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Thule Palaeopathology: The Health Concerns of an Arctic Lifestyle

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Keywords
Thule lifestyle, health, diet, environment, skeletal evidence, pathology, Arctic, archaeology

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Thule Paleopathology: The Health Concerns of an Arctic Lifestyle

Katherine Bishop

Introduction

Though “many people may think of the skeleton as merely a framework to which the more important soft tissues, those allowing for maintenance of life and personally identifiable characteristics, are attached and protected” (Jerkic 1993:214), the human skeleton can provide a vast array of knowledge once these soft tissues break down. Examining the skeletal remains for pathological markers, ante mortem stresses and other anomalies is the study of disease in ancient populations called Human Paleopathology (Aufderheide et al. 1998). These “osteobiographies” can be related to the specific environment, diet and lifestyle of individuals (Lovell and Dublenko 1999). While the osteological record for Thule is scarce, I hope to demonstrate that the remains that have been recovered provide sufficient information to suggest the overall health of Thule based on their Arctic lifestyle.

Who were Thule?

Thule or Neoeskimo describes a culture that prospered in Alaska and the Canadian Arctic from roughly 800-700 BP until they gave rise to the present Inuit culture around the time of European contact (Cassidy 1977; Hawkey and Merbs 1995). Originating in Siberia and migrating east into North America during a period of glacial cooling, the Thule were hunter-gatherers who specialized in marine mammal hunting in the winter (with a strong emphasis on whaling) and caribou and smaller game hunting in the summer. The Thule exhibited a more sedentary lifestyle than the cultures that pre-dated them in the Arctic though; the archaeological evidence shows they still had a moderate degree of logistical mobility that was seasonally-based (Buikstra 1976; Stenton 1991). Many semi-subterranean dwellings have been recorded at suspected large winter settlements along the coast, while smaller, more temporary, tent-dwellings have been found at proposed summer settlements in the interior (McCartney and Savelle 1985). The Thule expanded from coastal and interior Alaska (including the Aleutian Islands) along the coast of the central Arctic, extending as far east as the Eastern Canadian coast and Greenland prior to European contact. Cultural variations have been documented at settlements across this vast range; however, there are many characteristics of the Thule lifestyle that were consistent, and this general lifestyle will be applied to the skeletal and mummified human remains discussed in this paper. The general environment, diet and habitual lifestyle of Thule will be used to explore issues concerning Thule health.

While full-body remains (i.e. mummies) are rarely found within the archaeological record, they are incredibly useful when they do occur. Fortunately, the environmental factors present in the Arctic are favorable for the creation of such mummified remains. The cold climate, non-acidic soils and sparse carnivorous scavengers have preserved a number of known Arctic mummies which will be used in this analysis (Cockburn et al. 2000; Zimmerman and Aufderheide 1984; Zimmerman et al. 2000). The remaining evidence discussed will be skeletal-based, with comparison to modern skeletal remains and the applied ethnographic data from recent Inuit populations. There are many theories in Arctic paleopathology based on specific remains; however, I am choosing to focus on the main, and mostly recurring, health conditions that the Thule would have experienced.
The osteological paradox

Before jumping into the bioarchaeological record, it is important to first examine the limitations of using sparse skeletal remains to study the health of an entire population. Keenleyside (1998) outlined the four main limitations of:

…our ability to reconstruct the health of past populations…1) many diseases, particularly acute infectious diseases, leave no evidence in bone; 2) different diseases produce similar skeletal changes, making accurate diagnosis difficult; 3) skeletal samples may be biased due to differential burial practices or preservation; and 4) skeletal samples consist of individuals who failed to survive and are therefore not representative of the populations from which they are derived (53).

The fourth limitation described refers to the Osteological Paradox, which has been identified by many anthropologists as the main limitation when studying skeletal remains within the archaeological record (Wood et al. 1992). The majority of osteological specimens that are analyzed represent individuals that died of non-natural causes, which creates an anomaly-rich study sample. Although Wood et al. (1992) and Byers (1994) discuss the correlation of sedentism to the paradox, the basis of their argument is important for this analysis: simply put, skeletal remains do not accurately represent an entire demography.

