James Osborne has made a lot of really bad wine. Wine that smells like a hospital ward or like you stepped in something. Wine that tastes acrid and metallic, like a copper penny. Wine that reminds you of nail polish remover, rotten eggs or a wet dog.

It’s all part of his job as a microbiologist with Oregon State University’s Oregon Wine Research Institute. He studies how tiny organisms — like yeast and bacteria — can mean the difference between wine that lands on the pricier top shelf at the store or the bargain bottom level. And as an enologist with the OSU Extension Service, he uses his research results to help vintners solve problems in their cellars.

For example, winemakers were finding that their red wines weren’t so red after undergoing malolactic fermentation, which lessens the acidity. Osborne wanted to know if this secondary fermentation was in fact reducing the color, and if so, was there anything that could be done about it? With funding from the American Vineyard Foundation and the Oregon Wine Board, he found that the process did indeed diminish color in Pinot Noir and Merlot and that the culprit was Oenococcus oeni,
a bacteria that winemakers commonly add to wine to induce malolactic fermentation. Osborne, however, found that this microbe breaks down acetaldehyde and pyruvic acid. These two compounds are important to the development of polymeric pigments, which play a role in long-term color stability and account for most color in older red wines.

So what to do? Focusing on Pinot Noir, Osborne tried several fixes. He lengthened the period in which wine is left in contact with grapes skins prior to malolactic fermentation with the hope that more polymeric pigments might form. But that actually produced wines with a lighter hue. He added pyruvic acid. No dice. He added acetaldehyde. That restored about half the color and polymeric pigments. Taking his lead from an old winemaking technique, Osborne postponed the malolactic fermentation for up to six months. Although some color loss was still noted, polymeric pigments did not decrease. Starting malolactic fermentation later than normal, however, means delaying the addition of sulfur dioxide and possibly increasing the risk of spoilage. After all this, Osborne concluded that Pinot Noir color can be improved by delaying malolactic fermentation for six months but that wines must be stored at cool temperatures during that time to prevent spoilage.

Osborne, who has been at OSU since 2006, has also focused his attention on another stage in the winemaking process: cold soaking. After grapes are harvested, some winemakers chill them in a tank prior to fermentation because they believe it improves color, flavor, aroma and mouthfeel.

Osborne wondered if there was any truth to the aroma part, and if there was, what was causing it? He had a hunch that the rugged yeast that survive this cold bath played a role. Yeast are a ubiquitous fungi that float in the air and coat surfaces, including grape skins. So when grapes arrive at a winery, they bring their single-celled friends with them. These freeloaders then enjoy an all-you-can-eat buffet in the grape juice, gorging on the sugar as they convert it into alcohol and carbon dioxide.

Funded by the Oregon Wine Board, Osborne isolated yeast strains out of cold soaks then grew them in petri dishes in his lab. Beautiful teal streaks and white knoblike dots came into focus like a slow-developing Polaroid picture, allowing Osborne to identify the strains based on their color and shape. He then made wine with these strains and called on colleagues Michael Qian and Elizabeth Tomasinato assess the aromatic properties using lab equipment and human sniffers. The researchers found that cold soaking does influence smell regardless of whether yeast are present. But when they are, each individual strain has its own effect on the aroma. As a result, Osborne said, winemakers might want to manage their cold soaks accordingly to encourage or limit growth of the yeast.

Another project Osborne is working on involves Brettanomyces bruxellensis, a yeast that can cause problems for winemakers. Whenever vintners smell bandages, they know “Brett” is in the house. This opportunistic guest makes itself at home in oak barrels and can be difficult to kick out. It loves to dine on certain phenolics, and in the process, releases its trademark odors, which have been described as medicinal and horse manure, among others. With funding from the Northwest Center for Small Fruits Research, Osborne looked at winemaking practices that could unwittingly encourage the growth of Brett. He found that the growth of a strain of O. oeni called Vinoflorra during malolactic fermentation increases the phenolics that Brett noshes on. This results in Brett producing high levels of its telltale stench. Consequently, Osborne recommends that winemakers avoid using this particular strain in barrel-aged red wine.

In the meantime, he is evaluating more strains of bacteria to see if they increase the phenolics that feed Brett’s appetite.

I have changed some of my barreling down practices as well as malolactic inoculations after talking with James and listening to his presentations.

– Elizabeth Clark, winemaker at Airlie Winery

Left: James Osborne scrutinizes test tubes containing various yeast cultures. Below: Metschnikowia pulcherrima is a strain of yeast that Osborne isolated in a study on how non-Saccharomyces yeast that are on grapes prior to fermentation affect wine quality.