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## CHALLENGES 2022 – DIFFICULT MLF

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*2022 was a very challenging vintage for most of us... As we are hearing many concerns from winemakers about difficult Malo-Lactic Fermentations (MLF), we have put together some solutions to help you manage MLF, avoid stuck fermentations and/or spoilage.*

Malolactic fermentation (MLF) is the conversion of malic acid into lactic acid by Lactic Acid Bacteria (LAB), more commonly *Oenococcus oeni*. Wines that go through MLF become more microbiologically stable as malic acid is consumed and can no longer be used by other microorganisms that can alter wine. Additionally, these wines are softer since lactic acid contributes less aggressivity to wine. MLF also produces organoleptic changes that result in greater aromatic complexity and stabilization of wine color.

### WHAT ARE THE POTENTIAL CAUSES FOR INCOMPLETE MALOLACTIC FERMENTATION (MLF) ?

Nutrient limitation, difficult physico-chemical conditions and/or the presence of toxins to Lactic Acid Bacteria are well-known factors responsible for incomplete malolactic fermentation.

- **Nutrient Limitation:** Wines that struggle to complete alcoholic fermentations are more likely to be deficient in nutrients needed to support bacteria during MLF. Nutrient limitation is one of the major causes of incomplete malolactic fermentations.
- **Physico-chemical conditions of the wine:** It is important to know the parameters of the wine to understand why the bacterial strain used previously failed. The main wine compositional factors that determine the success of MLF are alcohol, pH, temperature, and SO<sub>2</sub> concentration (Molecular and Total). Each of these factors has a negative synergistic effect, making it increasingly difficult to complete MLF when combined.
  - Alcohol is toxic to most organisms, including ML bacteria. Any wine above 13% ABV is considered a difficult environment for Lactic Acid Bacteria, however, some commercial strains are equipped to tolerate up to 17% ABV. [OENO®1](#) and [BACTERIA XTREM](#) can tolerate up to 16% ABV.
  - Wine pH: All malolactic bacteria have environmental limits for pH and typically require pH levels above 3.3. Some strains such as [OENO®1](#) and [BACTERIA XTREM](#) can tolerate pH<3.
  - Total SO<sub>2</sub> >30 mg/L, Free SO<sub>2</sub> >10 mg/L and/or Molecular SO<sub>2</sub> > 0.3 can be causes of stuck or difficult MLF.
  - Wine temperature: MLF is favored between the temperatures of 64°F - 72°F. Different strains of MLB have different tolerances of low temperatures.
  - Additionally, vineyard sprays, initial malic acid content, yeast strain used for alcoholic fermentation, and wine polyphenol content such as condensed tannins can be stress factors. Volatile Acidity above 0.4 g/L is likely to behave as an inhibitor towards MLF.

### HOW TO RESTART A STUCK MLF OR FIX A SLUGGISH MLF ?

There are many reasons why MLF is slow-to-start, slow-to-finish, or stuck, often it is due to microbial or chemical inhibition.

The successful restart of a stuck ML fermentation depends upon three critical factors:

- 1- Diagnosis of the fermentation arrest causes and the degree of fermentation completion.
  - Analyze the microbial situation to assess the health of the malolactic bacteria and the risk of any competing microorganisms, particularly *Lactobacillus* and *Brettanomyces*.
  - Determine the chemical composition of your wine such as alcohol %, glucose-fructose, pH, L-malic acid, free SO<sub>2</sub>, and total SO<sub>2</sub>.
  - Other inhibiting metabolites also exist, such as short- and medium-chain fatty acids produced by yeasts during AF, or afterwards by *Brettanomyces*. C8 (octanoic acid), C10 (decanoic acid) and C12 (dodecanoic acid) fatty acids inhibit MLF bacterial growth particularly by disrupting membrane function. These fatty acids can be removed by detoxification with [ACTIBIOL®](#) (inactivated yeasts, yeast hulls, and purified cellulose).
- 2- We recommend treating the wine 24 hours before ML inoculation.
  - Adjust pH and alcohol if necessary.
  - Absorb toxins with 10 g/hL [ACTIBIOL®](#)
  - Eliminate any spoilage microbes with 4 g/hL of [KILLBRETT®](#) (pure chitosan, broad spectrum anti-microbial agent)
  - Let it settle for 24 hours and rack off the lees.
- 3- Proper ML bacteria addition:
  - Add the nutrients for ML bacteria with 10 g/hL [OPTIFLORE O](#)
  - Add directly to wine [OENO®1](#) and [BACTERIA XTREM](#) at 1 g/hL and stir for good repartition,
  - Maintain temperature at 65-75°

### A BIT MORE ABOUT LAMOTHE-ABIET MALOLACTIC BACTERIA

The two ML Bacteria, **OENO®1** and **BACTERIA XTREM**, offered by Lamothe-Abiet in North America are direct inoculation. No preparation or rehydration needed, simply add the freeze-dried bacteria in your wine.

**OENO®1** is a freeze-dried *Oenococcus Oeni* strain, very easy to use, in direct inoculation for clean and complete MLF.

**OENO®1** is recommended to be used for co-inoculation, sequential inoculation, or for restart of MLF.

- Great versatile ML bacteria for red, whites, rose and sparkling.
- Selected for its short lag phase, quick conversion of malic acid and strong resistance to difficult conditions (such as high alcohol content).
- Free of cinnamyl esterase activity, thus improving aromatic cleanliness and reducing risks of Brett taint later in the winemaking process.
- Low production of VA, biogenic amines and diacetyl.
- Consumes ethyl acetate, thus improving the SO<sub>2</sub> efficiency post MLF.
- Enhances fresh and fruity aromas, reduces perception of green characters or over-ripe aromas.

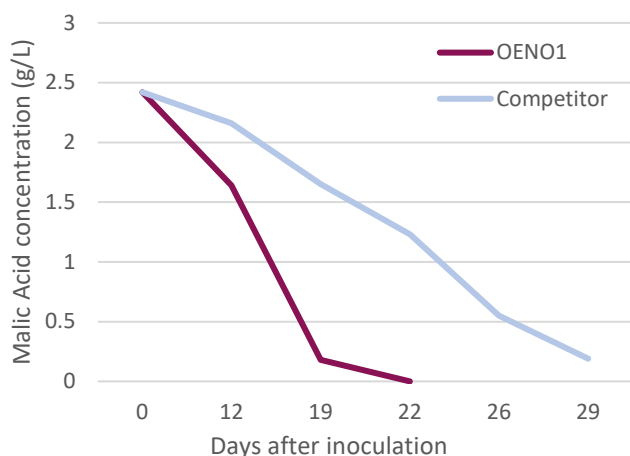


**BACTERIA XTREM** is a freeze-dried *Oenococcus Oeni* strain, used in direct inoculation for clean and complete MLF in extreme conditions. **BACTERIA XTREM** is recommended to be used for difficult MLF (low pH, high Alcohol content) and restart.

- Works for red, white, rose, sparkling wines.
- Selected for its quick conversion of malic acid and strong resistance to difficult conditions. It tolerates very low pH (~3) and high alcohol content (up to 16% ABV.)
- Free of cinnamyl esterase activity, thus improving aromatic cleanliness and reducing risks of Brett taint later in the winemaking process.
- Low production of VA and biogenic amines
- Produce diacetyl. *Tip: To block the production of diacetyl, add SO<sub>2</sub> about 48 hrs after the end of MLF*



MLF - CS (14.9% ABV - pH 3.5)



Average Length of MLF (days)

