AN ISOLATED CASE OF EARLY MEDICAL INTERVENTION.
THE BATTLE AGAINST NEONATAL TETANUS IN THE
ISLAND OF VESTMANNAEYJAR (ICELAND) DURING THE
19TH CENTURY

Madrid. June 2008

In 1838, the State physician responsible for Iceland (Landphysicus) Jón Thorstensen sent a letter to the Collegium Medicum in Copenhagen in which he criticized the attempts of the medical authorities in Denmark to find remedies against neonatal tetanus in the island of Vestmannaeyjar.¹ By then the Medical Board (Collegium Medicum) had sent no less than six medical doctors to make inquiries about the disease in this small island of slightly more than 200 inhabitants.² At that time there were only five physicians covering the rest of the country with its 60,000 inhabitants. The criticism of the Landphysicus was based on the pragmatic view that the resources spent on this small island would have been of more use in other parts of the country. In his view the evidence of history showed that the disease was incurable and deeply rooted in the manners and life style of the inhabitants.

When one takes into consideration the specific reason for the temporary establishment of the physician’s position, that is the inquiry about the so-called ginklofi³ (neonatal tetanus), it cannot be seen as necessary to uphold this position any longer. Experience has shown that there is no cure for this disease

¹ DNA (Danish National Archives). Det kongelige Sundhedkollegiums arkiv. Decanatsprotocoll 437-1838.
² The first one was the district physician Sveinn Pálsson. The Landphysicus Thomas Klogh (1768-1824) came to the island in 1810. Ólafur Thorarensen (1794-1870) was in the island 1821-22. In 1827 Vestmannaeyjar became a distinct medical district: C.F. Lund (1786-1831) in Vestmannaeyjar 1828-31, C.H.U. Bolbroe (1804-1888) in Vestmannaeyjar 1832-39, A.S.I. Haalland (1814-1845) in Vestmannaeyjar 1840-1845. P.A. Schleisner came to the island in 1846. Ideas of those physicians about the origins and remedies against neonatal tetanus is discussed in detailed in: Loftur Guttormsson and Ólöf Garðarsdóttir, „Public intervention.“
³ Ginklofi is the most common term used for neonatal tetanus in Iceland. It has the same meaning as lockjaw in English.
as it lies deeply rooted in the island’s natural conditions and its inhabitant’s way of life.⁴

The observations made by the *Landphysicus* in 1838 can be seen as typical of the general ideas about the causes of neonatal tetanus in Vestmannaeyjar. In line with the prevailing miasmatic ideas of disease causation, the physicians who visited the island in the early 19th century all looked for the cause of high infant mortality in the natural environment of the island, as well as in the diet and general living conditions of its inhabitants.⁵ Artificial feeding of newborns was generally seen to be one of the main factors behind high mortality rates from neonatal tetanus in Vestmannaeyjar during the 19th century.

The citation above elucidates how extraordinary the actions taken in Vestmannaeyjar were at the beginning of the 19th century. The disease and the situation in the island in general aroused great interest in the *Collegium Medicum* in Copenhagen during the first half of the 19th century. For the situation in Vestmannaeyjar was extreme even by Icelandic standards. The explanation for the acute interest in the island is without doubt to be found in the fact that levels of infant mortality exceeded all acceptable norms during the early 19th century.

**The extent of neonatal tetanus in Vestmannaeyjar**

Neonatal tetanus is a well-known disease in Third World countries today. It is caused by a bacterium *Clostridium tetani* that grows in animal faeces, dead tissue and decaying substances. It is in soil and animal excrement, and often on the surfaces of skin and tools. Transmission takes place when there is direct contact between bacteria and the umbilical stump and is therefore often related to unhygienic cord cutting or the application of filthy substances to the umbilical stump.⁶ Today the transmission of the disease is often related to home delivery and untrained assistance during delivery. Signs of neonatal tetanus appear two to ten days after birth and normally death occurs

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⁶ Neonatal tetanus thus differs from many other bacterial diseases in not being transferred from person to person.
within two weeks from birth. The first symptoms are difficulties with swallowing, followed by a general stiffness and convulsions that occur with increasing intensity. The case fatality rate in historic populations was close to 100 per cent.

