Wine Authentication

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wine: old, safe and low risk product

- Consumers, Producers & Brand Owners and Governments:
  - Safety
  - Quality
  - Integrity
  - Truthful and accurate labelling and advertising

- Laws, food safety, regulatory requirements and quality must never be compromised.
wine: old, safe and low risk product

- **Safety**
  
  The AWRI help desk & problem solving services; technical information.

- **Quality**
  
  Focus of AWRI R&D:
  - process & product innovation
  - maintaining and improving grape and wine quality

  ➢ Tools for verifying Integrity

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Wine: Integrity and Authentication

**Tools for verifying Integrity**

1. **Audits of producers**
   
   Steve Guy & team, Wine Australia

2. **Authentication: comparison of a wine to a reference sample**

3. **Authentication: unknown wine samples**
Authentication: comparison of a wine to a reference sample

BevScan® - Tool for non-destructive testing
in-bottle wine analyser and classifier

- Developed in collaboration with Jeffress Engineering (Adelaide) and CAMO (Norway).
- Adjustable for most bottle sizes, clear or dark bottles, red or white wines, and many other beverages.

Compositional analysis
- aroma compounds
- non-volatile grape and yeast metabolites (anthocyanins and beyond...)
- metals
- DNA

Sensory analysis
Authentication: 
unknown wine samples - origin verification and detection of counterfeit Australian wines

- Australian?
- Barossa Valley?
- Shiraz?

- Australian Wine Labelling  
  (Wine Australia Compliance Guide 2015)  
  Region (GI), Variety, Vintage are optional, but must be 85% if claimed.

- $^{87}$Sr/$^{86}$Sr isotopes  
  in Australian (‘1’) and non-Australian (‘0’) wines

- trace elements
- fermentation water:  
  $\text{H}_2\text{H}^1\text{O}$  
  $(\text{D}/\text{H})_2$: $\text{H}_3\text{C}-\text{CHD-OH} / \text{H}_3\text{C}-\text{CH}_2\text{-OH}$
Authentication: *unknown wine samples* - origin verification and detection of counterfeit Australian wines

- **Barossa Valley?**
  - **trace elements:** Ag, Al, B, Ba, Be, Co, Li, Mn, Mo, Ni, Pb, Rb, Se, Sn, Sr, V, Zn
  - **LDA analysis of PLS-DA scores**

<table>
<thead>
<tr>
<th>Region (actual)</th>
<th>Region (modelled)</th>
<th>Predicted (rain)</th>
<th>Predicted (irrigation)</th>
<th>Actual</th>
<th>Actual vs modelled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barossa Valley</td>
<td>20</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Big River (test)</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Central Ranges (test)</td>
<td>27</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Heathcote Valley</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Margaret River</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>McLaren Vale</td>
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<td>1</td>
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<td>1</td>
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<tr>
<td>Tumbarumba</td>
<td>21</td>
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<td>Yarra Valley</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- **additional regions**
- **seasonal effects – rain vs irrigation**

Authentication: *unknown wine samples* – varietal identity

- **anthocyanine profiles (esp. Pinot Noir; red hybrids)**
- **aroma profiles**
- **grape PR proteins in white must & wine:**

<table>
<thead>
<tr>
<th>ESI-MS</th>
<th>Internal ion (m/z)</th>
<th>Intensity (a.u.)</th>
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<tbody>
<tr>
<td>Chardonnay</td>
<td>21272</td>
<td>21272</td>
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<tr>
<td>Semillon</td>
<td>21272</td>
<td>21272</td>
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<tr>
<td>Sultana</td>
<td>21280</td>
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<th>pathway</th>
<th>kDa</th>
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<tr>
<td>Prunella</td>
<td>Thaumatin-likes</td>
<td>0.2</td>
</tr>
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<td>Chitinases</td>
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Authentication: Australian Import Controls

- Imported wine must comply with the Food Standards Code
- Risk based inspection at border – Wine low risk, therefore only 5% of consignments are inspected (the lowest legislated rate).
- Microbiological: None
- Physical: Label inspection (mandatory items-standard drinks, importer details, country of origin etc)
- Chemical: Sulphur dioxide tested, if not declared on label.

- Government focus: health risk
- Counterfeiting – brand owner
- Consumer deception – producer & importer
- ACCC, Australian Competition and Consumer Commission

Consequences of consumer deception

Europe:

French wine growers sell fake Pinot Noir

...between 2006 and 2008...
...sold 130,000 hectoliters...
...the highest penalty, 180,000 Euro.

Australia:

Coles ordered to pay $2.5 million for false 'freshly baked' bread claims; ACCC halts it as win for shoppers
Wine Authentication - Summary

- Counterfeiting, substitution and misleading information about wine affect producers and consumers in all Economies.

- **Integrity** as important as **Quality** and **Safety**.

  - Best tackled by **international cooperation** between customers & consumers, producers & brand owners, and governments & regulators.

  - **KPMG global head of agribusiness Ian Proudfoot:**
    “.. the only way to effectively tackle international food fraud is to establish a food integrity body...” (global role aka Interpol)
    “....an international body such as the Asia Pacific Economic Cooperation could be a leader in driving action on this issue.”