



→ Research by the University of Bordeaux 2 has confirmed that corks allow a small amount of oxygen to enter a bottle of wine.

NEW LIFE IN OXYGEN DEBATE

New research by the University of Bordeaux 2 has confirmed what winemakers have long believed — that corks allow a tiny amount of oxygen to enter a bottle of wine.

The findings reveal a less than three-fold variation in the oxygen transmission rates (OTR) of natural cork stoppers, contradicting recent claims of 1000-fold variability.

The Bordeaux team found that natural cork stoppers had transmission rates of between 0.24 and 0.50 mg of oxygen per litre per month (equivalent to 0.002 and 0.004 cc per day). OTR for Amorim's technical corks, Twin Top® and Neutrocork®, were 0.02 and 0.10 mg/L per month (0.0002 and 0.001 cc per day) respectively.

Synthetic stoppers showed considerably higher OTR than cork closures and all reached the equipment measurement limit before the end of the 12-month trial.

The findings have just appeared in the peer-reviewed *Journal of Agricultural and Food Chemistry*.

Paulo Lopes, Cédric Saucier and Yves Glories from the Oenology Faculty of the Université Victor Segalen Bordeaux 2 measured OTR in Reference 1 natural corks (22, 24 and 26 mm diameters), Twin Top®, Neutrocork®, a colmated and an agglomerate cork, and two leading brands of extruded and

moulded plastic stoppers. The trial did not include screwcaps, however a further study with screwcaps is scheduled.

Lopes and his colleagues used a non-destructive method that measured the colour of an indicator solution in bottles stored lying down. The work was supported by Amorim as part of its research and development program.

The Bordeaux results agree with those from the Australian Wine Research Institute's (AWRI) long-term closure trial, which used analytical and sensory methods to assess the extent of oxidation in wine bottled under different closures.

After 63 months, the AWRI figures showed that Reference 2 corks were only two to three times more variable than screwcaps. Amorim Twin Top® closures were as consistent as screwcaps. Most synthetic closures showed evidence of oxidation after 24 months.

A recent report published by the Australian Closure Fund (ACF) quoting 1000-fold variation in the oxygen permeability of natural cork stoppers is based on the Mocon method.

This is an established method for measuring oxygen permeability in 'dry

packages'. It is not a reliable indicator of cork's permeability in wines stored under appropriate cellaring conditions, that is on their side or inverted.

Richard Gibson, who headed the Southcorp team that carried out the research quoted by the ACF paper, has said, "there does appear to be a relationship between Mocon measurement and dry cork (i.e. upright storage) performance in the bottle. However there appears to be little relationship between the Mocon figures for cork and what actually happens in the bottle when the cork is wet."

The Bordeaux study confirms that cork closures allow a tiny amount of oxygen to enter the wine bottle. Further research may well confirm another widely held belief arising from centuries of experience with cork — that this oxygen has a beneficial effect on the long-term development of wine in the bottle.

Reference: P. Lopes, C. Saucier and Y. Glories, 'Nondestructive Colorimetric Method to Determine the Oxygen Diffusion Rate through Closures Used in Winemaking', *Journal of Agricultural and Food Chemistry*, 2005, 53, 6967-6973



RESEARCH AND DEVELOPMENT EVOLUTION

Amorim continues to advance its fight against TCA (2,4,6 trichloroanisole) even while its research and development focus broadens to explore important issues such as closure permeability.

ROSA Evolution, the next generation of Amorim's breakthrough steam distillation technology is now in the final stages of development. It promises to be even more effective than the original ROSA treatment in extracting TCA from cork. ROSA currently reduces releasable TCA by around 80 per cent.

It is also more efficient, which will help keep treatment and end-product costs down.

When combined with other measures to screen out contaminated raw material and avoid contamination during processing, Amorim is confident ROSA Evolution will reduce TCA in Amorim's corks to below detectable levels.

Dr Miguel Cabral, Amorim's head of research and development, lists ROSA and the switch from sensory analysis to gas chromatography for quality control as the most significant achievements of his department since it was established five years ago.

"The feedback from our customers has been very positive. ROSA has had a direct impact on product sales," he said.

"It has also helped bring about a change in mentality throughout the company, not just in our sales teams but on the factory floor, where it really matters. Our testing showed the difference after ROSA. Along with customer demand this has helped convince people of the need to change from the old ways.

"People really see the value of R&D now, to the point where all product changes, all technical changes, must be validated by the R&D department."

A major benefit of Amorim's investment in research and development has been a much deeper knowledge of cork as a material and how it behaves, especially in relation to TCA and other off-flavour compounds.

That knowledge is now extending to areas such as cork's permeability to oxygen and its contribution to wine development.

Research published recently by the University of Bordeaux 2 has concluded that corks in bottles allow a small amount of oxygen ingress and they do this in a fairly consistent way [see cover story].

Amorim-sponsored research with the University of Porto is investigating the mechanics of oxygen permeation.

Another study is looking at what factors determine the amount of permeation through cork stoppers.

