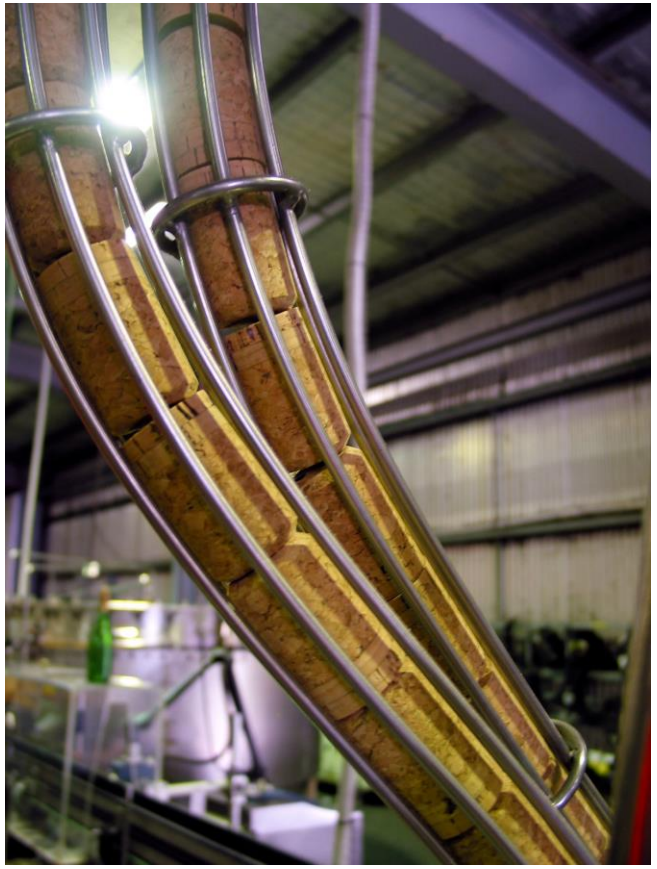
The Australian Wine Research Institute

Impact of closures on wine



Dr Eric Wilkes

Group Manager Commercial Services

What is the most common (mis)conception about wine

The Australian Wine Research Institute

All wines mature with age!

Well lots don't.

But many of the great ones actually do.

In other words winemaking does not end when the wine leaves the winery.

Closures, more than just a seal

The Australian Wine Research Institute

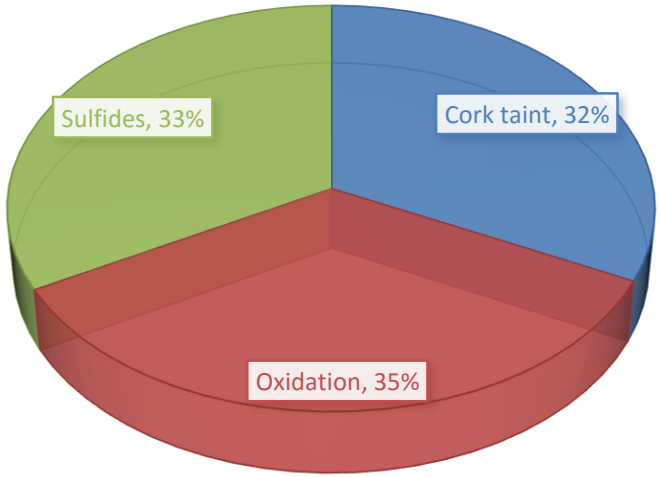
The primary role of the closure is to keep the wine in the bottle.

However apart from some extreme examples the closure never provides a 100% gas tight seal

The performance of the seal to oxygen ingress can lead to significant variation in wine flavour outcomes and possible wine faults.

Wine show rejection rate

Cork taint: 0.9%
Oxidation: 1.0%
Sulfides: 0.9%



Closure choice can have an impact on wine quality

The Australian Wine Research Institute

Range of colour 63 months post bottling, Semillon wine, 14 different closures

The availability of oxygen can drive much of the chemistry in bottle.

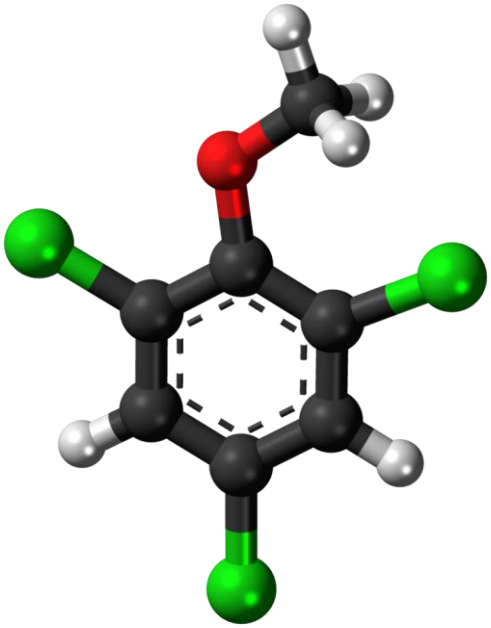
But it isn't the only factor!

Godden et al (2001) *Aust. J. Grape Wine Res*. 7, 62-105

Cork Taint

The Australian Wine Research Institute

2,4,6-trichloroanisol

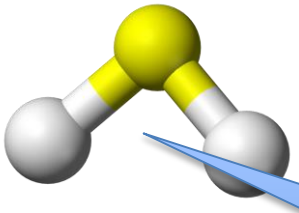


- Still having an impact in cork closures
- A number of companies have introduced technology to screen 100% of corks!