In some contemporary Third World countries a simple model has been used to estimate the occurrence of neonatal tetanus in given populations. As neonatal tetanus most frequently occurs between the 4th and the 14th day of life, the model assumes that it occurs in populations that show a 4-14-day mortality rate that is higher than the mortality rate during the last 14 days of the neonatal period. In a recent article, the anthropologist Daniel Vasey has applied this model in order to estimate the occurrence of neonatal tetanus in rural areas in Iceland. According to Vasey’s estimates, approximately one fourth of all infant deaths in Iceland can be explained by neonatal tetanus.

The tetani bacterium was not discovered until 1884. It is therefore an interesting fact that this disease was fought relatively successfully in Vestmannaeyjar as early as the 1840s, during a period when miasmatic ideas about disease causation dominated the medical debate. In other areas in the North Atlantic that were known for tremendously high mortality rates from neonatal tetanus, improvements were not made until the beginning of the 20th century. This was the case with the island of Grimsey in northern Iceland and the Scottish island of St. Kilda. Deaths from tetanus in St. Kilda peaked during the 1860s when neonatal mortality reached 690 per 1,000 live births. Improvements in Grimsey and St. Kilda occurred approximately at the same time in the early years of the 20th century.

The problem of neonatal tetanus has received relatively little attention amongst medical historians. Since the transmission of the disease is generally linked to unsanitary conditions, and in particular the contact with animal faeces, there is little

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doubt about its existence in rural societies in past times. Delivery frequently occurred under primitive conditions and the fact that domestic animals were often kept in human dwellings increased the risk of transmission. It is therefore rather paradoxical that neonatal tetanus was most common on islands where agricultural activities were of relatively little importance.

Here explanations for the high mortality rates from neonatal tetanus in Vestmannaeyjar are sought. The analysis is, however, mainly directed at the role of physicians and midwives in this process of early medical intervention to save the lives of young children. How was it possible to find remedies against a bacteriological disease long before the germ theory was developed and accepted?

Figure 1 compares the development of infant mortality in Vestmannaeyjar during the period 1816-1860 with the national average. Initially, infant mortality rates in Vestmannaeyjar exceeded 800 per 1,000 live births. There was a slow, but gradual decline in infant mortality in the island until the late 1840s with the mid-century levels of infant mortality around 650 per 1,000 live births. During the first half of the 19th century infant mortality rates in Vestmannaeyjar were
between two and four times higher than the national average. During the late 1840s the pace of infant mortality decline in Vestmannaeyjar accelerated and by 1860 infant mortality was slightly below 300 per 1,000. This was somewhat higher than the national average, but in line with mortality rates in the neighbouring high mortality county of Rangárvallasýsla on the mainland.

The majority of infant deaths in Vestmannaeyjar occurred during the neonatal period. When breaking up the distribution of neonatal deaths according to the Boerma and Stroh model it is shown that most neonatal deaths occurred during the 4th-14th day interval, when mortality in neonatal tetanus is most common (Table 1). During the period 1816-1846 the 4-14 day mortality rate reached levels above 600 per 1,000 live births. Improvements in the subsequent period occurred primarily during the 4th-14th day interval and by 1846-1863 neonatal mortality had dropped to a level of 216 per 1,000. At that point in time infant mortality on the island was 360, a rate that was comparable to the county of Rangárvallasýsla where Vestmannaeyjar is situated.

