



# Ergotism in Norway. Part 2: The symptoms and their interpretation from the eighteenth century onwards

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**Torbjørn Alm**

Tromsø University Museum, Norway

**Brita Ellevåg**

University of Tromsø, Norway

## Abstract

Ergotism, the disease caused by consuming *Claviceps purpurea*, a highly poisonous, grain-infecting fungus, occurred at various places scattered throughout Norway during the eighteenth and nineteenth centuries. By focusing on these cases we chart the changing interpretations of the peculiar disease, frequently understood within a religious context or considered as a supernatural (e.g. ghostly) experience. However, there was a growing awareness of the disease ergotism, and from the late eighteenth century onwards it was often correctly interpreted as being due to a fungus consumed via bread or porridge. Also, nineteenth-century fairy-tales and regional legends reveal that people were increasingly aware and fearful of the effects of consuming infected grain.

## Keywords

Ergot alkaloid, fungus, gangrene, Norway, psychoactive

## Introduction

Globally grain is one of the most important foods (van Wyk, 2005). Rye became especially popular since it grows well in cool areas that have poor drainage and acid soils, but unfortunately the fungus *Claviceps purpurea* thrives in conditions that are constantly damp. Although rye is especially vulnerable, a whole range of grasses can be infested. If so, the grass ‘seed’ (strictly, caryopsis) is supplanted by the sclerotia of the fungus. This has the appearance of a black oversized grain. Sclerotia are likely to be eaten as they are harvested along with the grain. The sclerotia may contain a variety of ergot alkaloids, of which several are poisonous and some are psychoactive (ergot alkaloids are

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### Corresponding author:

Torbjørn Alm, Tromsø University Museum, 9037 Tromsø, Norway.  
Email: torbjorn.alm@uit.no

derivatives of lysergic acid, and thus closely related to LSD). The pharmacological effects vary between individual alkaloids, with different strains of *Claviceps purpurea* and different soils all potentially having different ergot alkaloid compositions. When ingested in 'sufficient' quantity via flour or grain used for example in bread or for brewing beer, the ergot alkaloids may lead to the horrible disease called ergotism. Two main types occur, convulsive and gangrenous (Barger, 1931), although crucially the exact constellation of symptoms of ergotism is very unpredictable.

Gangrenous ergotism has been variously called *ignis sacer*, the Holy Fire or St Anthony's fire, terms all referring to the accompanying burning sensations, often associated with feverish hallucinations of flames and devils. The condition is characterized by dry gangrene of the extremities, followed by the dropping off of the affected body parts. Ergot causes vasoconstriction by acting on the muscles of the arterioles, such that if there are repeated doses of ergot the vascular endothelium will eventually be damaged, resulting in a reduction of blood flow and eventual terminal necrosis of the extremities. Since ergot alkaloids are powerful vasoconstrictors, symptoms in the cardiovascular system include constriction of arteries and veins, rapid or weak pulse, precordial distress or pain, muscle pain, cold skin, weakness, lameness, gangrene and cardiac arrest. In the gastrointestinal system ergotism may lead to nausea, vomiting and diarrhoea. In terms of motor control symptoms, the following may occur: tremors, spasm, writhing, wry neck, eyes going awry, loss of speech, muscular paralysis, renal spasm and permanent constrictions.

Additionally, ergot causes stimulation of the central nervous system (convulsive ergotism) followed by a variety of mental states, often depression and in some cases death.<sup>1</sup> Symptoms in the central nervous system include headaches, dizziness, depression, confusion, drowsiness, unconsciousness, panic, hallucinations, delusions and psychosis. Symptoms in the senses include unquenchable thirst, depressed or ravenous appetite, sensations of heat ('fever') or cold ('chills'), blindness, deafness, numbness, and feeling of being pinched, choked or suffocated. When the skin is affected there may be tingling and itching ('formication'), jaundice, redness, swelling and blistering. In terms of the reproductive system, ergotism suppresses fertility, induces abortion and stillbirth, may result in agalactia (inability to nurse) and the poisoning of the mother's milk.

During the first part of its long history in Norway (see Alm and Elvevåg, 2013), ergotism was clearly viewed as a disease, although so manifold, strange and grotesque that it was frequently interpreted within a religious framework. At least a small, learned elite was familiar with the symptoms, which are described in convincing detail in several medieval texts, partly adapted from continental (French and German) sources. As in other European countries, monasteries dedicated to St Anthony, the patron saint of the victims of ergotism, served partly as hospitals for those affected. At least two such monasteries operated in pre-Reformation Norway. The Lutheran church closed down these and all other monasteries, and during the seventeenth century, both the clerical and juridical authorities reinterpreted ergotism as witchcraft at work (Alm, 2003). The hallucinogenic properties of ergot may have convinced some victims that they possessed magic crafts. In other cases, the victims blamed witches for their troubles, with trials ensuing in the wake of accusations of witchcraft.<sup>2</sup>

Towards the end of the seventeenth century, the authorities in the twin kingdom of Denmark and Norway ceased to believe in witchcraft, much to the chagrin of some clerics, who remained convinced of the reality of witchcraft. In Denmark, the booklet of Brunsmann (1674, reprinted in many editions) used an early seventeenth-century Danish example to convince its readers that witchcraft was both real and dangerous. In the late seventeenth century, the Norwegian-born vicar Ole Bjørn tried in vain to instigate a witch trial in the Danish town of Thisted, which was also affected by what is reasonably interpreted as a bout of ergotism, affecting a group of females. He did so with such stubbornness that in the end he lost his position, and was forced into exile.

