Panel Discussion

Chair: Gary Baldwin, Australian Society of Viticulture and Oenology

Panel members: Blair Duncan, Southcorp Wines
                Noel Heyes, Australian Cork Association, Inc.
                Marianne Thiering, Australian Cork Company Pty Ltd
                Dr Paula Viera Neto, CTCOR

The following is an edited transcript of an incomplete recording of the panel discussion. The Society regrets that the entire transcript is not available, due to technical problems in making the recording. The few editing changes made were intended to abbreviate the transcript, and clarify relevant points. Care was taken to ensure that the meaning of comments and questions was not changed.

Gary
A question to start the discussion, directed to Paula. When you were talking about the cork bark being taken out of the forest and boiled, you said it got infected with mould. My original training is in microbiology, and it seems fairly straightforward that there must be a process whereby we can prevent the mould growing on the cork slabs.

Paula
That is something that we are researching. The moulding rooms are a traditional part of the process of cork manufacture. We must have this step because the planks of cork bark are round, and they turn flat during this stage. The growth of microorganisms is considered an indicator of the moisture level that permits the cork to be mechanically treated. Now we don't need that, so we are studying ways to do the mechanical stabilisation without the mould growth, in sterile conditions.

Gary
But at the moment the corks are still made with mould growing on the planks.

Paula
We are concerned not to let the moulds grow. We need a clean place, with light, aeration and moisture control, so that the growth of microorganisms is very small.

Marianne
It is necessary to increase the moisture content of the cork slabs before processing, so that they can be straightened, trimmed and punched. The problem is that the mould rooms usually have earthen floors and are very dark, and the mould proliferates. What they have to do is lift the bark off these floors, to avoid the effect of the bare earth. This is not a hard job! We go to Portugal every six months (sometimes more often and sometimes less if it is possible) to select suppliers who have already gone away from this way of making the cork pliable. There are other ways, such as just seasoning it a bit longer.

Gary
Does anyone else want to pursue that issue, is that something that anyone else recognises as something that should be considered?

Blair
I just have one comment. The last two visits I made to Portugal, I was surprised to learn from some producers that they encourage the mould growth at that resting stage after boiling and they use it as an indicator for moisture levels. Be that as it may, in all the cork factories I visited, I never saw TCA at that stage, and I did a lot of sniffing.

Gary
Blair, at that particular stage, as I understand it, particularly from what we saw earlier, there has been no chlorine in the process. As we understand the formation of TCA, there has to be chlorine somewhere in the process.

Blair
No, that is totally incorrect. You do not need chlorine. That is one theory, but the major theory is that TCA is a microbial metabolite resulting from the conversion of trichlorophenol to trichloroanisole. Chlorine is not involved as a compound in isolation.

Gary
But this mould you have seen is going to put a chlorine molecule (if you like to keep it very simple) onto the chlorophenol to make chloroanisole. Where is that chlorine going to come from?

Blair
Presumably it is in the environment as the result of agricultural spraying with pentachlorophenol over the last 3-4 decades, and a trace contaminant of the pentachlorophenol is the trichlorophenol. That is the major theory as to why we have TCA. That conversion can happen anywhere in the chain. It can happen in the forest, or theoretically anywhere in production, but I was surprised to not see TCA with a lot of mould on the cork just after it was boiled.

Gary
That is very interesting. We have also heard today that it is often fairly difficult to detect TCA unless the sample of cork is very wet, ideally with wine and not water. Is that perhaps the explanation: maybe the TCA was there and you did not see it?

Blair
No. You do not need wine to create TCA.

Gary
Not to create it, for you to smell it. You can smell TCA on a dry cork?

Blair
No, it is wet cork, with a moisture level of, in excess of say, 16%. It is the indicator of when the moisture level is around...
the 16%, which is then the ideal time to go through the physical cutting and punching of cork.

Gary
So your observation now is that there is no TCA at that point in time—it is somewhere down the track.

Blair
No, it is just that I was surprised. I expected to see TCA at that stage, and I went storming across there ready to say ‘Yes, I knew this would happen’. I was very surprised that there was no TCA. I saw TCA before, in the forest, and I have seen plenty of TCA afterwards, but not at that particular stage.

Peter Leske, The Australian Wine Research Institute
Paula, I think one of the aims of the Quercus project is to try and determine at which stage of the production process TCA is found—could you comment please?