Table 1. The distribution of infant deaths in Vestmannaeyjar 1816-1846 and 1847-1863 (per 1,000 live births)

<table>
<thead>
<tr>
<th></th>
<th>0-3 days</th>
<th>4-14 days</th>
<th>15-28 days</th>
<th>Post neo-</th>
<th>Post neo-</th>
<th>IMR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>natal mort.</td>
<td>natal mort. &quot;refined&quot;</td>
<td></td>
</tr>
<tr>
<td>1816-46</td>
<td>37,6</td>
<td>624,3</td>
<td>35,8</td>
<td>23,3</td>
<td>76,9</td>
<td>720,9</td>
</tr>
<tr>
<td>(N of births=599)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1847-63</td>
<td>10,4</td>
<td>216,7</td>
<td>41,8</td>
<td>91,4</td>
<td>125,0</td>
<td>360,3</td>
</tr>
<tr>
<td>(N of births=383)</td>
<td></td>
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Sources: NAI. Skjalasafn presta og prófasta. Prestshjónustubækur: Rangárvallaprófastsdaemi. Vestmannaeyjar BA2. 1816-1839 (Ofanleiti), BA4. 1816-1845 (Kirkjubær) and BA6. 1846-1863.

The decline in neonatal mortality in Vestmannaeyjar was accompanied by an increase in post-neonatal mortality. Here it must be mentioned that the results for post-neonatal mortality tend to be somewhat skewed. As both neonatal and post-neonatal mortality are found by using the same denominator (live births) post-
neonatal mortality outcomes tend to be low if many infants die during the neonatal period. Then relatively few infants belong to the actual at risk population (i.e. survivors after the first month), whereas a much larger population is used to calculate post-neonatal mortality (i.e. all live births). Because of the extremely high neonatal mortality rates in Vestmannaeyjar I have chosen to show separately the actual post-neonatal mortality rate\(^{13}\) (here called post-neonatal mortality “refined”).

It is shown that both methods reveal a higher post-neonatal mortality rate during the later period. The second method though offers a much more realistic picture of morality levels and it is shown that post-neonatal mortality lies approximately at the national level. The increase in post-neonatal mortality between the two periods is not easy to explain. A plausible explanation could be that those children who were spared from the disease belonged to the higher social strata where hygienic standards were quite good. It is also possible that the development of the fisheries and the accelerating population growth in Vestmannaeyjar during the second part of the 19\(^{th}\) century created a situation of over-crowding that would bring about a deterioration in the health of young children.

**Medical intervention**

The first attempt of the Icelandic medical authorities to shed light on the disease of *ginklofi* (lockjaw) in Vestmannaeyjar was made by the *Landphysicus* Jón Sveinsson (1753-1803), when in 1789 he sent a questionnaire to the parish minister in Vestmannaeyjar requesting information about the disease. Ten years later, the district physician Sveinn Pálsson went to the island to conduct an inquiry into the disease. He sent a detailed report to the authorities in Copenhagen. Sveinn pointed out that most newborns died before the 10\(^{th}\) day of life and observed that children of Danish parents were, to a large degree, spared from this dreadful disease. According to Sveinn, food was the main culprit, consisting, as it did, mainly of oceanic birds, primarily young fulmars, puffins, and gannet. He furthermore notes that the cause of this dreadful disease was, perhaps, just as much:

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\begin{align*}
al) & \text{ the oily down on which the mothers rest,} \\
b) & \text{ the water which the lethargic islanders refuse to fetch from other places but the few foul puddles and lava}
\end{align*}
\]

\(^{13}\) The denominator used in the “refined” method is the actual at risk population (i.e. live births minus those dying during the neonatal period).
fissures close to the farmsteads, which in the summer were full of podaris and all kinds of larvae, and which throughout the whole year were full of dirt and refuse from the houses; c) the low and confined living quarters, which were full of the foul stench from the oilskins; d) bad fuel, mostly from dried puffins corpses and other oily waste.14

Like many of his successors, Sveinn Pálsson noted that Danish middle-class families were to a large extent protected from the disease. Moreover, he noted that the disease was fairly common in neighbouring parishes on the mainland. In his view the disease could largely be avoided if newborns were breastfed. Moreover, he recommended the use of fresh water and improvements in the management of food. During subsequent decades, remedies suggested by physicians serving in the island were almost identical to those proposed by Sveinn Pálsson. The disease was mainly explained by cultural and environmental factors, such as bad air and the poor diet of the inhabitants. Danish physicians in particular were shocked by the prevailing practices of artificial feeding on the island and all of them suggested that breastfeeding be introduced as a means of saving infants from tetanus.