One study showed that only 60% of wines rejected from a wine show for cork taint had halo anisoles present!

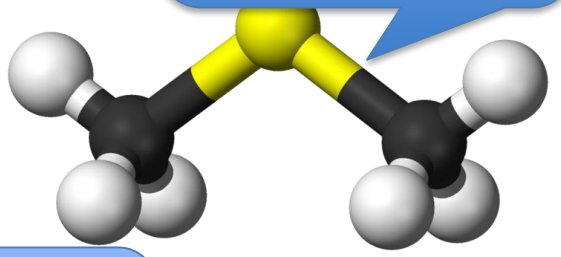
What about reduct rs?

The Australian Wine Research Institute



H_2S 1ug/L

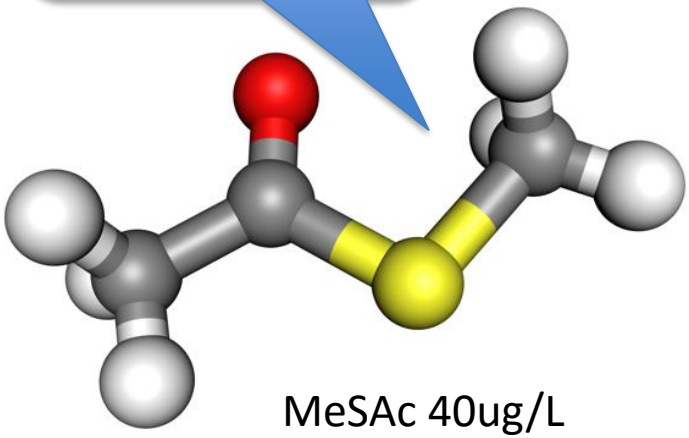
rotten egg, sewage like



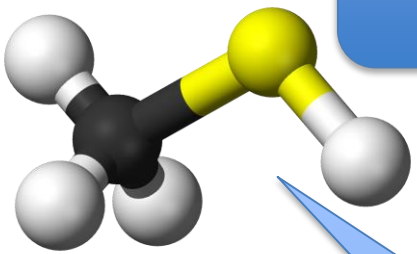
DMS 25ug/L

Blackcurrant, cooked cabbage, asparagas,canned corn

Sulfurous, cheesy, egg

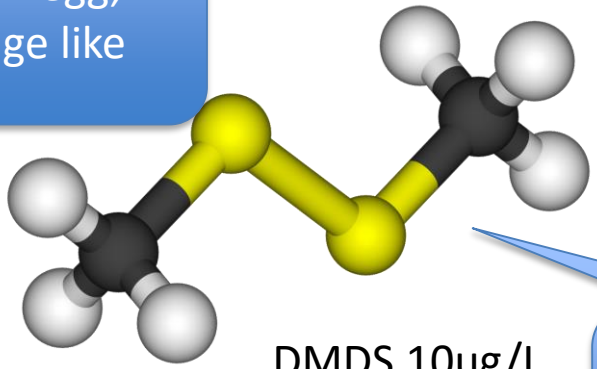


MeSAc 40ug/L



MeSH 1.5ug/L

rotten cabbage, burnt rubber, putrification



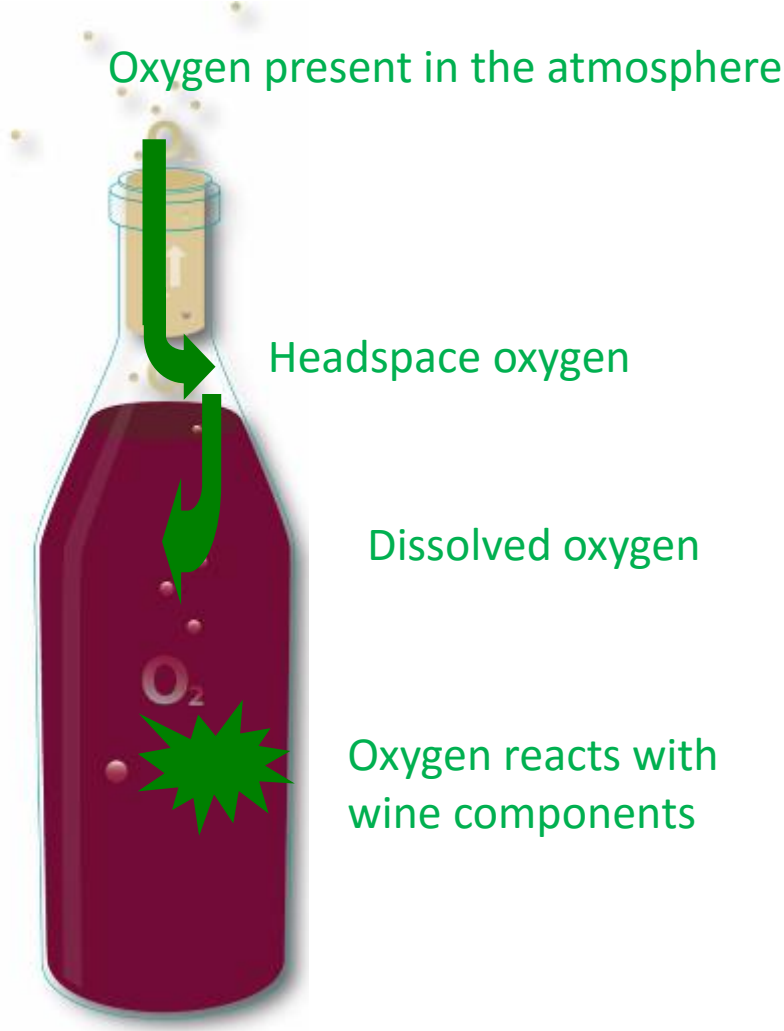
DMDS 10ug/L

Vegetal, cabbage, intense onion like

How much oxygen after bottling?

