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25. This article was written while I was the recipient of a John Simon Guggenheim Foundation Fellowship in residence at the University of Leiden. Help from Prof. F. Sobels, A. T. Natarajan, B. Leigh, J. H. Postlethwaite, and K. San-karanarayanan is gratefully acknowledged.

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Ergotism and the Salem Village Witch Trials

Records of the events of 1692 do not support the hypothesis that ergot poisoning was involved.

Nicholas P. Spanos and Jack Gottlieb

In a recent article in *Science* (1) it was suggested that the residents of Salem Village, Massachusetts, who in 1692 charged some of their neighbors with witchcraft did so because of delusions resulting from convulsive ergotism. The author of the article, L. R. Caporael, argued that (i) the general features of the Salem crisis corresponded to the features of an epidemic of convulsive ergotism, (ii) symptoms manifested by the girls who were the principal accusers were those of ergot poisoning, (iii) the symptoms shown by other accusing witnesses were also those of convulsive ergotism, and (iv) the abrupt ending of the Salem crisis suggests ergot poisoning. We shall attempt to show that these arguments are not well founded.

Features of Convulsive Ergotism Epidemics

Ergot is a fungus (*Claviceps purpurea*) that under some conditions infests rye and other cereal grains. When ingested the ergotized grain may produce a variety of cardiovascular effects leading,

among other things, to gangrene (gangrenous ergotism), or neurological effects leading, among other things, to convulsions (convulsive ergotism) (2-5). Epidemics of convulsive ergotism have a number of general features that differ substantially from the events that occurred in Salem.

According to Barger (2), epidemics of convulsive ergotism have occurred almost exclusively in locales where the inhabitants suffered severe vitamin A deficiencies. Ergot poisoning in individuals with adequate vitamin A intakes leads to gangrenous rather than convulsive symptoms. Vitamin A is found both in fish and in dairy products. Salem Village was a farming community and Salem Town, which bordered the village, was a well-known seaport; cows and fish were plentiful. There is no evidence to suggest a vitamin A deficiency in the diet of the inhabitants, and it would be particularly unlikely for the so-called "afflicted girls," some of whom came from well-to-do farming families. The absence of any instance of gangrenous symptomatology makes it highly unlikely that ergot played any role in the Salem crisis.

which would necessarily eliminate those cases with a broken or fragment Y chromosome lacking fertility factors.

18. E. Novitski, *Drosophila Inf. Serv.* **38**, 71 (1963).
19. B. Leigh and F. H. Sobels, *Mutat. Res.* **10**, 475 (1970); F. H. Sobels and B. Leigh, *ibid.* **12**, 100 (1971).
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Young children are particularly susceptible to convulsive ergotism. Barger states (2, p. 39):

All accounts of convulsive ergotism agree that children were more liable to convulsive ergotism than adults; thus 56 percent in the Finnish epidemic were under 10 years of age; 60 percent of Scirn's cases were under 15 years of age. . . .

Only 3 of the 11 afflicted girls at Salem were under 15 years of age and only one of those was under 10 (6, p. 57). There is no evidence either in the trial records or in eyewitness accounts to indicate a high rate of convulsive symptoms in the young children of Salem Village during the witch crisis (7-11). In fact we could find references to only two cases of convulsions in children under ten during the period of the crisis. One of these was the afflicted girl mentioned above. The other was an 8-week-old infant that convulsed before it died (11, vol. 1, p. 95). An 8-week-old infant would not yet have been weaned, and nursing infants do not suffer ergot poisoning even if their mothers have a very severe case of the disease (2, p. 38); it is therefore unlikely that this infant died from ergotism.

The fact that most of the individuals (including young children) living in the same households as the afflicted girls showed no symptoms is attributed by Caporael to wide individual differences in susceptibility to ergot poisoning. While there are wide individual differences in susceptibility to gangrenous ergotism, convulsive ergotism is another matter. According to Barger it was common for all members of a family to develop symptoms of convulsive ergotism during epidemics (2, p. 27). This tendency was so pronounced that convulsive ergotism was long (but erroneously) thought to be infectious.

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Convulsive ergotism characteristically produces the following symptoms: (i) vomiting, (ii) diarrhea, (iii) a livid skin color, (iv) sensations of heat and cold in the extremities, (v) spastic muscular contractions in the extremities, which in severe cases may become permanent sequelae, (vi) severe itching and tingling sensations, (vii) convulsions, (viii) a ravenous appetite following convulsions, (ix) death in severe cases (2, 3, 5, 12). Permanent dementia may also be a symptom in severe cases. Perceptual disturbances may occur, but such disturbances would not be expected to occur independently of the other symptoms (12).

