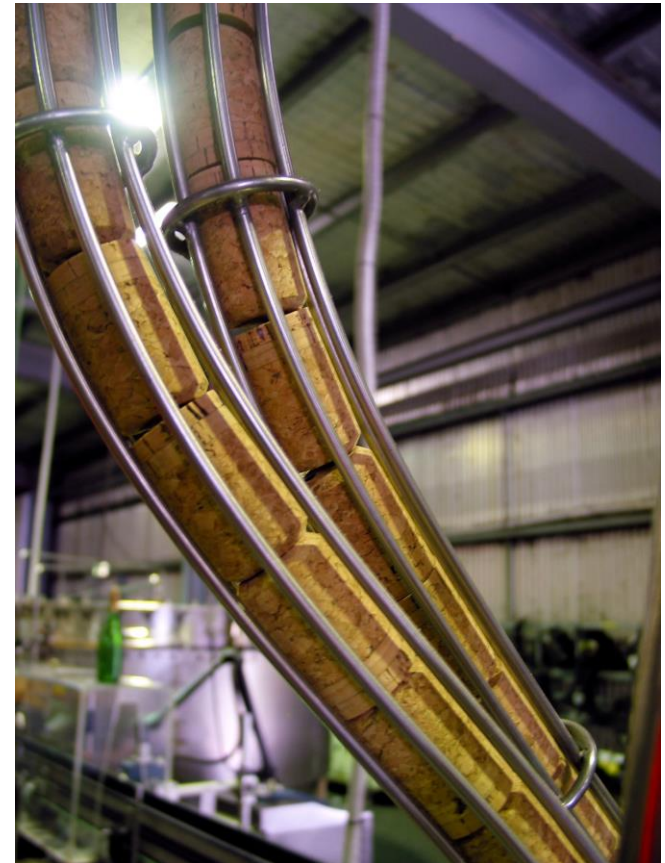




# Impact of closures on wine

Dr Eric Wilkes  
Group Manager Commercial Services



# What is the most common (mis)conception about wine



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*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



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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

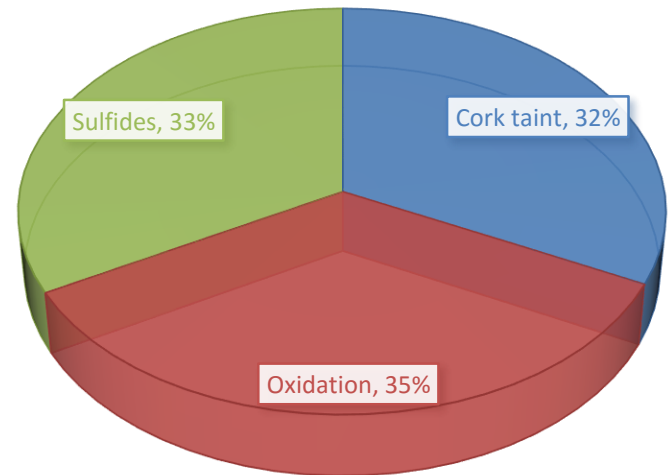
The performance of the seal to oxygen ingress can lead to significant variation in wine flavour outcomes and possible wine faults.

## Wine show rejection rate

Cork taint: 0.9%

Oxidation: 1.0%

Sulfides: 0.9%



# Closure choice can have an impact on wine quality



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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!**

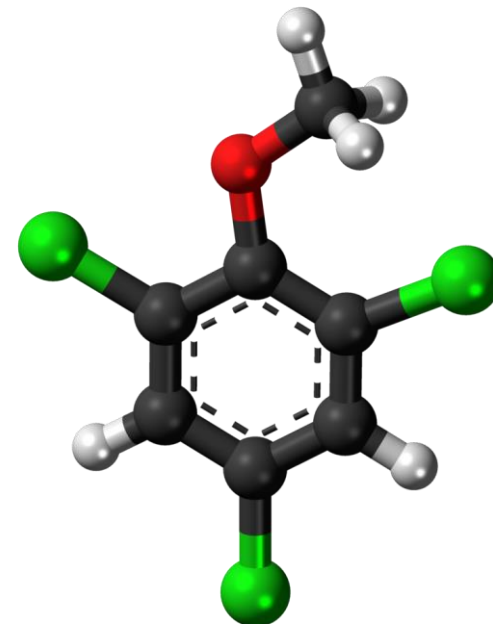
# Cork Taint



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## *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!

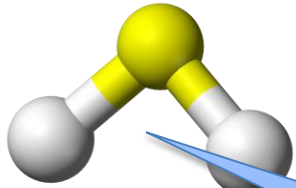
# What about reductants?