The Australian Wine Research Institute

- Depends on closure oxygen transfer rate (OTR) and storage environment



- OTRs range from <0.005 to 5 mg/L/year*
  * in 750 mL bottle
- In the first 3 to 6 months, the contribution of the oxygen trapped in the closure and in the headspace should not be ignored
- After 6 months, ingress through the closure is more important
- Therefore, controlling OTR means that winemaking can continue after bottling

What wine factors are involved?

The Australian Wine Research Institute

We must remember that in many case the die is set before we get anywhere near the bottling line.

- Phenolic content including tannins.
- Initial oxygen levels
- Oxygen exposure history
- Volatile sulfur compound precursors
- Levels of metals available in the wine.

Closures, the usual suspects

The Australian Wine Research Institute

Cork

The Australian Wine Research Institute

- Shoving a lump of bark in your finely crafted wine.

- Traditional
- Liked by customers (don’t stuff with my ritual)
- OK OTR
- Issues with cork taint
- Like all natural products variable

Technical Closure

The Australian Wine Research Institute

- Usually made from ground up bits of cork.

- A bit like cork
- Similar experience to cork
- OK to low OTR
- Not many taint issues (although some people claim a glue like taint)
- Less variable than natural cork

Extruded or synthetic closures

The Australian Wine Research Institute

- i.e. a lump of plastic

- Can look a bit like cork?
- Similar experience to cork, but the customers are not always convinced.
- Original ones had crap OTR, but claims to have improved.
- Taint free
- Very little variability

Screw caps

The Australian Wine Research Institute

- Not even remotely like a cork

- Dominating in Australia
- Market acceptance varies from region to region.
- Low to very low OTR
- Taint free
- Very little variability

Glass Stoppers

The Australian Wine Research Institute

- Glass core
- Plastic does the work

- Looks very flash
- Market acceptance varies from region to region.
- OTR depends on brand, but is OK to good.
- Taint free
- Very little variability
- Some need high spec bottles

Zork

The Australian Wine Research Institute

- Plastic construction
- Tamper proof and reusable.

- Looks, different
- Limited market pentration.
- OTR OK.
- Taint free
- Very little variability

And the trendy new ones…

The Australian Wine Research Institute

Lots of variations on the above that claim to manage OTR in detail.

Often describe

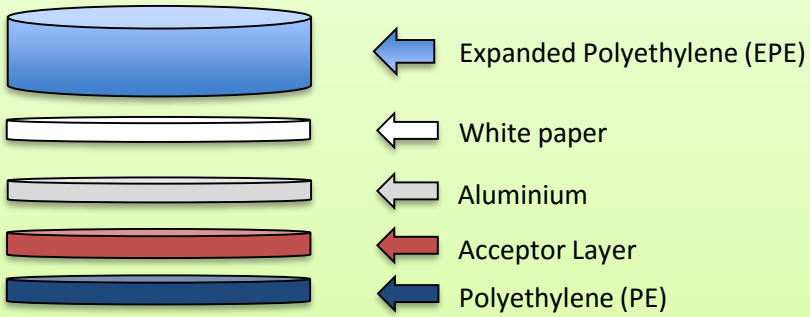
Many do as th
"good corks".

Still to be prov

Definitely not a silver bullet, need to get the wine right to make a difference.

