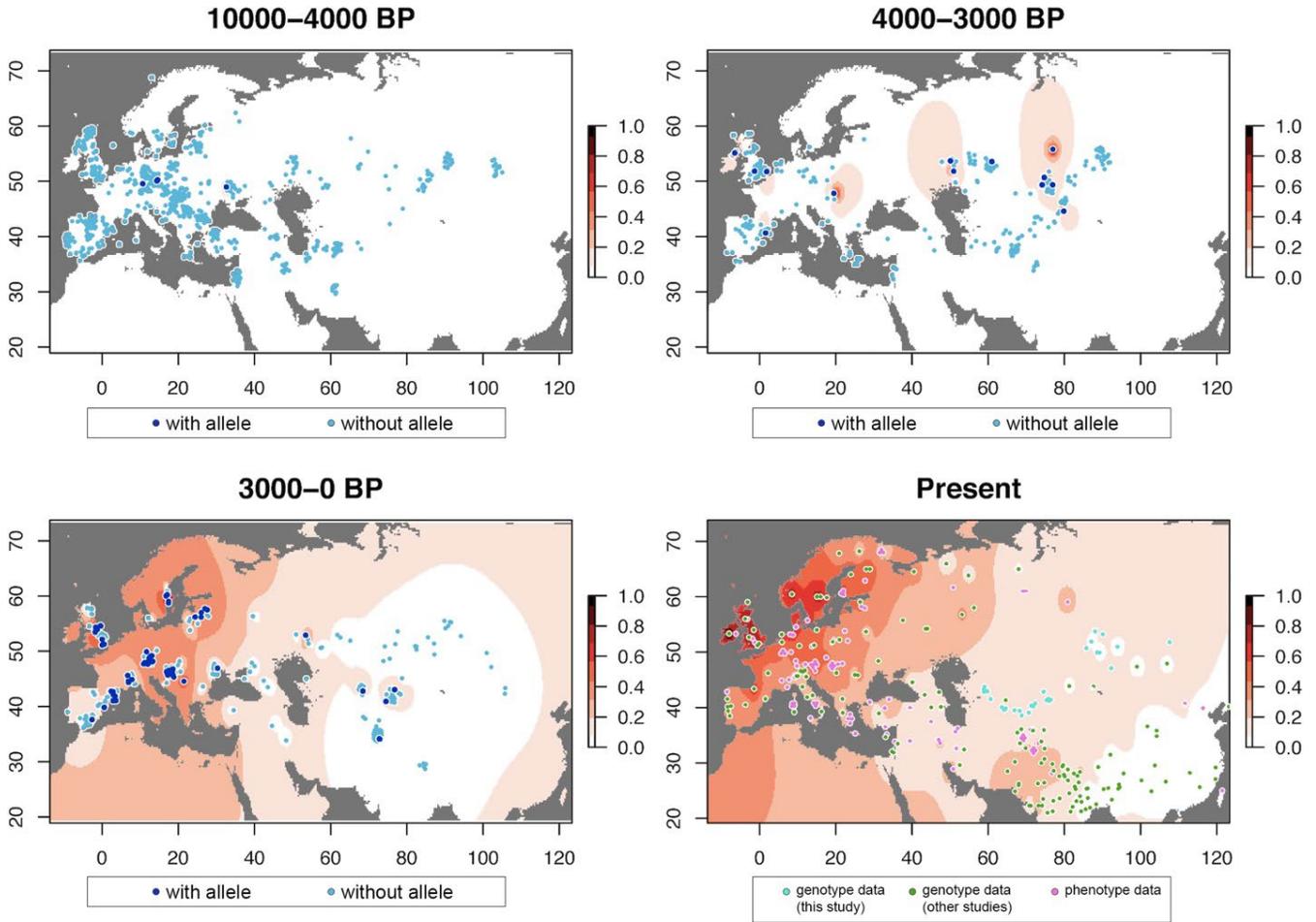




# Spread of a Lactase-Persistence Allele



**Caption:** Maps showing how a lactase-persistence allele spread through human populations over the last 10,000 years. Dots represent specific individuals or populations sampled in the study. The red/orange shading shows the estimated frequency of the allele among people in different geographic regions, based on the samples.

## OBSERVATIONS, NOTES & QUESTIONS

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BACKGROUND INFORMATION	BIG IDEAS, NOTES & QUESTIONS
<p>As babies, all mammals (including humans) produce an enzyme called <b>lactase</b>. Lactase breaks down <b>lactose</b>, the main sugar in milk, into other sugars that the body can use to get energy.</p> <p>Around the age of 5, most humans stop producing lactase. People with this trait, called <b>lactase nonpersistence</b>, are <b>lactose intolerant</b>, meaning they cannot break down lactose as adults. They may experience pain, gas, bloating, and diarrhea after drinking milk.</p> <p>However, some people keep producing lactase even as adults. This trait, called <b>lactase persistence</b>, allows them to break down lactose (and thus get more energy from milk) throughout their lives.</p> <p>People with lactase persistence have been shown to have specific variations in their DNA called <b>lactase-persistence alleles</b>. Today, lactase-persistence alleles are most common in people with certain ancestry living in African, Arab, or European regions. Populations in these regions were traditionally <b>pastoral</b>, meaning that they raised animals for food (including milk) since about 10,000 years ago.</p> <p>One hypothesis suggests that lactase persistence was strongly selected for in pastoral populations, because people who could break down lactose could get more energy from their food. To investigate this hypothesis, scientists traced the spread of a common lactase-persistence allele through Asia and Europe over the last 10,000 years. Their study included populations in Central Asia (such as Mongolia and Kazakhstan), which were also traditionally pastoral.</p> <p>To determine where and how common the lactase-persistence allele was in the <i>past</i>, the scientists analyzed DNA data from ancient human remains. They determined the presence or absence of the allele in many ancient individuals, whom they grouped into three time periods: 10000–4000 BP (10,000 to 4,000 years before present), 4000–3000 BP (4,000 to 3,000 years before present), and 3000–0 BP (3,000 to 0 years before present).</p> <p>To determine where and how common the lactase-persistence allele is in the <i>present</i>, the scientists analyzed data from present-day populations, specifically using individuals who had ancestors living in the same region over multiple generations. The scientists considered <b>genotype data</b>, which is obtained using DNA sequencing, and <b>phenotype data</b>, which is obtained using tests that measure a person’s ability to digest lactose.</p> <p>Based on these data, the scientists estimated how common the allele was among people in different regions over time. Their estimates of the allele’s frequency are shown by red/orange shading on the maps.</p>	