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Toads and Plague: Amulet Therapy in Seventeenth-Century Medicine

MARTHA R. BALDWIN

The seventeenth century witnessed a sharp interest in the medical applications of amulets. As external medicaments either worn around the neck or affixed to the wrists or armpits, amulets enjoyed a surprising vogue and respectability. Not only does this therapy appear to have been a fashionable folk remedy in the seventeenth century,¹ but it also received acceptance and warm enthusiasm from learned men who strove to incorporate the curative and prophylactic benefits of amulets into their natural and medical philosophies. Indeed, the interest in amulets in the seventeenth century was so great that as the century drew to a close, Jacob Wolff, a learned German physician, could fill a quarto volume of some four hundred pages with a catalog of diseases deemed treatable by amulets; and he could assume that the subject matter of his tome would interest physicians, philosophers, theologians, and lawyers.²

While an examination of seventeenth-century medical literature reveals widespread acceptance of amulet therapy, it also discloses sharp disagreements concerning when and why amulets were effective in preventing disease and in curing established diseases. In texts de-

1. On the widespread use of amulets in popular medicine in seventeenth-century England, see Keith Thomas, *Religion and the Decline of Magic* (New York: Charles Scribner's Sons, 1971), pp. 275–76, 189–90, 368, 493. See also Liselotte Hansmann, *Amulett und Talisman: Erscheinungsform und Geschichte* (Munich: G. D. W. Callwey, 1977).

2. Jacob Wolff, *Curiosus amuletorum scrutator* (Frankfurt, 1692).

fending the medical use of amulets one finds conflicting and competing philosophies of the natural action of medicines on the human body. Amulet therapy had its earliest seventeenth-century supporters among physicians and natural philosophers who endorsed the occult and sympathetic action of the amulet on the diseased part of the body. By the end of the century, physicians defending the therapy envisioned a mechanical operation of the amulet on the body. While the competition between occult and mechanical explanations of natural phenomena has long been regarded by historians of science and medicine as a fundamental characteristic of the Scientific Revolution of the seventeenth century, the far-rippling effects of the debate have not yet been exhausted.

Recent work by historians has challenged the assumption that the age of the Scientific Revolution represents a triumph of experimentalism and observation.³ This paper contributes to the current reevaluation of experimentalism in the seventeenth century by examining the types of evidence brought to the fore in the competing justifications of medical amulets. Instead of relying on modern notions of control groups and large clinical trials, seventeenth-century physicians and natural philosophers—representing varying theoretical schools—were swayed by such factors as the social background of the patients and the religious orthodoxy of the reporting physicians.

Amulet therapy did not arise *de novo* in the seventeenth century. Natural philosophers and physicians of the era recognized that the canonical ancient Greek physicians had endorsed and accepted amulets. They were familiar with Galen's assertion that a peony root hung about the neck was effective against epilepsy and that stones of green jasper worn over the stomach cured stomach complaints. They knew that Dioscorides had recorded the use of particular plant species as amulets to ease childbirth and to cure scrofulous swellings on the neck.⁴

The interest in medical amulets also owed something to the fact that collecting antiquities was in vogue among learned men. It was widely known that the ancient Greeks and Egyptians had believed

3. See especially Steven Shapin and Simon Shaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 1985); and Steven Shapin, "The House of Experiment in Seventeenth-Century England," *Isis*, 1988, 79: 373–404.

4. On Dioscorides' reservations about amulets, as well as his endorsements of them, see John M. Riddle, *Dioscorides on Pharmacy and Medicine* (Austin: University of Texas Press, 1985), pp. 83–86, 159–63. The standard seventeenth-century reference for Pliny was to his *Natural History*, 8.37–38; for Galen, to *De simplicibus*, chaps. 6 and 10.

that inscribed or sculpted stones possessed magical powers. Throughout the seventeenth century, samples of these ancient amulets were prized objects in cabinets of curiosities. Several antiquarians, including Chifflet, Gorlaeus, Capello, and Kircher, compiled catalogs of the gems, stones, and precious metals that had been used by the ancients as amulets to ward off evil, disease, and ill fortune.⁵ Thus the interest in amulets in the seventeenth century did not occur only in a strictly medical context.

The widespread acceptance of amulets in medical therapy in the seventeenth century was also strongly indebted to the Renaissance tradition of natural magic. Marsilio Ficino, Cornelius Agrippa, and Giordano Bruno had all maintained that magical power resided in certain natural objects that could be manipulated by philosophers who had extraordinary powers of cognition. Thus an important group of sixteenth-century natural philosophers left an intellectual legacy to physicians of the next century, and had a palpable impact on amulet therapy.⁶

By the seventeenth century, natural philosophers and physicians who advocated the use of amulets in medical practice had come to insist that amulets operated by strictly natural, if invisible, forces. They emphasized the congruency of this ancient therapy with their own modern theories of disease and with their own contemporary scientific and medical philosophies. Although not all knew of Thomas Aquinas's and Augustine's condemnation of amulets on the grounds that the operation of these objects depended on the presence of magical and demonic forces, they did not have to be reminded that the early Fathers

5. On the vogue of antique amulets—authentic and fabricated—see Campbell Bonner, *Studies in Magical Amulets, Chiefly Graeco-Egyptian* (Ann Arbor: University of Michigan Press, 1950); and E. A. W. Budge, *Amulets and Talismans* (New Hyde Park, N.Y.: University Books, 1961). Such antique amulets had a prestige among seventeenth-century learned men which we cannot appreciate today. When Nicholas Claude Fabri de Peiresc sought to establish himself as a patron of the famous baroque painter Peter Paul Rubens, he sent the artist a gift of four antique amulets and called attention to his own worthiness as a patron by boasting of his extensive collection of such gnostic gems. See Marjon van der Meulen, *Peter Paul Rubens, Antiquarius: Collector and Copyist of Antique Gems* (Alphen aan den Rijn: Canaletto, 1975), pp. 12–13, 17–24, 166–67.

6. For a discussion of the Renaissance tradition of natural magic and its use of talismans and amulets to effect physical cures, see Frances Yates, *Giordano Bruno and the Hermetic Tradition* (Chicago: University of Chicago Press, 1964), pp. 45–58, 62–83. Also see Ron Millen, "The Manifestation of Occult Qualities in the Scientific Revolution," in *Religion, Science, and Worldview: Essays in Honor of Richard S. Westfall*, ed. Margaret J. Osler and Paul Lawrence Farber (New York: Cambridge University Press, 1985), pp. 185–217; and Brian P. Copenhaver, "Scholastic Philosophy and Renaissance Magic in the *De vita* of Marsilio Ficino," *Renaissance Quart.*, 1984, 37: 523–54.

of the Church had warned of the importance of recognizing the dangerous presence of patently supernatural forces and non-Christian gods in some amulets. By insisting that their own amulets operated exclusively by natural forces, they were adapting an old therapeutic method once thought to work by the invocation of supernatural forces, and modifying it sufficiently to incorporate it into their modern understanding of the natural action of medicines on diseases.