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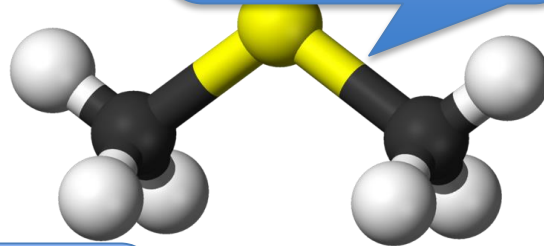
Blackcurrant,  
cooked cabbage,  
asparagus, canned  
corn

Sulfurous, cheesy,  
egg

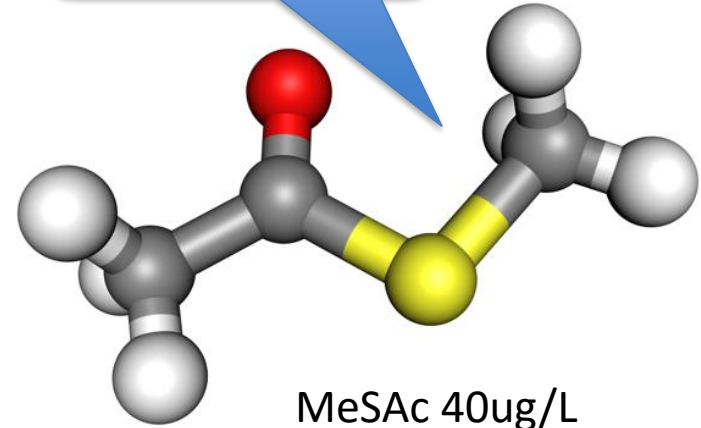


H<sub>2</sub>S 1ug/L

rotten egg,  
sewage like

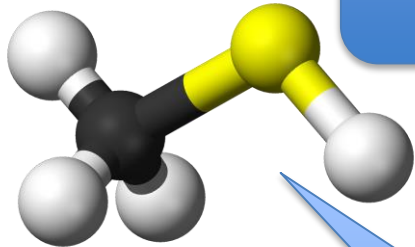


DMS 25ug/L



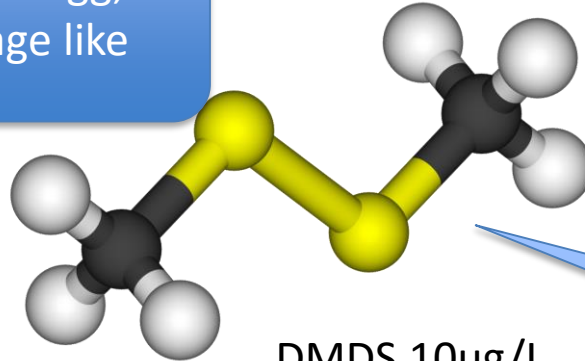
MeSAc 40ug/L

Vegetal, cabbage,  
intense onion like



MeSH 1.5ug/L

rotten cabbage,  
burnt rubber,  
putrification



DMDS 10ug/L

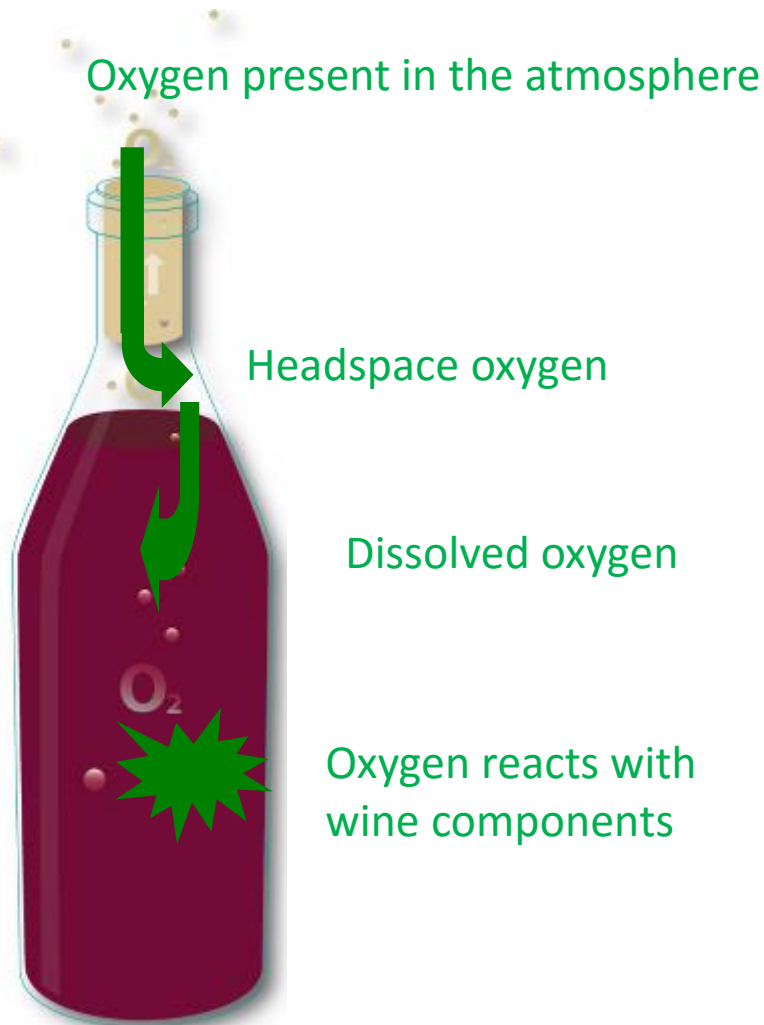


# How much oxygen after bottling?



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- ❖ 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?