Even though miasmatic ideas about the origin of disease continued to dominate the international debate on disease causation, two physicians arriving in Vestmannaeyjar during the late 1830s and early 1840s, developed a more concrete notion about the origins of neonatal tetanus. This was particularly true of A.S.I. Haalland (1814-1845) who served in the island in the years 1840-1845. He carried out a number of autopsies on tetanus victims. Haalland pointed out that in all cases the umbilical area was infected and he argued that the careless manner in which the umbilical stump was treated after birth was the main cause of the high infant mortality from tetanus in Vestmannaeyjar. He also noted that out of 14 infants born to families “living according to Danish traditions in houses of timber” only one died from tetanus.15

Haalland suggested that a young woman be sent from the island to study the art of midwifery in Copenhagen. Furthermore he proposed that a small maternity hospital be established in Vestmannaeyjar to which all women on the island would go to give birth. There, mothers would receive a more healthy diet than they were used to and would be educated about the beneficial effects of breastfeeding.

14 Lovsamling for Island 6 (1792-1805), pp. 644-45.
Following Haalland’s proposal, a young woman Sólveig Pálsdóttir was sent to Copenhagen in 1842 to study at the maternity hospital there. She arrived back on the island a year later. In the years that followed, however, most inhabitants in Vestmannaeyjar continued to rely on the services of the old midwife Guðrún Jónsdóttir who was Sólveig’s mother. During the period 1843-1846 Sólveig only delivered 14 infants, whilst her mother delivered 54. There were no changes of importance in neonatal mortality in the years immediately after Sólveig’s return from Copenhagen, with children she delivered almost as likely to die as the ones delivered by other women. Of the 14 children Sólveig delivered in the period 1842-1846 10 died (64%) and of the 54 infants her mother delivered 40 died (74%). The radical changes in infant survival took place towards the end of the 1840s both in the case of infants delivered by Sólveig and her mother. During the period 1847-1850 Sólveig delivered 35 children of whom 13 died (37%) and her mother 19 of whom 6 died (32%) The drastic change in infant mortality after 1846 was thus not related to the impact of individual midwives.16

The real breakthrough in survival chances on the island of Vestmannaeyjar occurred in 1847. Then the Collegium Medicum in Copenhagen decided to send to Iceland a young physician, Peter A. Schleisner (1818-1900), to make inquiries about the general etiology of the country. Schleisner’s second task was to establish a maternity hospital in Vestmannaeyjar. Schleisner arrived in Iceland in the spring of 1847 and spent the summer travelling in the western part of the country. He arrived in Vestmannaeyjar in June 1848. Upon his arrival, there was no doubt in his mind that neonatal tetanus was chiefly to be explained by the inadequate care of the umbilical stump. Autopsies went only to confirm his belief. During his stay, 23 women gave birth in Vestmannaeyjar. All were delivered in the maternity hospital and all were cared for by Schleisner and his housekeeper Guðfinna J. Austmann. During delivery he was most often assisted by the young midwife Sólveig Pálsdóttir and on a few occasions by her mother.

All infants were kept in the hospital for three weeks and during this period the umbilical stump was carefully washed every day, treated with oil

16 Two other women helped women in childbirth. Applying a proportional hazard model, it is shown that the survival chances of young infants were not related to the individual midwife. The only variable producing significant results is the “period factor”. The year 1847 marked the real breakthrough, when survival chances of young infants improved drastically. Infants that Sólveig delivered before the year
(balsamum copaiba) and covered with linen. When the child was sent home its mother received oil, a sponge to wash the child with, appropriate clothing and a feeding bottle. Schleisner had planned to keep the mothers in the clinic with the newborns being given a special diet. The plan was to diminish the share of seabirds and increase the amount of vegetables in the diet and an attempt was also to be made to encourage breastfeeding during this period. It turned out that only 8 of 23 mothers agreed to stay in the hospital. However, all the infants were kept there. Schleisner maintained that the women’s reluctance to stay in the maternity hospital resulted partly from the high costs and partly from their unfamiliarity with the food. According to Schleisner, mothers as a rule refused to breastfeed their babies.

