

ENTRETIENS
SCIENTIFIQUES

LALLEMAND

Les XXVI^e Entretiens Scientifiques Lallemand
BIODIVERSITY MEETS TERROIR
NK'MIP Conference Center
Thursday, April 28th, 2016, Osoyoos

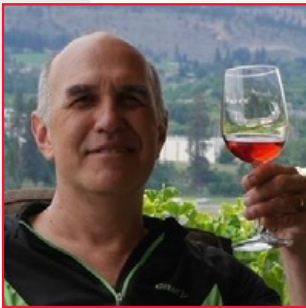
9:00 am

Welcome – Gordon Specht

9:15 am – 10:15 am

Yeast in winery fermentations over a five year period

Dr Daniel Durall – University of British Columbia, Canada

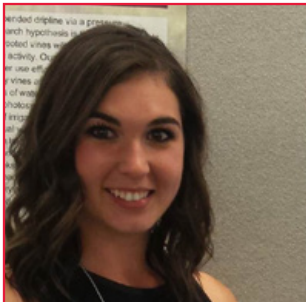


A review of lab's findings from the last five years on yeasts fermenting must of Pinot noir and Chardonnay in 4 different Canadian wineries. The results indicate that about 25-30% of inoculated fermentations will have commercial strains other than the inoculum involved in the fermentation. This results in an inoculum implantation and persistence of < 80% relative abundance. These commercial strains are usually strains that were used by the winery as inoculants for other fermentation. The research also indicates that spontaneous fermentations are usually conducted by a mixture of commercial strains used by the winery and not by indigenous yeasts originating from the vineyard.

Dan Durall is an associate professor at the University of British Columbia. He has been conducting research in the area of mycology for over 30 years. For the past 10 years, he has been particularly interested in wine yeast population and community dynamics during fermentation and how yeast diversity and composition affects chemical profiles and sensory attributes of wine. He is presently supervisor of five graduate students and is funded by the Natural Science and Engineering Research Council (NSERC) and B.C. Wine and Grape Council. The courses he teaches include enology, food and industrial microbiology, and mycology.

Effects of initial sulfur dioxide addition on wine yeast strains in spontaneous fermentations at a Canadian winery

Dr Sydney Morgan – University of British Columbia, Canada



The research focuses on identifying the yeasts conducting spontaneous fermentations at commercial wineries in the Okanagan Valley wine region of Canada. Her current research findings demonstrate that different levels of sulfur dioxide added at crush result in different *Saccharomyces cerevisiae* strain compositions during fermentation, and that commercial yeast strains dominate spontaneous fermentations at commercial wineries.

*Sydney Morgan is a Ph.D. student at the University of British Columbia in Kelowna, Canada. Her research focuses on identifying the yeasts conducting spontaneous fermentations at commercial wineries in the Okanagan Valley wine region of Canada. Her current research findings demonstrate that different levels of sulfur dioxide added at crush result in different *Saccharomyces cerevisiae* strain compositions during fermentation, and that commercial yeast strains dominate spontaneous fermentations at commercial wineries. Morgan's research is supported by UBC, the National Science and Engineering Research Council (NSERC), and the American Society for Enology and Viticulture (ASEV).*

10:15 am – 11:00 am A look into the microbial populations of Washington State vineyards and their persistence during wine fermentation

Thomas Henick-Kling, Hailan Piao, Patricia Okubara, Charles Edwards, Timothy Murray, Dean Glawe, Matthias Hess – Washington State University, USA



Recent studies of the grape and vineyard microbial populations in Washington State have revealed a wide diversity of fungi and bacteria. Fifty-three species were found among five fungal subphyla, including a new species of fungi that had not previously reported in the vineyard biota, *Curvibasidium rogersii* (class of Microbotryomycetes). In a recent study of the microbial succession we employed next-generation sequencing (NGS) – a culture-independent method to monitor the temporal succession of the bacterial population during the organic and conventional native yeast fermentation process of grapes farmed in WA. The sequencing data, based on the V1-V3 region of the 16S rRNA gene, showed different microbial profiles during the two fermentation techniques. We continue our studies on how native yeast and bacteria interact in wine fermentation and to what extent native

microorganisms persist in wine fermentation and aging in order to better understand how these populations influence regional and grape varietal flavors.

