

## Do Cork Closures Protect Wines from Dimethyl Sulfide Aromas?

Current discussions of wine closures increasingly mention the presence of reduced wines and sulfide-like odors (SLO). Observations by wine writers and competition judges have associated SLO with wines finished with screwcap closures.

In the March 31s issue of “The Telegraph,” Victoria Moore writes, “My view is that a large number of aromatic whites with screwcaps are slightly reduced and that it’s a phenomenon that’s largely brushed aside. There’s also a middle ground for which the effect of reduction is to dumb down the nose and give it a very particular taste. I think we are being trained to like wine like this.”

This comment is characteristic of the debate that includes numerous proponents of screwcaps, who claim that reduction problems are the fault of the winemaker – not the closure.

Discussions of specific sulfide compounds are usually focused on the redox reaction between disulfides and mercaptans.(1) While mercaptans are generally considered to be a serious but relatively infrequent wine fault, this review is directed at a more common and more ambiguous sulfide compound.

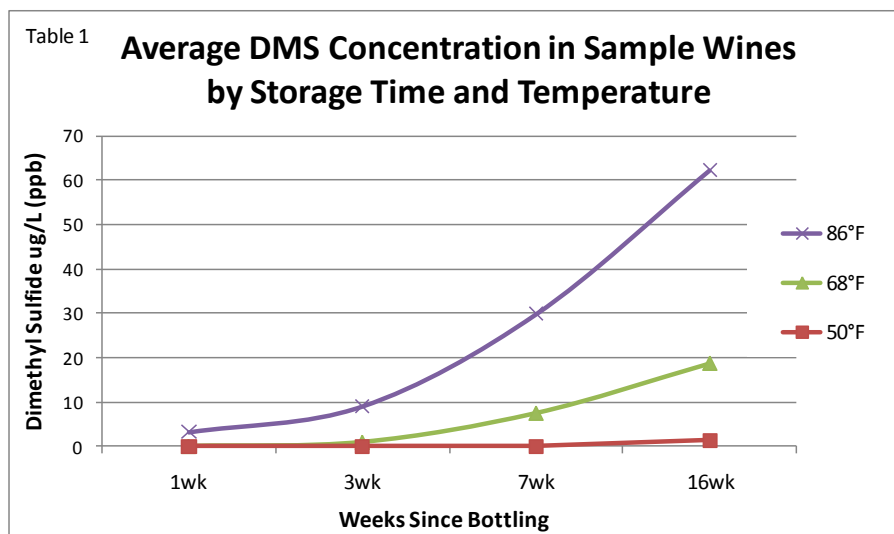
### Dimethyl Sulfide

The most commonly observed sulfide compound found in California wines is dimethyl sulfide (DMS).(2) This sulfide compound is associated with aromas of canned corn, cooked cabbage and asparagus. It has a reported sensory threshold of 25 micrograms per liter ( $\mu\text{g/L}$ ) or 25 ppb.(3)

A variety of origins have been identified for DMS in wine. It is clearly associated with fruit composition and is normally observed to occur at the onset of fermentation. Possible precursors include common amino acids cysteine and methionine.(4)

In addition to grape origins, literature shows that DMS concentration can increase in wines after bottling. The concentration of DMS in bottled wines has been demonstrated to be subject to storage temperature and time in the bottle. Evidence includes a series of wine analyses taken at different temperatures over a 16-week period.(5) [table 1]