The hospital stopped operating shortly after Schleisner’s departure. However, the midwife Sólveig Pálsdóttir continued to take childbearing women into her own home. Most of these infants were kept in the midwife’s home for a period of from two to three weeks after delivery, whereas the mothers went home after recovering from childbirth.

![Figure 2. Yearly fluctuations in neonatal mortality in Vestmannaeyjar, 1831-1863](image)

1847 were as likely to die as children delivered by other midwives and the survival chances of infants delivered by other midwives also improved greatly after 1847.


Ibid.

Ibid.

Schleisner’s achievement in Vestmannaeyjar was remarkable with neonatal mortality from tetanus declining immediately after his arrival. This can be illustrated by the example of changes in neonatal mortality in the year the maternity hospital was established. Before Schleisner’s arrival, between January and August 1847, ten children were born on Vestmannaeyjar. Only two of these children survived the neonatal period, all the other eight were said to have died from ginklofi 6 to 11 days after birth. After the maternity hospital was opened in September the situation was reversed. Between September and December twelve infants were born on Vestmannaeyjar of whom only one died from neonatal tetanus. The shift in neonatal mortality in Vestmannaeyjar after Schleisner’s arrival is clearly revealed in Figure 3 that shows yearly fluctuations in neonatal mortality for the period 1831-1863. Before Schleisner’s intervention neonatal mortality fluctuated between 500 and just above 800 per 1,000. After 1847, neonatal mortality rates infrequently exceeded 400, and commonly oscillated between 200 and 350 per 1,000 live births (see Figure 2).

Survival Function

Neonatal survival. Vestmannaeyjar

Figure 3. Neonatal survival. Vestmannaeyjar, 1816-1863
Sources: See Table 1.

21 NAI. Skjalasæfi presta og prófasta. Prestsþjónustubækur: Rangáravallaprófastsdæmi. Vestmannaeyjar BA2. 1816-1839 (Ofanleiti), BA4. 1816-1845 (Kirkjubær) and BA6. 1846-1863.)
The decline in neonatal mortality in Vestmannaeyjar occurred mainly during the interval from the 5th to the 10th day after birth. This is evident from Figure 3 (survival function) where the development of neonatal mortality is shown for three periods, (1) the period 1816-1830 when neonatal mortality rates remained at extremely high levels, (2) 1831-1845 when neonatal mortality started to decline and (3) 1846-1863 after changes in methods of delivery to counteract neonatal tetanus were introduced and implemented on the island. International studies have shown that mortality from neonatal tetanus is at its highest during the interval from the 6th to the 11th day after birth and this is the age group where most notable improvements occurred. A slight improvement took place between the two first periods, but it is the period 1847-1863 that is characterized by the most notable improvement. During this period 80 per cent of all infants survived the first 10 days, compared to slightly more than 50 per cent during 1831-1845 and 40 per cent during the period 1816-1830. Infant mortality in the island is by no means low during this period, but the changes were nevertheless dramatic.