Caporael says that "complaints of vomiting and 'bowels almost pulled out' are common in the depositions of the accusers" (1, p. 25). This statement is incorrect. *Records of Salem Witchcraft* (RSW) (11) contains 117 depositions by the afflicted girls and 79 depositions in which other witnesses describe the behavior of the girls. There are also eyewitness accounts by Mather (10), Lawson (9), Brattle (7), and Hale (8) which are not contained in RSW. We examined all these sources and were unable to find any reference to the occurrence of vomiting or diarrhea among the afflicted girls. In all these sources we found only three instances of gastrointestinal complaints among the girls (11, vol. 1, p. 106; vol. 2, p. 31). In one of these cases (11, vol. 1, p. 106) the girl making the complaint (Mary Warren) lived outside the area that Caporael suggested was exposed to ergot (13). Thus 8 of the 11 afflicted girls did not report any gastrointestinal symptoms. Those who did reported only a single instance. None of them reported vomiting or was observed to vomit, and there is no indication that any of them suffered from diarrhea.

We found no indication in any of the works examined that the afflicted girls manifested a livid color of the skin. We found no reference to cold sensations in the extremities, and only two references to burning sensations. In one of those cases an afflicted girl slowly reached out and touched the hood of an accused witch, then immediately pulled back her hand and "cried out, her fingers, her fingers burned" (14, vol. 2, p. 110). In the second case the judges had obtained a rag puppet which they believed had been used by a witch to afflict people at a distance. They burned the puppet in the presence of the afflicted girls with the following results: "A bit of one of the rags being set on fire (the afflicted) cried out dreadfully (that they were burned)"

(14, vol. 2, p. 216). Rather than ergot poisoning, these descriptions suggest that the afflicted girls were enacting the roles that would sustain their definition of themselves as bewitched and that would lead to the conviction of the accused.

According to Caporael, the afflicted girls' convulsions "appear to be epileptiform" and their reports of being bitten, pinched, and pricked by specters "may allude to the crawling and tingling sensations under the skin experienced by ergotism victims" (1, p. 25). There is no question that the girls frequently convulsed and reported being bitten and pinched. However, a careful look at the social context in which these symptoms were typically manifested belies the notion that they resulted from an internal disease process. The trial testimony indicates very clearly that the girls convulsed and reported being bitten and pinched when an accused person's behavior provided them with a social cue for such acts.

For example, when one of the accused was ordered to look at an afflicted girl, "he looked back and knocked down all (or most) of the afflicted who stood behind him" (11, vol. 2, p. 109). In another case, "As soon as she [the accused witch] came near all [the afflicted] fell into fits" (11, vol. 1, p. 140). The courtroom testimony contains a great many instances of the afflicted girls' convulsing en masse when the accused entered the room, looked in their direction, moved his chair, and so on (11). The afflicted girls' reports of being pinched, choked, and bitten are described thus by Lawson, an eyewitness (9, p. 156):

It was observed several times, that if she [the accused witch] did but bite her underlip in time of examination the persons afflicted were bitten on their arms and wrists and produced the marks before the magistrates, Ministers and others.

The afflicted also produced the pins with which the accused purportedly pinched them (9, p. 156).

The afflicted girls were responsive to social cues from each other as well as from the accused and were therefore able to predict the occurrence of each other's fits. In such cases one of the girls would cry out that she saw the specter of an accused witch about to attack another of the afflicted. The other girl would then immediately fall into a fit (11, vol. 1, p. 183). Termination of the girls' convulsions was also cued by social-psychological factors. In some cases convulsions would cease when a certain Biblical passage was read (9, p. 158). More

commonly the girls' convulsions would cease as soon as they were touched by the accused (7, p. 171).

Convulsions at the sight of a witch, alleviation of convulsions by the witch's touch, prediction of their own and others' convulsions, and production by the afflicted of bite marks and the pins used to pinch them were all considered standard symptoms in 16th and 17th century cases of demonic possession (15). Taken together, these facts indicate that the afflicted girls were enacting the role of demoniacs as that role was commonly understood in their day.