The types of remains that are analyzed need to be considered as well. The relative age of the remains (of the individual at death) can also provide results that are not representative of an entire population. As discussed by White and Folkens (2005), most health concerns increase with age, producing a worse-case scenario for elderly individuals. There are also limitations of studying specific Native North American remains. If remains are found, permission needs to be granted by the local Inuit leaders before any studies can be conducted. In some instances entire studies have been forbidden (Tom Porawski, personal communication, March 2010). Other studies have been conditionally granted as, for example, certain parts of a skeleton may not be examined due to societal taboos (Zimmerman and Auferheide 1984).

To summarize, paleopathology can be invaluable, but only if it is done with caution; while it does provide a sample of individuals, the sample is not necessarily representative of an entire population. In order to effectively conduct osteological research, it is important to note the type of remains, the relative preservation of these remains, and to what extent they have been studied when reported in the literature. This paper includes specimens from young and old individuals and only includes those specimens that were relatively well-preserved; the sources for all specimens have also been included from which to draw your own conclusions (Table 1).

Environmental impact

There are many physical, chemical and infectious environmental factors related to health concerns which have been documented as affecting present, as well as past, populations (Kumar et al. 2007; Roberts and Manchester 2005). Many of these agents are evident in the present Arctic environment and can be directly related to the environment the Thule lived in. Physical agents that contribute to negative health include temperature and trauma. As Hawkey and Merbs (1993) outlined, the temperatures experienced by the Thule could have been below -50°C in the winter, which is well below the point at which flesh freezles. Frostbite would not have been the only
health concern associated with temperature, as cold temperatures have been found to accelerate musculoskeletal trauma. As a result, individuals would be more susceptible to the effects of trauma in the cold, which then increased the severity of said trauma.

Also, cold temperatures would have created the need for a completely enclosed space such as that seen in the Thule semi-subterranean dwellings. These dwellings contained entire families, all of their waste, as well as the smoke and soot from seal oil lamps (Keenleyside 1998; Zimmerman et al. 2000). Evidence from the mummies analyzed by Cockburn et al. (1998), Zimmerman and Aufderheide (1984) and Zimmerman et al. (2000) demonstrated an incidence of emphysema and other anthracotic problems in the lungs. These lung conditions may be a direct result of the smoke within the dwelling. Emphysema can be directly analyzed through lung tissue, while other lung problems have been suggested by Keenleyside (1998) as being evident in osteological lesions within the ribs of specimens. Air pollution, another cause of emphysema, has never been suspected, suggesting that these black lungs are a direct result of lamp smoke.

Thule would have also been predisposed to a number of “zoonotic and parasitic infections because of the close and constant contact with their waste”, which was stored within the dwelling (Keenleyside 1998:53). Specific osteological markers demonstrate that “staphylococcal, streptococcal, and fungal infections” were present within some populations; these organisms have been shown to spread from animal waste directly to individuals (Keenleyside 1998:62; White and Folkens 2005). These infections could have resulted from animal waste at the site of a kill as well as from the increased refuse within the dwelling itself.

The absence of sun in the Arctic and the related chemical agent (or lack thereof) may have affected Thule health. Vitamin D, which is obtained through the sun’s rays, allows the body to process calcium which is necessary to repair all bone (Kumar et al. 2007). Both osteoporosis and problems with basic skeletal repair has been described in Thule skeletons (Cassidy 1997; Hawkey and Merbs 1993; Keenleyside 1998; Zimmerman and Aufderheide 1984; Zimmerman et al. 2000), which suggests that a lack of vitamin D (possibly caused by a lack of sunlight) may have increased these problems.

Demineralization of bone and other such osteoporotic problems can be the result of postmortem bone damage and decay; however, specific specimens demonstrate excellent preservation in addition to osteoporotic markers suggesting that these bone conditions did, in fact, exist among Thule (Keenleyside 1998). Therefore, based on colder temperatures, the conditions present in their dwellings and the lack of sunlight experienced by Thule, environmental factors had a direct affect on overall health and predisposed individuals to specific diseases.

