MINITOPIC
Insights into Cholera from Reconstructed 19th-Century Genome

High-throughput DNA sequencing from the preserved intestine of a victim of the 1849 cholera outbreak in Philadelphia helped to reconstruct the *Vibrio cholerae* genome from that era, highlighting differences from currently circulating strains of this pathogen, according to Hendrik Poinar of McMaster University in Hamilton, Ontario, Canada, and his collaborators. The results show that the first of two types of cholera, known as classical, was likely responsible for five of the seven devastating outbreaks of cholera in the 1800s. Moreover, the 19th-century strain shows “95 to 97% similarity with the classical O195 genome, differing by 203 single-nucleotide polymorphisms (SNPs), lacking three genomic islands, and probably having one or more tandem cholera toxin prophage (CTX) arrays, which potentially affected its virulence,” the researchers note. Details appeared January 8, 2014 in the *New England Journal of Medicine* (doi: 10.1056/NEJMoa1308663).

DIYbio does not match the survey data, according to Grushkin, Kuiken, and Millet. For example, the belief that DIYers are trying to produce deadly viruses is unfounded. Moreover, any credible effort to develop novel pathogens would require seasoned scientific skills and access to select agents, whereas typical members of the DIYbio movement are practicing basic biotechnology. For example, only 13% of those polled have synthesized a gene, considered a relatively low-level skill for bioengineering. Moreover, most respondents say they work with biosafety laboratory-1 (BSL-1) microorganisms and only 6% report ever handling BSL-2 microbes, which are only slightly more dangerous. Nonetheless, the Wilson group cautions DIYers to “be aware of the risks involved in working with potential pathogens and adhere to the BSL-lab standards.”

Despite the fact that so many DIYbio researchers say they are not gene synthesizers, almost 20% of survey respondents have Ph.D.s, another 27% have master’s degrees, and 37% graduated college. Not only are DIYbio researchers better educated than the general population, they are also younger; almost half are less than 35 years old.

The boundaries between home and institutional labs appear very porous among DIYers, with some 38% working in multiple places. “This is something we’re very concerned about because there’s a real threat of accidental release when people move [possible] infectious agents between labs,” says Michael Osterholm at the University of Minnesota in Minneapolis. The Wilson report is faulty because it is based on “too small a sample size of self-selected respondents,” he adds. “It’s really opinion, not fact.”

The Wilson survey reached 359 of about 4,000 (or fewer) DIYbio members, counters Kuiken. “Getting about 1 in 10 responses is a good survey statistic,” he says, noting that not all DIYbio members are actively conducting experiments.

“Most of the press coverage of DIYbio has been superficial, and this report unpacks much of what’s happening in a useful way,” says Andrew (Drew) Endy of Stanford University in Stanford, Calif., who was instrumental in fashioning OpenWetWare, a project to foster DIYbio.

“At this point there isn’t any evidence of deleterious science coming out of the movement but as the technology evolves and becomes simpler it will be important to monitor capabilities, intentions, and plans,” says Arturo Casadevall of the Albert Einstein School of Medicine in Bronx, N.Y. Osterholm, Endy, and Casadevall are members of the National Institutes of Health National Science Advisory Board for Biosecurity (NSABB)(http://oba.od.nih.gov/biosecurity/biosecurity_voting_members.html).

Marcia Stone is a science journalist based in New York City.

RESEARCH ADVANCES

Non-Saccharomyces Yeasts Lower Alcohol, Boost Wine Quality

David C. Holzman

The alcohol content of wine is creeping upward from about 12% to beyond 15%, a trend that oenophiles see as compromising quality and that has public health officials worrying more than ever about alcoholism. However, microbiology might provide a means for better controlling the ethanol genie within the bottle, so to speak, by substituting high-yielding wine yeasts with *Non-Saccharomyces* varieties for a first-round fermentation, according to Cristian Varela of the Australian Wine Research Institute, Adelaide, South Australia, and his collaborators. Details appeared on 27 December 2013 ahead of print in *Applied and Environmental Microbiology* (doi: 10.1128/AEM.03780-13).
Following systematic screening, 50 yeast isolates from 40 species and 24 genera were tested for their capacity to produce wine with reduced ethanol concentrations, Varela says. He and his collaborators then chose four of these to test in depth, adding them separately to freshly pressed Chardonnay and Shiraz grapes, or musts. After the slower-growing non-\textit{Saccharomyces} yeasts consumed 50\% of available grape sugars from those musts, \textit{S. cerevisiae} strains were added to finish fermenting the mixtures into wines. In terms of controlling alcohol content, this “sequential inoculation” approach proves effective, according to Varela.

The best of the non-\textit{Saccharomyces} strains, \textit{Metschnikowia pulcherrima} AWR1149, lowers the alcohol from Shiraz grapes from a high of 15\% to 13.4\%, Varella continues. Reduced ethanol yields are not common to all strains of \textit{M. pulcherrima}, “suggesting that studies exploring genetic diversity to discover the industry-relevant traits need to include several strains,” he says. Previous studies of non-\textit{Saccharomyces} yeasts “focused on few species and were concerned principally with the formation of flavor compounds.”

“The reduction [in alcohol] isn’t all that great, but it’s in the right direction, and with more work, they might get that even lower, perhaps by letting the non-\textit{Saccharomyces} yeast go longer,” says Alan Bakalinsky of Oregon State University in Corvallis, who was not involved in the research. “Because these species are already associated with grapes,” he adds, “it may turn out that they have value as biological control agents to reduce grape damage in the vineyard.”

This reduction in alcohol “will be of great benefit to the industry,” says Louise Rose of Yalumba and Hill-Smith Family Vineyards in Angaston, South Australia, who is also a director of the Australian Wine Research Institute. Not only will reducing alcohol provide wine lovers “a better overall experience,” she adds, it also could reduce wine costs in countries where wine alcohol content is taxed directly.

The right alcohol balance is difficult to achieve in wines, points out Eduardo Agosin of the Pontificia Universidad Catolica de Chile. Higher levels in wine of alcohol come in part from later harvesting of red grapes, a delay that “allows the tannins—responsible for astringency and bitterness—to soften and, in some varieties, to minimize the principal off-flavors, like methoxypyrazines, [which confer] green pepper and asparagus sensory notes,” he says.

David C. Holzman is the Microbe Journal Highlights Editor.