Where does beer come from?

AT A GLANCE...

- Ale and lager yeast strains were derived from European grape-wine and Asian rice-wine. This finding suggests beer yeast came from the East-West trading along the Silk Route, similar to the spread of domesticated plants and animals.
- The strains also had genes not present in any other population.

FOR thousands of years brewers made beer using specialised strains of the budding yeast *Saccharomyces cerevisiae*.

But the historical origins of brewer's yeast are not well understood as brewing predates the discovery of microbes.

A new study published in the journal *PLOS Biology*, led by Justin Fay at the University of Rochester in the US, shows that modern brewing strains were derived from a mixture of European grape wine and Asian rice wine strains.

This finding points to the emergence of beer yeast from a historical East-West transfer of fermentation technology, similar to the transfer of domesticated plants and animals by way of the ancient Silk Route.

The historical origins of any domesticated organism are often clouded by recent migration, gene flow and mixing with other groups. While analysis of ancient DNA has been a boon to reconstructing many historical events, ancient fermented beverages and the microbes used to produce them are not available.

A living relic of ancient ancestors

But many beer strains are known to be polyploid – having more than two copies of their genome – which allows them to remain isolated from other populations and provides researchers with a living relic of their ancestors.

To reconstruct the history of beer strains, the researchers sequenced and compared the genomes of beer strains to a panel of reference strains from around the world. The beer strains formed four related groups:

- Two ales;
- One lager; and,
- One group containing both beer and baking strains.

All of these groups show mixed ancestry from both European grape wine strains and Asian rice wine strains. The strains also contain novel gene variants not present in any other population.

The origin of these novel variants is less clear, but their abundance suggests they were derived from an uncharacterised or extinct population.

A complete reconstruction of the order and timing of events during the evolution of beer strains is difficult since their polyploid genome is not static.

Changes in their polyploid genome have occurred during cell divisions, generating beer strain diversity and likely playing an important role in specialisation to various brewing styles.

Acknowledgements: University of Rochester, USA. This work was supported by a National Institutes of Health, the Rita Allen Foundation, Karl Handelsman, and the National Science Foundation.