Paula
Yes, we have followed TCA from the forest. We are now at the bottling stage. The cork collected from some parts of the forest already has a small quantity of TCA. During the boiling process the TCA drops and remains as a ‘background noise’. It does not increase until the bottling stage.

Peter
Until the bottling stage? After insertion into bottles, or during testing pre-insertion?

Paula
The corks that have been followed chemically and microbiologically since harvest are now about to be used in bottling. We will continue to follow them for one year more.

Peter
And at that stage you will presumably have some data on this issue of development of TCA in the bottle after insertion, which we discussed this morning.

Paula
Yes, that part of the work will be done in France and Germany.

Question from audience
Have you tested the difference between chlorinated cork and peroxide-treated cork?

Gary
Following on from the last question, Paula: what about the precursors that Blair was talking about before, do they behave similarly to TCA?

Paula
That depends. We look carefully for pentachlorophenol, as a residue of biocides in the forest. It does not appear frequently, and then only in a small quantity. Pentachlorophenol does not disappear so easily as it is not so volatile, but in this work the corks do not have chlorophenols. They have only chloroanisoles at that stage.

Philip Shaw, Rosemount Estate
We did work, as did some of the others, using PMS-washed corks instead of chlorine or hydrogen peroxide. Generally we thought we had the answer when we used hydrogen peroxide, but we were concerned about oxidation in wine so we went away from that. Then we thought we had the answer with PMS but trials showed (and also that rose I mentioned this morning used PMS-washed corks) that the rate of contamination was just as high with PMS as it was with chloride. We don’t use it any more. We just worry about the quality of the cork rather than the wash—except we do not use hydrogen peroxide. I am pretty sure that Penfolds have the same requirement.

Richard Gibson, Southcorp Wines
If the mould in the moulding room caused TCA we would have taint rates in all corks of about 80%. The growth is so ubiquitous that there is no way that any corks would be free of TCA.

Terry Lee, The Australian Wine Research Institute
I tend to agree with Richard. In fact I was going to make the comment that I am not really convinced that moulding rooms are a problem, because if it was, as Richard said, we would see a much wider incidence of cork taint. Hopefully the work in the Quercus project will prove me right or wrong. From our work we have seen that you can pick up the chlorophenols coming through from the forest. They are usually a mixture of pentas- and tetra- and trichlorophenols, and you can pick those up easily by GC/MS. I think that is what Paula just referred to, but a lot of the corks we see that are straight TCA contaminated, they just have one chlorophenol: the trichlorophenol. We really have not found where that is being produced. Our assumption is that it is produced post-processing, and may be caused by the chlorine treatment. Paula showed a slide this morning, and I think there was maybe a slight mistake: the chlorine concentration in those dips is about 35% chlorine (350 g/L, not 35 g/L). That is a very powerful oxidising solution, and I think it would oxidise a lot of compounds, particularly minor components that come through from wherever. So we believe, until we are proven wrong, that most of the TCA is produced post-processing. This is why I was interested to hear the talks this morning. It is a microbiological problem, not a chemical problem. The chemistry is the outcome of the microbiology. I am a little concerned that there is not enough effort into looking at the microbiology of the cork post-processing, and the techniques to prevent mould growth.

John Casey mentioned this morning one of the factors which may be important, and that is the desorption and absorption characteristics of the individual corks. We do not know enough about that, and it may be very important. We do not know, for instance, what factors through the cork processing chain, even the growth in the tree, influence the desorption and absorption of moisture in cork. What we are talking about is the control of mould growth by manipulating moisture content. The food industry transports millions of tonnes of food susceptible to mould growth around the world each year without a problem. Why can’t the cork industry do it? That is the challenge, I think. I believe that is the evidence we have to date, and I am very hopeful that the Quercus project will answer and prove me either right or wrong—then we can get on and solve the particular problem we have got.

Blair
Terry, in my opinion the majority of mould is found in the forest, and you seem to be eliminating that as a possibility, and saying it is all occurring after boiling and in the processing. That certainly may be a factor, but I don’t think it is a major factor.

Terry
Blair, what are you referring to when you are talking about mould in the forest?
Blair
I am talking about walking around in the forest and smelling intense TCA on the bark.