While the belief in witchcraft died out, this was not the case with *Claviceps purpurea*, the highly poisonous, grain-infecting fungus responsible for ergotism. Bouts of disease that are hardly compatible with anything but ergotism occurred at scattered localities in Norway in the seventeenth and eighteenth centuries as well, but were no longer interpreted in terms of witchcraft at work.<sup>3</sup> Some episodes were only recorded as ‘strange events’; a mid-seventeenth century epidemic at Skjervøy in Troms, northern Norway, was interpreted as a ghost story, and an eighteenth-century epidemic in western Norway caused religious fervour. However, most eighteenth-century incidents were correctly identified as ergotism at the time, providing medical records of physical and psychiatric effects similar to those noted in a number of witch trials, or previously interpreted as visions of ghosts, heaven and hell. This paper compiles all relevant eighteenth- and nineteenth-century episodes known to us. In addition, we have included sections on ergot in Norwegian folk tradition, where intriguing details are found, for example, in some fairy-tales and regional legends.

## Eighteenth-century ergotism

Despite the existence of a rather extensive literature, in particular in the wake of rationalism, there is sparse evidence of ergotism occurring in Norway during the eighteenth century. A single record from Finnmark points strongly to a case of convulsive ergotism, with extreme muscular contractions. According to an eighteenth-century manuscript by Isaac Olsen, acting as a missionary among the Sámi of Finnmark, something strange affected ‘the maid serving the sister of the pastor in charge at Vadsø, who rises [curls] towards the roof so that not even eight strong men are able to hold her still on the bed’ (quoted from Qvigstad, 1910: 70; cf. Pollan, 2007: 21).

Olsen’s account of contemporary Sámi magic may suggest that ergot and ergotism played an important part: ‘They can help sick people and animals and heal them. They sing, chant and carry out magic until they fall asleep as if they were dead, and their faces become black and blue. Then, they can heal people who are almost dead and look dead, so that they revive in an hour’ (Qvigstad, 1910: 9–10; see also Pollan, 2007: 21). According to the same source, Sámi children were served a special kind of food, from which they acquired witchcraft (Qvigstad, 1910: 29).

A somewhat oblique reference to black-coloured skin among the inhabitants of eastern Finnmark may suggest that they were affected by ergotism. During his visit in 1738, Bishop Eiler Hagerup was disappointed that so few people attended church service at Kjøllefjord, but:

The priest assured [me] that this was due to their poverty. Most of them had been without flour and bread since Advent, others since March, and they are incapable of walking or rowing. Their food has been fish and water. The same is the case among the Norwegians in Kjøllefjord, and everywhere else in eastern Finnmark, of which many have died, and many are confined to bed. The rest go hungry and are black. Thus, it is a pity to see them or stay among them. (quoted from Nilssen, 1951: 194)<sup>4</sup>

In the 1740s, the Danish government distributed questionnaires to clerics and government officials all over Norway, with the intention of acquiring better knowledge of all aspects of life and nature in the twin kingdom of Denmark-Norway. The account received from the commune of Land in Oppland, SE Norway, describes a disease that in all likelihood was ergotism, although interpreted by those affected as an infectious disease:

In this parish, no other disease has been observed than the violent fever, which at times occurs everywhere in Norway, and the peasants call *landfarsoet* [land-running-disease], and in the last few years, it has been more violent, contagious and poisonous than usual. It has been so violent and contagious, that in the farms where it has appeared, almost all people have been affected, and many people at several farms have died;

yes, it has been poisonous, and left many bad cases, and in its wake, some have for a long time been speechless, deaf, and with lame hands and feet, and two young people in the parish have been forced to amputate their legs, as the poisonous fever had affected them, and caused such gangrene that the feet became black as coal, and pieces fell off, yes, it was feared that if the legs were not amputated, their whole body would rot, as it advanced upwards from day to day, which could be seen in one of them, where it had passed the knee. (Røgeberg, 2004: 207)<sup>5</sup>

A 'ghost story' is worth including here. During his visitation in northern Norway in 1753, Bishop Fredrik Nannestad was soon met with a rumour of extraordinary events that had occurred at Skjervøy in northern Troms during the past year. He requested a report from the local vicar, which is included *in extenso* in Nannestad's own account.<sup>6</sup> Nannestad himself concluded that the trouble was due to a 'physical weakness, which is totally unknown here, although extraordinary, which the layman interprets as a disturbance by evil ghosts, which Jørgen Gamst, a rich and ungodly merchant among them, or his wife, has cast on them'. Those affected generally claimed that they were haunted by ghosts or apparitions. They were certainly anxious, but also suffered a variety of physical symptoms. Several cases are described, including six males (numbered 1–6 below) and two females (7, 8).

Hans Christopherson (1) claimed that the ghosts tried to strangle him. He was also affected by pain in the limbs, 'which were like broken'. Some days later, he was struck down by what may have been convulsions. He was also troubled by a feeling of extreme cold, though only days later, and in mid-winter, he ran into the sea up to his hips.

Another victim, Niels Pederson (2), was at first drowsy, and claimed to see ghosts. After some days, he 'was attacked so acutely, that five strong men could hardly hold him, and this recurred almost two to three times each day for eight days'. During these attacks, 'he once had such extraordinary strength, that it was hardly possible to hold him, [as he was] seeking in all possible ways to break free, and made such noises, that we were scared'. The illness lasted from 31 October to 13 January, but later recurred. He seemingly suffered brain damage, 'for now his brain is so severely attacked, that the poor father knows no way or means of controlling him, and perhaps he will never regain his health'.