***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



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# Cork



- 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



- 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



- 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



- 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



- 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



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- Plastic construction
- Tamper proof and reusable.
- Looks, different
- Limited market penetration.
- OTR OK.
- Taint free
- Very little variability



# And the trendy new ones...

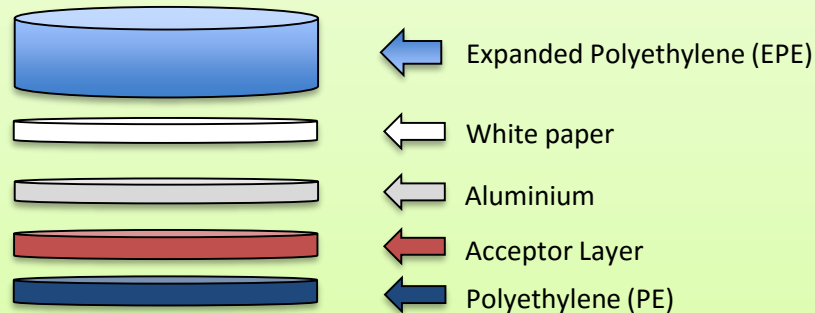


Lots of variations on the above that claim to manage OTR in detail.

Often described as **Breaking news**

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

Watch this space



Many do as the  
“good corks”.