You are what you eat

Directly related to the environment, the Thule had a relatively limited diet that was obtained through hunting and some gathering. Their hunting was directly affected by the seasonal variations in the polar ice pack, coupled with variable vegetation that ranged from scarce to nonexistent (Stenton 1991). For example, “during abnormally cold winters when bowhead [whale] migrations were restricted, Thule Eskimos depended upon alternate [re]sources, or perhaps suffered drastic short term population loss, similar to that which is well documented in Arctic Literature” (McCartney and Savelle 1985:51). Periods of starvation are a direct result of limited diet, which is visible within the skeletal
record; one mummy analyzed by Zimmerman et al. (2000) demonstrated that a child specifically died of starvation. Similarly, the skeletal remains studied by Buikstra (1976), Keenleyside (1998), Kennedy (1989), and Zimmerman et al. (2000) contain osteological markers called Harris lines, physical growth arrest lines that occur on bones which indicate a severe stress such as a strong fever, malnutrition, or extreme and prolonged shock (White and Folkens 2005). A repetitive patterning of Harris lines occurs because of a regular stress cycle due to a specific disease or from a constant state of malnutrition (Buikstra 1976:356). The prevalence of many repetitive patterns on numerous samples suggests that the source of growth arrest was also widespread. While a specific disease may have been the cause of Harris lines in some individuals, malnutrition due to an unstable and limited food supply is the logical source for a wider demographic.

A well-balanced diet includes fruits, vegetables, meat, grains, and dairy, which all have unique vitamins and nutrients a human body needs to remain healthy. The type of food consumed by the Thule is not considered well-balanced and would have caused specific deficiencies. Many deficiencies can lead to further problems, and in some instances, disease. Spina bifida was noted in some samples analyzed by Merbs (2004), which is a spinal condition present at birth. This condition has been linked to deficiencies in folic acid in the mother (Kumar et al. 2007; Roberts and Manchester 2005 2009). Folic acid is a supplement found in grains, cereals, beans and the dry leaves of some vegetables and fruits, which would have been absent in the Thule diet. Other genetic factors may be related to the presence of spina bifida in Thule skeletons, but these factors have yet to be analyzed in present-day cases. Similarly, both cribra orbitalia and porotic hyperostosis (conditions where the bone tissue becomes spongy) were present in skeletal remains analyzed by Keenleyside (1998). Both of these conditions have been strongly linked to iron deficiencies and resulting anemia. Iron deficiencies arise in diets that lack iron-rich vegetables, beans, or specific red meat. While the Thule had a diet rich in red-meat, periods of malnutrition would have been sufficient enough to cause anemia in some individuals and would have increased the risk for cribra orbitalia and porotic hyperostosis. The evidence of spongy bone tissue has also been associated with diseases such as syphilis; however, prior to European contact, this pathogen had not been documented in the Arctic.

Within the mummies analyzed by Zimmerman and Auferheide (1984) and discussed in Cockburn et al. (1998), there was strong evidence of atherosclerosis, which is a condition of the heart related to a diet heavy in animal fats and cholesterol. A fatty diet would have helped create stores of nutrition for individuals during periods of food shortage, however too much fat and cholesterol is dangerous for the heart and can lead to heart failure (Kumar et al. 2007). Atherosclerosis is not a condition visible in the skeletal record; however, the mummies demonstrated that it was present in Thule communities, and that the fatty Thule diet would have increased the risk for certain heart diseases. Not only did the Thule eat a lot of red meat, they also consumed raw meat, which has been known to carry parasites. Similar to the infections that may have resulted from close contact with their refuse, parasites associated with consuming raw meat would have created many gastrointestinal problems as evident in one of the mummies from Utqiagvik (Zimmerman and Auferheide 1984). Trichinosis, which is an infection caused by a parasite, was evident in the mummy’s gastrointestinal tract and has been linked to
the consumption of undercooked polar bear meat.