*Causes of death in Vestmannaeyjar*

In the case of Vestmannaeyjar, there is no doubt about neonatal tetanus being a major baby killer during the early 19th century. The disease was obviously well known among contemporaries and the symptoms were unmistakable for laymen and physicians who served in the island. Nevertheless, care is needed when analysing information on cause of death given in the parish registers of Vestmannaeyjar. Physicians serving on the island frequently complained about parents not calling for a doctor when their children fell ill and the parish minister had on most occasions not seen the infant before it was buried.
Figure 4 shows cause specific neonatal mortality in Vestmannaeyjar in the years 1816-1863. Until 1847 when Schleisner arrived in Vestmannaeyjar there was a continuous increase in the share of neonatal tetanus compared to other causes of death. The cause *trismus, ginklofi* (lockjaw) or *vestmannaeyjabarnaveiki* (Vestmannaeyjar-childhood-disease), all terms used for neonatal tetanus, are most frequently given during the period 1841-1847, when 94.9 per cent of all neonatal deaths were attributed to the disease. Infant mortality from the disease alone thus reached the level of 587 per 1,000 live births compared to 375 per 1,000 in 1816-1830 and 461 in 1831-1840. There is a strong reason to believe that there was some under-registration of *ginklofi* during the earliest period when 47 per cent of all neonatal deaths received a relatively unspecific cause of death, namely *barnaveikindi* (childhood disease) or even *vanaleg barnaveikindi* (common childhood disease). On the other hand it can be assumed that there was a certain over-registration of *ginklofi* during the period 1840-1847. Then the debate about the disease was at its height and since it was extremely common on the island, it is not unlikely that a parish minister who hadn’t seen the infants, simply assumed that newborns that died a few days after birth died from tetanus. Medical reports indicate that breastfeeding was uncommon in Vestmannaeyjar and it must therefore be assumed that many infants in the island died from diarrhoea at early ages.
A comparison of Schleisner’s report to the *Collegium Medicum* in Copenhagen with the church registers, strongly indicates that there was an over-registration of neonatal tetanus in the parish records during Schleisner’s stay on the island. During his stay in Vestmannaeyjar, 23 women gave birth at the maternity hospital. Five of the 23 children died during the neonatal period. According to Schleisner’s report three of these children were reported to have died from *ginklofi*, one child was born weak and one died from acute diarrhoea. On the other hand, in the death register maintained by the parish minister, all five neonates were said to have died from *ginklofi*.

Information on neonatal tetanus is likely to be fairly accurate after 1847. Most infants were delivered in the midwife’s home and it can be assumed that the parish minister generally consulted the midwife about the cause of infant deaths. According to the church records, neonatal tetanus remained a fairly common disease in Vetmanneayjar after 1847. During the period 1847-1863, the mortality rates from neonatal tetanus was 83 per 1,000, whereas 134 per 1,000 died from the less specific disease of *barnaveikindi /barnaveikleiki* (childhood disease/ childhood weakness) and 13 per 1,000 from other diseases.

In a recent article, the anthropologist Daniel E. Vasey presents an estimate of neonatal tetanus mortality in Iceland for the period 1790-1839. He bases his analysis on 21 parishes in Iceland and he uses the statistical model developed by J.T. Boerma and G. Stroh (see description above). For reasons that are by no means obvious, Vestmannaeyjar was not included in his study. Vasey concludes that around 25 per cent of all infant deaths in pre-industrial Iceland were caused by neonatal tetanus. Vasey criticizes studies carried out in other areas in northern Europe with high neonatal mortality rates and argues that neonatal tetanus was bound to be a common cause of death in rural areas with high mortality during the first 14 days of life. Vasey’s criticism of Nordic research is directed in particular towards Anders Brändström’s study of infant mortality in the parish of Nedertorneå in northern

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22 See Johnsen, *Ginklofinn í Vestmannaeyjum*, p.12.
24 The model is based on the assumption that mortality rates in the 4-14 day and 15-27 day intervals tend to be equal when the disease of neonatal tetanus is not present in a population. On the other hand, mortality rates in the first period (4-14 days) tend to exceed those in the second period (15-27) when there are many deaths from neonatal tetanus.
Sweden. Nedertorneå was, like many districts in northern Sweden and Finland, characterized by the artificial feeding of newborns. Brändström showed that infant mortality in Nedertorneå peaked during the second and third week of life and that the most common cause of death was diarrhoea. Brändström’s analysis is based on fairly reliable cause of death data both from parish records and in medical reports. On the other hand, the most serious flaw in Vasey’s study is the fact that he uses only a little qualitative evidence to support his argument. Thus, he does not use information on cause of death in parish records and he does not analyse medical reports available in his research areas.