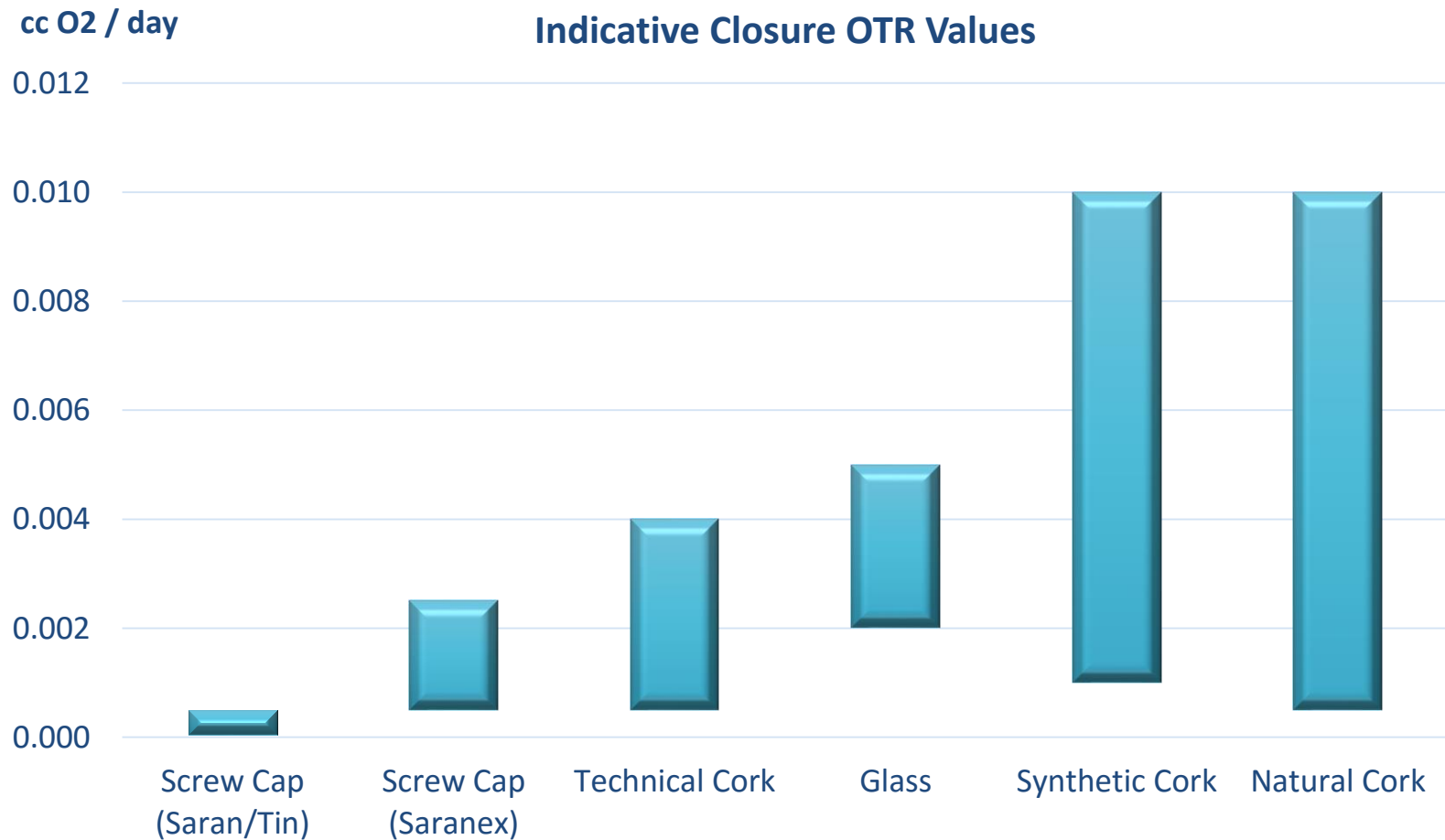
Still to be proved

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

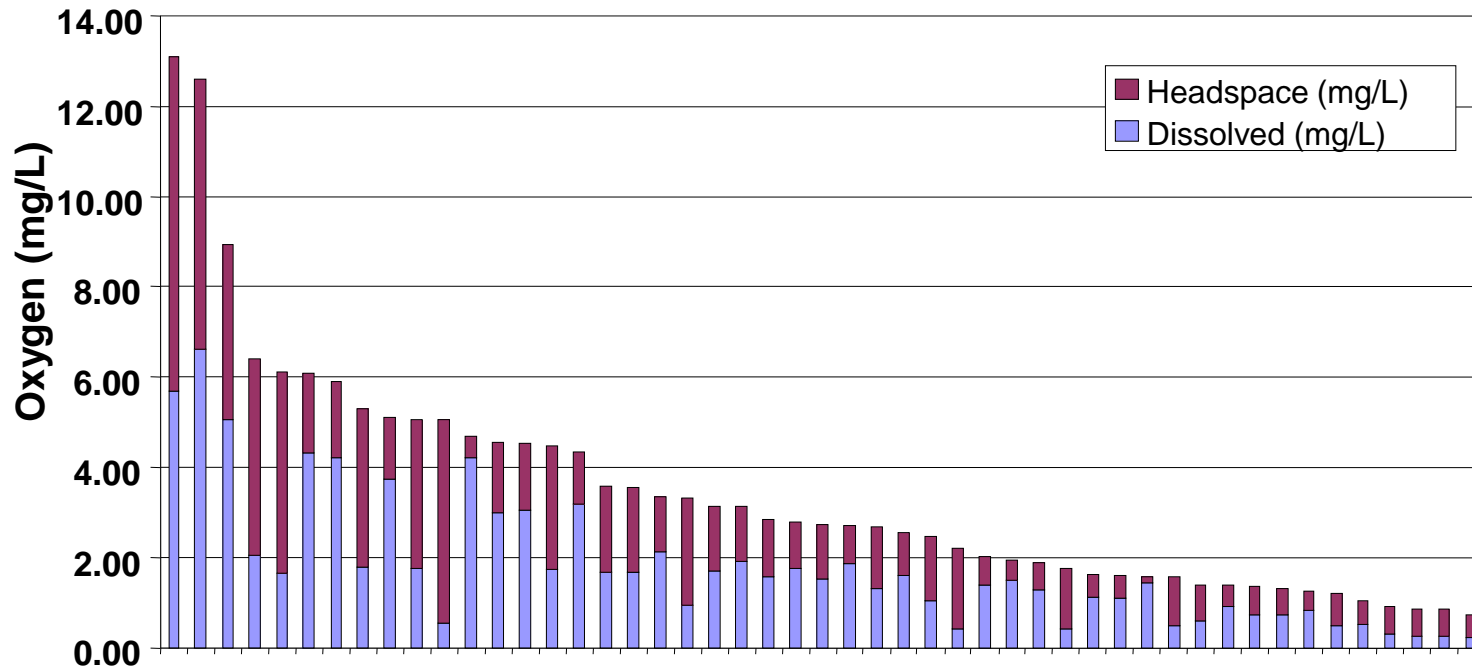
# O<sub>2</sub> Contribution from different closures



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# How much oxygen at bottling?