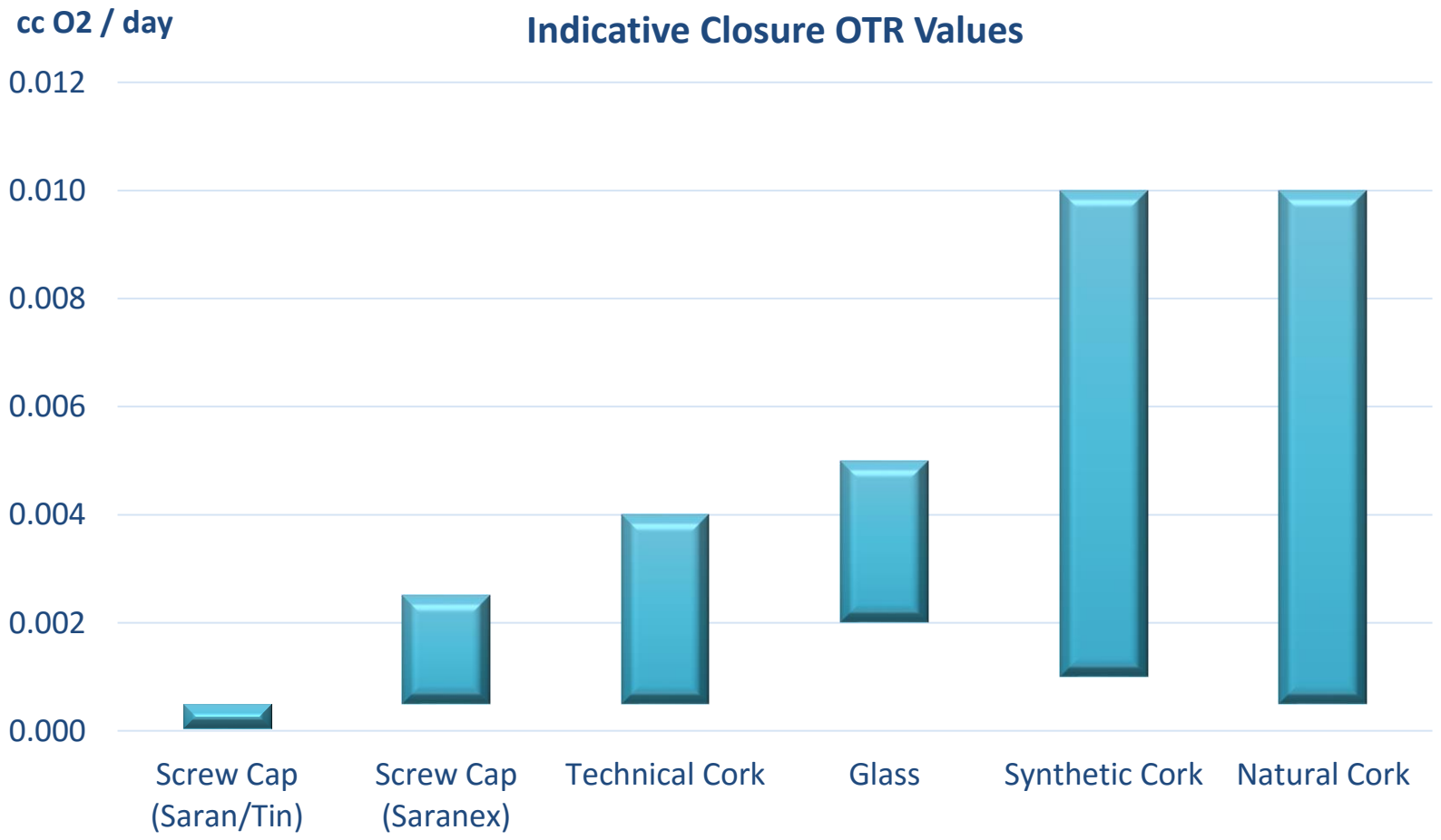
Breaking news

Industry level trials are just beginning for a screwcap liner which actively scavenges bad sulfur compounds.
Watch this space



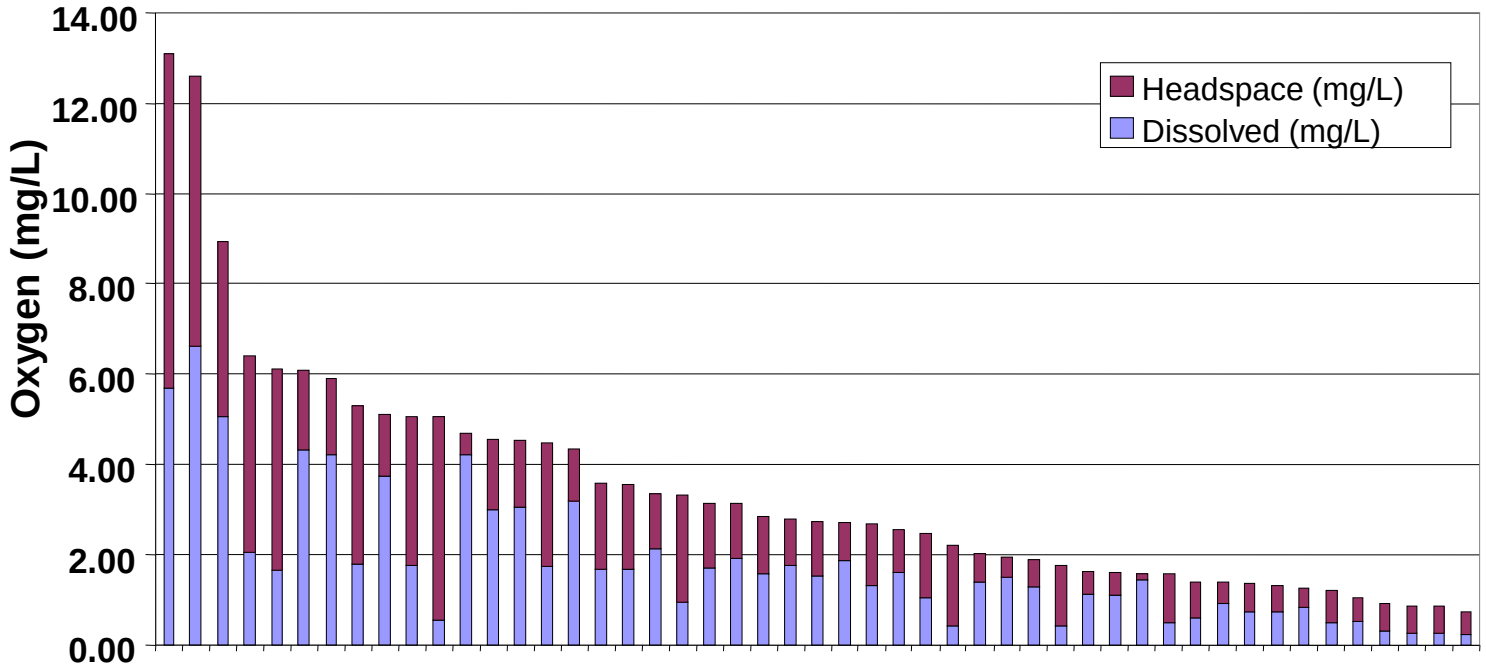
O_2 Contribution from different closures