Though in the seventeenth century amulets were believed to cure a broad variety of diseases, in this paper I will focus on the uses of amulets in the prevention and cure of bubonic plague, an endemic and fearsome disease whose outbreaks reached into almost all parts of Europe during that century. Although early modern physicians had no knowledge of the microbe *Yersinia pestis* and its cycle of hosts—rats, fleas, and humans—they gave accurate descriptions of the course of the disease and offered a wide variety of explanations of its origins, such as stellar emanations, infected clothing and goods imported from the Levant, subterranean toxic effluvia, and corrupted air. They also offered a wide array of traditional remedies, including phlebotomy, emetics, purgatives, and ointments.⁷

The mysterious word *zenexton*, of unknown etymology, seems to have been coined during the sixteenth century. It was attributed to Paracelsus, and was used to denote an amulet to be worn specifically in time of plague. Editions of Paracelsus's works proliferated at the turn of the century, and the word, or its plural, *zenechta*, began to recur often in seventeenth-century discussions of plague. Paracelsus did not describe in detail the amulet that he claimed unfailingly preserved the wearer from plague, but he placed infinite hope in it.⁸ It fell to his seventeenth-century successors to discover its exact recipe.

In the seventeenth-century search for the *zenexton* one sees a lively discussion involving learned men of broadly varying intellectual backgrounds and philosophical predispositions. Recipes for amulets to be worn in time of pestilence poured forth. Commonly their principal

7. A good discussion of seventeenth-century descriptions of the disease is found in Carlo M. Cipolla, *Fighting the Plague in Seventeenth-Century Italy* (Madison: University of Wisconsin Press, 1981), pp. 89–110.

8. Theophrastus Paracelsus, *De la peste et de ses causes et ses accidents*, trans. Pierre Hassard (Anvers, 1570), refers to the use of amulets and to the *zenexton* at pp. 143–45. In Paracelsus's *De vermibus, serpentibus, araneis, bufonibus cancris & maculis a nativitate liber* (Frankfurt, 1603), p. 240, there is a description of a toad amulet effective in times of pestilence. Whether or not these texts are spurious is not the issue here. What is important is that in the seventeenth century both the word and the concept of the *zenexton* were attributed to Paracelsus.

ingredients were arsenic, quicksilver, orpiment (arsenic trisulphide), silver, toads, pearls, or spiders.

The Search for the Zenexton

Early in the century, the Swiss medical reformer Oswald Croll (1560–1609) published a work, the *Basilica Chymica*, in which he developed and systematized the chemical therapy of Paracelsus and both extended and clarified the Paracelsian pharmaceutical roster. It is here that we find the first clear and precise description of Paracelsus's zenexton. Although Croll credited Paracelsus with the description, it appears to be essentially original with Croll. Croll called for the preparation of a polypharmaceutical substance compounded of eighteen desiccated and pulverized toads and specified quantities of the first menstrual blood of young maidens, white arsenic, orpiment, dittany roots, pearls, corals, and oriental emeralds, all standard ingredients in Galenic and Paracelsian pharmacy. This concoction formed a paste, which the physician then shaped into small cakes. The recipe also required the fabrication of a small, cylindrical metal case engraved on its top with a serpent, and on its bottom with a scorpion. The physician imprinted the toad cakes with the seals of the serpent and scorpion and then enclosed them in the cylinder (see fig. 1).

Croll insisted that in addition to preparing the pharmaceutical with the correct substances, the physician also had to fabricate the toad medicine at the proper phase of the moon. Such attention to lunar phases enabled the physician to regulate the sympathetic action of the planets on the human body. Hung from the neck by a silk ribbon and worn near the region of the heart, the metal case filled with the correctly prepared toad cakes preserved the wearer from plague. Croll explained that the amulet's efficacy was natural because the natural substances of which the amulet was composed would, when spagyrically treated and prepared under astrologically sympathetic conditions, extract venom from the body and revivify the disturbed spirits.⁹

9. Oswald Croll published his *Basilica chymica, continens philosophicam propria laborum experientia confirmatam descriptionem & usum remedium chymicorum selectissimorum e lumine gratiae et naturae desumptorum. In fine libri additus est eiusdem auctoris tractatus novus de signaturis rerum internis* (Frankfort, 1609). The book went through many seventeenth-century editions and translations. I cite the English translation of 1669 which was edited and augmented by Johannes Hartmann, the German iatrochemist. This edition appeared with the following title: *Basilica Chymica, & Praxis chymiatricae; or Royal and Practical chymistry in three treatises. Wherein all those excellent medicines and chymical preparations are fully discovered, from whence all our modern chymists have drawn their choicest remedies.*

Croll also described a far more elaborate zenexton for the very wealthy. Here the case was fabricated from pure gold and adorned with one sapphire, one gem called hyacinth, and four stones extracted from the bodies of spiders or toads. A paste made from desiccated toad and vinegar was applied to the interior of a perforated gold pipe. Then, linen rags moistened with the menstrual blood of a young virgin were stuffed into the pipe, which was then sealed (see fig. 2). The wearer of the amulet could be assured of immunity to pestilential infection, by reason of the mutual cooperation and sympathy of the menstrual blood and the poisonous toad with the pestilential venoms.¹⁰

Croll showed in his recipe a concern that the ingredients of the zenexton be aligned with one of the planets, for each toad was to be suspended alive facing the east before it was pulverized. Moreover, Croll's selection of sapphire and hyacinth was not merely fortuitous but was consciously intended to align celestial influences on mineral ingredients that had known correspondences with parts of the human body.