One positive health aspect of Thule subsistence patterns relates to the lack of refined sugars and starches. Studies done by Cassidy (1977), Hillson (2001), Jerkic (1993), Keenleyside (1998), and Zimmerman et al. (2000) concluded that Thule had a much lower rate of dental caries; some samples had no incidence whatsoever. This finding can be attributed to the lack of sugars in the diet; a correlation has been shown between increased tooth decay and a diet rich in sugar (Goodman 1993). It should be noted, however, that there is evidence of destructive wear on teeth; layers of dentine were exposed relatively early in the life of specimens. This enamel erosion has been attributed to the reliance on teeth as a tool in everyday life (Jerkic 1993). It has also been suggested that in times of food shortage, the Thule would have chewed on animal hide, which would have caused dental wear over time (Zimmerman et al. 2000:59). While there are many causes for dental deterioration, the lack of sugars in Thule diet is the strongest evidence for the lack of dental caries throughout the population.

The overall subsistence patterns would have created problems with malnutrition, vitamin deficiencies, and in some instances, starvation in Thule communities. These instances are specific examples of health problems and may not have been experienced by the entire population. Studies of health related to the diet of modern Inuit strongly suggest that these specific types of dietary problems would have been prevalent as a result of the Thule lifestyle.

**Life is habitual**

The environment and the available subsistence in the Arctic conditioned a specific labor-intensive Thule lifestyle. This lifestyle had a sexual division of labor that would have also changed with the seasons. Every activity Thule participated in would have had risks associated with it, especially in relation to trauma. As already mentioned, the cold climate increases the risk of severe trauma. In addition to this risk, travelling on sleds, riding in umiaks (a type of skin boat) and kayaks, as well as travelling on ice increases the chance for impact-related falls and drowning. In addition to the hazards associated with where Thule activities took place, the tasks themselves increased the risk of trauma. Within the skeletal record, specific musculoskeletal markers (MSMs) illustrate the stresses associated with these specific day-to-day activities.

Specifically associated with the habitual stress involved in everyday life, “…certain anatomical regions such as the bones of the upper extremities, lower extremities, thorax, manual and pedal appendages…” would have particular MSMs (Kennedy 1989:308). The work of Jerkic (1993) and Lovell and Dublenko (1990) demonstrate where MSMs are indicative of excessive use and subsequent strain on the joints associated with lifting, carrying, paddling and rowing, among other activities. Arthritis is one condition that can result from constant and excessive strain on the joints and was evident in some skeletal samples analyzed by Hawkey and Merbs (1995), Jerkic (1993) and Keenleyside (1998). Jerkic (1993:227) also discussed one particular infection called osteomyelitis, which resulted from a severe fracture in the left humerus of the sample. This example illustrates that there is not only an increased risk of trauma associated with the habitual lifestyle, but there is also an increased risk due to infection and other healing problems that can occur in addition to the initial trauma.

There have also been indications of contact between Thule groups that increases
risks of both trauma and disease. Steen and Lane (1998) outlined instances of warfare in
the Aleutian Islands, which has a direct correlation to increase risk in trauma and
death. Keenleyside (1998) discussed the potential for spread of disease associated
with trade routes. This same mechanism has been the suggested cause for the spread of
European disease post contact.

There are particular concerns associated with trauma caused by a labour-
intensive lifestyle. Not only are Thule at an increased risk of experiencing trauma, but
because of their environment, they are at risk of more serious trauma that requires an
extensive amount of time to heal properly. Thule relied upon this lifestyle in order to
survive; if a member of their basic family unit became injured and was unable to
perform their everyday practices, the entire group suffered.

**Overall health and conclusion**

As Keenleyside (1998:66) rightly noted, “many aspects of the physical and
cultural environment provided conditions favorable for the outbreak and spread of
diseases” among the Thule. These conditions create health problems that leave
specific traces on the skeletal record, as well as within mummified remains. Paleop-
athology uses these specific markers to demonstrate the risks associated with
environment, diet and lifestyle. Arctic environmental factors have been shown to
cause a stressed immune system, emphy-
sema and other lung diseases, bacterial
infection from both staphylococcus and
streptococcus, and osteoporosis in many
samples. The subsistence of the Thule has
also been correlated to starvation, mal-
nutrition, spina bifida, atherosclerosis,
gastrointestinal infections such as trich-
inosis, as well as cribra orbitalia and porotic
hyperstosis. While there is reduced risk of
dental caries associated with this diet as seen
in most skeletal remains, there is still a
suggested risk of dental deterioration and
ante mortem tooth loss. The Thule lifestyle
required a lot of physical activity which
taxed the body, as seen through specific
MSMs. This stress increases the risk for
joint problems such as arthritis, increases the
susceptibility of severe trauma, and in some
instances, increases the risk for death.