The Australian Wine Research Institute



How much oxygen at bottling?

The Australian Wine Research Institute



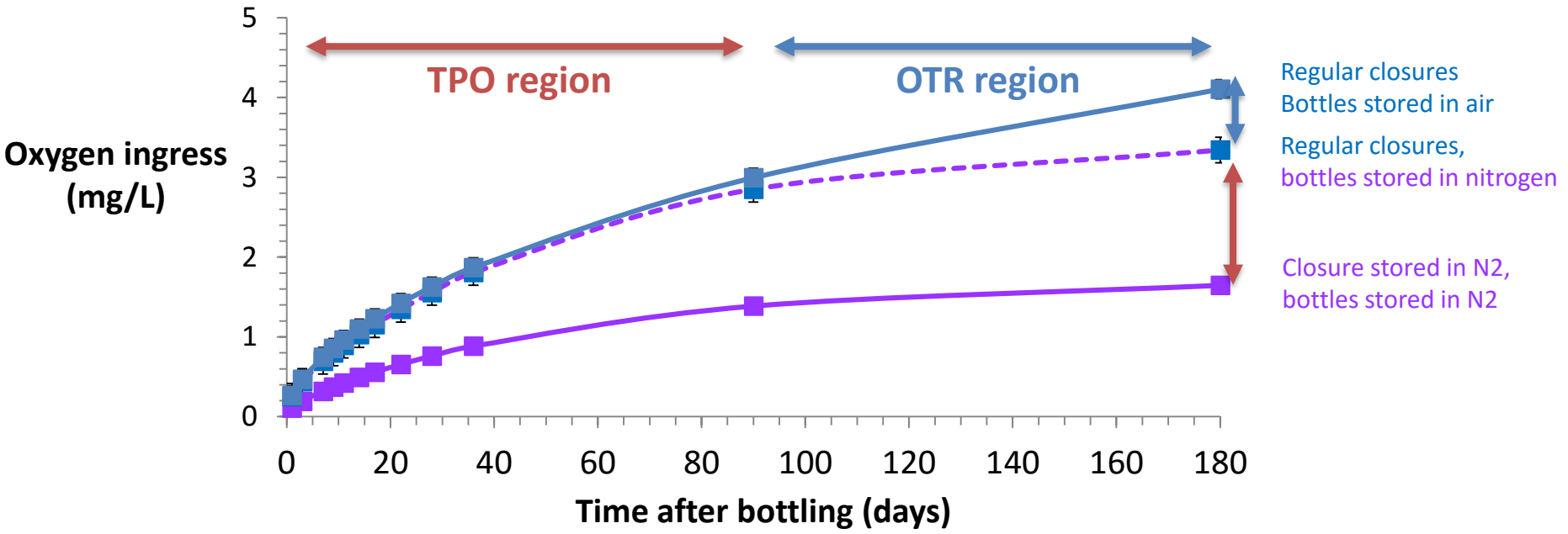
- DO can be significant.
- Headspace oxygen dominates under screwcaps
- Cylindrical closures outgas too

1-10 mg/L

- Generally less than during must processing:
  - 2 to 10 mg/L oxygen during crushing
  - Up to 4 mg/L oxygen during pressing

