Preliminary Analysis of Dental Calculus from Viking Age Iceland: Implications for Reconstructing Diet and Lifeways

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I. Abstract

Dental calculus (calcified plaque) analysis is becoming increasingly important in the area of dietary reconstruction for ancient humans. As it forms, dental calculus incorporates food and other particles that are in the mouth, providing a record of ingested items. Iceland is an area where not much is known of ancient diet other than the fact that meat and fish were the main sources of sustenance. A high-protein diet affects the pH levels of saliva, which in turn can produce excessive amounts of plaque. In this study, calculus samples from multiple individuals recovered from the farm Keldudalur (c. 1000 AD) in the Skagafjörður region in northern Iceland were chosen for reflection and transmitted light microscopic analysis. Preliminary results reveal that starches and plant fibers were present in most samples. The range of sizes of starch grains suggests the consumption of at least three different plants, one of which may be barley. In addition, twisted hairs and/or fibers that may derive from textiles were observed under both reflected and transmitted light. Red and blue fibers suggest dying of textiles, an unusual result from this early time period. Further analysis of dental calculus from Keldudalur has the potential to illuminate areas of Viking Age Iceland which are otherwise invisible archaeologically.

II. Introduction

Iceland was unoccupied until European settlers arrived in the 9th century. This study examines human skeletons from the farm Keldudalur in the Skagafjörður in northern Iceland (Figure 1) in order to investigate early Icelandic diet. Keldudalur dates to around 900-1000 AD, just after the Icelandization conversion to Christianity (Zoëga and Traustadóttir, 2007). Yoga Viking Age Icelandic diet is thought to have been particularly protein-focused due to a lack of agriculturally fertile land and a lack of historical and archaeological evidence to the contrary. It is known that domesticated animals were consumed as well as sea birds, seals and fish (McGovern, 2006). While there is some evidence of wild plant consumption, it is not thought to have been a major part of the diet.

In order to investigate diet, dental calculus (mineralized plaque) was recovered from the skeletons at Keldudalur (Figure 2). Dental calculus allows us to study materials that are a direct link to consumption, as well as provides a record of items that are potentially ingested into the mouth (Hardy, 2009). Starches and other materials tend to become trapped within plaque and if the plaque is not removed, it calcifies and becomes calculus (Liewerse, 1999). Therefore, anything that comes in contact with saliva has the potential to become part of the dental calculus.

This would include items ingested for eating or inhaled. Using calculus analysis as a means identifying materials that came in direct contact with the teeth, what can we learn about this early Icelandic population?

III. Methods

Of the 54 Graves uncovered, 23 individuals had teeth that could be sampled for calculus. Six individuals are examined here. Samples collected from Keldudalur were collected using dental picks and powder-free glasses over an aluminum foil lined box. I collected 2-3 samples from each individual, depending on the amount of calculus present. Unprocessed calculus was first examined with a reflected light microscope (Olympus BX50, 50-500x magnification) in order to visualize any items in situ and to eliminate the possibility of modern contamination. Subsequently, calculus samples were processed to recover and isolate plant microfossils. Calculus was dissolved with 10% HCl, centrifuged, rinsed with distilled water and resuspended in 100% ethanol. An aliquot of the processed sample was washed on gauze on a microscope slide and viewed with a transmitted light microscope (Olympus BX60, 50-500x magnification) magnified from 50x-500x. For both types of microscopy, images were captured with a Dino-Lite USB camera. The images were compared with modern material and published samples for identification (Henry and Piperno, 2008; Hardy and Moncel, 2011).

V. Results & Discussion

Microscopy of the calculus samples resulted in the identification of a wide variety of materials including plant fibers, phytoliths, starch grains, hairs, feathers, fish scales, and possible textile fibers (Table 1). All of these types of materials were observed in unprocessed calculus, thus demonstrating that they are not modern contaminants.

Plant fibers and phytoliths:

Plant fibers and/or phytoliths were visible in most samples that were examined under reflected light and in all samples under transmitted light. Figure 3 shows a phytolith that may derive from a wild edible plant (McGovern et al., 2007). While some phytoliths may be diagnostic of particular plants, a larger reference collection of phytoliths from Icelandic plants is necessary before a more specific attribution can be made.

Hair:

Hairs were observed under reflected light in more than one of the samples, but none were seen under transmitted light. Hairs could be incorporated into calculus through diet or other cultural practices.

Figure 1: Note extreme calculus deposits. Singular tooth from KEH-A-11

Figure 2: Note extreme calculus deposits. Singular tooth from KEH-A-11

Figure 3: Phytolith from individual KEH-A-11 (original magnification 100x)

Figure 4: Feather fragment from unprocessed calculus from individual KEH-B-16, original magnification 100x

Figure 5: Photograph showing distribution of plant fibers and phytoliths from KEH-A-11 (original magnification 500x)

VII. Conclusions

Preliminary results suggest that this Viking Age Iceland population was consuming starchy and high-protein diets that have been historically documented. As we increase the sample size and build our knowledge of possible foods, we can make better comparisons and assumptions about early Icelandic foodways. If the observed fibers are from textiles, they provide a record of material and practices that are otherwise invisible archaeologically. The analysis of dental calculus from Keldudalur has demonstrated the enormous potential of this method for further elucidate early Viking settlement in Iceland.

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Works Cited