Although Croll practiced medicine at the courts of the emperor Rudolf II in Prague and the Protestant prince Christian I of Anhalt-Bernberg, he took seriously the physician's moral and social responsibility to search for locally available and inexpensive medicines. Thus, in addition to devising zenechta for his wealthy clients, he also worked to discover inexpensive amulets that would be equally efficacious against plague. For example, he presented a somewhat elaborated version of the common peasant amulet of quicksilver encapsulated in a filbert-nut shell. Croll's mercurial zenexton consisted of a careful spagyric treatment of a compound of mercury, vitriol, common salt, and verdigris, which was cooked into a plaster that was then rolled and cut into bits the size of coins, and stamped with the seal of the stars. The impressed coins, kept until needed at the outbreak of a plague, were to be wrapped in red silk before being worn about the neck. When the absorption of pestilential venom from the surrounding air or from the body itself changed the silk to a bluish color, Croll

being a translation of Oswald Crollius his Royal Chymistry, augmented and enlarged by John Hartman. To which is added his Treatise of signatures of internal things; or a true and lively anatomy of the greater and lesser world. As also, the practice of Chymistry of John Hartmann M.D. augmented and enlarged by his son (London, 1669). I also use this edition for the plates illustrating the zenechta. Hartmann clearly separates his own editorial remarks from Croll's original text. On Croll, see Owen Hannaway, *The Chemists and the Word: The Didactic Origins of Chemistry* (Baltimore: Johns Hopkins University Press, 1975), pp. 1–72.

10. Croll, *Basilica Chymica* (n. 9), p. 137.

warned that the blue cloth should be burned in the fire and a new piece of red silk should replace the old, saturated cloth.

Croll also presented a recipe for an amulet whose principal ingredient was arsenic; and his posthumous editor, Johannes Hartmann (1568–1631), the first professor of chemiatry (or iatrochemistry) at the University of Marburg, and a protégé of Moritz of Hesse-Kassel, described still more amulets of this kind. Hartmann also clearly disabused the reader of the misleading inference, drawn from Croll, that Paracelsus had invented the pestilential zenexton. Hartmann affirmed that such an amulet had first been invented by Giacomo Berengario da Carpi, who had used it to keep Pope Adrian VI safe from plague in the early sixteenth century.¹¹

Almost three decades after Croll published his work, the posthumous work of the Belgian physician Johannes van Helmont (1577–1644) became available in print. Far more critical of Paracelsus than Croll had been, Helmont also accepted the doctrine of signatures and the use of amulets as an effective therapeutic and prophylactic against plague. Helmont preferred amulets made from gems and common stones to those made with potent mineral poisons. Drawing on a tradition going back to Pliny, he believed that a sapphire, when turned around a pestilential bubo or lesion, would grow dark as it absorbed the poisonous miasms of the infected body. But Helmont, like Croll, preferred to seek remedies affordable to the poor. Indeed, he had learned from a Spanish surgeon that a piece of common red amber, when rubbed against the veins of the wrist for the length of seven pulses and then applied to the temples, insteps, and left breast, was also an effective preservative against plague.¹² Though Helmont had acquired his recipe from the unnamed Spaniard, he devised his own explanation of its operation: amber possessed a natural tractive force

11. Johannes Hartmann, editorial remarks in Croll, *Bazilica chymica* (n. 9), pp. 170–71. While I cannot verify the validity of Hartmann's attribution of the amulet to Berengario da Carpi (1460–1530), it is quite probable that this well-respected anatomist and physician treated Pope Adrian (who served briefly as pope in 1522–23). We do know that Berengario attended other popes, including Julius II, Leo X, and Clement VII. Berengario da Carpi's works were available in seventeenth-century editions. On Hartmann see Bruce T. Moran, *Chemical Pharmacy Enters the University: Johannes Hartmann and the Didactic Care of Chymiatry in the Early Seventeenth Century* (Madison, Wis.: American Institute of the History of Pharmacy, 1991) and Bruce T. Moran, "Court Authority and Chemical Medicine: Moritz of Hessen, Johannes Hartmann, and the Origin of Academic Chemiatry," *Bull. Hist. Med.*, 1989, 63: 225–46.

12. Johannes Baptista van Helmont, "Butlerus" in *Ortus medicinae* (Lyon, 1647), pp. 358–65.

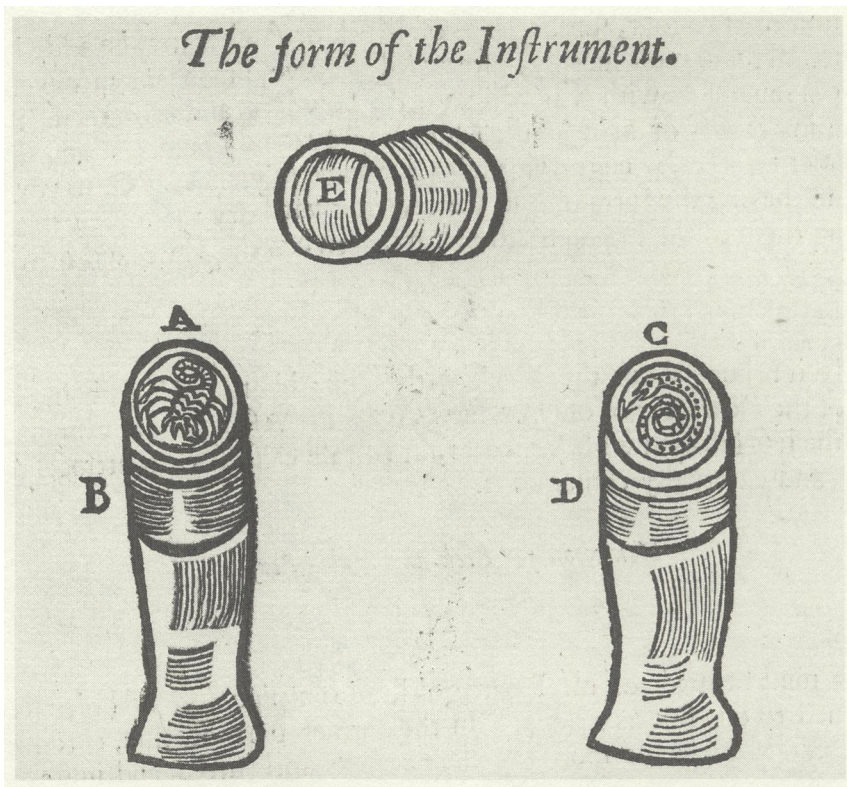


Fig. 1. Both figures 1 and 2 are reproduced from the English edition of Oswald Croll's *Basilica Chymica*, which was entitled *Bazilica Chymica & Praxis Chymiatricae or Royal and Practical Chymistry in three treatises. Wherein all those excellent medicines and chymical preparations are fully discovered, from whence all our modern chymists have drawn their choicest remedies. Being a Translation of Oswald Crollius his Royal Chymistry, augmented and enlarged by John Hartman. To which is added his Treatise of Signatures of Internal things, or a true and lively anatomy of the greater and lesser world. As also the Practice of Chymistry of John Hartman M.D. augmented and enlarged by his son. All faithfully Englished by a Lover of Chymistry* (London, 1670). Figure 1 (p. 135) depicts an amulet made of a cylindrical steel case into which are placed "plague cakes" concocted of various pharmaceutical ingredients, notably pulverized toads. The cakes themselves are imprinted with the seal of scorpion, which depicts the requisite position of the zodiac when the instrument is fabricated if it is to be effective. Croll considered it necessary to pay attention to the proper celestial position, "for so the superiors with the inferiours in sympathal undissolvable union are conjoynd and united" (p. 135). Reprinted by permission of the Houghton Library, Harvard University.