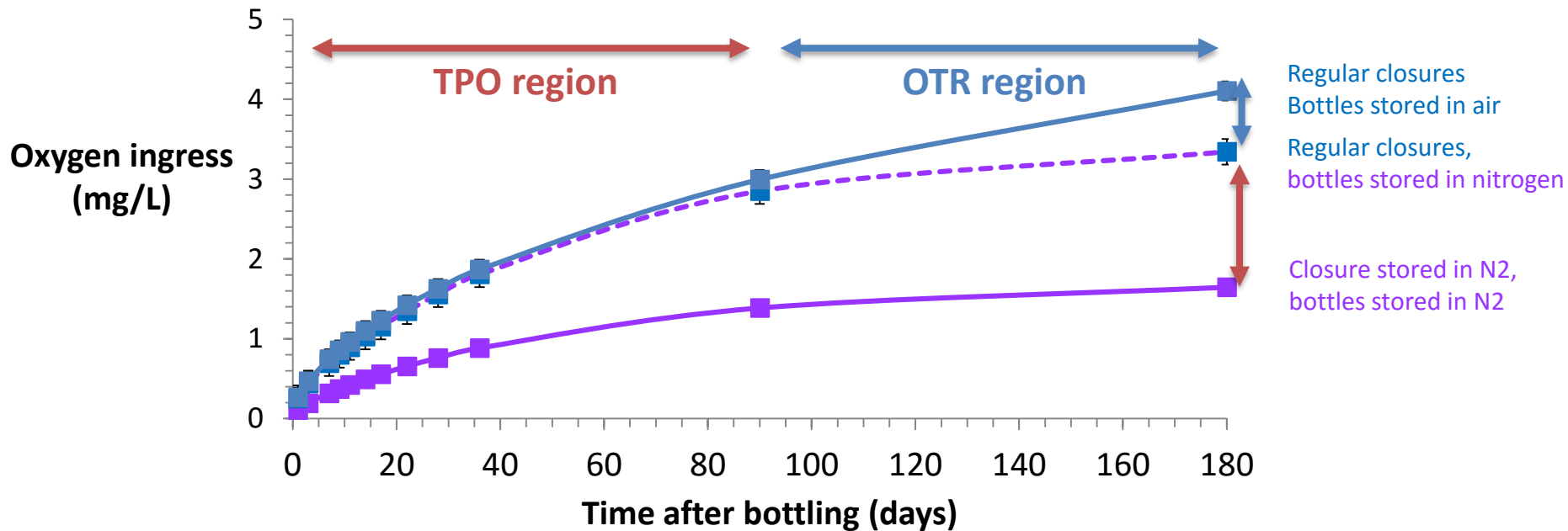


- DO can be significant.
  - Headspace oxygen dominates under screwcaps
  - Cylindrical closures outgas too
- } 1-10 mg/L
- Generally less than during must processing:
    - 2 to 10 mg/L oxygen during crushing
    - Up to 4 mg/L oxygen during pressing

# The level of oxygen in the closure itself is not trivial



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Oxygen introduced by the closure itself.

Oxygen contributed transmitted through the cork.

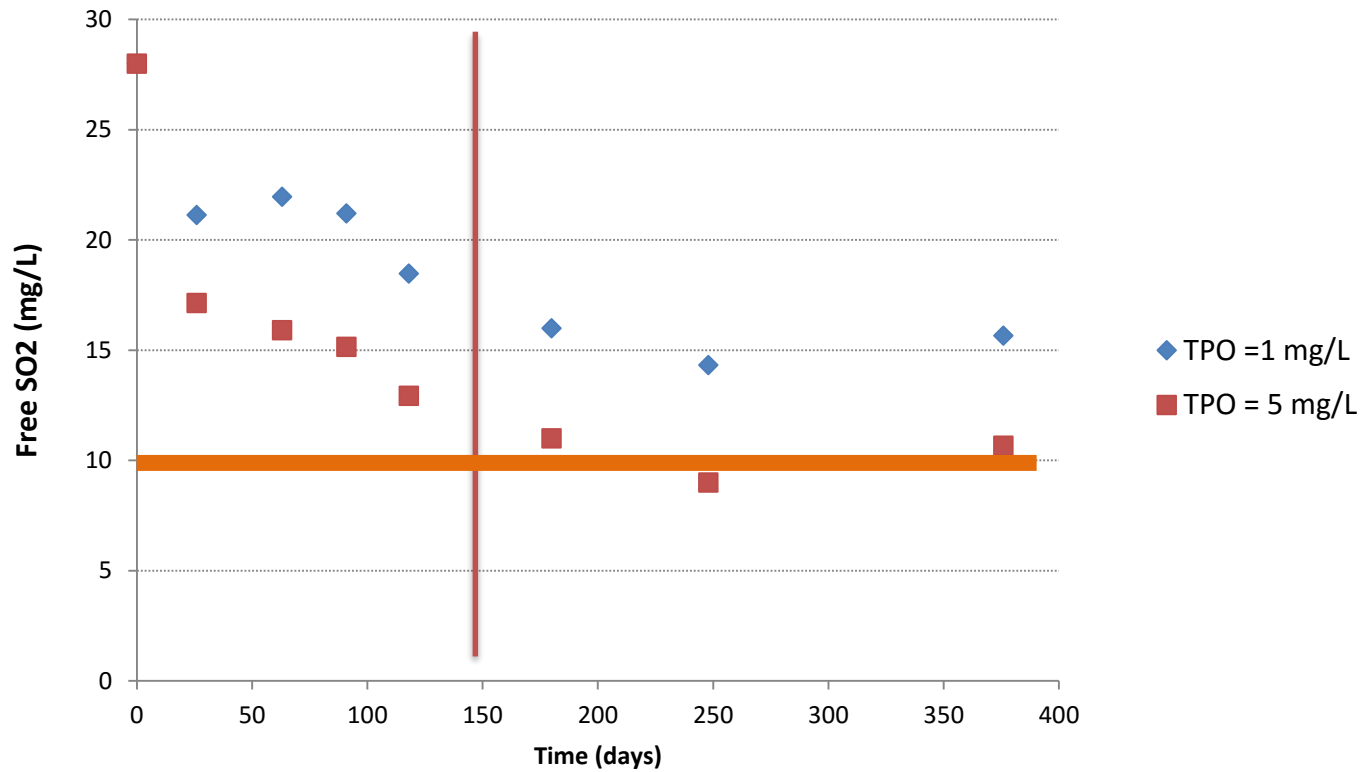
A major part of oxygen exposure in the first three months comes from the closure itself (desorption)

