Ancient Cultures:
The Archaeology of Dairy and the Enduring Legacy of ‘Heirloom’ Microbes

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 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.

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-
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 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 egzi (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

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