While the cases analyzed here illustrate a rather pessimistic outlook on
overall health, it is important to remember these are specific cases of what could have
happened and is not what definitely occurred for everyone in the entire population. The
limitations presented by the analysis of skeletal remains in the archaeological record
will always create a biased outlook on
overall health. Furthermore, while it was not
discussed here, the lack of European contact
actually protected Thule from such diseases as “…smallpox, influenza, measles, scarlet
fever, mumps, diphtheria, whooping cough,
syphilis, gonorrhea, typhoid, chicken pox,
poliomyelitis, and tuberculosis” (McGhee
1994:571). These diseases decimated many
populations post-European contact including
many Arctic populations (Stenton 1991). In
relation to what occurred for Inuit health
post-contact, pre-contact Thule health was
very good.

Overall, the use of skeletal remains
provides a limited yet in-depth analysis (on
an individual level) of Thule health. Using
skeletal remains in conjunction with other
lines of evidence proves that a skeleton is
more than a mere framework to which the
more important soft tissues are attached and
protected; the framework of a single human
can become the illustrative framework for an
entire culture.

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interest on this topic. Her advice on the subject was immeasurably helpful; I hope I fulfilled my promise by keeping it interesting.

Works Cited


Zimmerman, Michael R., and Arthur C. Aufderheide. 1984. The frozen family of Utqiagvik: the autopsy...
<table>
<thead>
<tr>
<th>Author</th>
<th>Specimen</th>
<th>Geographic Location Found</th>
<th>Relative Age of Remains</th>
<th>Sex of Individual</th>
<th>Age of Individual</th>
<th>Cultural Affiliation</th>
<th>State of Preservation</th>
<th>Defining Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buikstra (1976)</td>
<td>25 individuals from the National Museum of Canada</td>
<td>Northwest Territories Hudson Bay Area (12 assorted grave sites in area)</td>
<td>Post-Contact/Historic</td>
<td>N/A</td>
<td>All were at least 12 years of age</td>
<td>Caribou Eskimo</td>
<td>14 are relatively complete skeletons, all are well-preserved</td>
<td>Harris lines on over one-half the observable adult long-bones; resorptive lesions on spinal column of appendicular skeleton</td>
</tr>
<tr>
<td>Cassidy (1977)</td>
<td>Sadlermiut Eskimo Mandible</td>
<td>Native Point, on Hudson Bay, N.W.T.</td>
<td>N/A, prior to AD 1902</td>
<td>Female</td>
<td>28-30 years</td>
<td>Sadlermiut Eskimo</td>
<td>Some postmortem damage</td>
<td>Dental Caries, osteoporosis, possible malignant lesions</td>
</tr>
<tr>
<td>Hawkey and Merbs (1995)</td>
<td>83 Siliumit Thule Skeleton Remains</td>
<td>Siliumit, Chesterfield Inlet on Hudson Bay</td>
<td>AD 1205</td>
<td>44 Male</td>
<td>Adult</td>
<td>78 Early Thule</td>
<td>Complete and well-preserved skeletal remains</td>
<td>Very high prevalence of activity-induced stress lesions; strong expression of MSM at sites of muscle attachment (upper and lower appendages), 'Kayaker's clavicle', osteoporosis at joints</td>
</tr>
<tr>
<td></td>
<td>53 Kamarvik Thule Skeletal Remains</td>
<td>Kamarvik, Roes Welcome Sound on Hudson Bay</td>
<td>AD 1205</td>
<td>31 Male</td>
<td>Adult</td>
<td>47 Early Thule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hillson (2001)</td>