In Jens Andersøn (3), the disease also started with an apparition or a ghost he saw while out in a boat. Afterwards 'he was as if enchanted, talked as if out of his right mind, and his eyes were fixed at the point where the ghost had appeared'. At home, he failed to recognize his own relatives, and fell asleep for a very long time. Later, he passed out from time to time, and on 11 November 'he was attacked so badly, that six to seven persons could hardly hold him'. Another attack occurred on the second day of Christmas, 'when his weakness was so bad, that one could hardly get a hand on him, or hold him without causing him harm, and they had to put him down on the church floor, but his yelling was frightening, and he hit about him'. This attack lasted until 13 January.

The fourth victim, Jørgen Lauridsøn (4), also suffered violent attacks, 'and cried out, that they should let him loose'. People tried to help him with advice culled from folk medicine, and poured a bucket of water over him while they held him, 'advice which is used here for those who are affected by "the falling sickness" [epilepsy], or they are thrown into the sea'. It helped somewhat, but attacks recurred.

Hans Tønneson (5) was attacked on 28 December. He fainted for two hours, followed by a convulsion during which 'five strong men could hardly hold him'. His eyes were turned, he chewed froth, and looked as if in a rage, and claimed to see a head rolling on the floor. His tongue was also affected, he had difficulty in speaking, and once tried to run into the sea, but later regained his health.

Søren Gamst (6), according to his brother, had also seen a ghost. Otherwise, he suffered a mild attack, causing contractions. On 31 December, 'he fainted, and clenched his hands ... and almost each evening, it attacked him'.

A female victim, Karen Knudsdatter (7), was a serving maid. She was attacked while keeping guard over some of those affected, 'her eyes went black [i.e., she lost her sight], her blood chilled, and she fainted'. The next evening, she suffered a violent attack, and lost her ability to speak, her chest and waist were swollen, and when they tried to bleed her, not a drop of blood issued. At this point, the vicar added that 'some years ago, all females in the house of Mr Juel Fygenskov had been attacked in almost the same way, and it took some years, before they recovered from fainting all the time'.

In a final comment, Bishop Nannestad confirmed that the vicar's account was in accordance with what he himself had heard during his visit. As a postscript, an additional case is mentioned. It affected a Sámi girl (8), who had been attacked on 29 August, while herding cattle. She had seen and talked to a ghost, which 'finally attacked and held her for three hours'. When she was found, she was very anxious, and had temporarily lost the ability to speak, so people had to wait a couple of days for her own account of the events. On 6 September, the attack recurred; she thought someone hit her over the neck two or three times, and she fell to the ground, stumbling again as she tried to rise.

The above 'ghost stories' are strongly suggestive of ergotism. The victims suffered variable, but typical symptoms: violent convulsions (1, 2, 3, 4, 5, 7, 8), which caused some to cry out loudly (2, 3); epileptic fits (4); contracted hands (6); loss of speech (5, 7, 8) and sight (7); a feeling of intense cold (7) – and probably heat, the latter 'relieved' by running into the sea (1, 5); and mental disturbances (1–8). Many victims claimed to see the local merchant, Jørgen Gamst, in various apparitions, and seemingly blamed him for their troubles. This may have had some justification, as he in all probability provided the ergot-infested flour that was the likely cause of the symptoms. However, no connection with food is made either by the victims or the clergy.

Bishop Nannestad may have been particularly interested in this affair. During his previous visit to northern Norway in 1750, he had compiled a small manuscript on various topics – antiquities, natural history, and some 'Histories on the exploits of an evil ghost' – mostly at Andenes in Nordland, northern Norway. According to the last part, the ghost had also troubled the house of the vicar at Vågan in Nordland in 1726; a young boy was particularly affected, in a way that is strikingly similar to the stories (mentioned above) from Skjervøy. He may well have been a victim of ergotism, suffering convulsions and (as it seems) mental disturbances. People certainly found him difficult to control:

A young boy, 14 years old, was severely attacked both day and night, now by hearing desperate words in Latin and Danish, which were whispered in his ears, now by being hit, now by being dragged across the yard and field, now by being drenched in water at night. Other people had to help him, and lie down on him to save him. (quoted from Qvigstad, 1946: 229)

A single eighteenth-century bout of ergotism was recognized as such at the time. Johann Gottlieb Hempel, who served as a military doctor in Bergen (SW Norway), provided an account of poisoning caused by imported oats (*Avena sativa*). Although the effects were similar, the disease was probably not caused by *Claviceps purpurea*, for Hempel himself searched several tons of oats from a number of ships, but could not find any trace of ergot. However, the oats contained darnel (*Lolium temulentum*), which made up more than 10 per cent of the grain (Hempel, 1778: 46–7). Like most other grasses, darnel itself is not poisonous, but it is susceptible to infection both by ergot and endophytic fungi, which also produce ergot alkaloids (Strickland et al., 2011; Wilson, Clement and Kaiser, 1991). As with ergot, admixture of darnel, for example in grain used for bread or porridge, or in malting and brewing, will cause disease, but usually less serious than ergotism caused by *Claviceps purpurea*.