# Impact of headspace oxygen

## White wine controlled TPO dosing trial



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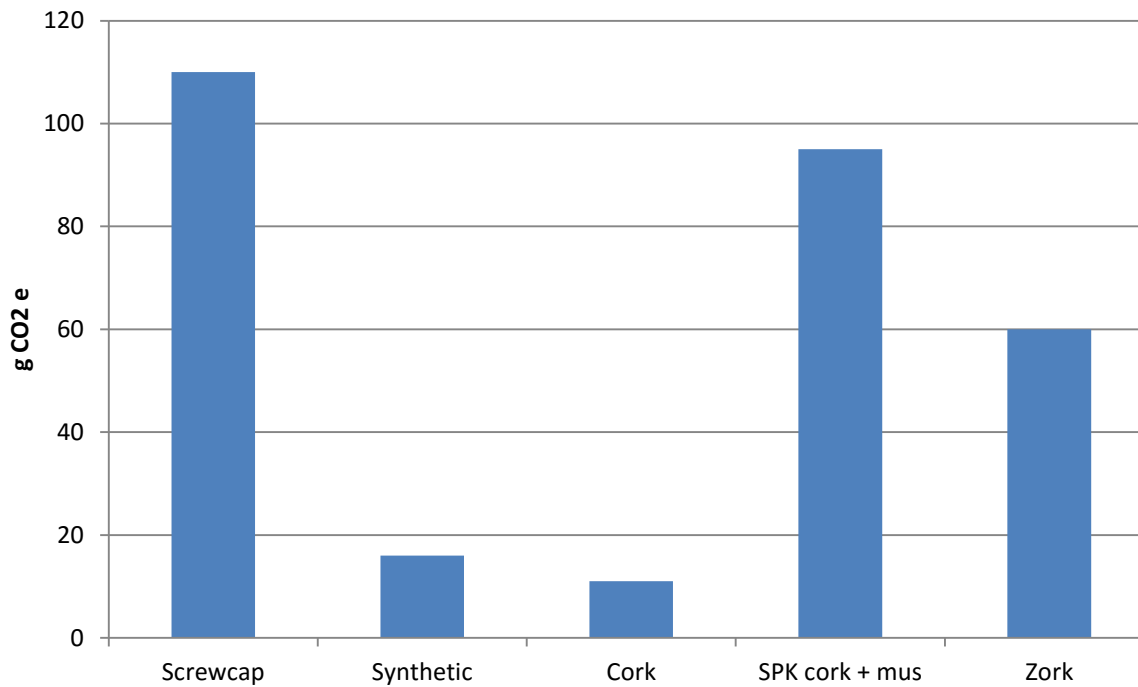


# Don't forget the environment!



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Natural cork, synthetic or screwcap?