<td>Past analysis of a living community</td>
<td>Angmagssalik in East Greenland</td>
<td>AD 1884</td>
<td>N/A</td>
<td>N/A</td>
<td>Inuit</td>
<td>Just over 4% of individuals had caries, with 0.3-0.6% of permanent teeth with lesions</td>
<td></td>
</tr>
<tr>
<td>Jerki (1993)</td>
<td>Sagleq Bay Collection</td>
<td>Sagleq Bay, Labrador</td>
<td>~ AD 1450</td>
<td>N/A</td>
<td>N/A</td>
<td>Late Thule</td>
<td>Skeleton</td>
<td>Tooth wear was evident through tooth loss and abscesses; degenerative joint disease was present, advanced case of osteomyelitis</td>
</tr>
<tr>
<td>Keenleyside (1998)</td>
<td>62 Eskimo Samples</td>
<td>Point Barrow, Alaska</td>
<td>AD 500-900</td>
<td>71 Males, 47 Females</td>
<td>Mostly 18-50 years of age</td>
<td>Birmik</td>
<td>24 specimens: cranium and/or mandible; remaining 169 had complete skeletons</td>
<td>Dental carries, Harris lines, cribra orbitalia, porotic hyperostosis, osteoporosis, MSM trauma lesions and potential lung problems (evident on some ribs)</td>
</tr>
<tr>
<td></td>
<td>66 Eskimo Samples</td>
<td>Point Hope, Alaska</td>
<td>AD 1400-1850</td>
<td>Mostly Adult</td>
<td>Late Thule</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>65 Aleut Samples</td>
<td>Nikolski, Aleutian Islands</td>
<td>1500BC-1000AD</td>
<td>30M, 31F</td>
<td>Mostly Adult</td>
<td>Pale-Aleuts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lovell and Dublenko (1990)</td>
<td>Skeletal remains of 4 adults posted on the Fair Trade</td>
<td>Fort Edmonton, trading post on the Canadian fur trade</td>
<td>AD 1800</td>
<td>3 Males, 1 Female</td>
<td>All adults</td>
<td>3 Caucasian, female was Mongoloid</td>
<td>Well-preserved skeletons</td>
<td>Chronic infectious disease, malnutrition, trauma, arthritis, other physical stress indicators (MSMs)</td>
</tr>
<tr>
<td>Merbs (2004)</td>
<td>33 Vertebrae from a collection of Remains</td>
<td>Southampton Island</td>
<td>AD 1200</td>
<td>7 F, 11 M</td>
<td>N/A</td>
<td>Sadlermiut</td>
<td>All Skeletal: well-preserved</td>
<td>Segmentation error within vertebrae, Sagittal Clefing and spina bifida present within specific vertebrae, specifically T11 and S1.</td>
</tr>
<tr>
<td>Zimmerman &amp; Aufderheide (1984)</td>
<td>2 mumified remains from &quot;The Frozen Family&quot;</td>
<td>Kamarvik and Siliumit, Hudson Bay Coast</td>
<td>AD 1205</td>
<td>8 females</td>
<td>N/A</td>
<td>Late Thule</td>
<td>All Mummified; excellent preservation</td>
<td>Severe emphysema, mild atherosclerosis, osteoporosis in both, severe and moderate dental wear, trichinosis in one body,</td>
</tr>
<tr>
<td>Zimmerman et al. (2000)</td>
<td>2 mumified remains from &quot;The Frozen Thule Mummy &quot;Little Girl&quot;</td>
<td>Utiqagvik, modern-day Barrow, Alaska</td>
<td>~ 1500AD</td>
<td>2 females</td>
<td>Early/Mid 40s and 2+31 year old</td>
<td>Late Thule</td>
<td>All Mummified; excellent preservation</td>
<td>Severe starvation, emphysema, a rare congenital disorder, alpha-1-antitrypsin deficiency; Harris lines and osteoporosis, dental wear was evident, including sand/pebbles and fragments of hair within the lungs</td>
</tr>
<tr>
<td></td>
<td>Ukkulqi, the old whaling village of Utiqagvik</td>
<td>AD 1200</td>
<td>Female</td>
<td>5-8 years old</td>
<td>Thule</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.

Overview of Thule Inuit remains found within the Arctic and used within this analysis, divided by researcher.