The poisonings occurred in the spring of 1773. In a single household, five men and two girls became affected within an hour of eating porridge made of oats. The effects are described in some detail:

The cases were these: that the people lost almost all senses, and thus became powerless. Some were extremely merry, others on the contrary sad. One of them sat on a chest and said that he was much superior to his comrades, who were partly lying, partly running about; but unexpectedly, he was attacked by such a convulsive quiver that he, although still conscious, fell to the ground, and wriggled like a fish, which has been thrown on land. (Hempel, 1778: 43)

Soon they were all vomiting heavily, followed by a strong diarrhoea, whereupon they fell sleep, and woke up more or less recovered the next morning, except that they were (not surprisingly) somewhat anxious. The breakfast once again included porridge of oats, and the attacks recurred so the doctor (Hempel) was called for. He forbade further use of the suspect oats, and no further trouble occurred. Hempel was handed a complaint dated 12 April 1773, addressed to the merchants who had sold the grain, noting that the oats: ‘... hide such a hard and terrible disease, that all those, who have eaten from [them], have had to go to bed due to sickness and misery. The cattle, who walk in the fields, dare not eat any of [the grain], for it causes the same trouble in them.’ (Hempel, 1778: 44–5). Poisonous grain was also reported from the Sunnmøre area, where people eventually threw it into the sea, and lawsuits against the merchants followed (Ehlers, 1895: 35–6; Hempel, 1778: 45). According to Hempel’s account, no further cases were reported after darnel was removed from the oats.

## Nineteenth-century ergotism

During the nineteenth century, the medical care system of Norway improved from virtually non-existent to being modestly well developed, at least in the south (Reichborn-Kjennerud, Grøn and Kobro, 1936). With the introduction of formally schooled doctors, a scientific literature appeared. Ergotism was obviously a rare disease by now, but four episodes are known to have occurred.

The first of these was in 1851 in Østfold, SE Norway, and it attracted the attention of a local newspaper (Anon., 1851). Unfortunately, the only medical evaluation is a brief comment made by Dr Schjøtt in the annals of the *Det medicinske Selskab i Christiania* (The Medical Society in Christiania [Oslo]). Both he and other doctors present at the meeting of the Society on 27 August considered that the reports received suggested poisoning caused by ergot. We have to rely on a series of newspaper entries for further details. The first is rather vague:

From different parts of the county, it is reported that rye cultivation has failed utterly, which unfortunately is also the case for most places in this [Østfold] area. Partly, it [the rye] is even unfit for human consumption, as people in various places have become ill from eating food prepared from the new rye. From Høland, it is reported that the oats are mixed with a poisonous weed, which people call ‘*skjak*’, and is similar to wild oats [*Avena fatua*]; it causes dizziness and headache, and is almost impossible to separate from the threshed and cleaned oats. (Diriks, 1851a)

This suggests that the local agriculture faced a number of problems in 1851. The rye was probably infected by ergot, and the cultivated oats were mixed with wild oats, which are a serious and troublesome weed, although not poisonous. *Skjak* is an old Norwegian term usually reserved for darnel, which frequently contains ergot alkaloids (see above).

Much more detailed information is provided in the next report, a few days later:



From various parts of the county it has been reported, that cases of disease have occurred, which are supposed to be caused by eating bread, baked from this year's rye. The disease causes nausea, vomiting, sometimes diarrhoea, a dry throat, pains in the underbelly, weakness of sight, dizziness, numbness and feeling of lameness in the feet, which quickly makes the patient tumble. We are informed that the authorities are making efforts to investigate the phenomenon, and if possible find a means to prevent or reduce the potential damage and at this point we are only making people aware of the problem ... (Diriks, 1851b)

A week later, the public was informed of the result of the investigation:

In connection with the poisonous substances frequently found in this year's rye, the county has issued the following statement:

'In several places in the county, as elsewhere in Norway and Sweden, the rye cultivated this year has turned out to contain substances, which are detrimental to health. They cause the same effects as the consumption of poisonous substances in general, that is: nausea, vomiting, sometimes stomach troubles, a dry throat, pains in the underbelly, weakness of sight, dizziness, numbness and a feeling of lameness in the feet, quickly making people tumble. Similar consequences of consuming such grain is seen in livestock, and thus it must not be used for fodder without being cleaned, [a process] which will be discussed below.

According to the investigations carried out by capable men both here and in Sweden, the effects described are probably due mainly to the so-called *Mel-Droie*, *Mel-Øke*, (*Moder-Korn*, *Secale cornutum*) [i.e. ergot] that is well known to the layman, which this year is found in an unusual quantity of rye and in a single grass species growing among it.'

A long and detailed description of procedures suitable to clean the grain is also included, as are some suggestions for treating flour and dough with heat. (Diriks, 1851c)

A further brief entry noted that similar problems were reported from western Norway: 'From several places in Vestlandet [the west coast], it is reported that the consumption of this year's rye has caused the same kind of disease as in this area' (Diriks, 1851d). Unfortunately, no further data on the 1851 cases of ergotism have been traced, though some may be hidden in medical archives. At present, we know nothing about the number of people affected, or their fate.

Evidence is also fragmentary for an episode of ergot poisoning at Hordnes in Setesdalen, southernmost Norway. According to Schübeler (1886: 230), it took place 'approximately 25 years ago', i.e. about 1860. Schübeler had been informed of the poisoning by a local doctor, who noted that several persons were affected. All survived, but no further details are known.

Ironically, the next poisoning took place at an agricultural school (Huseby Landbrugsskole) in Lyngdal, southernmost Norway, in 1861 (Schübeler, 1886: 230), affecting several students. For a long time, they had been eating porridge of rye flour, which contained a substantial quantity of ergot. The symptoms noted were stomach pain, loss of appetite, vomiting, fever, headache, fatigue and contractions, especially of the legs. All soon recovered, following what Schübeler described as 'a suitable treatment'.

