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The 1727 St Kilda epidemic: smallpox or chickenpox?

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ABSTRACT An acute infectious epidemic almost eliminated the St Kilda community in 1727. An epic tale of survival in adversity followed. Contemporary records reveal atypical features, suggesting a speculative alternative.

KEYWORDS Chickenpox, Mary Wortley Montagu, Rachel Chiesley, St Kilda, smallpox

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St Kilda is a remote Hebridean archipelago which was occupied by a small, often malnourished community for 2,000 years until its depopulation in 1930 on the grounds of non-sustainability. During its inhabitation bad weather and the small rocky harbour discouraged visiting sailing vessels before the steamship era. With limited external contacts, no 'healthcare professionals' and low herd immunity, St Kildans were susceptible to common contagious diseases. Neonatal tetanus, causing the tragic death of many St Kildan babies, is well documented, but other infectious diseases also had severe effects.[1–3] An outbreak of possible smallpox killed nearly the entire population in 1727.

THE SMALLPOX EPIDEMIC IN ST KILDA

Martin Martin, a doctor who had qualified in Leyden, visited St Kilda in 1697 and reported a population of about 180 as well as observing the 'boat cough'.[4,5] He wrote that 'the smallpox hath not been heard of in this place for several ages, except in one instance… two of the steward's retinue… not having been well recovered … infected one man only.'

In the eighteenth and nineteenth centuries smallpox outbreaks were common on the Scottish islands.[6] The Shetland Islands recorded ten outbreaks between 1700 and 1830. The 1740 diary of Thomas Gifford of Busta, from Greig's *Annals of a Shetland parish*,[7] recorded that two of his daughters became unwell and bed-bound, developed a rash five days later and died a further eight and nine days respectively after that. Some of Gifford's 11 other children developed a rash but all survived, thus illustrating the typical features of smallpox:

- Severe symptoms preceding the infectious rash
- Deterioration and death of a few
- Greater vulnerability in children
- Relatively slow spread to household contacts
- Most survive mild but obvious disease

The first report of the 1727 epidemic came from Daniel MacAulay, a minister from Skye, who visited St Kilda in 1728 to evaluate the work of its Church of Scotland minister, Alexander Buchan. MacAulay's letter to the Society of Scotland for the Propagating of Christian Knowledge stated how Buchan 'surpriz'd me with the lamentable account of the depopulation of that place by smallpox, for, of the twenty one familys that were there, only four remain.'[8]

The steward of St Kilda learned of the disaster when he visited for rent collection, heard the survivors' story and discovered that three men and eight boys were marooned on Stac an Armin, a 196-metre high sea stack (Figure 1). They were rescued on 13 May 1728, having survived the whole winter. A small bothy gave limited shelter, and the small group lived off the stack's fresh water supply, birds and their eggs and fish caught with a bent nail. Although the greater resources of Boreray Island were 100 yards away, the vertical rock face prevented ascent from the water.

Kenneth Macaulay, minister on St Kilda from 1758 to 1759, wrote the most contemporary account of the epidemic:

> A contagious distemper swept away the greatest part of this people about four and thirty years ago. The distemper… was the smallpox… of twenty one families, four grown persons only remained, and these had the burden of twenty six orphans… Before the distemper was propagated, three men and eight boys were sent into one of their islands, with a design of catching Solan Geese… An universal confusion and mortality ensuing at home, they continued there from the middle of August, till about the middle of May in the following year. The boat in which these men had been wafted over into that island was brought back to Hirta, before the distemper… Before that memorable year, the smallpox had never visited St Kilda… This terrible distemper has never since visited St Kilda.[9]

Neither Daniel MacAulay nor Kenneth Macaulay gave any clinical features of the illness. Neil MacKenzie, minister on St Kilda from 1829 to 1843, described the islanders' susceptibility to infection: 'When whooping cough, measles or scarlet fever visit… there are more than the average number of deaths.' His notes on St Kilda and the Stac an Armin survivors add more information:

> Death after death followed. At last there were scarcely sufficient to bury the dead… There were 94 deaths… those who had been left on Stack an armin [were] all well. They lived on fish and fowls, but at times suffered much from cold and hunger. They made fish hooks out of a few rusty nails, and also contrived to stitch together their clothing with feathers and patch them with the skins of birds. They returned mostly to empty houses.[10]

THE HISTORY OF SMALLPOX

Smallpox caused ten per cent of deaths worldwide until the successful World Health Organization eradication campaign, which ran from 1959 to 1979. It probably originated in Asia, spread to Europe and Africa around 700 AD and to the Americas during the sixteenth and seventeenth centuries.[11] Smallpox may have caused an Athenian epidemic described by Thucydides in 430 BC and the Antonine Plague described in Galen's *Methodus medendi*.[12] Galen documented fever, diarrhoea, pharyngitis and a rash with either dry or pustular lesions, compatible with smallpox. Rhazes or al Razi, the ninth-century Islamic physician, differentiated between measles and smallpox in *A treatise on the small pox and measles*.[13]