Terry
If that is the case, then why are we not seeing a greater incidence of taint in the corks supplied to the industry? We are hearing of proportions of 2%-which is annoying-and this is why I get fairly passionate about it, because I hate to see wines that winemakers have put a lot of effort and time into making being spoiled by 2%-3% of corks. I think if mould growth in the trees was producing the TCA, and it is coming right through the processing chain, I would think we would see a much higher incidence of cork taint in the corks supplied to you.

Blair
You have to have evidence to say that it will be a large percentage. The percentage is the one that we see-you have to look for it. You might see half a dozen trees that are cut, you can look at half a section of cork from a trunk of a tree, and you might find one small area which will have TCA. That will usually be near the bottom, and that will be intense, and within 2 or 3 cm of that area it is clean. This is an empirical observation.

Terry
The problem that I have with that is that the cork is not just immediately used from the tree. It goes through a period (don't forget that these compounds, particularly TCA, are very volatile-in fact that is one of the problems we have acknowledged today, that we can have another contamination route: migration of TCA from the floorboards in the container). So when you stack your cork in the forest for a year, it may be volatilised off. A necedal evidence suggests that we had a lot of oak come into this country a little while ago, which because of the pressure on oak supplies was used very quickly, and we had a lot of wines contaminated with TCA from oak. If the oak was left outside for a period of time, we did not see so much of the problem. I think the TCA just volatilised off.

I am only going from anecdotal evidence. I would think that if what you are saying is true we might see a higher incidence, but I am fairly sure that through that long processing chain there is ample evidence for any TCA that is produced in the tree to volatilise off, be boiled off, or be destroyed by 35% chlorine. We do not know, but I am suggesting that it is a more likely route, and the more likely cause of TCA production is mould growth on the cork post-processing. This is made possible by poor handling of the cork and poor management of the moisture, particularly the water activity of the cork.

Blair
I have faith in a lot of the good cork producers in Portugal and other countries. They do not have any wild growth of mould on the corks after boiling. Another comment about the boiling: after a slab of cork is boiled for one hour, the cork that is punched to form the closure comes from the inside of the slab, and is not necessarily exposed to the same level of heat. You also spoke about seasoning wood. We have done a lot of analysis of wood as part of our quality control program for oak, and we find that after two years very strong TCA may be found on the surface of the wood. When that wood is then dressed, it is shaved, and the TCA is removed. It is not volatilised by that process at all. Here again, it is all empirical, but I still feel that the major problem is in the forest.

Paul Wagner, Natural Cork Quality Council
Our experience is that Blair's explanation is fairly accurate. We have worked with about five different suppliers in Portugal. They do sensory analysis of the raw cork bark as it comes in from the forest and they observe what Paula describes as that 'background incidence' of maybe 1%-2%. We then do the sensory exams-that we have talked about all day today-at every stage of the processing, immediately before it goes into the container, once it comes out of the container when it arrives in California, once it is shipped out by the cork supplier in California, and finally at post-bottling analysis with a number of the wineries, such as Mondavi, Sebastiani, and Beringer. That background level of TCA taint is very constant through that entire process. It may be that we are really lucky on all of these lots, but our belief is that the primary source of TCA is actually in the forest rather than at some point in the processing of the corks.

Question from audience
My question is directed to Paula. The fungi and the moulds have a fairly complex life cycle and as part of that they produce fruity bodies and spores. Have you looked at the incidence of viable spores in the cork, and have you looked at the microflora of cork that has been tainted with TCA?

Paula
That is another part of the work, to do the comparison. We are following the growth, and also incubating cork with species of mould that are found in the factories. We are looking for the metabolites with GC-sniff and GC/MS. We have already shown the formation of guaiacol within 24 hours with Streptomycess and vanillin.

We have also observed small quantities of balsamic aromas. We are also trying to see the different characteristics of green and yellow stain of cork, and the associated microorganisms that can give the off-flavour compounds.

Marianne
I think there are two key words mentioned here by Dr Lee: absorption and desorption. We talked about TCA coming and TCA disappearing. We are picking it up at higher levels at one stage and lower levels at the other, and everyone is wondering where it is in the meantime. I feel listening to Dr Lee and Mr Casey this morning, that absorption and desorption are key elements. They may explain a lot of problems that we have talked about, such as: shall we put the bottles near pine crates? Why do we have to look at the floor of the containers? Why do we have to look at the pallets we are keeping the corks on? It has to do with absorption and desorption of cork cells. If we put more research into this, and we can determine what compounds are absorbed more readily and what compounds the cork cells can shed, then we will be able to control it. In the last six years we have had a method of accelerating this phenomenon, and extracting and volatilising some of the volatiles that have a negative effect on the performance of the cork. This process is used for around 300 million corks sold worldwide every year. The problem is that this process is not cheap, and I am not sure 100% foolproof, but we have not yet found anything better.

