

Ancient Cultures:

The Archaeology of Dairy and the Enduring Legacy of 'Heirloom' Microbes

The researchers aim to identify the microbes used in non-industrial, traditionally made dairy products in Europe and Asia identifying which bacteria are present in these foods as well as characterising their nutritional value. To use recent advances in archaeological science to identify traces of dairy products in antiquity on pots and in tooth tartar, in order to understand how and why these products were powerful enough to shape both the human genome and millennia of human culture.



By Prof. Dr. Christina Warinner, Group Leader of Microbiome Sciences in the Department of Archaeogenetics at the Max Planck Institute for the Science of Human History in Jena, Germany and Dr. Jessica Hendy, Group Leader of Proteomics in the Department of Archaeology at the Max Planck Institute for the Science of Human History in Jena, Germany.

present day in Europe and Western Asia. Additionally, they discovered that these milk proteins can distinguish which species of animal milk was consumed, revealing how and where people in the past used different livestock for their dairy products.

The origins of dairying are deeply rooted in human prehistory. Chemical analysis of milk fats recovered from archaeological ceramic artefacts indicates that people have been consuming dairy products for nearly 10,000 years. However, we also know that the earliest farmers did not have the genetic ability to digest the milk sugar lactose after infancy, a trait now common in modern European populations. Somehow, these ancient farmers must have processed these dairy products in order to remove or reduce the lactose content, and thus avoid unpleasant side effects of lactose intolerance. In Central Europe, the archaeological discovery of characteristic ceramic 'sieves' suggests that people curdled and filtered their dairy products to reduce the lactose content.

The archaeology of dairy

Recently, Warinner and Hendy discovered that ancient dairying practices can be studied using an unlikely source – ancient calcified dental plaque, also known

as dental calculus or tooth tartar. In a study published in 2014, they found that milk proteins can be extracted from the ancient dental tartar found preserved on human teeth. This enabled them to identify individuals consuming dairying products from the Bronze Age to the

Although these archaeological and scientific advances are revealing insights into when and where humans consumed dairy foods, we know almost nothing about how people processed their dairy products and the kinds of dairy foods they created. In addition, a crucial element of this history is also almost com-



**Mongoliet er omdrejningspunktet for forskningsprojektet. Her indgår mælk fra et bredt spektrum af dyr, som yakokser, kameler, heste, får, geder og kvæg.
Foto: Christina Warinner**

pletely unknown – the role of microbes in these ancient dairy products.

Dairy microbes in prehistory

While microbes can often have a bad reputation in our society, they play a vital role in dairying – contributing to the complexity of flavours and textures that we see in dairy products around the world. Throughout history, people appear to have been ‘domesticating’ microbes in products such as yoghurts and cheeses, before they even knew of their existence. However, current microbial strains used in commercial food fermentation are greatly limited in scope and are highly regulated in order to maintain hygiene and health standards. As a result, we are largely unaware of the incredible microbial diversity involved in traditional “heirloom” dairy production both today and in the ancient past, and also the impact this microbial diversity would have had on flavours and textures. Additionally, as a result of contemporary food globalization and industrialization, traditional methods of dairying and their unique microbial cultures (such as yoghurt starter strains passed down through generations) are being lost.

Mongolian dairying traditions and lactose intolerance

Hendy and Warinner are now turning their attention to dairy cultures outside of Europe by investigating the origins and dairying traditions of Asia. Their project, “Heirloom Microbes: The History and Legacy of Dairying Bacteria” aims to characterize the diversity of dairy products and the bacteria used to produce them in a major center of Asian dairying - Mongolia. The study will also test tooth tartar from archaeological collections in this region in order to identify dairying practices in the past, and will link these past practices to contemporary, traditional dairy production strategies.

Mongolia has a rich and deep-rooted dairying tradition, with milk products being an integral part of the cuisine. One



Produkter af heste og kamelmælk i supermarked i Ulanbaatar, Mongoliet.
Foto: Jessica Hendy.

distinctive aspect of Mongolian dairying is the diversity of animals used for milk production, including yaks, camels, horses, sheep, goats and cattle. In addition, dairy products are processed without rennet, with microbial species playing a central role in the creation of products such as airag (fermented mare’s milk), tsurum (dried yogurt) and ezgi (carmelized curds). Surprisingly, although dairy products make up a significant portion of the Mongolian diet, the majority of the population is lactose intolerant. To investigate these unique histories and traditions, Warinner and Hendy are partnering with the Khovsgol Dairy Project, (which Dairy without Borders is part of) to study traditional yak herding and milking practices in dairy producing regions of northern Mongolia.

Connecting the past and the present

Scientific advances are continuously revealing the richness of the microbial world. By connecting archaeology to these biomolecular advances, it becomes possible to explore the importance of microorganisms through time, as well as the impacts they have on our food products and health today. Through their multidisciplinary research spanning archaeology, microbiology and dairy science, Warinner and Hendy aim to enrich scientific understanding of the rich biodiversity and enduring legacy of ancient and contemporary dairying cultures around the world.

Project Facts:

Title: Heirloom Microbes: The History and Legacy of Ancient Dairying Bacteria

Project Managers: Prof. Dr. Christina Warinner and Dr. Jessica Hendy

Project Period: May 2017 to April 2019

Links

“Heirloom Microbes: The History and Legacy of Dairying Bacteria”: <http://www.shh.mpg.de/349696/heirloom-microbes>

The Khovsgol Dairy Project: <http://www.khovsgoldairyproject.org> ■

Dansk resumé

Forskerne Prof. Dr. Christina Warinner og Dr. Jessica Hendy fra Max Planck Institute for the Science of Human History, Jena i Tyskland, har undersøgt historiske traditioner omkring mælk og mejeriprodukter. I lyset af nylige fremskridt inden for arkæologiske metoder – blandt ved tandanalyser af gamle skeletter - stiller de nye spørgsmål til oprindelsen af den kulinariske praksis. På trods af laktoseintolerance har vore forfædre med forskellige teknikker således formået at håndtere mælkeprodukter som en vigtig del af deres basiskost. I Mongoliet bruges de traditionelle produktionsmetoder stadigvæk i udbredt grad, hvorfor undersøgelsen centerer sig her. Mælkeritidende blev gjort opmærksom på forskningsprojektet igennem Mejerifolk uden Grænser som har indgået partnerskab med forskerne igennem organisationens projekt i Mongoliet, Khovsgol Dairy Project. Forskerne bruger projektets målgruppe som undersøgelsesgrundlag.