The last known, food-based ergot poisoning of humans in Norway was at Audnedal (Undal) in southernmost Norway in 1883 when 13 people were affected.<sup>7</sup> In this case, the local doctor provided a detailed account in his annual medical report:

All members of three families were affected. All suffered from headache, nausea, stinging and tingling sensations, with a variable but restricted, dark red to bluish discolouration of the skin, especially of the hands and feet. In addition, they suffered from spasms of very different strength and distribution, from a

painful contraction and stiffness of some muscle groups, [via] a lasting, fixed, bowed or straight, crooked, strained position of a single limb or one half of the body, to complete, epileptic fits. The disease was particularly violent in a 50-year-old female and her 30-year-old son; both had many, violent seizures. The female became very confused and furious, so that she had to be guarded, but she recovered in the course of some weeks. The son, who was found lying on the floor, speechless and out of his mind, died within a couple of days. Two of these families had borrowed flour from the third family. Upon inspection, the grain ('*Kapsæd*', i.e. a mixture of barley and oats) of the latter family was found to be considerably contaminated with ergot. The flour had been used mainly for porridge. (quoted from Schübeler, 1886: 230)

Apart from people, cattle had been fed with the same flour. This had caused them to get angry, attack people, and bang themselves against fences and house walls (Helland, 1903: 239). At Nes in Hedmark, Bakken (1944: 29) similarly noted that: 'sometimes the cows act if they are seized by a rage' – but in this case, the only explanation given is the gift of second-sight, supposedly often found in livestock. Helland (1903: 238–9) provided a general account of the episodes of ergot poisoning mentioned above. He noted that ergot seemed to be more common on rye and barley in the south-western parts of Norway than elsewhere (see Fig. 1, below).

Trained doctors were now available throughout the country, although often at a considerable distance, so it is likely that other cases of ergotism were never brought to their attention. For instance, the American traveller Bayard Taylor commented on a supposed case of leprosy from Telemark, which in fact sounds much more like the result of gangrenous ergotism: 'In this case, instead of hideous swellings and fungous excrescences, the limbs gradually dry up and drop off piecemeal at the joints.' (Taylor, 1858: 347).

## Ergotism in animals

Animals are no less susceptible to the poisons of ergot than humans, as shown for example in a number of gruesome experiments (e.g. Dale, 1906); for a more general account, see Strickland et al. (2011). In dogs, poisoning will often lead to the malfunction of the hind legs (Heusinger, 1856: 8–9), a detail also noted in a single Norwegian witch trial in Stavanger (7 Dec. 1616): 'Hans Lauritsen confessed that some five years ago he had a little dog, its hind part was taken away [lamed] when it was lying in bed with his woman, so that it died some time later. At once, his woman became ill, and had no health thereafter.' (Erichsen, 1903: 129).

In the 1667 trial of Barbra Åsmundsdatter in Farsund, Vest-Agder, it was noted that soon after she had left a farm, the livestock acted as if it was mad, made loud sounds, and people had to go twice to the outsheds to tie the animals (Lohndal, 1998: 62). These symptoms were similar to those recorded in cattle in the 1883 bout of ergotism at Audnedal noted above.

## Ergot and religion

Due to its hallucinogenic properties, ergot may well stimulate visions interpreted within a religious context. The excesses occurring during an episode of religious fervour in Romsdalen in Western Norway about 1860 were disapproved of by the parish priest, Otto Theodor Krogh (Ekre, 1954). In a newspaper article, Krogh (1861) commented on the curious combination of 'epilepsy' and religious rapture rampant in his parish. His description suggests ergotism; those who participated, displayed early signs of gangrene, convulsions (interpreted as 'dropsy' by Krogh), insomnia, and mental disturbances – the latter interpreted as religious visions by the victims.

I assure you, that there are already many who will hardly or never recover from the damage they have suffered to their health, which is clearly shown by the frequent seizures, probably caused by fear,



sleeplessness and an overwrought state, for people who have watched those fallen, confirm that they were sometimes black-coloured in their skin and under the nails. ... A reliable man in our village has assured me that his servant girl had such 'limp nerves' after the [epileptic] falls, that her head was dangling for a day or more, and she was not capable of keeping it upright.

Krogh goes on to provide a detailed description of the seizures – and some glimpses of the religious visions that accompanied them:

A few days ago a reliable man, Erik Oriset from Indfjorden, told me that one day, or rather one evening, during a congregation of readers at Oriset, he witnessed a gruesome spectacle, which caused him to faint. Five or six young people fell to the floor, all forcedly kicking with their feet, twisting and creeping with all their might, as if they were trying to escape an enemy, who would grab them and treat them worse than any worldly executioner, and stretched his arms and claws for them, to take them away, and they cried out repeatedly: – Now he is taking me, now he is taking me! – It was the devil himself, who they thought they saw in the shape, which the preachers and the books they distributed had painted [described] for them.

A young girl had somewhat more benign visions:

For instance, Rasmus Eriksen Gol at Innfjorden has a daughter, who according to the rumours has behaved as if she was silly all through the summer, following the events of last winter. During the summer, she has repeatedly – so people believe, and she says – been allowed access to heaven, where she has spoken with God and his saints, and in particular with Christ, with whom she has counselled on clothing, and he has told her what kind of clothes it would be most decent for her to wear. At the same occasion, she got a glimpse into hell, and she has seen the damned and their condition, and there she has seen awful things.

