaillan, M. "Le Voyage de Marseille à Paris de Monseigneur de Belsunce (1730)." *Bulletin de Géographie historique et descriptive* 1906 (1906): 368-382.
- Chomel, N. *Dictionnaire oeconomique, contenant divers Moyens d'augmenter et conserver son Bien, et même sa Santé*, 2 vols. Lyon: Pierre Thened, 1709.
- Clark, B. *A Series of Original Experiments on the Foot of the living Horse, exhibiting the Changes produced by Shoeing, and the Causes of the Apparent Mystery of this Art*. London: Sherwood, Neely, and Jones, 1809.
- Delcampe, J.-B. C. *La Connoissance parfaite des Chevaux...* Paris: La Compagnie des Libraires, 1741.
- Donaghy, T. "Feeding the ancient horse." *Journal of the Veterinary History Society* 16/3 (2012): 303-324.
- Farmer, J.S. *The Proverbs, Epigrams, and Miscellanies of John Heywood...* London: Early English Drama Society, 1906.
- Fischer, K.-D. "'A horse! A horse! my kingdom for a horse!' Versions of Greek horse medicine in Medieval Italy." *Medizinhistorisches Journal* 34/2 (1999): 123-138.
- Fleming, G. "Forage for Military Purposes." *Journal of the Royal United Service Institution* 33 (1889): 471-497.
- Freeman, S. *The Farrier's Vade Mecum; or, Gentleman's Pocket Companion: A Compendious Treatise on the Practice of Horse Medicine, or the Art of Farriery*. London: J. Wheble, 1772.
- Fry, J.S. *Letters on the Corn-Trade. Containing Considerations of the Combinations of Farmers, and the Monopoly of Corn...* Bristol: Philip Rose, 1816.
- Fulwell, U. *The First Parte, of The Eyyghth liberall Science: Entituled, Ars adulandi, The Arte of Flatterie...* London: Richarde Jones, 1579.
- Furnivall, F.J. and Kirk, R.E.G. *Analoguees of Chaucer's Canterbury Pilgrimage (April 1386) and His Putting-up Joust-Scaffolds, etc. in West-Smithfield (May 1390) being the Expenses*

- of the Aragonese Ambassadors for 58 Days in England, 21 July to 16 Sept. 1415, including their 4-days' Journey from London to Canterbury and back, 31 July—3 Aug. 1415...* London: Kegan Paul, Trench, Trübner & Co., Ltd, 1903.
- Gabrielli, M. *Le Cheval dans l'Empire achéménide / Horse in the Achaemenid Empire*. Istanbul: Studia ad Orientem Antiquum Pertinentia 1, 2006.
- Garrison, M.B. *The Ritual Landscape at Persepolis: Glyptic Imagery from the Persepolis Fortification and Treasury Archives*. Chicago: Studies in Ancient Oriental Civilization 72, 2017.
- Garsault, F.A. de. *Le nouveau parfait Maréchal, ou la Connoissance générale et universelle du Cheval, divisé en sept Traités*, 3rd ed. Paris: Chez Ganeau, 1755.
- Griffiths, W. *A practical Treatise on Farriery; Deduced from the Experience of above Forty Years...* Wrexham: R. Marsh, 1784.
- Hallock, R.T. *Persepolis Fortification Tablets*. Chicago: Oriental Institute Publication 92, 1969.
- Harrison, S. *Jordanus Ruffus and the late-medieval hippiatric tradition: Animal-care practitioners and the horse*. Unpubl. PhD diss. The University of Leeds, 2018.
- Harvey, K. *The Little Republic: Masculinity and Domestic Authority in Eighteenth-Century Britain*. Oxford: Oxford University Press, 2012.
- Henkelman, W.F.M. "Administrative realities: The Persepolis Archives and the Archaeology of the Achaemenid Heartland." In *The Oxford Handbook of Ancient Iran*, ed. D.T. Potts, 528-546. New York: Oxford University Press, 2013.
- Henkelman, W.F.M. "Persia." In *A Companion to the Achaemenid Persian Empire*, vol. 2, ed. B. Jacobs, B. and R. Rollinger, R., 881-904. Malden: John Wiley & Sons, 2021.
- Hinz, W. and Koch, H. *Elamisches Wörterbuch*, vol. 1. Berlin: Archäologische Mitteilungen aus Iran Ergänzungsband 17, 1987.