Vasey’s article is though an important contribution because of the way he discusses the occurrence of a disease that has received too little attention from historians. However, it must be doubted whether Vasey’s high estimates of mortality from the disease hold for Iceland as a whole or for other areas with artificial feeding practices. Previously, the Boerma-Stroh model has only been used to estimate neonatal tetanus mortality in modern Third World countries where breastfeeding of newborns is the norm. It was shown in part 2 that in areas where newborns were solely artificially fed, neonatal mortality tended to be high and in such areas it has been shown that mortality tended to peak during the second week of life. Thus, there is an overlap between the period of most intense tetanus mortality (peaking during the 6th to 11th day) and mortality from diarrhoea and dehydration caused by the unsuitable feeding practices of newborns (peaking primarily during the second week). This makes the estimation of the relative effects of neonatal tetanus in pre-industrial Iceland, and in other areas with prevailing traditions of artificial feeding of newborns, difficult.

Explanations

Why were infants in Vesmannaeyjar and the other small islands in the North Atlantic affected to a larger extent by the disease of neonatal tetanus than was the case with populations living in the immediate neighbourhood under comparable social and

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economic conditions? Both in the case of the islands of Vestmannaeyjar and Grimsey in Iceland and of St. Kilda in Scotland, neonatal mortality was several times higher than was the case with infants on the mainland of Iceland and Scotland. We can only speculate as to the causes of high mortality from tetanus on the islands, compared to the neighbouring areas.

The geographical background of the inhabitants of Vestmannaeyjar was not to any important degree different from that of populations in neighbouring parishes on the mainland. Because of the extremely high infant mortality there was no natural increase in the island and consequently only 12 per cent of the adult population was born there according to the national census of 1845.27 Three quarters of all the inhabitants had inmigrated from various parishes in southern and southwestern Iceland. Because of the varied backgrounds of the inhabitants, it is highly unlikely that the treatment of newborns varied from what was common practice in other districts of Iceland. Here it is of importance to note that midwives serving on the island came from different parts of Iceland and were in general not related to each other. It is thus unlikely that they passed some specifically traditional treatment of the umbilical cord to each other. Moreover, physicians sent to the island were generally extremely precise in their description of the treatment of infants and their reports contain no description of any practice involving the application of any substances to the umbilical stump. On the other hand, physicians on several occasions reported that the umbilical stump was not covered and never washed. This was likely to be the case in other areas in Iceland as well. The question then remains why infants in Vestmannaeyjar were to a larger extent exposed to the tetani bacterium than was the case with infants in other areas of Iceland.

There are several reasons as to why the tetani bacterium could have survived better in the Vestmannaeyjar environment than in other areas. As in the two other Atlantic islands with high mortality from neonatal tetanus (Grimsey and St. Kilda), Vestmannaeyjar was known for an acute shortage of clean water. The inhabitants, therefore, frequently collected water from shallow ponds. The tetanus bacterium is frequently found in the sediment at the bottom of such ponds28 and it is thus likely that contagion can be explained by the use of infected water.

28 Personal communication from ….
Another important factor that could have contributed to the frequent occurrence of neonatal tetanus is the fact that, because of the lack of firewood, dried corpses of puffins and other seabirds were used as combustible material. As the tetani bacterium grows ideally in decaying matter this is likely to have been the most common source of contagion. Traditionally, women were responsible for the firewood and in an era when elementary hygienic measures such as handwashing were not common, the frequent handling of decaying substances was likely to bring about contagion. As soon as elementary hygienic measures were introduced, death rates from tetanus were bound to decrease. Thus, tetanus mortality fell permanently as soon as women started to give birth in the midwife’s home where she would care for the infant while the umbilical wound healed. Here it must be mentioned that the physician C.E. Levy who was the head of the maternity hospital in Copenhagen (where midwives were educated) wrote a book that was used in the education of midwives both in Denmark and in Iceland. In the first edition of the book he recommended that midwives pay special attention to the care of the umbilical stump. Levy sat on the Medical Board (Collegium Medicum) in Copenhagen and thus took an active part in decisions concerning public health measures in Vestmannaeyjar. He was one of the individuals who took decisions about which physicians were sent to Iceland and he decided that a local woman from Vestmannaeyjar should come and study midwifery.

