PCR TESTING — FOR BEER, NOT COVID

John Mackay

At best, it's dull. Lifeless. At worst, its undrinkable – and there's a recall. Product and packaging, not to mention customers and reputation, lost. Names like Lactobacillus lindneri bring a nervous twitch to some and some brewers are learning why winemakers are similarly twitchy when hearing the word Brettanomyces. Nothing travels faster than bad news. As such, many brewers are aware of major infection issues in the industry that have damaged label and manufacturing reputations.

These spoilage organisms can be hard to detect. Yeasts like Brettanomyces can take up to a week to grow on a culture plate and may be overtaken by other species growing. Some lactobacillus species do not grow well in culture and may be missed altogether.

Contrary to what some believe, PCR testing did not begin with a certain virus pandemic.

The testing methodology currently used for detecting the virus behind Covid-19 — quantitative PCR or qPCR for short — has been used for the past 20 years to detect a wide range of viruses, bacteria, pathogens and has brewing applications such genetic differences behind hop cultivars, detection of viruses in hops, as well differentiating yeast strains.

The origins of PCR go back to the late 1980s when an American scientist had a lightbulb moment while on a Friday night drive. A team at his company worked to make the method practical and the rights to the method were sold in the early 1990s to the Swiss company Roche for a few million dollars — 300 of them to be exact. Its current form has many differences to the original method, but it still relies on the sensitive detection and amplification of DNA sequences that are only contained within the target organism. In essence, looking for a needle in a haystack and then building a haystack of needles.

Scientists can take advantage of these DNA sequences to design tests that detect only a certain species (e.g. Brettanomyces bruxellensis) or else design a test in such a way that it detects all lactic acid bacteria for example (i.e. all lactobacillus and pediococcus species are detected but not differentiated as a screening test).

One of the main advantages of the q part of qPCR for quality control in beer and cider is the quantitative aspect. From 10 to 10 million, qPCR will generate numbers that can be used to measure and manage what is happening. For some organisms, 100 or 1,000 per ml will have little effect on your beer. For others, 2 cells per ml is two cells too many. Diastatic yeast traits are desired for crisp, dry beers – but not for secondary fermentations in bottles, cans and kegs. Knowing the numbers (and indeed, whether the yeast is actually likely to cause these undesirable effects) can help produce a better, more reproducible quality product. A beer where your name is known for all the right reasons.

John Mackay is the owner and technical director of dnature diagnostics & research. John has over 25 years' experience in molecular diagnostics and has developed qPCR diagnostic tests for PSA in kiwifruit, Mānuka honey and COVID-19 to name a few. John is a qPCR 'nerd' and an appreciator of craft beer.