Caporael points out that one ergot alkaloid, isoergine (lysergic acid amide), has 10 percent of the activity of LSD and might therefore produce perceptual disturbances. She remarks that "the spectral evidence of the trials appears to be hallucinogenic symptoms and perceptual disturbances accompanying ergotism" (11, p. 25). The term "hallucination" is, unfortunately, very unspecific, and in the psychological literature is used to refer to a wide variety of distinct experiences (16). Although LSD is commonly referred to as a hallucinogen, Barber has correctly pointed out that "subjects who have ingested [LSD] very rarely report, when their eyes are open, that they perceive formed persons or objects which they believe are actually out there" (17, p. 109). Instead, they tend to report perceptual distortions such as persistent afterimages, rainbow-like colors, halos on the edges of objects, changes in depth perception, contours that appear to undulate, and the like. None of the testimony given by the afflicted girls indicates perceptual distortions of that kind. Instead, they reported seeing "formed persons"—the specters of the accused—attacking, biting, pinching, and choking them and others.

As to the remaining symptoms of ergot poisoning, none of the work we studied indicates that the girls experienced ravenous appetites after their convulsions, suffered permanent contractures of the hands or feet or other signs of permanent neurological damage, suffered permanent dementia, or died. It should be noted that the girls often appeared to be quite healthy outside the courtroom. Even in the courtroom they did not exhibit the signs of chronic malaise and debilitation that might be expected after months of chronic poisoning. Thus, Brattle wrote (7, p. 187):

Many of these afflicted persons, who have scores of strange fits in a day, yet in the intervals of time are hale and hearty, robust and lusty, as tho' nothing had afflicted them. I remember that when the chief Judge gave the

first Jury their charge, he told them, that they were not to mind whether the bodies of the said afflicted were really pined and consumed, as was expressed in the indictment; but whether the said afflicted did not suffer from the accused such afflictions as naturally tended to their being pined and consumed, wasted etc.

In summary, while the afflicted girls exhibited rather dramatic behavior, none of them displayed the syndrome of convulsive ergotism. Instead, they showed symptoms of "demonic possession," a phenomenon that was fairly common among 16th- and 17th-century Puritans in both England and Colonial America (18, 19).

It is worth noting that the initial symptoms of the afflicted girls were rather ambiguous, and that they began to correspond more closely to popular stereotypes of demonic behavior as the girls gained increasing exposure to information about those stereotypes. The initial symptoms included "getting into holes, and creeping under chairs and stools, and [using] sundry odd postures and antic gestures, uttering foolish and ridiculous speeches" (20, p. 342). About 2 weeks after these symptoms began a neighbor had a "witch cake" baked in order to determine whether the girls were bewitched. Only after this event did the girls begin convulsing and reporting the specters of witches (20, p. 342). As the witchcraft trials progressed, the girls added to the repertoire. They collapsed en masse when looked at by the accused during the first trial (11, vol. 1, p. 18). During the fourth examination they began complaining of being bitten whenever they observed the accused nervously bite her lip and of being pinched when she moved her hand (14, vol. 2, p. 48). In later examinations they began to mimic the accused; they held their heads in the same position as that of the accused (11, vol. 1, p. 87) and rolled their eyes up after the accused did so (11, vol. 1, p. 142). This temporal pattern suggests that the demonic manifestations were learned, that the girls' behavior was gradually (although perhaps unwittingly) shaped to fit the expectations for demonic behavior held by the community.

In Caprael's view, there is a "major difficulty in accepting the explanation of purposeful fraud . . . [namely] the gravity of the girls' symptoms" (1, p. 22). The implication of this statement is that the girls' performances somehow transcended the volitional capacities of normal, physically healthy people. Therefore it should be pointed out that numerous 16th-century English demoniacs who displayed all the symptoms manifested

by the Salem girls later confessed that they had faked these displays (21). They confirmed their confessions by publicly enacting all of their supposedly involuntary symptoms. These facts certainly do not prove that the performances of the Salem girls consisted entirely of conscious faking, but they do indicate that the girls' behavior can be accounted for without recourse to explanations based on unusual diseases.

Symptoms of Other Witnesses

Twenty-nine of the accused witches lived in or on the fringes of Salem Village or had moved from the village within a few years of the crisis (22, p. 375). Boyer and Nissenbaum (23) have pointed out that most of the accused lived in one half of the village and most of the witnesses who testified against them lived in the other half. They hypothesize that this geographical split in the pattern of accusations was to a large extent a function of political and social factionalism within the village. Caprael postulates that the accusing witnesses were exposed to ergot poisoning by their location while the accused were not exposed by theirs. She suggests that not only the girls but "many of the other accusers" had physical symptoms such as are "induced by convulsive ergot poisoning" (1, p. 25).