Krogh disliked the meetings taking place, which he found loud and disgusting and, again citing a local informant (the *ordfører* or spokesman), says they were 'like a real Babel or a wolf cry, with people making unarticulated sounds just like in *Daarekisterne* [the madhouses].<sup>8</sup> Some lie, some stand and some sit, yelling on top of each other, some call out for God, some for Christ, and say that they see him with his crown; others seem to be in the company of the devil ...'.

Lindtorp (1948: 165–71) described a religious revival among the ethnic Finns of the Finnskogene area of SE Norway in the 1850s, which could also perhaps indicate ergotism – not least because rye was a staple of their diet. It affected young girls in particular, who 'saw' (or had) what they considered to be religious visions. It is worth pointing out that this episode is contemporaneous with the report of ergot poisoning in Østfold (1851) noted above. 'Nitahå-Jussi' (Johannes Johansson Oinonen, born 1873), an old male Finn of the area, left no doubt that the rye bread he ate in his youth was less than wholesome:

But the worst was the rye bread – if we had bread at all. It cracked like gravel between the teeth. And worst of all: it was like spirit! Even if the loaves were so thin that they fell apart if you were breathing at them, it occurred more than once that I became so dizzy that I could not tell a cow from a flower. ... The old Finns did not know how to properly clean the grain ... (Grønset, 1957: 22)

A more oblique reference that may point to ergotism is worth including here. At Nes in Hedmark, a local *trollmann* (sorcerer) may have suffered from 'holy fire', the burning sensations connected with gangrenous ergotism. According to Bakken (1944: 26), people believe he was unable to die because of all his witchcraft, for: 'He tried to cut his veins, but just as when he stopped blood, it would not run. But he was burning all over his body, and people said, he suffered the flames of hell while still alive.'

## Ergot in Norwegian folk tradition

Ergot, the dark sclerotia of *Claviceps purpurea*, is known by various folk names in Norway, including *mjøldryge* 'make flour last longer', *mjølauke* 'increase flour', *kornauke* 'increase grain', *bogne* 'bow under the weight of something', or simply *auk* 'increase' (Aasen, 1860: 36; Donali, 1988: 589; Høeg, 1974: 115; Larsen, 1965: 106). None of them suggests any awareness of the danger posed by ergot. On the contrary, the names either reflect the fact that ergot is slightly larger than the grain it parasitizes, or simply that people, and perhaps mainly the poor, used such infected grain to *drøye* (*dryge*) their food, i.e. to make it last longer (Larsen, 1965: 106). Similar vernacular names are known locally for other plants used as food, e.g. *Bistorta vivipara* (Mejland, 1962). A dictionary entry from the early nineteenth century, included in Kolsrud (1957: 66), explains the term *Meeløgen* (ergot) as: 'A misgrowth which hangs on some rye spikes, looking like a grey root, white inside, tasting like rye, and giving much flour.'

The existence of vernacular names provides evidence that people, at least locally, had noted the black sclerotia. In the twentieth century, people were also aware that these were toxic. Høeg (1974: 115) included two comments on this in his vast collection of Norwegian ethnobotany. '*Mjølauke* affected rye, especially in rainy summers. Some years, it was so abundant that the grain was not suitable as food for humans' (Sør-Odal in SE Norway); 'We were told to remove it by our father. The flour could be stained black from it, and was repugnant' (Hedrum in SE Norway). At least locally, ergot was used as an abortifacient: 'Pregnant girls tried to incur abortion by ingesting *mjøldryge*' (Høeg, 1974: 115).

## Ergotism in fairy-tales

Fairy-tales may seem an unlikely place to look for clues to ergotism. Although often told for amusement, they are frequently tales with morals, with an embedded symbolic meaning, reflecting both the fears and fancies of ordinary people. A striking parallel with the Finnmark witch trials and their emphasis on 'learning' witchcraft by consuming it (Alm, 2003) – in several cases by eating porridge containing black grains – is found in Norwegian fairy-tales related to the 'subterranean'. In the words of Hans Strøm (1762: 540), the hill-folk 'were not considered to be harmful, except that sometimes they bring people with them into the hill, as they say here, and these either suddenly disappear, or if they return, they remain thereafter mad and silly all their life.'

The most frequently used term for such 'kidnappings' in Norwegian is *bergtatt*, literally: 'taken into the rock'. Local cliffs were often assumed to be the dwelling of the 'subterraneans'. What is interesting, however, is that people lost their senses by eating a particular kind of food offered by the subterraneans. According to a tale recorded in various parts of Norway, they served a strange porridge, which was dangerous due to a blue eye or black spots. We include excerpts of three such stories. The first derives from Hordaland in western Norway:

One evening a tenant farmer's wife from Øygarden in Sund parish was going out in the field to loosen a bound lamb. When she had been away for, perhaps, a couple of hours, the people scything [grass] saw her come running at full speed, dragging a rope behind her. She neither heard nor saw [them], no matter how they called for her, but put her head into the barn peep-hole – which she assumed to be the house door – and yelled: 'they are taking me! they are taking me!' She was trembling so badly, and her eyes were so stiff ... that her mother was awestruck. When touched, she hit about her in a rage. Finally, they succeeded in getting her to bed, but it took several weeks before she regained her wits, and could provide some explanation. She said that she had been inside the rock, with the subterraneans. How she came there, she

did not know, but she remembered lots of ugly, small trolls, sitting about a table, and the table was shining like pure gold, and so did all the utensils placed on it, and those hanging on the walls, and as far as she could tell, there was no other light there. The small trolls ate of a large dish of porridge, and the porridge had a strong, red colour, and black spots in it, and they did their best to persuade her to eat with them, but she refused, since she knew, that if she was fooled into eating their food, they would gain such power over her, that she would never be able to leave the rock. (Wesenberg, 1862: 166)