The level of oxygen in the closure itself is not trivial

The Australian Wine Research Institute



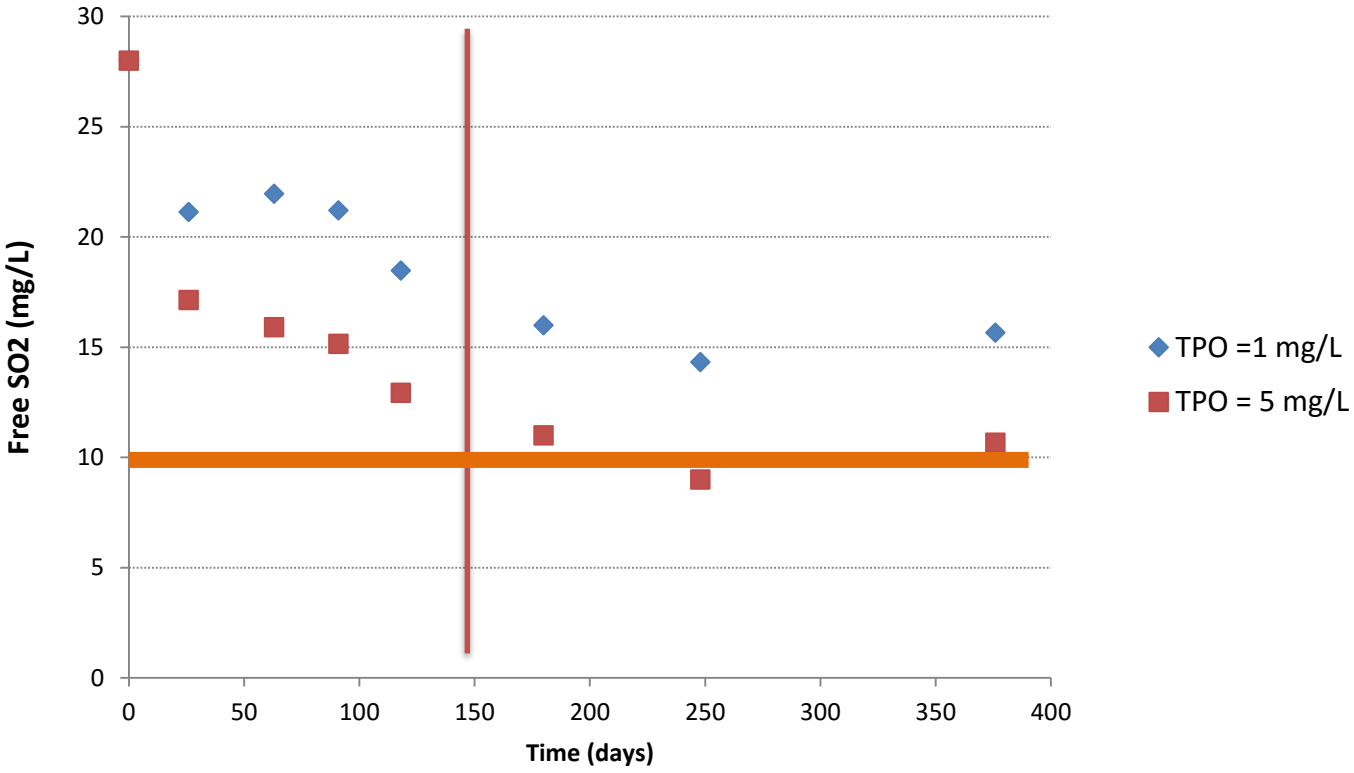
Oxygen introduced by the closure itself.
Oxygen contributed transmitted through the cork.

A major part of oxygen exposure in the first three months comes from the closure itself (desorption)

Impact of headspace oxygen

White wine controlled TPO dosing trial

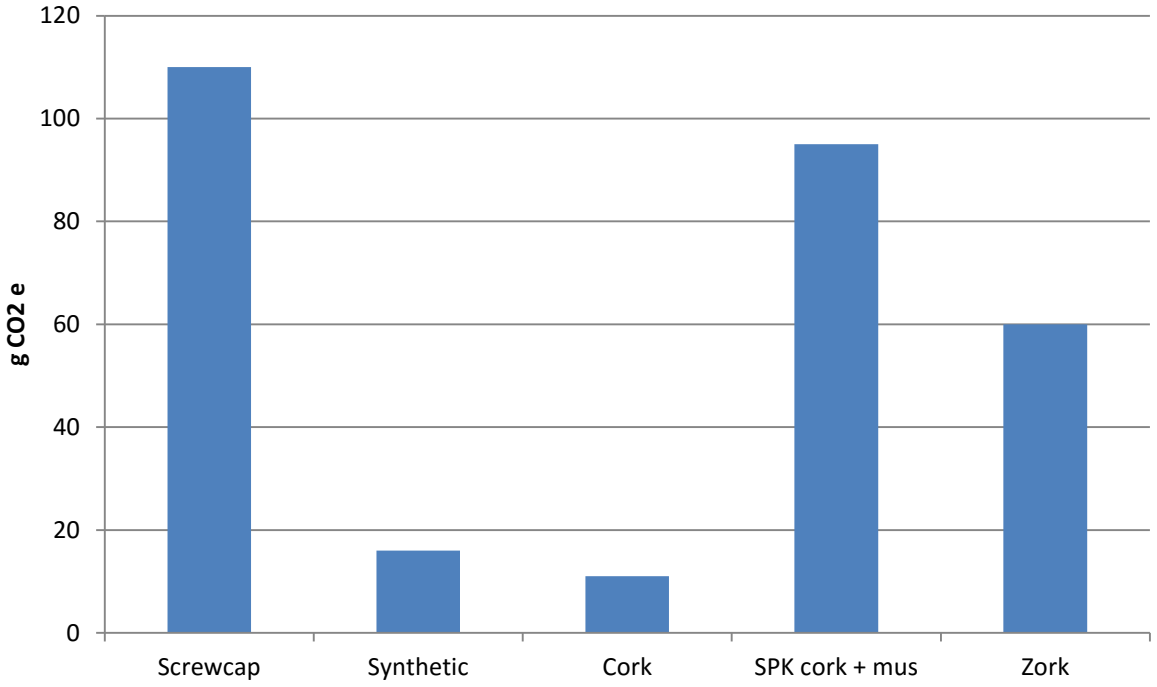
The Australian Wine Research Institute



Don’t forget the environment!

The Australian Wine Research Institute

Natural cork, synthetic or screwcap?