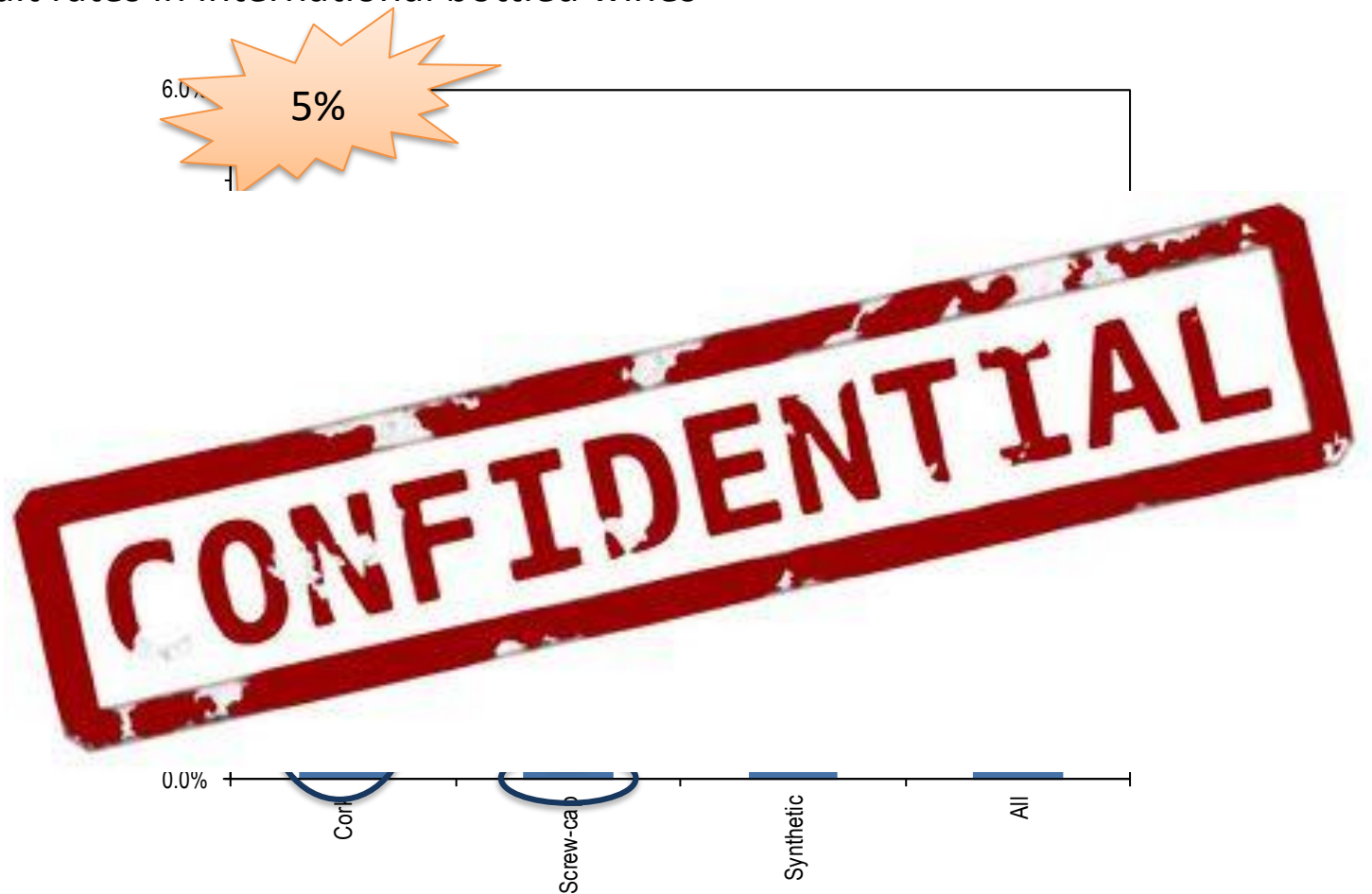


# Cork and Screwcap are **not** so different



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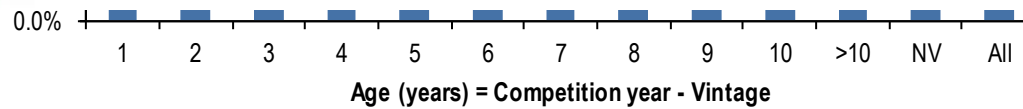
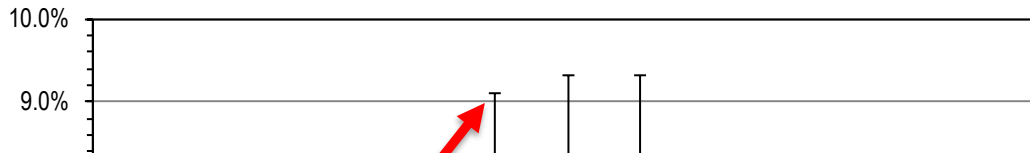
Fault rates in international bottled wines



80,000 samples over 7 years

Closure

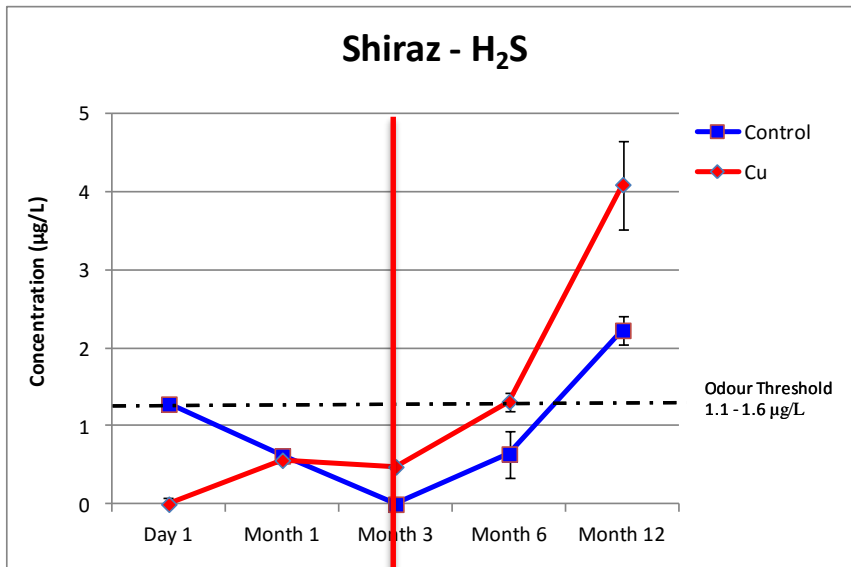
# And the rates change with time.