Amorim also continues to make improvements to its production and distribution processes to enhance quality and reduce costs. One study is investigating ways to protect corks from the effects of temperature variations and from contamination during shipment in containers. Another is evaluating the efficacy of new glues for technical corks. Amorim is also participating in an EU-funded project to develop a new eco-friendly glue derived from a cork or wood-based product such as lignin.

New product development is a further research front, where the company hopes to develop new technical corks with specific attributes.

"Natural corks have done an exceptional

job for three centuries. With proper selection, processing and quality control, they will continue to meet the requirements of winemakers," Dr Cabral said.

"Our goal now is to develop products that can be tailored to particular market segments or wine styles."

AMORIM R&D PRIORITIES

- » Maintain fight against TCA
- » Understand oxygen permeability of corks and contribution to wine development
- » Optimise production and distribution processes
- » Develop new technical corks



→ Dr Miguel Cabral — natural corks will continue to meet winemakers' requirements.



→ All product and technical changes at Amorim are validated by the R&D department.



NEW PLANT TO LIFT STANDARDS

Small and medium-sized cork producers will soon have access to state-of-the-art processing technology employed by large manufacturers such as Amorim.

The Portuguese Cork Association (APCOR) has unveiled plans to establish a high-tech communal cork processing plant for use by all producers.

A joint project with the Municipality of Santa Maria da Feira, the industrial complex is designed to raise cork processing standards across the industry.

"We want improvements in cork quality throughout the industry, not confined to a few pockets of excellence," said APCOR chairman, António Amorim.

The Portuguese cork industry has a large presence in Santa Maria da Feira, with the municipality home to 66 per cent of the industry and 90 per cent of national cork stopper production.

Known as PEC — Parque Empresarial da Cortiça — the industrial park will incorporate the latest cork processing equipment.

Small and medium-sized companies will be able to transfer their processing operations to the complex in a move that APCOR says will enhance the industry's overall competitiveness.

Providing the latest technology and equipment for collective use will reduce the financial burden of new investment for individual companies.

Cork producers will access the industrial park under a 'user pays' system.

The complex will include a cork boiling unit, a facility for treating cork and areas for raw cork and material storage. Effective environmental management will be promoted at the site.



→ Raising standards — APCOR is establishing a communal cork processing plant.



→ The beer industry, like other food and beverage industries, has had to contend with TCA contamination.

TCA RAISES ITS HEAD IN BEER

Say the letters TCA and almost anyone in the wine industry immediately thinks cork taint. But when TCA or 2,4,6-trichloroanisole is encountered in a wine, how often does the winemaker consider sources of this contaminant other than the cork?

It's a fair question because, although musty or mouldy corks are a common cause, TCA contamination of wine may be due to any one of a host of sources in the winery itself.

A spate of serious TCA contamination problems among Californian wineries in the last few years has highlighted the ubiquitous presence of TCA in the winery environment. Following exhaustive investigations by these wineries, the contaminant — initially assumed to be due to musty corks — was variously traced to cellar equipment and the use of chlorine-based cleansers.

While the results of these investigations may have surprised some, the history of TCA research indicates that other food and beverage industries have been long aware of in-situ contamination.

Coffee beans, for example, have been known to suffer from what is called 'Rio Taint' for many years. As far back as 1986, researchers at Australia's chief science agency, CSIRO, discovered that musty off-flavours in exports of dried fruit were due to the presence of TCA and the related compound, tetrachloroanisole. These researchers identified the same problem in cocoa and flour.

Most interestingly, among these early investigations were tests undertaken in the beer industry where, in sharp contrast to the wine industry, the issue of TCA has attracted little or no consumer attention.

In 1994-95, brewing industry researchers in Australia and the US published the findings of investigations into the cause of musty taints in bottled and canned beer.

In both instances, the research implicated chloroanisoles, including TCA.

A simulation trial undertaken by Australian researchers at the Castlemaine Perkins brewery in Brisbane established how easily TCA is formed by ubiquitous moulds in the presence of fibreboard containers and pallet timber kept wet with distilled water. After just 12 days, a musty aroma was evident on the fibreboard. After 36 days, the musty aroma had managed to infiltrate sealed bottles of beer, producing an off-flavour.

The Castlemaine researchers considered several possible sources for the chloroanisole contamination, including chlorophenol treatments on the pallet timber and chlorophenols resulting from chlorine bleaching of the recycled fibreboard.

This research is now a decade old and it is instructive to see how the brewing industry dealt with the issue in the years that followed.

A noted example has been the Labatt Brewing Company in Ontario, Canada, a beer maker that was dogged by musty taints in its beer in 1999 and 2000. Labatt responded with a comprehensive program of remediation and prevention, including improvements in ventilation to reduce mould growth, the use of carbon-filtered water for bottle rinses, removal of protein deposits in tanks, the use of pallet liners and analytical monitoring of beer and water.

Other brewers have sought to deal with the problem by reducing the amount of water vapour and airborne microflora in packaging areas and daily sterilisation of the packaging floor and floor drains.