Cork and *Screwcap* are **not** so different

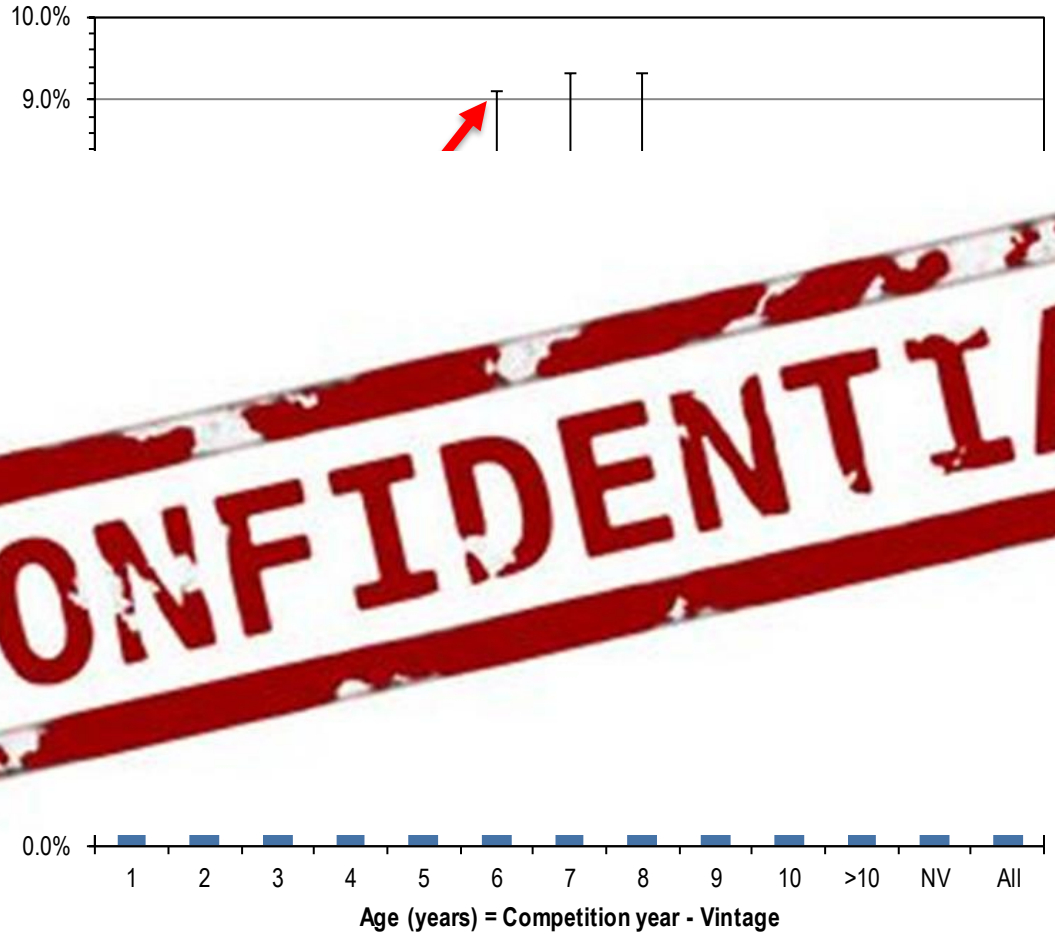
The Australian Wine Research Institute

Fault rates in international bottled wines

80,000 samples over 7 years

And the rates change with time.