It must be assumed that Levy paid close attention to his apprentice Sólveig Pálssdóttir and made sure that she received the best possible instruction as to the importance of sanitary measures in relation to childbirth. Upon her return to Iceland, however, Sólveig was apparently not able to introduce her new-found knowledge immediately. All births occurred in the home and even if the midwife followed all instructions about hygiene when she delivered the children and cut the umbilical cord, she was in all likelihood not in a position to convince mothers of the need to avoid bringing the stump into contact with filthy material. This changed dramatically as soon as newborns were kept in the midwife’s home.

One must conclude that the Vestmannaeyjar case is a good example of how the sanitary movement produced important improvements in infant survival. In part the improvements were accidental and certainly not based on scientific knowledge as to the mechanisms of contagion by bacteriological diseases. It is worth

noting that mothers in Vestmannaeyjar continued the practice of artificial feeding and infant mortality rates remained relatively high compared to the national average and certainly compared to mortality levels in Denmark. Mortality had, however, now dropped to levels close to those of neighbouring parishes on the Icelandic mainland.

The fact that breastfeeding was not initiated in Vestmannaeyjar is interesting in the light of the fact that a well educated midwife and a physician served on this small island, where communications were easier than in most other parts of Iceland. Sólveig Pálsdóttir had been trained as a midwife in Denmark where infants were as a rule put to the breast. Sólveig has been described as a strong and determined woman who was respected in the local community. It is hard to believe that she would not have been able to encourage local women to breastfeed if she was convinced about its beneficial effects.30 Sólveig had only spent a few months in Copenhagen and for her there was no obvious or quantitative evidence of the positive effects of breastfeeding. Her mission was to combat a lethal disease that caused extremely high neonatal mortality rates. Once this disease was more or less eradicated there was no apparent reason for further changes in the living arrangements in Vestmannaeyjar. Infants and young children were perceived as vulnerable beings that were prone to die. It is highly unlikely that Sólveig or other inhabitants in Vestmannaeyjar believed that further improvements could be achieved in the field of infant health. Fatalistic ideas prevailed, not only in Iceland but in other countries as well. Anne Løkke has argued for Denmark that during the early 19th century, relatively high infant mortality levels were seen as inevitable. Infants simply died of childhood, or young age just as the elderly died of old age. There were, however, limits to the acceptable norms.

High mortality areas in Denmark and in other parts of the Danish kingdom always received special attention from the medical authorities.31 As a result the situation in Iceland was frequently debated in the Collegium Medicum. There, Vestmannaeyjar presented the extreme case. Neonatal mortality rates of between 70 and 90 per cent were seen as scandalous, both in Iceland and in Denmark. The radical actions taken to improve the survival chances of infants on Vestmannaeyjar in the early 19th century must then be seen in this light. The measures taken on the island represent an isolated example of early medical intervention and were not extended to

31 Anne Løkke, Døden i barndommen. Spædbørnsdødelighed og moderniseringsprocesser i Danmark 1800 til 1920 (Copenhagen, 1998), above all chapter 3.
other high mortality areas in Iceland. On the other hand, medical reports on health conditions on Vestmannaeyjar did in the long run, awaken interest in infant health in Iceland, although further concrete actions against high infant mortality levels there were not taken until after the mid-19th century. The inquiries made in Vestmannaeyjar increased the existing knowledge about infant health in Iceland and about infant feeding in particular. The lack of breastfeeding was thus on several occasions remarked upon by physicians in Iceland and in Denmark during the 19th century.