Central Europeans already digested milk 1,000 years ago, researchers find

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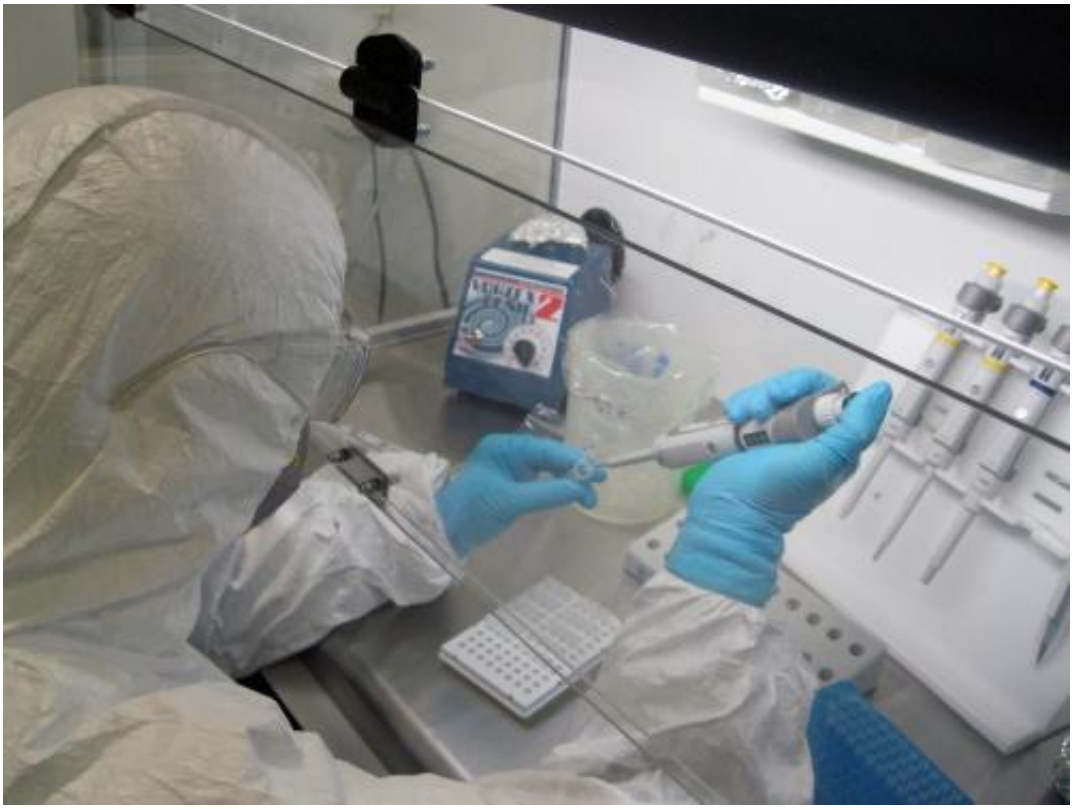

An undergraduate researcher analyzes DNA from 1,000-year-old human teeth for genetic adaptations to milk consumption. Credit: Christina Warinner, UZH

Back in the Middle Ages, Central Europeans were already capable of digesting milk, yoghurt and cheese just as well as us today. Researchers at the University of Zurich's Centre for Evolutionary Medicine have discovered that the population of the medieval town of Dalheim had a

similar genetic predisposition for milk digestion to present-day Germans and Austrians. Moreover, the study reveals that lactose tolerance was more widespread than previously believed.

Milk is the staple food for infants and contains the sugar lactose. Most mammals lose the ability to digest lactose, and thus milk, as they get older. The ability to digest the sugar is governed by the production of the enzyme lactase in the small intestine. As children get older, the lactase gene is gradually disabled, which means that no lactase is formed and the lactose enters the colon undigested, where it is typically converted into acids and hydrogen gas and, in many people, causes the painful symptoms of lactose intolerance. However, at least five populations in Europe, Saudi Arabia and East Africa have developed genetic mutations independently that allow them to produce lactase throughout their entire lives, a condition known as lactase persistence.

Dairy products have long been a central feature of European cuisine and cultural identity, and nowadays 60 – 90 percent of the European population is lactase persistent, which means they can digest milk in adulthood. Earlier studies on DNA samples taken from European farmers from around 5000 BC revealed a low lactase persistence rate. The earliest indications of lactase persistence to date were found among farmers in Spain during the Late Neolithic (approx. 3000 BC; 27 percent with lactase persistence) and Scandinavian hunter-gatherers (5 percent with lactase persistence). However, the question remains as to when and where humans began to exhibit a similar level of lactase persistence to us today.

Prevalence rate not the same everywhere

The latest study from the University of Zurich reveals a 72-percent lactase persistence rate among the population of the medieval town of Dalheim in Germany between 950 and 1200 AD, which indicates that

lactase persistence had already reached modern Central European levels (71 – 80 percent) around 1000 years ago. Interestingly, these results contradict the previous research conducted on human remains from medieval Hungary, which exhibited a lactase persistence rate of 35 percent compared to 61 percent in the country today. The University of Zurich's study therefore suggests that the evolution of lactase persistence did not follow a single pattern throughout Europe and that genetic lactase persistence may have been common in Central Europe earlier than in Eastern Europe.

"Undoubtedly, a number of factors played a role in the prevalence in different regions, such as different food and migration patterns," explains Christina Warinner, the senior researcher on the University of Zurich's study. "Our research reveals that lactase persistence already developed during the Middle Ages in Central Europe but this was clearly not the case everywhere on the continent."

Majority of the global population lactose-intolerant

Nowadays, lactase persistence is so prevalent among Europeans and European-descendent populations in America and Australian that, until very recently, lactose intolerance was considered an abnormality, deficiency or disease. It was only when dairy products were promoted in national and international food campaigns in the mid-20th century that it became apparent that the majority of the global population is lactose-intolerant. Subsequent research has revealed that lactase persistence is actually the abnormal condition, resulting from the recent evolution of specific genetic mutations in certain populations.

More information: Annina Krüttli, Abigail Bouwman, Gülfirde Akgül, Philippe Della Casa, Frank Rühli, Christina Warinner. Ancient DNA analysis reveals high frequency of European lactase persistence allele (T-13910) in medieval Central Europe. *PLOS ONE*. January 23,

2014. dx.plos.org/10.1371/journal.pone.0086251.