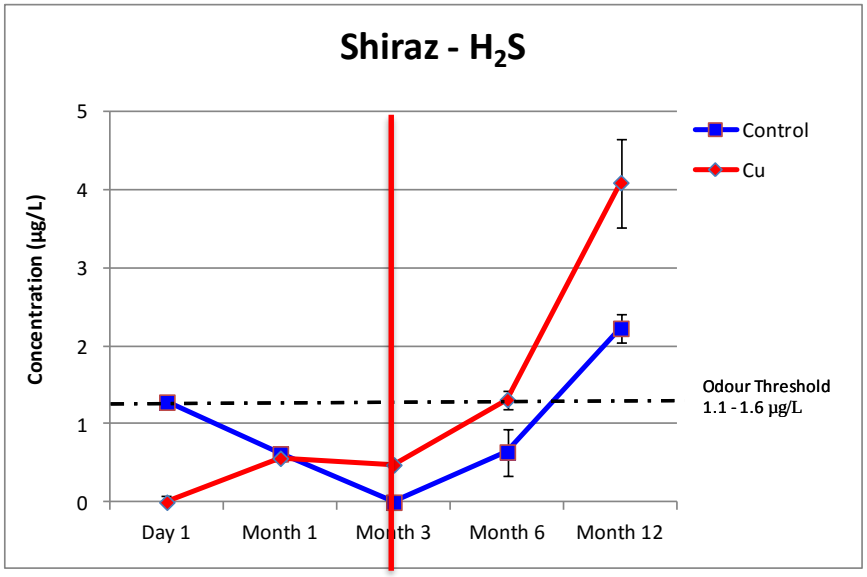
The Australian Wine Research Institute



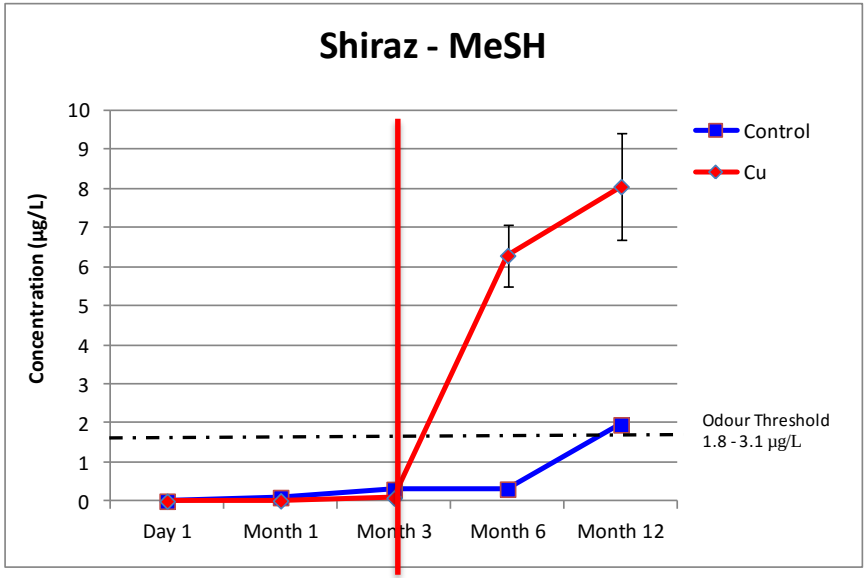
CONFIDENTIAL

Time in bottle

The Australian Wine Research Institute



oxygen depletion

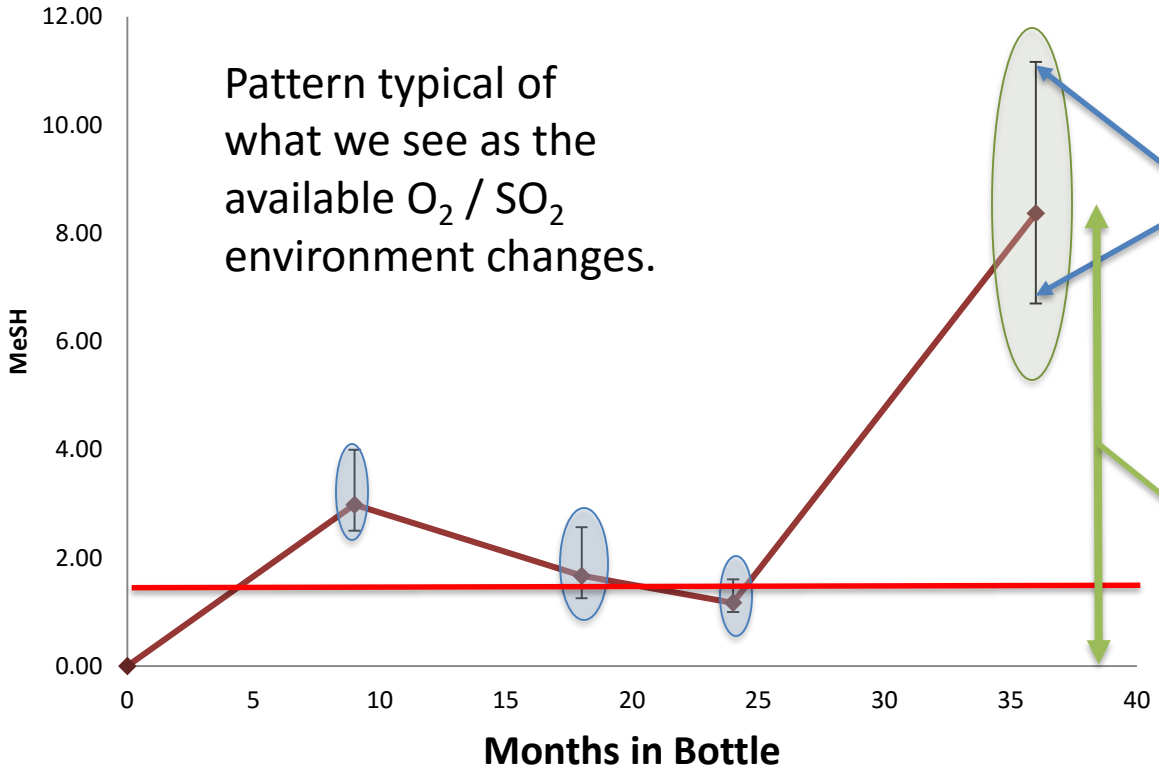


oxygen depletion

Wine decides reductive potential more than closure

The Australian Wine Research Institute

MeSH (rotten cabbage or burnt rubber)



Pattern typical of what we see as the available O_2 / SO_2 environment changes.

Average results for 9 different closures.

For at least the first 2

For the whole trial the differences due to closures is smaller than the impact of the wine chemistry.

Take home points

The Australian Wine Research Institute

- Closure choice can modulate the amounts of;
  - Reductive compounds
  - Varietal thiols
  - Oxidative characters.
- TPO at packaging has a bigger impact in the first 6 months
  - And possible long term effect on final outcomes
- OTR effects are not obvious until later in the wines life.
- Wine composition and history is likely to have a bigger impact on reductive characters than closure choice
- Residual metals in the wine can accelerate the development of reductive characters.

Get the wine right and the closure is going to be a marketing issue.

Thankyou

The Australian Wine Research Institute

Questions?