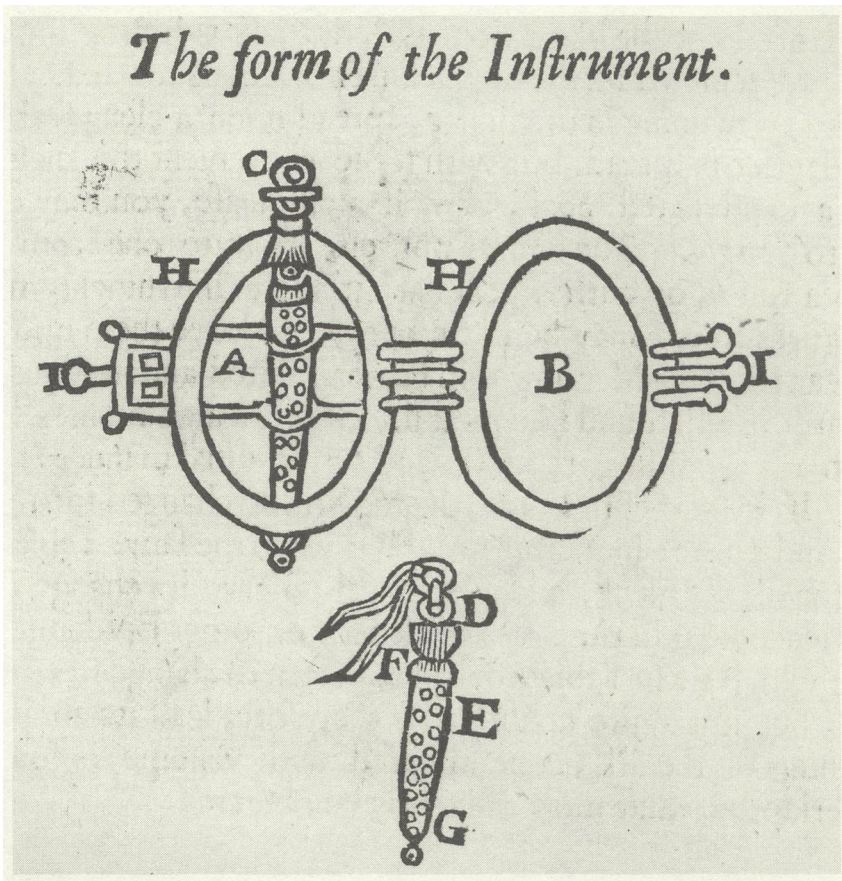


Fig. 2. This plate (p. 137) depicts a far more elaborate amulet for those threatened with plague and Croll says specifically that it is for rich and noble persons. In addition to the inexpensive pulverized toads, this amulet requires gold, sapphire, and precious gems for its fabrication. The zenechta or plague amulets were also illustrated in earlier editions of Croll's work. See his *Basilica chymica* (Frankfurt, 1622) p. 238 and p. 242; the French translation of 1634 (*La Royale Chymie de Crollius*. Traduite en Francois par I. Marcel de Boulene [Rouen, 1634]) has the zenechta illustrations on p. 401 and p. 406. The fact that these plague amulets are the only textual illustrations in Croll's book further underscores their importance. Reprinted by permission of the Houghton Library, Harvard University.

resembling that of a magnet,¹³ which operated on many light substances, including the mumial ferment or mumial odor, in which the seeds of pestilence lodged.

Helmont also modified Croll's toad amulets and bitterly criticized Paracelsus for the imprecision and secrecy of his recipe—he had not specified at what time of year and in what lunar phase the toads should be collected. Furthermore, Helmont dismissed as mendacious Paracelsus's report that dried toads placed on top of pestilential buboes became swollen with the poison they extracted from the patient's body and the surrounding infected air.¹⁴

Helmont's own recipe for a zenexton involved concocting a paste from worms that lived parasitically in toads' eyes, along with matter vomited by toads kept suspended upside down for three days under a waning moon in July. Helmont's explanation of how his zenexton operated centered on toads' innate fear of men, a fear that imprinted itself on the archeus (or organizing principle) of the disease and killed the ferment of the pestilential poison.¹⁵

Helmont firmly rejected all the providential causes of plague and all the astral origins of pestilential effluvia which Croll had endorsed. Thus, he specifically condemned amulets and talismans inscribed with the images or names of God or Jesus Christ, as well as those engraved with astral or planetary images.¹⁶

Helmont's toad amulet in particular, and his medical works in general, aroused sustained interest during his century. When plague swept certain major cities of Italy in 1656, references to Helmont's zenexton appeared in the works of two major figures who witnessed and survived the plague at Rome. The first of these, Cardinal Geronimo

13. Magnetism, for Van Helmont and for many seventeenth-century writers, had little to do directly with lodestones; rather, it was an occult, invisible power through which one body could affect another without contact. Explanations about how such magnetic actions operated were rarely specific and magnetic remedies were commonly conflated with those operating by sympathy or attraction. Van Helmont's concept of magnetic action at a distance directly influenced that of Kircher (see below). On seventeenth-century concepts of magnetism, see Walter Pagel, *Joan Baptista van Helmont: Reformer of Science and Medicine* (Cambridge: Cambridge University Press, 1982); Allen G. Debus, "Robert Fludd and the Use of Gilbert's *De magnete* in the Weapon-Salve Controversy," *J. Hist. Med. Allied Sci.*, 1964, 19: 389–417; Martha Baldwin, "Athanasius Kircher and the Magnetic Philosophy" (Ph.D. diss., University of Chicago, 1987), pp. 359–405. Mechanists, leaning heavily on Descartes's explanation of magnetic actions, used the term *magnetism* in a completely different sense.

14. Van Helmont, *Tumulus pestis* (n. 12), p. 184.

15. *Ibid.*, p. 185.

16. *Ibid.*, pp. 181–82.

Gastaldi, had been appointed by Pope Alexander VII to supervise all quarantines, trade restrictions, food provisions, and pesthouses for the infected city. He cited Helmont's toad dust as among the most effective preservatives used by the priests, monks, and physicians who attended the sick and dying in the lazaretto.¹⁷ In his account of the administration of the Holy City besieged by plague, Gastaldi laconically reduced Helmont's explanation of the remedy's operation to a certain sympathy between toad and plague.