In a twentieth-century version of the tale, from Nordland in northern Norway, a young girl is taken into the rock, and again offered a strange porridge:

And then they would give her food, but she did not want it. They both persuaded and threatened her, and so she did not dare to refuse. It was a kind of porridge they gave her. She had never before tasted a similar porridge. It was very good, and fine-looking, but in its middle, there was a blue eye. She ate all else, but left the blue eye untouched, for she had heard that if one ate it, one could never leave the rock. (Martinussen, 1907: 31)

An almost similar story was told at Senja in Troms, northern Norway:

A man from Rødsand said that once he fell asleep outdoors, and when he awoke, everything was so strange that he did not know where he was. He realized he had come to the subterraneans. They placed food in front of him, and he ate. But, in the middle of all the bread slices, there was a blue spot, and he knew he had to avoid it. (Brox, 1970: 53)

In another story from the same area, it was the *huldra*, a beautiful female subterranean looking like an ordinary girl except for her cow-tail, who served a dangerous dish: ‘When you were taken into the rock by *huldra* [or: fell in love with her], she served you porridge. There were some black spots in the porridge, and these you should never touch, because you would never be able to leave the rock.’ (Brox, 1970: 116).

All these stories suggest that people who were ‘taken into the rock’ were aware of the dangers involved in accepting the food offered there, even though it was usually just porridge or bread, like the staple diet of ordinary people. The danger is clearly connected with the blue eyes or dark spots in these cereal dishes, and may reflect some level of understanding that flour products with dark admixtures (namely ergot) were toxic and dangerous. They could indeed disturb the senses, and make people stay in the dark realms of the subterraneans – or insanity – forever after.

Other fairy-tale or legendary accounts of disturbed senses may refer to the same, ergot-induced madness, but are less convincing. According to an old Norwegian (and Germanic) tradition, *åsgårdsreia* made a wild chase across the skies at Christmas.<sup>9</sup> An account from Setesdal notes that: ‘If someone does not throw himself to the ground, when he hears the [wild] chase, his soul will have to follow it, leaving the body. When the soul returns, the body is weak, and often remains weak, and is often sickly forever after.’ (Asbjørnsen, 1852: 178).

## Discussion

Even in the eighteenth and nineteenth centuries, when the cause of ergotism was widely known, German doctors found it extremely difficult to persuade ordinary people that ergot was dangerous (Heusinger, 1856: 31ff.; Wichmann, 1770). Its effect was unpredictable and it could strike down a single member of a family, often a child. Sometimes, those affected were hospitalized, healed by being served food without ergot, and returned home to their families with strict

instructions to throw away the ergot-poisoned bread, which was described as black. The peasants frequently refused to believe this causal mechanism, pointing out that all members of the family had eaten from the same bread, and thus it could not be the cause of the disease. Within a short period, the child fell ill again, and sometimes succumbed to ergotism.

During the eighteenth and nineteenth centuries, a number of sources describe scattered outbreaks of ergotism in Norway. Some are recognized as such in the sources, whereas others were not understood at the time, and interpreted as other, partly (or so it seemed to the observers) infectious diseases, religious fervour, or simply as strange and inexplicable phenomena. In the nineteenth century, the medical profession had become sufficiently widespread and well versed to recognize and describe the rare cases of ergotism that occurred in Østfold (1851), Lyngdal (1861) and Setesdal (about 1860, 1883) as the age-old disease caused by ergot-contaminated grain or flour, usually rye.

However, although neurogenic ergotism may have become rarer, it is eminently possible that cases of iatrogenic ergotism in the last century were undiagnosed, or misdiagnosed within the field of psychiatry. Indeed, in other European countries (e.g. Germany) some relatively recent reports have been understood as suggesting that in some cases the underlying cause of lethal catatonia may have been chronic ergotism (Castillo, Rubin and Holsboer-Traschler, 1989). Although the reported symptoms – catatonia, agitation and delusions – are consistent with ergotism they are of course not pathognomic of it. ‘However, when considered in conjunction with the co-existing physical signs of skin discoloration and acrocyanosis – hallmarks of the peripheral vasocclusion of ergotism – as well as tense muscles and cramped posture, the psychiatric presentation is highly suggestive of this multisystemic mycotoxicosis’ (Packer, 1989). It remains to be established whether some cases of (lethal) catatonia in Norway in the twentieth century were also attributable to chronic ergotism.

Also, possibly undiagnosed – or misdiagnosed – in the last century are cases of puerperal psychosis and ergot poisoning. Bromocriptine is an ergot-derived agent used to treat a variety of conditions, including preventing lactation following childbirth (Boyd, 1995). There have been some suggestions that bromocriptine may induce puerperium manifestations consistent with ergotism (Iffy, Lindenthal, Szodi and Griffin, 1989). Indeed, there is considerable overlap between common psychological manifestations of puerperal psychosis and ergot poisoning, and even suggestions that ergot derivatives are a major trigger of puerperal psychosis (Iffy, Lindenthal, McArdle, et al., 1989), and coincidental infanticide (Iffy and Jakobovits, 1992). Unlike other psychoses (e.g. schizophrenia), pure puerperal psychosis’s prognosis is favourable. However, this does raise the question of how many cases of postpartum dramatic mood changes – traditionally attributed to the body’s changes in metabolic or hormonal equilibrium – were (or are) in fact a consequence of obstetric use of powerful vasoactive agents (e.g. ergometrine or ergotrate) for the reduction of postpartum blood loss.