Peter
Marianne has led us in the direction of shipping conditions, and I would like to pose a question to both she and Noel. We are aware that other industries have problems with TCA and some of them are actively using what was described today as 'smart packaging': barrier film materials. We have also heard
winemakers saying how they are insisting on metal containers, plastic pallets have been mentioned, and Philip Shaw mentioned using other than polyethylene bags. What are you as suppliers, the people responsible for transporting corks, doing about a code of practice for your industry in relation to such transport issues?

Marianne
It is very difficult for me to answer because I am only one of the cork suppliers, so I cannot really speak for all of them. But yes, the industry has been working on this, but what you must understand is that this idea of harmful absorption and desorption has only come up in the last 6-8 years. We are trying to understand how it is actually happening. We are trying to eliminate or at least limit those conditions where harmful materials can be absorbed, such as in the containers. Many suppliers are aware of this. Further, I am sure I can speak for every cork supplier who belongs to our Association, that one of the main issues of dealing with deliveries from overseas is the condition of the shipping container. Usually it is specified in writing: what the floor has to be like, what the moisture content of the goods must be, where the container has to travel, whether it has to be a sealed container or not, which products have to be shipped in a metal-lined or metal-floored container, and which not. There is a lot of work being done on this. It is not easy to eliminate everything at once. I know that for you, we are moving extremely slowly, but it is being done. With more research to help us to identify which part of this whole process from the bark, all the way to the bottle is risky, we can eliminate these harmful processes one by one.

Noel
In our experience, shipping corks out of Portugal in polythene bags is an absolute disaster. The problem is that irrespective of whatever instructions we give to the shipping companies as to where the container ought to be on the vessel—preferably under deck—it invariably comes as above-deck cargo. The cargo is positioned on the vessel by weight, and weight alone. Corks are fairly light items and tend to go on the higher part of the vessel. Even if the shipping company gives instructions and actually positions the container in under-deck cargo, you will find that the captain has ultimate authority, and which not. There is a lot of work being done on this. It is not easy to eliminate everything at once. I know that for you, we are moving extremely slowly, but it is being done. With more research to help us to identify which part of this whole process from the bark all the way to the bottle is risky, we can eliminate these harmful processes one by one.

Paula
How do you want to be involved? You can be involved with winemakers, with The Australian Wine Research Institute?

Mick
The logical place, from the way I see it, would be The Australian Wine Research Institute. It was one of the very early research centres in this field, and had quite some success—so it would seem useful to draw on this pool of expertise they have developed, with the assistance of some of the wineries. Perhaps we should move on from there—but I hope that perhaps you take that home as your ‘take-home message’, Paula.

Paula
Yes.

David Wollan, Tarrawarra Vineyard
I would like to change the direction of the discussion away from taint to another one of what I see as the unacceptable. I am addressing this comment, observation and question, to the suppliers in the room. Something that I have found unacceptable from my own company as a small producer is the extravagant cost of our corks. Now our industry is very concerned about the
price we pay for bottles— in fact I think it is one of the items for consideration by the Industry Commission. I would suggest that we are paying an awful lot too much for our corks. In my consulting efforts I have clients in Bulgaria (not exactly a rich country), but somehow they manage to pay generally about one third to one half the price of corks that we do. And you can say that "Gee, they are then obviously getting rubbish", but they are buying from one of the biggest (and supposedly one of the most reputable) cork suppliers in Portugal, a name that would be familiar to us. They are buying what they say is their first grade or reference one, and frankly they do not look a lot worse than our reference one or two. So they are buying corks that are cosmetically the same, but I am telling you that they are paying about 3 lev per cork, which is around 8 cents per cork! Would the suppliers like to explain the simple arithmetic to me, the poor small winemaker?

Noel

I have to report to my board each year on the profit we make. We never quite get what we would really like to see for the amount of investment. It is tremendously hard to compare our situation with Bulgaria, Bulgaria, or the Russian states, used to buy in cork in one block, of all qualities.