Thomas Henick-Kling, director, Viticulture & Enology, at Washington State University, was the first graduate student at the Australian Wine Research Institute at the University of Adelaide where he earned his Ph.D. degree. He earned his masters in microbiology and food science at Oregon State University. Henick-Kling worked at Cornell University for 20 years. He was instrumental in the establishment of Cornell's undergraduate program in enology and viticulture.

His research has focused on the development of bacteria starter cultures for malolactic fermentation of wine. Based on his initial research and extension efforts, winemakers now recognize that the yeast strain they use has a major impact on the final wine flavor profile.

11:00 am – 11:30 am Coffee break

11:30 am – 12:15 pm Precision enology: comprehensive wine terroir analysis with Wineseq

Elizabeth Hénaff, Matt Perisin, Julian Mendoza, Adrián Ferrero & Alberto Acedo
Biome Makers Inc., USA, Spain



In winemaking, *terroir* is the set of environmental factors, including climate, geography and soil, which contribute to the identity of a wine from a given region. The microbial component of the environment is an essential factor, indeed, yeast and bacterial communities associated with ripe fruit are regionally differentiated (Bokulich *et al.*, 2013) and there is a positive correlation between regional microbial signatures and differential wine phenotypes (Knight *et al.*, 2015). Notably, the soil has been identified as a key source of the vine-associated microbiome preharvest (Zarraonaindia *et al.*, 2015). Therefore, the microbes in the soil hold the potential of defining a wine *terroir*.

Winemakers are faced with decisions throughout the winemaking process: from the growth conditions of their vines (choice of land, pruning, irrigation) to the time of harvest, and after harvest (barrel oak, cultured or ambient yeast, maceration time, fermentation temperature, micro-oxygenation, etc). All of these decisions alter the contribution of the initial microbial communities to the final product, and thus alter the expression of the *terroir*. Currently, the choice is between two extremes: either producing wine that is *terroir*-driven, unique to and dependent on the naturally occurring microbial communities and often less predictable, or predictable winemaking with added cultured yeast.

Here we present Wineseq, a technology that bridges this gap: we have developed a method to identify the relevant microbial communities throughout the winemaking process, from the soil to the bottle, and the data science to interpret the results. We empower winemakers with the knowledge of the microbial dimension of their vineyards' *terroir* enabling them to maximize its potential, shape and craft their individual wines' properties, and anticipate early problems.

Elizabeth Hénaff was born of French/American parents in Austin in 1981, grew up in France, and has since lived in the US, Japan and Spain. She received a BS in Computer Science, an MS in Plant Biology (both from UT Austin) and a PhD in Bioinformatics from the University of Barcelona. The impetus behind her research is a fascination with the way living beings interact with their environment. She has made contributions to understanding how plants respond to the force of gravity, how plant genome structure changes in response to stress, and most recently has turned her attention to the ubiquitous and invisible microbial component of our environment. She has consistently made the tools - software, wetware, hardware - needed to answer her research questions, and enjoys both this process and the goal equally. Her interests in biological interactions and data visualization have inspired her to create interactive installations, and she has collaborated with artists and musicians in Barcelona, Paris and New York designing custom interactive visuals for their events. She currently works as a postdoc at the Weill Cornell Medical College in New York City.

12:30 pm – 2:00 pm Lunch

2:00 pm – 2:30 pm Presentation Lallemand Prize

1. **Gordon Walker:** Impact of the [GAR+] Prion on Fermentation and 2 Bacterial Community Composition with *Saccharomyces cerevisiae* UCD932 – Winner of the best student poster – ASEV 2015
2. **Diego Bonnel:** Essay on: principal challenges facing winemakers in the years ahead will be: longevity, acidity management and alcohol levels – Winner of the Lallemand – Institute of Masters of Wine Bursary 2016

2:30 pm – 3:15 pm Through the Looking Glass: A view into both “native” (non-inoculated) fermentations and fermentations inoculated with commercial yeast strains.