Records of Salem Witchcraft contains 111 depositions made by 80 different witnesses (not including the afflicted girls) against the 29 accused village residents. Trial records compiled by Boyer and Nissenbaum (22) include a deposition made by one of these witnesses that is not included in RSW. We examined these 112 depositions looking for behavior that, even in a broad sense, might possibly represent symptoms of convulsive ergotism. These symptoms, and the number of individuals who suffered from them, are shown in Table 1. Witnesses were excluded from this table if they reported that their symptoms occurred a year or more before the Salem crisis began (five cases), or while they were out of Salem and therefore not exposed to the supposedly ergotized grain (one case), or for some other reason could not have been exposed to ergot (one case—that of the 8-week-old infant referred to earlier). One of these excluded witnesses, John Londer, gave a colorful account of seeing a "thing" with a monkey's face and cock's feet (11, vol. 1, p. 160). Caprael specifically cites this testimony as a probable example of ergot poisoning (1, p. 25) despite the fact that

Londer stated explicitly that he had experienced the apparition 7 or 8 years before the outbreak of the Salem crisis.

The first fact uncovered by our examination was that 78 percent of the witnesses did not report suffering even a single symptom; only 18 reported suffering one or more symptoms after the ergotism is hypothesized to have begun. Most of the testimony consisted of observations made on the afflicted girls or other factual information (such as that the witness's cow died three days after the accused passed by his barn). Three witnesses testified about the death of one man and several testified about symptoms of three other individuals. Altogether, the testimony examined contained symptoms for 21 individuals other than the afflicted girls.

The first thing to note about Table 1 is that none of the witnesses reported a pattern of symptoms characteristic of convulsive ergotism. There is no evidence that any of them suffered vomiting, diarrhea, a livid skin color, permanent contractures of the extremities, a ravenous appetite, or perceptual disturbances (other than apparitions). In 10 of the 21 cases only a single symptom was reported. G. Cory reported a short-lived inability to say his prayers, and W. Putnam mimicked the gestures of one of the accused (he clenched his fist when she clenched hers and held his head in the same position as she did hers). These are obviously not cases of ergotism. In a third case, J. Putnam suffered briefly from "strange fits." The timing of these fits makes ergot an unlikely possibility. Caprael reasons that the village was exposed to ergotized rye by December 1691. Putnam reported having his fits in April 1692. It is unlikely that he would have been so late in succumbing to its effects.

In a fourth monosymptomatic case two of the afflicted girls testified that J. Holton was "tormented" by specters and that while they observed him the specters left him and began attacking them instead. Holton testified that he was immediately cured as soon as the girls reported that the specters had left him to attack them. Such an immediate alleviation of symptoms is obviously not characteristic of ergot poisoning.

In the other six monosymptomatic cases the witnesses each reported an apparition. These individuals all stated that on one or more occasions they saw a specter of some sort, usually the vivid image of an accused witch, a dead person, or an animal. All indicated belief that these imaginings were real events

rather than dreams (some occurred while they were in bed) or flights of fancy. However, none of these witnesses also reported perceptual disturbances (such as halos around objects). As was pointed out above, apparitions or perceptual distortions in the absence of other symptoms are not characteristic of ergot poisoning (13). The apparitions described by these five witnesses were very similar to apparitions that five other witnesses (not included in Table 1) said they had experienced several years before the hypothesized outbreak of ergotism.

The remaining 11 witnesses in Table 1 each exhibited more than one symptom. In two of these cases (Bittford and Gould) the witnesses' experiences consisted primarily of what were probably dreams or hypnagogic experiences. Both men reported being in bed at night when they saw apparitions of accused witches. Bittford testified that his experience was accompanied by a stiffness in his neck that lasted several days, and Gould said that he was pinched twice on his side. Gould also reported a second apparition, which was followed by a pain in his foot lasting 2 or 3 days.

Daniel Wilkins died after an illness that lasted about 2 weeks. The only symptom reported about his illness was that he appeared to be choking shortly before he died, and this was reported only after the afflicted girls testified that

they saw specters choking him. Wilkins did not show any sign of illness before the beginning of May 1692. For ergot to explain these events he would have had to be eating poisoned rye for 4 months without exhibiting any symptoms and then suddenly to have fallen ill and died in 2 weeks—a highly improbable occurrence.