Psychoactive substances from plants and fungi are clearly linked with religion in many parts of the world (Rätsch, 2005; Schultes et al., 2001). A hallucinogenic brew based on ergot may have been at the heart of the Greek Eleusinian mysteries (Samorini, 2000; Wasson, Hofmann and Ruck, 1998; Wasson, Kramrisch, Ott and Ruck, 1986), and although such a connection is impossible to prove, it is at least biochemically feasible (Webster, Perrine and Ruck, 2000). Furthermore, Packer (1998) found a link between epidemics of ergotism in Europe and surges of Jewish mysticism. Thus, it is hardly surprising that in 1860 the victims of ergotism in the Romsdalen area of western Norway, situated within Norway’s ‘Bible belt’, interpreted the ensuing visions in a religious context, leading to a bout of religious fervour.



medical system, and more doctors at work, ensured that some of the latest cases of ergotism in Norway were recognized as such at the time, the first being the 1773 poisoning described by Hempel (1778). Four nineteenth-century poisonings were identified as ergotism at the time. It is worth noting that the general distribution of ergotism as recorded in the witch trials and in the eighteenth century and later medical and botanical literature is largely congruent (Fig. 1), affecting in particular the SW part of Norway (Sørlandet and Vestlandet) – with the Finnmark witch trials (Alm, 2003) and the 1752 ‘ghost story’ from Skjervøy as notable exceptions. In the two latter areas, all grain was imported, often from Baltic ports bordering on some of the traditional heartlands of convulsive ergotism in Europe. Even there, ergotism was often interpreted as witchcraft or demonic possession, despite an accumulating medical knowledge and literature of the disease; the symptoms were well known and described by the medical college at Marburg, Germany, at the end of the sixteenth century (Barger, 1931). The cause, namely ergotized grain, remained obscure for another century. Most western countries now have strict rules on the amount of ergot allowed in grain (Müller, 2010; Scott, 2009), and epidemics of ergotism are confined to the poorer countries (Raghavender and Reddy, 2009). Nonetheless, even in the west, there is a serious lesson to be learned from history, namely that strange and seemingly unlikely and inexplicable events, with both physical and psychiatric symptoms, may have a rational explanation as the consequence of toxins consumed in food. However, even in our modern era, mass psychogenic illness has been erroneously cited as responsible for outbreaks of gastrointestinal illness in school-children when in fact toxic poisoning (from pesticides) was the cause (e.g. Aldous, Ellam, Murray and Pike, 1994). Indeed, in the past we had only to contend with the ‘naturally’ occurring toxins in food, whereas today we have an even wider range of food poisons to be aware of, namely those employed in the growing of food.

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### Notes

1. Although ergot alkaloids may be regarded as creating a suggestible state of mind, it is the cultural and contextual factors that determine the precise nature of interpretations.
2. The weather features prominently in several accounts of ‘strange’ illness, ‘odd’ behaviour and also witch-hunts. Frequently some aspect of the weather was linked with these illnesses and behaviours, and in the cases of witches some were accused of directly affecting the weather. Ironically, it is indeed likely that the weather did contribute to these usually horrific scenarios by increasing the likelihood of certain toxic fungi – specifically ergot – growing on food that was later consumed.
3. We acknowledge that retrospective diagnosis is a highly speculative process which runs the risk of mis-attributing symptoms to ergotism where in fact it may have been due to syphilis or epilepsy, for example. Indeed, it has been suggested that many cases of leprosy in medieval Europe were actually cases of syphilis. As Diamond (1997: 210) writes, ‘[W]hen syphilis was first definitely recorded in Europe in 1495, its pustules often covered the body from the head to the knees, caused flesh to fall off people’s faces, and led to death within a few months.’ Naturally, where such clear symptoms of the presence and course of a disease such as syphilis exist, we do not suggest ergotism as a possibility! Likewise it is possible that some descriptions of putative demonic possession or visions interpreted as religious experiences may have been attributable to epileptic seizures. Nonetheless, we present cases that we consider are surrounded by considerable evidence indicative of ergotism.
4. All translations are by the present authors.
5. Patients might well survive the ‘dry’ gangrene caused by ergotism even if it resulted in the loss of whole limbs, whereas ‘ordinary’ gangrene would easily lead to death in the era before the introduction of antibiotics (in the mid-twentieth century).



6. Nannestad F (1754) Unpublished and untitled account of events at Skjervøy in Troms, including the local vicar's 'Beretning om de Personer, som her paa Skervøe Præstegaard Ved Kirken vare blevne svage' [Account of the persons who became weak here at Skjervøy parsonage at the church]. Norwegian state archives, Oslo; included in: Generalinspeksjonskollegiet, box 2, Visitasberetninger, Trondheim stift, 1753, from Bishop Nannestad, 'No. 45'.
7. In western countries, ergotism has reappeared in recent years due to the use of ergotamine to treat migraine; Enge and Sivertssen (1965) reported a Norwegian case due to excessive self-medication.
8. Literally, a 'foolchest', a wooden closet in which to keep the insane, used in the 1600s and 1700s (Kringlen, 2004).
9. *Åsgårdsreia* is part of Norwegian and Germanic folklore that around Christmastime the restless dead souls ride through the night and can take the living with them. It has also been linked to old Norse mythology.

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