Physicians have attempted to prevent smallpox since ancient times. In the procedure of variolation, intradermal inoculation or nasal insufflation of smallpox scabs caused a severe infection with a mortality rate of 0.5–2%, but survival produced immunity. In eighteenth-century Scotland, before inoculation, wrapping patients in blankets before a fire to induce sweating and plying them with whisky to 'force out' the pocks was popular therapy.[14]

Lady Mary Wortley Montagu, wife of the ambassador to Turkey, discovered variolation in that country in 1717. She wrote that injection of material from 'the best sort of small pox' prevented smallpox. Montagu variolated her two children and aimed to bring the procedure to England regardless of anticipated opposition from the medical establishment:

> I am patriot enough to take pains to bring this useful invention into fashion in England, and I should not fail to write to some of our doctors very particularly about it if I knew any one of them that I thought had virtue enough to destroy such a considerable branch of their revenue for the good of mankind.[15,16]

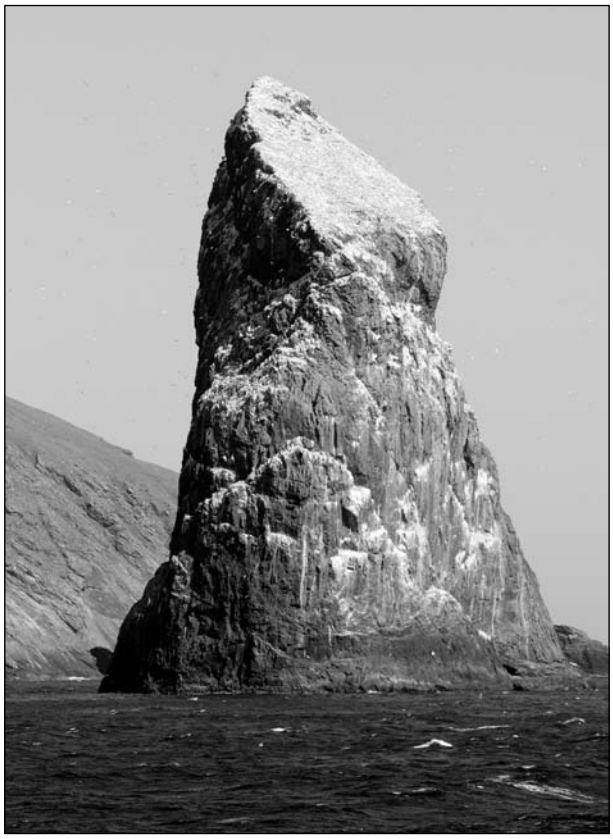

FIGURE 1 Stac an Armin, where three men and eight boys were marooned in the winter of 1727–28. (© Warwick Lister-Kaye/istockphoto.com)

Montagu has an extraordinary coincidental connection with St Kilda. Her sister, Lady Frances Pierrepont, married John Erskine, the 22nd Earl of Mar, a Jacobite general in the 1715 battle of Sherriffmuir. John's brother, Lord Grange, married Rachel Chiesley, who suspected her husband's infidelity and Jacobite loyalties. Grange imprisoned her, initially on the Monarch Islands and then on St Kilda from 1734 to 1742, where she became the celebrated Lady Grange.[17] The minister on St Kilda, Rev. Roderick McLennan, told Chiesley about the recent smallpox deaths. Had Chiesley heard of vaccination from Lady Montagu, her brother-in-law's sister-in-law, and arrived seven years earlier, she may have prevented the epidemic.

In 1796 Edward Jenner developed a vaccination, inoculating with cowpox material to protect against the disease. Vaccination ultimately commenced on St Kilda in 1873, preventing further smallpox.[17] A doctor visiting in 1906 discovered a greasy and dirty ancient vaccination lancet used for blood-letting by one of the elders,[8] supporting the author's concept of unsterile equipment used to cut the umbilical cord as a cause of neonatal tetanus.[1]

SMALLPOX OR CHICKENPOX?

William Heberden is credited with differentiating chickenpox from smallpox in 1767. 'Smallpox' epidemics prior to that date cannot be accepted as indisputable.