Several symptoms are recorded for Wilkins's sister Rebecca, but she had not exhibited any of them until after a physician had diagnosed her brother's illness as preternatural and after the afflicted girls had reported seeing specters attack his body.

Another brother, S. Wilkins, reported an array of symptoms which included a pain in his hand, specters of a witch and of a black hat, falling off his horse, and a strong urge to run. None of them were experienced before June 1692.

Four persons, J. Doritch, J. Indian, T. Indian, and Mrs. Pope, displayed symptoms during the trials similar to those displayed by the afflicted girls. All convulsed and reported seeing specters that afflicted them or others. Mrs. Pope convulsed whenever an afflicted girl "saw" her about to be attacked by specters (14, vol. 2, p. 109), and J. Indian's convulsions could be terminated by the touch of a witch (14, vol. 2, p. 241). On one occasion Mrs. Pope also reported pain in her stomach whenever an ac-

cused witch "did but lean her Breast against the Seat" (9, p. 156). T. Indian eventually confessed that she had reported apparitions and enacted other symptoms because her master had beaten her and otherwise threatened her until she agreed to do so (20, p. 343).

E. Keysar is the only witness in all the Salem records whose testimony includes symptoms even vaguely resembling the perceptual distortions associated with LSD. Keysar reported that, while in a darkened room, he saw "strange things" that quivered (22, p. 75). This was immediately followed by seeing a quivering hand in his fireplace. Testimony of this type may be associated with acute anxiety and a host of other factors as well as with hallucinogenic substances. There are at least three reasons to infer that Keysar's experience was due to anxiety and expectation rather than to ergot: (i) he reported no other symptoms, (ii) the experience occurred in May 1692, five months after the time he would have begun ingesting ergot, and (iii) earlier that same day he had been severely frightened because he believed that an accused witch "did steadfastly fix [his] eyes upon me."

The final case, and the only one to exhibit as many as four of the symptoms listed in Table 1, is that of J. Bayley, who as Capraeal points out did not live in Salem Village. He and his wife had spent

Table 1. Symptoms of witnesses (other than the afflicted girls) who testified against the accused witches. A, vomiting. B, diarrhea. C, livid skin. D, permanent contractures. E, pain in extremities. F, death. G, temporary muscle stiffness. H, convulsions. I, ravenous appetite. J, perceptual disturbances (not including apparitions). K, apparitions. L, sensations of hot and cold. M, skin sensations (biting and pinching). N, stomach pain. O, choking sensations. P, temporary inability to speak. 1, symptom reported; 0, symptom not reported; ?, symptom questionable.

Reported sufferers	RSW (14) volume and page	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Total
W. Allan	1 38	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
J. Bayley	1 113	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	4
S. Bittford	1 108	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
A. Booth	2 180	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
J. Childen	1 92	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
G. Cory	1 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
J. Doritch	1 262	0	0	0	0	0	0	0	?	0	0	1	0	1	0	0	0	3
	2 179																	
B. Gould	2 178	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	3
J. Holton	1 71	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	1
J. Hughes	1 38	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
J. Indian	1 64	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
T. Indian	1 44	0	0	0	0	0	0	0	?	0	0	1	0	0	0	0	0	2
E. Keysar*	*	0	0	0	0	0	0	0	0	0	?	1	0	0	0	0	0	2
M. Pope	1 59	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	3
H. Putnam	1 275	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
J. Putnam	1 95	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	1
W. Putnam	1 96	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
D. Wilkins	2 7	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2
R. Wilkins	2 5	0	0	0	0	0	0	0	?	0	0	1	0	0	0	1	0	3
S. Wilkins	2 3	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	3
E. Woodwell	2 178	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Total		0	0	0	0	2	1	2	7	0	1	16	0	3	3	2	2	39

*This testimony may be found in (22), p. 75.

one evening . . . and left the next day. On their way out of the village they passed the house of a man and wife accused of witchcraft. Bayley reported that at this point he felt a blow to his chest and a pain in his stomach. He also thought he saw the accused witches (who were jailed at the time) near the house and then became speechless for a brief period of time. Shortly thereafter he experienced another blow to the chest and thought he saw a woman in the distance. When he looked again he saw a cow rather than a woman. After arriving at his home he reported feeling pinched and bitten by something invisible. His wife experienced no symptoms. Caporael says Bayley's testimony "suggests ergot" (1, p. 25). It seems far more plausible, however, that being a fervent believer in witchcraft he experienced an upsurge of anxiety as he approached the house of two convicted witches than that he ingested ergot during his stay in the village and by coincidence experienced the first symptoms of his poisoning as he happened to pass the witches' house.