Richard DeScenzo, ETS Laboratories, USA



Is it possible to have a non-inoculated fermentation dominated by indigenous yeast strains? Do commercial yeast strains (ADY) added to must always dominate the fermentation? Answers to these questions and others will be discussed as we look at the results from a number of “native” (non-inoculated) and inoculated fermentation trials. Multi-locus VNTR (Variable Number, Tandem Repeat) analysis was used to monitor yeast populations during fermentation. This tool provides information on the changes in yeast populations that can occur during the fermentation process. A brief overview of the technology will be presented along with selected trials encompassing six years of analyzing industry fermentations. Analysis of both non-inoculated and inoculated fermentations will be presented. A multi-year trial, involving six wineries and six vineyards, will focus on differences in yeast populations observed in non-inoculated fermentations at different wineries using grapes from the same vineyard. In addition, results from successful and less successful ADY inoculated fermentations will be presented. The results discussed in this presentation will provide insight into the yeast population dynamics occurring during both inoculated and non-inoculated fermentations.

Richard DeScenzo is the Microbiology Group Leader for ETS Laboratories. ETS provides microbiological analysis for problematic fermentations using a combination of classical microbiology methods and molecular biology techniques. Dr. DeScenzo received his Masters in Plant Pathology and Ph. D. in Plant Biology at the University of New Hampshire, and conducted his postdoctoral studies on disease resistance genes in barley with the USDA/ARS at Iowa State University. He spent 10 years conducting research on grape genomics, development of molecular diagnostics, and fermentation monitoring in the wine industry. Dr. DeScenzo joined ETS in January 2006, leading the Microbiology Group and guiding the development of the Scorpion Wine Spoilage Detection Kit. Most recently, Richard has focused on transitioning the Scorpions technology for use in the fuel ethanol market. In addition to developing improved diagnostics for the fermentation industry, Richard works with clients to help them understand their microbial fermentation problems, and develop monitoring programs to prevent future problems.

3:15 pm – 4:00 pm

Microorganisms and terroir wines

Vincent Gerbaux, IFV Beaune (Bourgogne).



The terroir, a key factor for quality wine is a complex equilibrium between soil, grape variety, weather and viticultural practices. The biodiversity of this environment is also an important element for the production of quality grapes. But the vine has very different conditions from those imposed found during winemaking. For example, fermenting yeasts do not dominate on grapes. *Kloeckera apiculata* can easily colonize the must by producing ethyl acetate. The problem with the production of volatile phenols by *Brettanomyces* will accompany the wine for its entire life. The absence of lactic acid bacteria may delay malolactic fermentation, and thus promote microbiological contamination or oxidative evolution. In order for the terroir to be expressed, it should not be dependent on microbiological lottery, but instead, controlling fermentation is required. The transformation of a quality wine quality grapes must use the

biodiversity of microorganisms selected by humans for oenology, in the cleverly integrated management and shaping of a wine style. The IFV is developing new cultures and new oenological applications for this this objective.

Vincent graduated in 1982 from Ensba (now AgroSup Dijon), Master degree in Biology applied to Nutrition and Food, and in 1983 from the national diploma of Enology. He studied wine lactic acid bacteria during his thesis at the University of Dijon (1983 to 1985). In 1985, he started working for IFV at Bordeaux then joined IFV Beaune three years later.

*Vincent is in charge of the IFV project « Technoferm », gathering all the studies on alcoholic and malolactic fermentations. Collaborating with Lallemand for many years, he has selected and characterized original *Oenococcus oeni* strains, commercially available. He is also managing for 5 years studies on the selection of strains of *Saccharomyces* and *Non-Saccharomyces* for specific technological applications. In parallel, the team also works on spoilage microorganisms in wine, especially *Brettanomyces*. Last research topic deals with the technologies involved in red and white wines production, especially in Burgundy area. The diversity of research and applications contributes to improve enological practices.*

6:30 pm

Departure

7:00 pm

Reception at Tin Horn Creek and dinner at Mirodora.