The Jesuit Athanasius Kircher, the second major figure to cite Helmont's zenexon, also wrote an account, entitled *Scrutinium physico-medicum contagiosae luis quae pestis dicitur*, of the 1656 plague at Rome. Here he, like Helmont, severely condemned amulets inscribed with scriptural verses, crosses, Hebrew letters, or magical numbers. He warned his reader that such objects were proscribed by the Roman Catholic Church because their effectiveness, which he did not deny, was due to the devil's impious cooperation with the engraver, who had used graven images to command spiritual forces, and with the wearer, who had misplaced his faith.¹⁸

With far greater vehemence than Helmont, Kircher attacked arsenic- and mercury-based amulets, which he believed to be dangerous if not lethal. Though Kircher approved of Helmont's toad zenexon, he believed that many antidotes to pestilential vapors were still undiscovered. Like Gastaldi, Kircher preferred his own simpler explanation of Helmont's remedy, an explanation based on the doctrine of signatures and on an occult theory of magnetism.

Kircher believed the toad to be an appropriate remedy because its tuberous and swollen skin corresponded to the swellings, lesions, spots, and carbuncles on the skin of the plague victim, and because the toad's preference of worms as its favorite food corresponded to the existence of intestinal worms in plague victims. Moreover, the miraculous appearance of large numbers of toads born spontaneously underground immediately before the outbreak of a plague epidemic was another sign that indicated to the observant natural philosopher the toad's special affinity for pestilence.¹⁹

Kircher argued that the toad amulet worked because the toad's innate hatred of men caused it to pour forth invisible poisons from

17. Hieronimo Gastaldi, *De avertenda & profligenda peste* (Rome, 1673), pp. 787–88.

18. Athanasius Kircher, *Scrutinium physico-medicum contagiosae luis quae pestis dicitur* (Rome, 1658). Kircher also attacked magical belief in amulets in his *Arithmologia, sive, de abditis numerorum mysteriis qua origo, antiquitas & fabrica numerorum exponitur* (Rome, 1665), pp. 216–25.

19. Kircher, *Scrutinium* (n. 18), pp. 199–201.

its mouth into the surrounding air. This poison, strengthened and vivified in Helmont's toad amulet, acted magnetically on the pestilential poisons and attracted and held them tenaciously to the amulet itself.²⁰

Though Helmont's toad recipe was the most detailed of those offered during the seventeenth century, Helmont was by no means alone in advocating the iatrochemical preparation of toads. A contemporary, Pierre Jean Fabre, a physician trained in Montpellier, noted in his *Panchymicum* of 1646 that toads harbored a secret for extinguishing all poisons, but that it was first necessary to convert the animals into ashes by a strong fire, to soak the ashes in chemical waters, and to extract a salt from this. When taken internally, this medicine would purify the blood that plague had corrupted.²¹ Many others, including Daniel Sennert, Rudolf Goclenius, and Matthias Untzer, also devised their own variations of toad amulets and medicaments, all based on explanations of sympathy, occult forces, and correspondences between pestilential spirits and the occult qualities of toads.²² Like Helmont, many of these men called attention to the role of fear—the toad's fear of men, and men's fear of outbreaks of plague in their communities.

There were other seventeenth-century physicians and natural philosophers who sharply *opposed* the view that occult spirits and sympathetic actions were the reasons for amulets' effectiveness, but who endorsed the efficacy of amulets as both prophylactic and remedy in plague and other diseases. Robert Boyle, the heralded father of chemistry and exponent of the mechanical philosophy, spared no weapons in attacking occult principles in his *Sceptical Chymist*, and countered that all chemical phenomena were explicable in terms of the size, shape, and motion of material particles. But though Boyle may have rejected the theoretical explanations for various therapies of specific diseases propounded by the occult philosophers, he kept intact most of these philosophers' remedies. Not trained as a physician, but keenly interested in using the viewpoint of the corpuscular natural philosophy to improve medicine, Boyle wrote frequently on medical subjects. He shared the iatrochemists' enthusiasm for medical reform, and the conviction that natural philosophers could discover how to manufacture affordable and effective pharmaceuticals out of common, even scorned, ingredients, such as parsley, common ink, the smoke of burnt

20. *Ibid.*, p. 202.

21. Pierre Jean Fabre, *Panchymicum sive anatomiae totius universii* (Paris, 1646), pp. 629–31.

22. Daniel Sennert, *De febris libri iv* (Lyon, 1627), pp. 803–6; Rudolf Goclenius, *De pestis febrisque pestilentis causis* (Marburg, 1607), pp. 69–75; Matthias Untzer, *De Lue Pestifera libri tres* (Halle, 1615), pp. 189–96.

feathers, horse manure, and insects.²³ Like other medical reformers, he claimed that university-trained physicians had much to learn from the humble practitioners of folk medicine.

Boyle preferred the externally applied medicines of the occult philosophers to the more painful and violent purgatives and evacuants used by traditional Galenic physicians. He believed that amulets of powdered toad cured urinary incontinence, while amulets of excised kidney stones, when tied to the wrists, relieved pain caused by stones in the kidneys.²⁴ He cited the case of a friend who had been cured of violent cramps by wearing and handling the tooth of a hippopotamus.²⁵ He had seen cases where plague had been cured, and cases where plague had been averted, by drinking an extract of horse dung and rotting ivy berries.²⁶

Boyle attributed the efficacy of amulets to the invisible material effluvia exuded by the chemical or animal substance contained in the externally applied medicine. Such particles entered through the pores of the skin, then passed into the blood and circulated throughout the body until they reached the diseased part, where their shape caused them to produce a lasting alteration in the textures of the body. Because various ferments resided in localized parts of the body, the size, shape, and motion of tiny corpuscles of the medicine could cause these ferments to make significant alterations in the local parts. At times the corpuscles of the amulets acted corrosively on other corpuscles, dissolving diseased corpuscles that were choking up the slender internal passages of the blood; in other circumstances the amulet's corpuscles would cling to and strengthen the weakened fibers of the body and thicken the blood. Whereas some specifics operated by precipitating the morbid matter out of the blood, yet other amulets induced the blood to reject the disease in some other manner.²⁷ Whatever the imagined mechanism of the medicinal corpuscles, Boyle maintained that material effluvia from the amulets entered the bloodstream via the capillaries lying close to the skin. Though he believed it to be

23. Robert Boyle, *The Works of the Honourable Robert Boyle*, ed. Thomas Birch, 2d ed., 6 vols. (London, 1772), esp. Boyle's "Of the Reconcilableness of Specific Medicines to the Corpuscular Philosophy," 5: 74–108; "The Advantages of the Use of Simple Medicines," 5: 109–29; and "Of the Usefulness of Natural Philosophy," 2: 5–246, see esp. pp. 113–32.

