The MYTH BUSTER

DR. PAULO LOPES DISPELS LONG-HELD BELIEFS ABOUT **CORK**

by Deborah Parker Wong

WHEN IT COMES TO WINE STORAGE, old habits are hard to break. But Dr. Paulo Lopes, Research and Development Manager at Amorim Cork, advises that if temperature and humidity are maintained at the correct levels, wine can be stored upright with no ill effects. In fact, sparkling wine should *always* be stored upright: a little-known fact that seems lost on many wine experts. During the course of his groundbreaking research, Lopes has seen no difference in the amount of oxygen found in wines that have been stored horizontally or vertically.

Using science to debunk the myths that persist within wine culture is liberating largely because the facts can be even more compelling than the misleading maxims. In his recent presentation at the San Francisco Wine School on the reductive and oxidative nature of wine, Lopes made it abundantly clear that, after bottling, the main source of oxygen in wine comes from the cork itself. Atmospheric oxygen doesn't make its way through the cork (neither does mold, for that matter); rather, the air trapped in cork's lenticels, or pores, diffuses into the wine over a period of roughly three years.

Wines bottled under cork are impressionable in their youth (they're a bit like humans in this way). How a wine ages over an extended period depends largely on the amount of oxygen released by the cork during the wine's first few years in the cellar. Not surprisingly, different grades of cork contain different amounts of oxygen: A longer, higher-quality Grade A cork with fewer lenticels will release less. "Longer corks are much more homogeneous in oxygen release," said Lopes. "Also, due to the [sloping] shape of the bottle neck, the cork is less compressed and thus releases less oxygen."

Corks used to seal wine bottles have a lifespan of about 25 years, after which they begin to lose elasticity and can start to let atmospheric air into the bottle along their sides. "After ten years, a cork will lose only 1–2 percent of its elasticity," said Lopes. "And if stored in contact with the wine, it will absorb about 3 millimeters of wine."

But it's the temperature and humidity of the storage space that ultimately dictate the lifespan of the cork, which initially consists of 80–90 percent air: an amount that decreases by 10–15 percent over time. Lopes explains that at temperatures below 20 degrees Celsius (68 degrees Fahrenheit) and at 50 percent humidity, the head space in a wine bottle is as moist as vapor. Above 20 degrees Celsius, temperature has a huge impact on natural cork; it loses humidity faster than it can take in moisture from the wine and will eventually dry out. In the case of sparkling wine, corks absorb both liquid and gas as they pull carbon dioxide (CO_2) from the wine. The classic mushroom shape of a sparkling-wine cork is formed by its contact with CO_2.

PHOTO BY POPLASEN VIA THINKSTOCK

Dr. Paulo Lopes, Research and Development Manager at Amorim Cork.

WHO'S AT FAULT?

For many reviewers and wine judges, cork taint can be a scapegoat for a host of problems hovering elusively below the sensory threshold. "We see reductive and oxidative faults occurring at a much higher incidence than brettanomyces and 2,4,6-Trichloroanisole [TCA]," Lopes said during his presentation.

In tackling the dynamic winemakers face between working anaerobically or reductively and aerobically, Lopes dispels the myth that the former can successfully "freeze the wine in time." Reactions can occur in the absence of oxygen, with the most notable being the formation of smelly sulfur compounds.

Lopes furthered this point in his research by using an unadulterated sample as a control along with four doctored samples of Chilean Sauvignon Blanc. He selected this control wine for its thiols—aroma compounds with tropical-fruit and citrus flavors. "Sauvignon Blanc has distinct markers; it's very rich in sulfur-like compounds, including methoxypyrazines, which have grassy, vegetal notes and can be an indication of reduction," he explained.

Oxidation in wine can occur via two pathways—alcohol or phenols. Either way, it's relatively easy to identify and can be attributed to a host of factors not related to cork. Browning in white or red wines is a dead giveaway of oxidation. Too little nitrogen in the vineyard, heavy-handed pressing in the winery, and bottling at low temperatures can all contribute to oxidation.

The result of alcoholic oxidation is acetaldehyde, a sherried or aldehydic character that's cherished in oxidative-style fortified wines like Sherry but detracts from the quality of still table wines. This results in a bruised-apple character on a palate that is flattened, dry, diluted, and bitter.

Reduction, on the other hand, doesn't affect color; it's detected by aromas and can cause astringent, buttery, or metallic flavors that originate from natural or added sulfur compounds. This family of volatile sulfur compounds can have a positive or negative impact on wine. Desirable compounds are formed by long-chain thiols, while the undesirable compounds that mask primary-fruit character and produce reductive off-flavors are short-chain thiols.

Because yeast produces sulfur dioxide during fermentation and there are other naturally-occurring sources of sulfites in wine, winemakers want to reduce the potential formation of sulfur compounds. Lopes showed us three reductive faults: hydrogen sulfide, which has the smell of rotten eggs; ethanethiol, a compound that's reminiscent of garlic, natural gas, and pesticides; and one of the simplest sulfur compounds, methanethiol, which reeks of dirty drains and cabbage. For the latter, prevention is the only real "cure."

Through these faults, Lopes demonstrated the vital role played by the oxygen transmission rate (OTR) in wines and the effect that particular closures have on the potential for reduction to emerge after bottling. In his studies, screwcaps were most effective at increasing levels of both good and undesirable volatile sulfur compounds (VSC); natural cork, meanwhile, fared better in showing lower levels of bad compounds and had an equal impact on certain types of good VSC. SJ