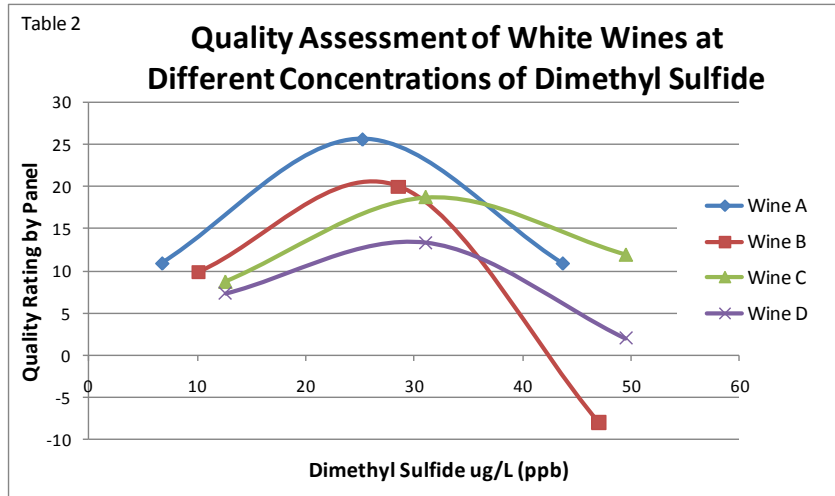
Post-bottling DMS has been attributed to several sources. One possibility is the spontaneous degradation of S-methylmethionine, though that process reportedly requires high temperatures ( $60^{\circ}\text{C}$ ) that are unlikely attained during normal wine storage.(6) A more widely reported source for DMS is attributed to the reduction of naturally occurring dimethyl sulfoxide (DMSO).(4)



### DMS from Flavor Enhancer to Flaw

At low concentrations, DMS is sometimes considered an enhancement for some wine flavors. A New Zealand study by Spedding and Raut<sup>(7)</sup> included a quality assessment of four white wines at different DMS concentrations. Results indicate that DMS concentrations between 20-40µg/L received positive sensory results. Higher DMS concentrations were viewed negatively. [table 2]

Wines used in this survey were, Riesling x Sylvaner (2), Gewurztraminer, Chardonnay and Pinot Noir. This panel considered DMS to be detrimental to the red wine at all concentrations. Results indicate that different wine matrices must be considered when evaluating the sensory impact of DMS.



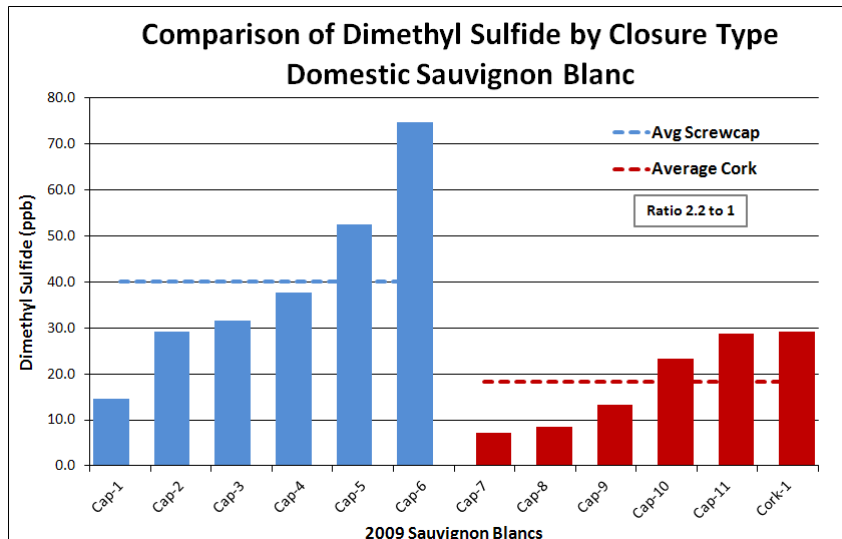
### Influence of Closure Type on DMS Formation

A study of DMS formation in sparkling wines during secondary fermentation has shown that the concentration of DMS accumulated more rapidly with bottle caps having low oxygen permeability.<sup>(8)</sup> This is consistent with the view that post bottling DMS formation is associated with reduction of DMSO.

### Survey of Sauvignon Blanc by Closure Type

The Cork Quality Council recently conducted a survey of California Sauvignon Blancs to measure DMS concentration (3/5/11). All wines were from the 2009 vintage, and samples were obtained from commercial retail stores. Six wines finished in screwcap closures and six wines with cork closures were selected. Results showed that DMS ranged from less than 10µg/L to over 70 µg/L. Only two of twelve wines had DMS above 40 µg/L.