24. Boyle, "Usefulness of Natural Philosophy" (n. 23), 2: 160, 156.

25. Boyle, "Reconcilableness of Specific Medicines" (n. 23), 5: 104.

26. Boyle, "Usefulness of Natural Philosophy" (n. 23), 2: 130.

27. Boyle describes the corpuscular action of toxins inside the body and the body's response in "Usefulness of Natural Philosophy" (n. 23) 2: 190–93; "Reconcilableness of Specific Medicines" (n. 23) 5: 103–4; and "Advantages of the Use of Simple Medicines" (n. 23) 5: 126–28.

within the confines of reason for a philosopher living before Harvey's great discovery to have doubted the action of amulets, he held it indefensible for any contemporary to do so.²⁸

Boyle also contrived a mechanical etiology of plague, an etiology that involved the presence of invisible and poisonous subterranean mineral exhalations. He was quite familiar with the literature on mining, mining damp, and the toxic illnesses suffered by those working below ground, and he knew well the lethal qualities of certain minerals. When he explained why plague killed some victims yet spared others, he appealed to the unequal distribution of the invisible noxious particles and to their unequal dispersement within equal volumes of air. Despite his high praises for amulets and externally applied medicines, he was cautious about recommending arsenic-based amulets as a protection against plague, for he knew of cases in which the poisonous remedy had proved harmful, and sometimes fatal. He preferred the application of a chemical plaster to the carbuncles, or the drinking of sea salt dissolved in water, treatments far milder than the wearing of a powerful poison directly over the heart.²⁹

Other physicians and natural philosophers developed similar corpuscular or material explanations of amulets' efficacy in protecting against and curing diseases. Thomas Bartholin (1615–80), the most distinguished physician in Denmark and the recognized discoverer of the lymphatic system, also defended the use of amulets. He believed that they operated "by an external species of vapors and atoms attracted either through the respiration or through open pores of the skin";³⁰ and he used this reasoning to support amulet therapy. He approved the use of an amulet of elk horn to calm the convulsions of an epileptic; another of frogs' skin to cure urinary incontinence; and one made of the liquid drained from a human skull to stanch nosebleeds. Bartholin felt that his approval of common amulets needed no defense, for "there are a thousand other amulets whose virtues happily are recognized by the consensus of physicians."³¹ William Boghurst, a London apothecary who treated the sick throughout the plague of 1665–66, also left a corpuscularian etiology of the plague. "Those who have outgrown Aristotle and are acquainted with the Epicurean or corpuscular philosophy" could readily see that "this

28. Boyle, "Reconcilableness of Specific Medicines" (n. 23), 5: 103–4.

29. Robert Boyle, "An Experimental Discourse of Some Unheeded Causes of the Insalubrity and Salubrity of the Air," in *Works*, 5: 38–70; see esp. 5: 43–50.

30. Thomas Bartholin, *Historiarum anatomicarum rariorum centuria III et IV* (Copenhagen, 1657), p. 122.

31. *Ibid.*

venome is a body or a concretion of many little bodyes, though very subtile and invisible.”³² Boghurst turned to the famous French philosopher Pierre Gassendi as his authority on the propagation of pestiferous corpuscles in the air and within the humors of the body. Though Boghurst lamented that even the best of microscopes did not allow men to see the material particles of pestilence, which must be imagined from their effects, he speculated that the peculiar shapes of such particles gave them the power to alter and compose the spirits and the blood of a plague victim.³³

The celebrated English physician and physiologist Thomas Willis wrote a work of 1659, *De febribus*, in which he, too, gave corpuscular explanations of amulets’ ability to preserve the wearer from the poison of plague. He argued the “atomical” bodies emerging from the amulets had shapes congruent with those of particles of the pestilential infection. The atoms exuded from such amulets “by reason of the likeness of their shapes,” “allured the pestilential particles out of the infected patient’s body, into their embraces” and freed the infected person from the infection.³⁴ Hence Willis commended the use of amulets made from arsenic, quicksilver, the powder of toads, and other poisons as effective prophylactics against plague.³⁵

Standards of Evidence

This account by no means exhausts the seventeenth-century medical literature on plague and amulets; rather, I hope that it establishes that amulets were an accepted and traditional part of the treatment of plague and that the use of this therapeutic could be justified according to the various competing or alternative natural philosophies of the age. Amulets were not without their gainsayers during the century, but those who denied their efficacy on theoretical grounds were very few indeed. More commonly, their challengers objected to the potentially pernicious effects of wearing violent poisons close to the heart,

32. William Boghurst, *Loimographia: An Account of the Great Plague of London in the Year 1665* (New York: AMS Press, 1979), p. 10.

33. *Ibid.*

34. Willis’ treatise on fevers, *De febribus* appeared in 1659 as *Diatribae duae medico-philosophicae* (London, 1659). I have consulted a posthumous edition of Willis’ collected works which was translated into English and entitled *Dr. Willis’s Practice of Physick, being the whole works of that renowned and famous physician* (London, 1684). Here “On Feavers” is paginated separately, pp. 1–152; see p. 108.

35. *Ibid.*, pp. 108–13. Willis also approved the quite common practice of opening a vein to prevent the blood’s overheating and to permit diseased matter in the blood to exit easily from the body.

an objection that even amulets' most ardent champions acknowledged. Physicians' ingrained prejudice in favor of amulets to ward off plague was so great that when, at the beginning of the century, Francis Hering, a Cambridge-trained physician and a fellow and officer of the College of Physicians, wrote a work challenging the remedy as ineffectual, he complained that his stance on the issue had earned him the social and professional ostracism of physicians, surgeons, and apothecaries.³⁶

Regardless of their theoretical defenses of amulets, seventeenth-century natural philosophers and physicians were keenly interested in accumulating evidence to justify their theories. Most took seriously their task of documenting amulets' efficacy by reference to actual experience or case studies. Since readers of later centuries dismiss the efficacy of the remedy without hesitation, these writings on amulets are particularly revealing about early modern standards of evidence in medicine and natural philosophy.

Most of the writers discussed above had direct, hands-on experience with plague epidemics. Helmont had applied toads to plague victims during his practice at Vilvord, and when he condemned the use of arsenic-based amulets in times of plague he spoke as one who had seen hundreds of soldiers wearing arsenic-based amulets lying dead of plague in a military garrison outside Brussels. Similarly, Bartholin had witnessed the outbreak of plague in Copenhagen in 1645, and Kircher and Gastaldi that in Rome in 1656. In London, Willis had witnessed the plague of 1645, Hering that of 1604, and Boyle and Boghurst that of 1665–66.