Voice from audience

Not any more!

Noel

That might have changed in recent times, and I do not know particularly what the Bulgarians are buying. From what you have seen the quality of the cork is similar to what we are getting here.

I guess we will have to address that. What I can say however is that the industry here has grown significantly. There are now 180 million wine corks and 60 million sparkling wine corks coming into this country, and we are buying better today than what we were some years ago. If you actually study the price of cork, it has hardly increased in the last six to seven years. A lot of the increases that we get affected by here are more to do with currencies than increases in the price of cork in Portugal. Some years ago there was a huge price increase in Portugal which I mentioned in relation to granulated cork. The Portuguese increased the price by about 30% at that time, but it has since fallen back. It is all dependent on supply and demand. When there is plenty of supply and not a lot of demand, we can buy better, when we are in the other situation we are paying the highest prices, and we struggle to maintain our quality base. I guess this is something we can address at the Association level and discuss with our individual suppliers.

Gary

One of the other questions I feel that we must address is the new CETIE bottle. Many of you would be aware that there was a letter written in the Australian Grapegrower and Winemaker a couple of issues ago, where an agent of one of the suppliers suggested that the new slightly increased dimensions, even though it is a longer bore in the CETIE bottle, is going to cause a problem because the cork might be compressed too much. He actually referred to the Amon and Simpson article which I think was referred to earlier today as well. I find that the people that I deal with out there are asking me that same question. I am told by the other suppliers that I deal with out there are asking me that same question as well: 'Is there going to be a problem?'. I am told by the other end of the industry 'Oh no, it is all resolved, and there isn't a problem'. However, if we just do the simple measurements of the size of the cork versus the increased bore of the bottle, we seem to have a reduced difference. The CETIE bottle goes up by 1 mm in tolerance. I think, Noel, you might comment again.

Noel

The CETIE finish has been developed as an economic product for the industry. It is an attempt to standardise glass throughout the industry, to make it cheaper for everyone to put their package into a bottle. The CETIE finish has been tested and tried, and in the trials to date there was no significant difference between the CETIE finish or the Stein finish. I think that it is difficult to answer on the long-term storage, as we have no history as yet.

However, Penfolds have been importing CETIE finish bottles for quite some years, and have been using 24 mm corks in those bottles. They have not had any problems. The performance of that finish has been just, as good as the Stein. I think if we look at the CETIE finish and compare it to the Stein finish, the basic difference is the nose. The Stein finish is 17.5 mm plus or minus 0.5 mm. The CETIE finish is 18 mm plus or minus 0.5 mm. However, the Stein finish was only controlled to 32 mm depth in the bore. If you measure the internal bore, the Stein bore diameter is generally around 20 mm at 45 mm depth. So, if you are using a 45 mm cork, you have a 20 mm diameter at the sealing point; sometimes a little more, sometimes a little less. The CETIE finish is specified to be 19–22 mm at 45 mm. The aim of the glass company is to maintain this at 20 mm and not much more; maybe 20.5 mm, and that is what we are finding. If we consider that it is the bottom of the cork that has to seal, not the top, then there should be no difference in the performance of the CETIE finish.

The Association was concerned that the original bottle design did not, in our opinion, leave sufficient headspace for expansion. That has been addressed and we are quite satisfied. As a member of the Association, I am very pleased to have been involved with the Winemakers' Federation, with the cap-seal people, and with the glass people in developing this bottle. I think that what we have developed is something that the wine industry will find in time a major improvement. I believe that a 24 mm cork is going to work quite well in the CETIE bottle.

If you are nervous, use a 25 mm cork in the meantime, and perhaps experiment with some 24s. This is, of course, more expensive.

Blair

We did not see any big difference when we did our trials with the CETIE and Stein finishes. For many months we conducted the extraction tests that I showed on the board here a while ago. We found that there was a slight reduction in the extraction force required for the CETIE, but it is not that great; in the vicinity of 20 N.

Noel

There is another benefit with the new CETIE finish, too, something that I do not think anyone realised or perceived at the time. The fact that the bore is more parallel makes it easier to extract the cork, but more difficult to push it into the bottle. The Stein bottle is convex, and if you are using vacuum corkscrew equipment, when you go to put in a gauge or a corkscrew, you can sometimes push the cork into the bottle. The CETIE bottle performs better in that area, according to tests that we have done.