Heberden described the clinical features of chickenpox as follows:

> These pocks break out on many without any illness or previous sign: in others they are preceded by a little degree of chillness, lassitude, cough, broken sleep, wandering pains, loss of appetite and feverishness for three days… Most of them are of the common size of the smallpox… I never saw them confluent nor very numerous. The principal marks, by which the chicken pox may be distinguished from the small pox are,
> 1. The appearance on the second or third day from the eruption of that vesicle full of serum from the top of the pock.
> 2. The crust, which covers the pocks on the fifth day; at which time those of the smallpox are not at the height of their suppuration.[18]

The 1727 epidemic has always been labelled smallpox. St Kilda's leading historians accepted this diagnosis,[2,8,17,19] although the historian Bill Lawson (personal communication) wondered why the illness was more severe among the adults. The following points suggest the alternative of chickenpox:

- No clinical features of the 1727 St Kilda epidemic are available;
- The similar exanthemas of smallpox and chickenpox were not distinguished at the time;
- The epidemic spread widely and rapidly, more like chickenpox than smallpox;
- The epidemic caused a higher death rate among adults than children – again, more like chickenpox than smallpox;
- Chickenpox probably had a high mortality in the 'virgin soil' of the Americas, although there are no data on the comparative mortality of smallpox;
- The viability of the smallpox virus is inversely related to its infectivity. Smallpox is only highly contagious in the aerosolised form. Smallpox virions have a low survival rate and an even lower infectivity in fomites.

For two millennia smallpox generated fear among communities. Severe fever, malaise and back pain usually confined and isolated patients to bed prior to a contagious rash. The St Kildans recognised and isolated islanders with tuberculosis,[17] and probably isolated each new island case in 1727, with only a few relatives attending, thus blocking the chain of transmission. Smallpox sufferers usually only infect another five people, who are four times more likely to be household contacts than other community members as the bedside is the major site of transmission.[20]

Comparisons with pre-Columbian North America are interesting and relevant. The indigenous population had not encountered European viruses and its genetic biodiversity of histocompatibility antigens, the genetic key to immunological defence against viruses,[21] was 64 times less than that of the Europeans. The population declined from perhaps 100 million to a few million in 300 years. Smallpox is incriminated, without indisputable evidence, as causing the death of 90% of non-immune indigenous Americans in the sixteenth and seventeenth centuries.

Crosby defines the term 'virgin soil' epidemics as 'those in which the populations at risk have had no previous contact with the diseases that strike them and are therefore immunologically almost defenceless'.[22] John Morgan, a Manchester physician, used the term when writing about his visit to St Kilda in 1860: 'May we not explain the accumulated fatality in all these cases by supposing that in the same manner as the different cereals flourish best when planted in virgin soil, or at longer intervals of time, so it is with infectious disease? The more distant their visitation, the richer the pabulum supplied for the epidemic.'[23]

The Morrisons and the McDonalds[24] were predominant among the inbred St Kilda families in 1727, suggesting limited genetic diversity. St Kilda, as a 'virgin soil' environment, had a non-immune adult population, with increased morbidity and mortality from most infections. Chickenpox is usually more severe in adults, and deaths in adults tending children with chickenpox are well documented:[25] the complication or fatality rate is 25 times higher in adults than children.[26]

Aerosolised smallpox is highly infectious but short-lived when exposed to air or sunlight. The smallpox virus is viable outside a host and has been isolated from scabs sitting on a shelf for 13 years.[27,28] Infection from contaminated clothes or blankets is infrequent as the virus must still enter the host's respiratory tract.

Chickenpox is more contagious, being contagious before the rash develops, and infects 90% of household contacts. The 1727 disease was virulently contagious, a catastrophically rapidly transmitted disease. The sea stack party left a healthy community, yet within 10–14 days there were not four healthy males among 30–50 men to row four miles,[10] a transmission rate more compatible with chickenpox. Chickenpox is spread from respiratory secretions by sneezing and coughing and viable droplet nuclei <5μm remain airborne indefinitely. Pneumonia and secondary bacterial skin infection are the most common fatal complications, but hepatitis and fatal neurological problems can follow chickenpox.[29]

The last St Kildan case of 'smallpox'

The St Kilda smallpox versus chickenpox conundrum has a twentieth-century coda. Norman John Gillies, the last survivor of depopulation, was born on St Kilda in 1925. (The death of his mother, Mary Gillies, from appendicitis in 1930 led to depopulation.) While on *HMS Cossack* in Alexandria in 1945, Gillies developed a rash,

J R Coll Physicians Edinb 2009; 39:276–9

possibly smallpox, requiring isolation and the inoculation of the crew. They shook their fists when passing Gillies' ward, on discovering later that it was chickenpox.[30]

CONCLUSION

A catastrophic epidemic, with a higher mortality in adults, killed 80–90% of St Kilda's population in 1727. The catastrophe required the repopulation of the island and included an amazing survival story. Although attributed to smallpox, no clinical details are documented, and the disease may have been chickenpox instead. The infectivity of clothing months after the alleged smallpox victims' deaths would be low, and concurrent shingles in a visitor causing chickenpox may have led to the epidemic. Chickenpox is a more contagious disease than smallpox, and may have an equal mortality in an immunonaive, malnourished population with limited genetic diversity.

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