Winemakers interested in finding out more about reducing the risk of TCA contamination in the winery can contact their local Amorim representative.



DROP US A LINE

For more information about cork and/or Amorim please drop a line to:
The Editor, Bark to Bottle
Fax: +61 3 9654 3785 Internet: www.corkfacts.com
E-mail: carlos.dejesus.ai@amorim.com

IN BRIEF

FIRES MISS CORK FORESTS

The August forest fires in Portugal had no impact on the country's southern cork forests.

Most of the devastation occurred in the north, in vast areas of pine and eucalypt forests and wild bush. Some 180,000 hectares were lost.

Large forest fires are unlikely in southern Portugal. The terrain is flat, easily accessible and cork forests are not as dense as the northern plantations. Also, cork forests are well managed and the soil is cleared of debris and other potential fuel throughout the year.

Cork is also a great insulator, which helps protect the cork oak from fire. It is rare for a tree to completely ignite. Bark from a burnt oak can usually be extracted within two years of a fire and the tree automatically resets itself to a new nine-year cork growth cycle. → 01

STANDING ROOM ONLY AT VINEXPO

Wine producers need to adapt to a new profile of demand for wine and increased competition brought about by world over-production and the growing volume of free trade. This was the main conclusion of the annual Amorim Academy debate at Vinexpo in June.

More than 150 people packed a forum on the topic, *How distribution methods affect trends in consumption*. The debate explored the importance of current distribution methods and the increasing role played by the internet.

A regular feature on the Vinexpo program, the Amorim Academy forum is traditionally well attended due to the quality of its speakers. This year's panel included Vinexpo president Jean-Marie Chadronnier; France's leading wine critic, Michel Bettane; chief editor of *Wine International*, Robert Joseph; Bernard Eloi of Chateauonline.com; Auchan wine buyer Olivier Mouchet; Robert Tinlot of the

Amorim Academy; University of Lyon III professor Catherine Pivot; SAQ (Société des Alcools du Québec) vice president Alain Proteau; and debate moderator, journalist Thierry Desseauve.

ACADEMY PRIZES AWARDED

A student from Bordeaux, Stephane La Guerche, has won the 2005 Amorim Academy Grand Prix with his work titled *Musty earthy wine faults: geosmin identified as the main cause*.

Mushroomy, earthy, or cellar-like aromas in wines are the focus of the study by La Guerche, who has identified in geosmin the mushroom responsible for these organoleptic variations.

Celine Simmonet-Toussaint, also from Bordeaux, won the Coup de Coeur prize for her work titled *Study of what wine means to young adults*.

And Francois Audouze has earned the Cork Oak prize with his essay *The corks of old wines and their messages*.

The Amorim Academy encourages research that enhances our understanding of wine. Each year a jury of wine and scientific community representatives award the Amorim Academy prizes. For further information visit www.academie-amorim.com. → 02

SCHOOL RECYCLES A MILLION CORKS

The Glen Huntly Primary School in Australia has collected one million corks for recycling.

It took the small school of 265 students four years to collect one million corks with the effort contributing \$A7000 (\$US5000/€4400) to a new elephant enclosure at the Melbourne Zoo.

The original objective was to collect 25,000 corks in six months for a school competition but the 'corkathon' exceeded all expectations.

"Our cork collection had a two pronged effect — supporting the Melbourne Zoo appeal for the elephants and also teaching

the children and school community to be more environmentally aware," said the school's 'corkaniser' Cherrill Earls. → 03

MARKS & SPENCER VISIT PORTO

Amorim has sponsored a special cork training course for wine advisors from the United Kingdom's Marks & Spencer retail chain.

Sixty members of the wine advisors and support staff from the top 40 Marks & Spencer stores attended the course held in the port lodges of Porto. The main focus was to further their knowledge of faulty wines in order to enhance customer service.

Executives from Amorim addressed attendees, explaining in detail the cork production process and discussing closure issues.

The Marks & Spencer team also learnt about Amorim's fight to defeat TCA and how to recognise TCA contamination in wine.

ACCREDITATION IN SOUTH AFRICA

Amorim Cork South Africa recently secured ISO 9001/2000 and HACCP 0330 accreditations.

HACCP 0330 is recognised by food safety professionals around the world and is viewed as critical to food safety because it helps prevent contamination by identifying potentially unsafe links in the processing chain.

ISO 9001/2000 is an international standard for a quality management system where an organisation demonstrates its ability to consistently provide product that meets customer and regulatory requirements.

Amorim is the first wine closure supplier in South Africa to demonstrate compliance with regulatory and quality management standards for the food/retail industry while also addressing the important issue of ethical trade.

Amorim Cork South Africa was awarded Ethical Trade Accreditation by WIETA last year.



→01

→ Portugal's cork forests escaped damage from the August fires.



→02

→ The 2005 Amorim Academy laureates — (L-R) Stephane La Guerche, Francois Audouze and Celine Simmonet -Toussaint.



→03

→ The Glen Huntly Primary School collected one million corks for recycling over four years.