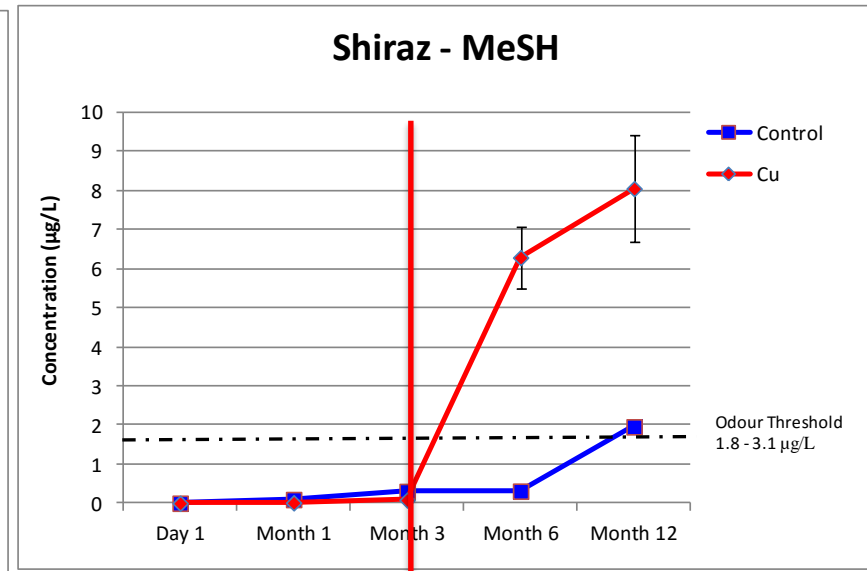
# Time in bottle



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oxygen depletion

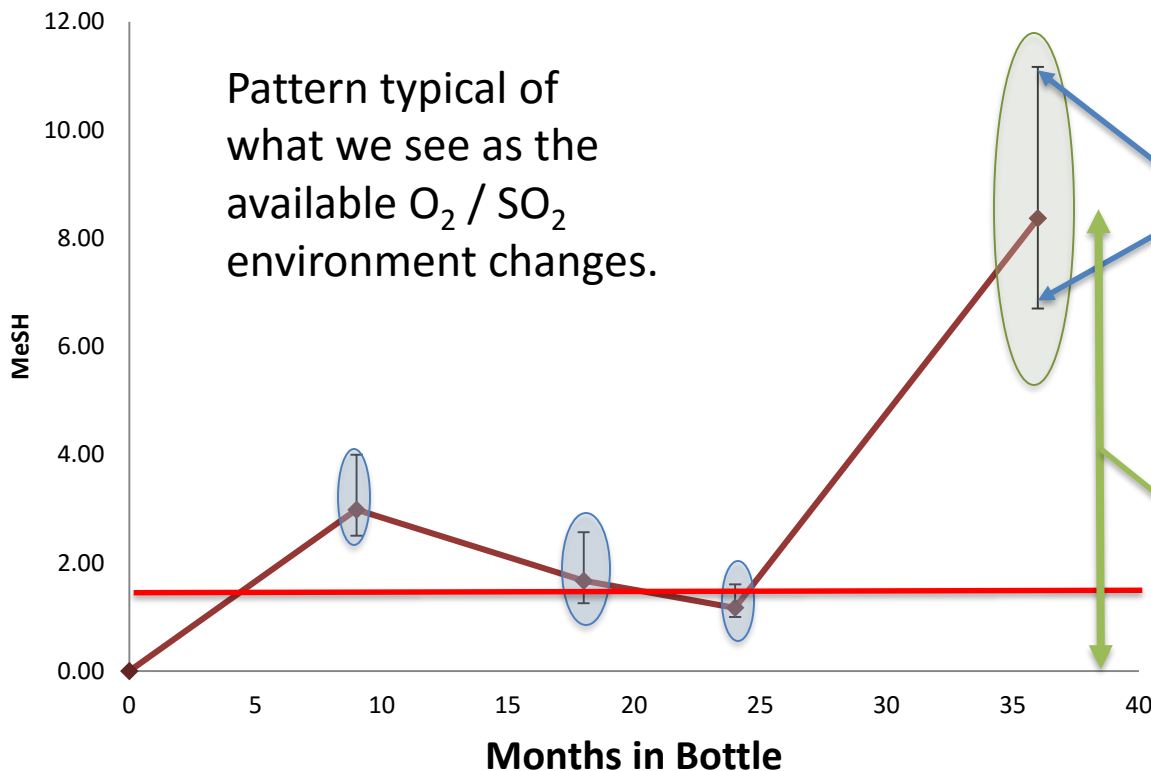


oxygen depletion

# Wine decides reductive potential more than closure



## MeSH (rotten cabbage or burnt rubber)



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



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- 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



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## Questions?