In addition to encounters with plague epidemics, a writer's personal experience with sickness undoubtedly shaped his ideas on the use of amulets. Robert Hooke, the famous experimenter of the Royal Society, was passionately interested in his own incessant maladies and those of his friends. He noted in his diary that his friend Christopher Wren had tied an amulet of bog-lice (or millipedes) around Mrs. Wren's neck to give her some relief from thrush, a mouth infection.³⁷ Robert

36. Francis Hering, *A Modest Defense of the Caveat Given to the Wearers of Impoisoned Amulets as Preservatives from the Plague* (London, 1604). Complaining of the rejection he had suffered because of his opposition to arsenic-based amulets, Hering wrote, "As a result of my dispute with them [physicians, surgeons, and apothecaries], they have shut me off, and slandered me. I have been discourteously and hardly intreated, rejected and shut out from conference" (p. 36). Hering's reference to apothecaries tells us that members of this profession commonly sold the amulets, or "plague cakes," in their shops.

37. Robert Hooke, *The Diary of Robert Hooke*, ed. Henry W. Robinson and Walter Adams (London: Taylor & Francis, 1935), p. 307.

Boyle described himself as being of a frail and weak constitution and constantly prone to sickness. He recorded that he had been cured of a violent quotidian fever by amulets made of basalt, hops, and a quarter pound of blue currants tied upon his wrists.³⁸ Chronically subject to violent nosebleeds, Boyle recounted one incident in which he had been afflicted in this manner while visiting his sister's house. As she happened to have on hand some moss from a dead man's skull (it had been sent her as a present from Ireland, where it was esteemed a useful remedy), Boyle tried the remedy on himself. But rather than stuffing it up his nostrils, as was the custom, he chose to hold it in his hand. Covering the moss with his fist "that the warmth might a little actuate the medicine," he found that the nosebleed stopped speedily, much to the wonder of the bystanders. Moreover, he recounted that he had not been troubled with a nosebleed for several years following the use of the moss.³⁹ On another occasion, Boyle tried to cure himself of leg cramps by wearing a ring made of elk's hoof provided him by a physician. Boyle candidly reported that the remedy had failed to help his leg cramps, but noted that it had in fact relieved more moderate cramps in his hands and that it was his habit to keep the ring at his bedside for times when the finger cramps returned.⁴⁰

In addition to taking note of their personal encounters with illness, all of these seventeenth-century writers uncritically accepted the narrative accounts of other physicians, both ancient and modern. Many cited Galen's commendation of the peony root amulet to prevent and relieve epileptic fits. Though Boyle believed that modern physicians should not be confined to Galenic and Aristotelian orthodoxies, he happily quoted the ancients to support his arguments. Robert Burton's popular *Anatomy of Melancholy* (1621) offers a particularly illustrative example of the persuasive force of evidence cited by learned men. Burton wrote that he had dismissed cures by amulets as the superstitious practice of midwives and ignorant farmers until he had actually observed his mother, a local wise woman in Leicestershire, cure someone of an ague by means of an amulet made from a spider shut inside a filbert-nut shell. But ocular evidence alone was insufficient to convince Burton, who continued to think the experiment "most absurd and ridiculous." It was not until he found that the cure was approved by learned and respected authorities such as Dioscorides, Matthioli,

38. Boyle, "Usefulness of Natural Philosophy" (n. 23), 2: 200, 157.

39. Boyle, "Reconcilableness of Specific Medicines" (n. 23), 5: 106.

40. *Ibid.*, 5: 104.

and Aldrovandi that he accepted the evidence of experience.⁴¹

The seventeenth-century habit of marshaling all the printed evidence on a particular medical debate reached its acme in the work of Jacob Wolff (1642–94), a physician and professor of medicine at Jena. In 1690 Wolff published his catalog of all diseases ever treated by amulets, and exhaustively cited all the extant literature on the subject. Another German, Pieter Friedrich Arpe, repeated Wolff's attempt to amass all the written evidence on amulets, and published in 1717 his *De prodigiosis naturae et artis operibus talismanes et amuleta*.⁴²

Though the testimony of ancients was accepted, the testimony of the most recent physicians was especially valued. Helmont acknowledged that he was indebted for his toad recipe to one "Hibernus Butlerus," an Irishman being held prisoner in the castle at Vilvord. Helmont esteemed Butler, who claimed to have cured several thousand men and women of plague at London in 1625. Helmont appears to have given complete credence to Butler's account, since he had witnessed the Irishman's marvelous cure of a fellow prisoner's erysipelas, a disease completely unrelated to plague. Though Butler left prison before teaching Helmont all his recipes, Helmont believed he had been truthful in his tales.⁴³ Nor was Helmont the only one of his contemporaries who believed in Butler's accounts: the early correspondence of Henry Oldenburg reveals the efforts of physicians in Montpellier and Languedoc to replicate Butler's vaunted remedies.⁴⁴

This unquestioning reliance upon the testimony of fellow physicians for truth about amulets was also seen in the work of Johannes Zwelfer (1618–68), a physician practicing in Vienna, who attempted to reform the traditional pharmacopeia used throughout Germany. When Zwelfer published his *Pharmacopeia Augustana Reformata cum Animadversionibus* in 1653, he cited the evidence sent him by the royal physician

41. Robert Burton, *The Anatomy of Melancholy*, ed. Holbrook Jackson (New York: Vintage Books, 1977), 2: 250.

42. Pieter Friderich Arpe, *De prodigiosis naturae et artis operibus talismanes et amuleta* (Hamburg, 1717).

43. Johannes Baptista van Helmont, "Butlerus" (n. 12). Identifying Butler has defied even the most painstaking Helmont scholars. See Robert Halleux, "Helmontiana," *Mededelingen van de Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België*, 1983, 45: 35–63, p. 39 (n. 21). Halleux's studies show that Helmont also claimed that his wife had been cured of plague by Butler. Apparently Helmont successfully intervened with the authorities to get Butler freed.