Thus, the testimony of the witnesses who testified against the Salem Village witches does not support the ergot poisoning hypothesis. On the contrary, it tends to disconfirm it.

The End of the Salem Crisis

Caporael says that "the Salem witchcraft episode was an event localized in both time and space" (1, p. 25). The implication of this statement is that the episode was confined to the geographical area hypothesized to be affected by ergotized grain. However, by midsummer of 1692 individuals were being accused of witchcraft not only in Salem but also in the neighboring towns of Amesbury, Andover, Beverly, Billerica, Boxford, Charlestown, Gloucester, Ipswich, Salisbury, and Topsfield (11). The Salem crisis even spurred on witch accusations in Connecticut (24). No one has proposed that the spreading panic resulted from a concurrent spread of ergotized rye. It is therefore worth noting that the witnesses from neighboring towns who testified against their own local witches provided the same kinds of spectral testimony that are found in the Salem records. Andover even produced its own afflicted girl.

Caporael cites a "commonly expressed observation" that the Salem witch hunt, after escalating through the

summer of 1692, ended abruptly "for no apparent reason" (1, p. 25). Her own view is, apparently, that it ended abruptly because the village was no longer exposed to ergotized rye. She points out that, after the crisis had passed, some of the magistrates and jurymen experienced deep remorse and had difficulty comprehending their own behavior. She suggests that ergot may have altered their thought processes during the crisis and after they regained their senses they could not understand what had happened to them (1, p. 25).

It is important to point out that abrupt endings to large-scale panics about witchery were the rule rather than the exception. Midelfort, who has studied the many large-scale witch crises that occurred in 16th- and 17th-century Germany (25), describes the process. These crises commonly began with accusations against socially deviant and lower-class individuals. Accusations escalated quickly, and more and more prominent individuals who did not fit the popular social stereotype of a witch were accused. Inevitably, many people, including some of the prosecuting judges, became increasingly skeptical of the validity of the judicial procedures and the spectral evidence, and persons of standing took steps to bring the persecutions to an abrupt end. These crises were often followed by remorse and second thoughts on the part of some magistrates and other officials. The course of the Salem crisis was the same as that of the typical German crisis.

In summary: The available evidence does not support the hypothesis that ergot poisoning played a role in the Salem crisis. The general features of the crisis did not resemble an ergotism epidemic. The symptoms of the afflicted girls and of the other witnesses were not those of convulsive ergotism. And the abrupt ending of the crisis, and the remorse and second thoughts of those who judged and testified against the accused, can be explained without recourse to the ergotism hypothesis.

References and Notes

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- Four of the afflicted girls, S. Bibber, S. Churchill, E. Hubbard, and M. Warren, lived outside of the area supposedly exposed to ergot, and the place of residence of two others is uncertain. Caporael (1, p. 24) offers post hoc speculations concerning how three of these girls might have been exposed to ergot, but provides no unambiguous evidence to support her views. For instance, she cites a document indicating that Mary Warren stayed overnight in the village and might, therefore, have eaten ergotized food. She does not mention, however, that the same document (1, vol. 1, pp. 63-64) clearly indicates that Mary was experiencing her symptoms before spending the night in the village. In short, there is no evidence that 6 of the 11 afflicted girls were exposed to the supposedly ergotized grain before they began exhibiting symptoms.
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- The great popularity of Increase Mather's "Illustrious Providences" may be cited as an example of the widespread Colonial interest in demonic possession. In this work Mather discussed the case of Ann Cole of Connecticut in 1662 and that of Elizabeth Knapp of Groton, Mass., in 1671. He also discussed numerous other "preternatural happenings" in both old and New England [An Essay for the Recording of Illustrious Providences" (originally published in 1684), in *Narratives of the Witchcraft Cases 1648-1706*, G. L. Burr, Ed. (Scribner's, New York, 1914)].
- More or less simultaneous occurrences of "demonic possession" in a group of children or adolescents were by no means rare in the 16th and 17th centuries. The most famous of such cases in England involved about a dozen afflicted youths and led to the execution of three alleged witches [*The Most Strange and Admirable Discovery of the Witches of Warboys . . .* (London, 1593)].
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