- Hore, J.P. *The History of Newmarket, and The Annals of the Turf*, vol. 1. London: A.H. Baily and Co., 1886.
- Hyland, A. *The Horse in the Ancient World*. Stroud: Sutton, 2003.
- Jones, C.E. and Stolper, M.W. "How many Persepolis Fortification Tablets are there?" In *L'archive des Fortifications de Persépolis: État des questions et perspectives de recherches*, ed. P. Briant, W.F.M. Henkelman and M.W. Stolper, 27-50. Paris: Persika 12. 2008.
- Karaberopoulos, D., Karamanou, M. and Androutsos, G. "The theriac in antiquity." *The Lancet* 379 (May 26, 2012): 1942-1943.
- Kawase, T. "The management of horses in the Persepolis royal economy." *Bulletin of the Society for Near Eastern Studies in Japan* 30/1 (1987): 21-40.
- Kent, R.G. *Old Persian: Grammar, Texts, Lexicon*. New Haven: American Oriental Society, 1950.
- Krünitz, J.G. *Oeconomische Encyclopädie, oder allgemeines System der Land- Haus- und Staats-Wirtschaft*, vol. 1. Berlin: Joachim Pauli, 1775.
- Lavalard, E. *Le Cheval dans ses Rapports avec l'Économie rurale et les Industries de Transport*, vol. 1. Paris: Librairie de Firmin-Didot et C^{ie}, 1888.
- Lavalard, E. *L'Alimentation du Cheval*. Paris: Librairie Agricole de la Maison Rustique, 1912.

- Leadam, I.S. *Select Cases before the King's Council in the Star Chamber commonly called the Court of Star Chamber Volume II A.D. 1509-1544*. London: Bernard Quaritch, 1911.
- Lean, V.S. *Collectanea: Proverbs (English & Foreign), Folk Lore, and Superstitions, also Compilations towards Dictionaries of Proverbial Phrases and Words, old and disused*, vol. 2/2. Bristol: J.W. Arrowsmith, 1903.
- Legros, D. and Pallandre, L. *Mémoire sur l'Horſe Braed [sic], ou Pain de Cheval, destiné à remplacer l'Avoine donnée habituellement aux Chevaux*. Lyon: Imprimerie Typographique et Lithographique de Louis Perrin, 1840.
- Lemery, N. *Cours de Chymie, contenant la Maniere de faire les operations qui sont en usage dans la Medevine, par une methode facile*, 7th ed. Paris: Estienne Mechallet, 1690.
- Liger, L. *Oeconomie generale de la Campagne, ou nouvelle Maison rustique*, 2nd ed., vol. 1. Amsterdam: Henri Desbordes, 1701.
- Markham, G. *Cavalatrice, or The Arte and knowledge belonging to the Horse-ryder: how horses are to be handled, ridden, or made perfect, either for service or pleasure*. London: Edw. Alde for Edward White, 1616.
- Markham, G. *The Complete Jockey or the most exact Rules and Methods to be observed for the training up of Race-Horses*. London [no publisher named], 1680.
- Markham, G. *Markham's Master-Piece Reviv'd Containing all Knowledge belonging to the Smith, Farrier, or Horse-Leach, touching the Curing All Diseases in Horses*. London: John Wright., 1681.
- Mennessier de La Lance, G.R. *Essai de Bibliographie hippique donnant la Description détaillée des Ouvrages publiés ou traduits en Latin et en Français sur le Cheval et la Cavalerie*, vol. 2. Paris: Lucien Dorbon, 1917.
- Montendre, A. de. *Des Institutions hippiques et de l'Élève du Cheval dans les principaux États de l'Europe*, 2 vols. Paris: Bureau du Journal des Haras, 1839-1840.
- Montendre, A. de. "Nourriture des Chevaux avec le Pain." *Supplément du Journal des Haras, des Chasses, et des Courses de Chevaux, des Progrès des Sciences zoïatriques et de Médecine comparée* 26 (1840): 15-16.
- Parker, R.A. and Dubberstein, W.H. *Babylonian Chronology, 626 B.C.–A.D. 75*. Providence: Brown University Press, 1956.
- Pennell-Elmhirst, E. *The Hunting Countries of England, Facilities, Character and Requirements. A Guide to Hunting Men*, part 3. London: The "Field" Office, 1882.