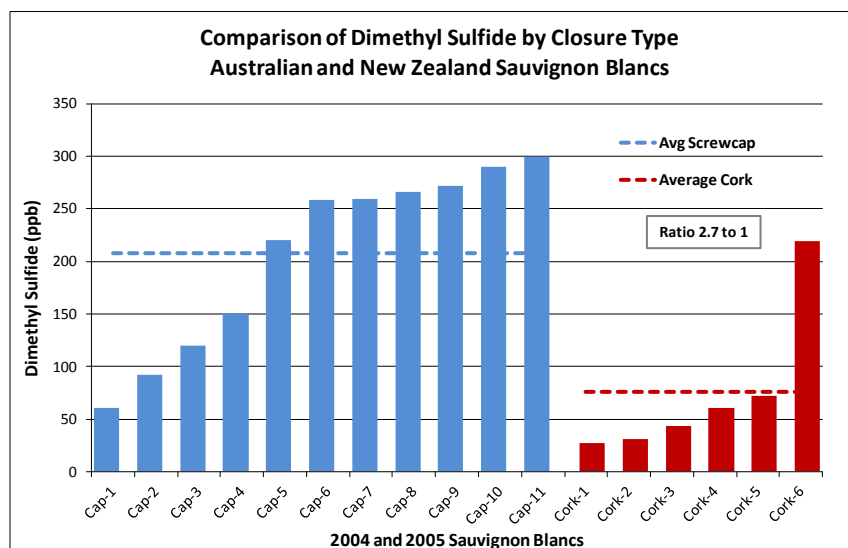
There was a noticeable difference between closure types. Wines with screwcaps had an average DMS concentration of 40µg/L compared to 18µg/L for wines under cork. The ratio of DMS by closure type was 2.1:1 for screwcap to cork.



This ratio is comparable to an earlier CQC survey (2/16/07) of Sauvignon Blancs from Australia and New Zealand. This study revealed much higher levels of DMS than seen in the recent California survey, but presented a similar ratio of DMS in wines under screwcap equal to 2.7:1 for wines under cork.

The large difference in DMS concentrations between the two surveys is likely due to differences in fruit characteristics and the fact that the southern hemisphere wines (made up of the '04 and '05 vintages) had more bottle aging at the time of analysis than seen in the California samples.

Other sulfide compounds were analyzed with only dimethyl disulfide achieving measurable levels. None of these exceeded the sensory threshold.



<p><i>Screwcap samples from this survey consisted of wines from the '04 and '05 vintages. Average DMS concentrations were higher in the older wines.</i></p>	<b>DMS by Vintage</b>		
	<i>Screwcap Bottles (AU &amp; NZ)</i>		
	<u>Vintage</u>	<u>Samples</u>	<u>DMS (ppb)</u>
	2005	7	184.3
	2004	4	249.4

### Conclusion

Dimethyl sulfide is a potential wine flaw that can develop in the bottle as a result of storage conditions including heat, time and the oxygen permeability of the closure. DMS can develop after bottling to a level that will cause the overall quality of some wines to deteriorate within a short period of time. In the examples shown only wines stored at 50°F failed to develop measurable DMS within a 16-week period.

The results from two market surveys of commercial Sauvignon Blanc wines indicate that those bottled with a cork finish develop less DMS than adjacent wines finished with screwcaps. This evidence suggests that a wine closure with higher oxygen permeability offers some protection against excessive formation of DMS after bottling.

### References:

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- [7] Spedding, D.J. and P. Raut - The influence of dimethyl sulphide and carbon disulphide in the bouquet of wines - Vitis 21, 240-246 (1982)
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### Survey:

Wines were submitted to ETS Laboratories for analysis using their Sulfide Panel. With the exception of DMS, no other sulfide compounds were detected above sensory thresholds.

Compounds tested: hydrogen sulfide, ethyl mercaptan, methyl mercaptan, diethyl sulfide, dimethyl sulfide, diethyl disulfide, dimethyl disulfide, carbon disulfide

CA wines surveyed: Bogle, Bonterra, Ch. St. Jean, Concannon, Dancing Bull, Dry Creek, Fortress, Geyser Peak, Kunde, Morgan, Murphy-Goode, Phelps

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