44. On the dissemination of Butler's cures in English circles via the Oldenburg network, see *The Correspondence of Henry Oldenburg*, ed. and trans. A. Rupert Hall and Marie Boas Hall (Madison: University of Wisconsin Press, 1965), 1: 219, 234, 236–37, 239, 241, 252, 254, 349–50, 362.

of the states of Moravia, Joannes Irmbler, who had recently treated plague victims there. Irmbler related to Zwelfer his careful but foiled attempts to reproduce exactly Helmont's toad amulet. But Irmbler had been unable to induce vomiting in the suspended toads and had been forced to substitute toad feces in place of the vomited matter. With this one exception, Irmbler then followed Helmont's recipe precisely. Zwelfer, impressed with Irmbler's precision, accepted the veracity of his report that all the plague victims on whose carbuncles he had placed the powdered toad amulet had recovered, and published it in full. Irmbler also reported that his friends, family, and domestic servants who had worn the amulets had all avoided infection.⁴⁵

Wishing to cast their nets yet wider for proof of remedies acclaimed by others, seventeenth-century physicians and natural philosophers also elicited and reported accounts from their friends and acquaintances. In judging the trustworthiness of such reports, they commonly relied on indications of the observers' social class. For instance, in 1680, when Denis Dodart, a member of the Académie Royale des sciences, published in the *Journal des Scavans* an account of a man who had avoided contracting the plague then rampant in Turkey by wearing four dried toads in his armpits and groin, he made it clear that this was the testimony not of a swarthy and unbathed Turk but of a fellow Frenchman and man of learning residing in Smyrna.⁴⁶

Similarly, Boyle was content to accept wholeheartedly almost any evidence presented by his friends, and he unflinchingly gave credence to reports by fellow aristocrats. Thus, when he condemned arsenic amulets as too dangerous, he cited an unfortunate case involving not a commoner but a young noble who had so overheated his body on the tennis court that he was killed when the poisonous effluvia from his amulet had entered too copiously into the wide-open pores of his skin.⁴⁷

Though Boyle paid lip service to the belief that learned men should seek remedies from folk medicine, he felt compelled, when citing the case of a woman cured by a gypsy's tying a toad amulet around her neck, to strengthen the credibility of his account by adding that the remedy had also been successfully used by a physician treating "exquisite persons." In justifying his use of second-hand reports, Boyle wrote, "If these stories were related by *ordinary* persons of what hap-

45. Johannes Zwelfer, *Pharmacopeia Augustana Reformata cum Animadversionibus* (Dordrecht, 1672), pp. 614–15.

46. As cited in Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols. (New York: Columbia University Press, 1958), 8: 209.

47. Boyle, "Experimental Discourse" (n. 29), 5: 62.

pened to other men, the oddness of them might well tempt a wary man to suspend his judgment; but the judiciousness of the writers and the professions they were of, and their relating these as things that did more than a few times happen to themselves, may well be permitted to bring credit to their assertions."⁴⁸

Given this willingness to accept completely reports of physicians working marvelous cures, it is not surprising to find almost no call to test the toad amulets by controlled experiments. One exception was Israel Tonge, an Oxford-educated cleric and English provincial gentleman who contributed notes about the motion of sap in trees, and other matters, to the *Philosophical Transactions* of the Royal Society. In 1670 Tonge wrote to Oldenburg about Helmont's toad amulet. Tonge had encountered difficulties in replicating Helmont's recipe, and he proposed further experiments on the matter to "the Ingenious fellows of the Royal Society," as he had discovered that "a toads pisse is so hot yt it will scorche a glove whereon it falls as a live coale would doe if laid thereon."⁴⁹ Tonge suspected that toad urine and toad dung were potent enough to produce by themselves the desired cure and prevention of plague. He wanted his hypothesis to be tested by experiments conducted by the Royal Society, and he called for comparisons of his simple remedy with Helmont's more elaborate recipe, which called for pulverized whole toads. However, despite the widespread acceptance of toad amulets by physicians and natural philosophers, Tonge's call for the test of experiment fell on deaf ears. There is no evidence that his project ever aroused interest among other members of the Royal Society; but Tonge could not have known that the 1665 outbreak of plague would prove to be the last of the century in England.

Conclusion

Lest we judge physicians and natural philosophers of the seventeenth century by standards of the twentieth century, we might do well to remember that all these men conceded that no medicine was universally effective. This may well explain their willingness to accept as valid a remedy that may well have failed a great proportion of those employing it. Boyle believed that remedies that worked externally should be subject to tests of efficacy no greater than those used for standard internal medicaments, and these medicaments were notoriously ineffective. Moreover, many of these seventeenth-century phy-

48. Boyle, "Usefulness of Natural Philosophy" (n. 23), 2: 160.

49. Tonge to Oldenburg, *Correspondence of Henry Oldenburg* (n. 44), 1: 27.

sicians, notably Helmont and Willis, were well aware that fear played a role in the contraction of plague and that sheer confidence in a remedy contributed in some unspecified way to avoiding contagion. Like his contemporaries who opposed the straitjacket of orthodox Galenic medicine, Boyle believed that contemporary medical therapy was in greater danger from the evil of excessive rigidity than from excessive credulity. And Thomas Willis noted that when dealing with plague, physicians and patients generally used many remedies simultaneously: Galenic internal medicaments, Paracelsian mineral-based drugs, purgings, and bloodlettings were used together with amulets. Unquestionably this made the evidence of experience difficult to assess.

Within the span of the seventeenth century, the only significant change that one sees with respect to the therapeutic use of amulets is the rejection of amulets inscribed with words or biblical verses. Such amulets became universally decried as magical, superstitious, demonic, or ineffective; but this was not particularly novel, because the same objections had been raised by the early Fathers of the Church and by some of the Neoplatonic philosophers of the late fifteenth century.

Though the theoretical explanations of the action of amulets broadened significantly during the course of the century, the therapeutic use of amulets seems to have been as common at the end of the century as it was at the beginning. In their acceptance of amulet therapy, early modern physicians and natural philosophers struggled to fit the evidence of reported case histories into theoretical frameworks. Neither occult philosophers nor mechanists saw plague as directly caused by the hand of God. Both remained confident of the ability of human reason to grasp the underlying cause of the insensible, occult effects of externally applied medicines on the human body, no matter how baffling or mysterious these effects might appear to be. Mechanists saw the actions of amulets on diseases as occult or invisible, but they offered their own explanations of these occult natural phenomena. In devising new explanations for the efficacy of amulet therapy, mechanists came to include occult qualities as part of the experience of nature. Improvements and advancements in physiology and anatomy during the early modern period affected the discussion very little. Tonge's call to subject the toad amulet to rigorous experimental tests in the Royal Society went unheeded. Neither observation nor experiment proved powerful enough to overturn early modern physicians' deeply ingrained though faulty conceptual systems. The disappearance of Helmont's toad amulet in the eighteenth century owed more to the disappearance of bubonic plague from western Europe than to any fundamental change in the natural philosophy of early modern physicians.