- Perron, N. *Le Nâicéri. La Perfection des deux Arts ou Traité complet d'Hippologie et d'Hippiatrie arabes*, vol. 1. Paris: Imprimerie et Librairie d'Agriculture et d'Horticulture de M^{me} V^e Bouchard-Huzard, 1852.
- Peters, R. "On coarse Flour, brown Bread, and the Force of Habit, as it relates to Esculents." *Memoirs of the Philadelphia Society for Promoting Agriculture* 1 (1808): 227-236.
- Phillott, D.C. *The Faras-nama-e Rangin or The Book of the Horse by "Rangin"*. London: Bernard Quaritch, 1911.
- Potts, D.T. "Medes in the desert: Thoughts on the mounted archer near Taymā'." In *Klänge der Archäologie: Festschrift für Ricardo Eichmann*, ed. C. Bührig et al., 335-342. Wiesbaden: Harrassowitz, 2021.

- Potts, D.T. and Henkelman, W.F.M. “On animal hides and (pre-)tanning in the Persepolis Fortification archive.” In *Achemenet. Vingt ans après: Études offertes à Pierre Briant à l’occasion des vingt ans du Programme Achemenet*, ed. D. Agut-Labordère et al. Paris:277-299, Persika 21, 2021.
- Powell, J. *The Assise of Bread...* London: John Windet, 1595.
- Powell, R. *A Treatise of the Antiquity, Authority, Uses and Jurisdiction of the Ancient Courts of Leet...* London: Richard Badger, 1642.
- Puvis, M.-A. *Du Remplacement de l’Avoine par le Seigle cuit dans l’Alimentation des Chevaux*. Paris: Chez M^{me} Huzard, 1839.
- Robinet, J. *Dictionnaire d’Hippiatrique pratique, ou Traité complet de la Médecine des Chevaux*. Brussels/Nancy: Chez Babin, 1777.
- Rollet, N.J.F. “Mémoire sur un nouveau Mode d’Alimentation des Chevaux.” *Mémoires de la Société Royale d’Agriculture et des Arts du Département de Seine-et-Oise* 36 (1836): 77-96.
- Rubel, W. “English Horse-bread, 1590-1800.” *Gastronomica* 6/3 (2006): 40-51.
- Schmitt, R. *Die altpersischen Inschriften der Achaimeniden: Editio minor mit deutscher Übersetzung*. Wiesbaden: Reichert Verlag, 2009.
- Schwarzenberger, M. *Theodoricus Cerviensis: Mulomedicina. Libri I-II, Band 2: Übersetzung und Kommentar*. Hildesheim: Georg Olms Verlag, 2022.
- Sharpe, R.R. *Calendar of Letter-Books preserved among the Archives of the Corporation of the City of London at the Guildhall. Letter-Book L. Temp. Edward IV.— Henry VII*. London: John Edward Francis, 1912.
- Shaw, D.G. “Horses and Actor-Networks: Manufacturing Travel in Later Medieval England.” In *The Historical Animal*, ed. S. Nance, 133-147. Syracuse: Syracuse University Press. 2015.
- Steele, I.K. “A London Trader and the Atlantic Empire: Joseph Cruttenden, Apothecary, 1710 to 1717.” *The William and Mary Quarterly* 34/2 (1977): 281-297.
- Stewart, J. *Stable Economy: A Treatise on the Management of Horses, in relation to Stabling, Grooming, Feeding, Watering, and Working*, 3rd ed. Edinburgh: William Blackwood and Sons and London: Thomas Cadell, 1840.
- Toulmin Smith, J. *English Gilds. The Original Ordinances of more than one hundred Early English Gilds...* London: N. Trübner & Co., 1870.
- Trichter, V. *Curiöses Reit-Jagd-Fecht-Tanz- oder Ritter Exercitien-Lexicon*. Leipzig: Johann Friedrich Gleditsch, 1742.
- Tuplin, C. “All the King’s horse: In search of Achaemenid Persian cavalry.” In *New Perspectives on Ancient Warfare*, ed. G.G. Fagan and M. Trundle, 101-182. Leiden/Boston: Brill, 2010.
- Winter, J.W. *The Horse, in Health and Disease...* London: Longman, Brown, Green, and Longmans, 1846.
- Wörz, J.J. *Die Gesundheitspflege des Pferdes, oder die Lehre von der Ernährung, Fütterung, Stallung, Pflege, Wartung und sonstige Behandlung desselben*. Ulm: Druck und Verlag der J. Ebner’schen Buchhandlung, 1874.