



Roundtable on Fermented Beverages

ABSTRACT

This paper has been developed to inform a roundtable to be held on 31 May 2019

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Issues Paper - Fermented Beverages

Issue

- The findings of a nationally coordinated surveillance survey to investigate alcohol content and labelling of fermented beverages have revealed the presence of undeclared alcohol in a number of these drinks.
- This has raised public health concerns (such as potential consumption by pregnant women and underage consumers; driving/working under the influence, and interference with medications).
- It has also raised food regulatory concerns about the potential for these beverages to fail to comply with the Australia New Zealand Food Standards Code (the Code).
- Liquor Licensing Acts vary across states and territories – posing an issue for regulators and for manufacturers in complying with laws for products that are sold interstate/nationally.

Scope

The objectives of this roundtable are to better understand the current status of the fermented beverages industry; to raise awareness among stakeholders of the findings of a recent nationally coordinated surveillance survey and associated public health concerns, and to consider any risk management required to ensure public health and safety.

Stakeholders include fermented soft drink manufacturers/ producers, major retailers, and regulation and enforcement agents.

Desired outcome

Ensuring that all manufacturers and retailers of fermented beverages are aware of the risks of the presence of alcohol in these products and understand and commit to applying risk mitigation processes; and that regulators are aware of the challenges of compliance with the regulations from the perspective of industry.

Background and Survey Results

- Fermented soft drinks generally contain a base (such as tea, water or coconut milk), sugar, flavours and a starter culture (comprised of microorganisms, including yeast and bacteria).
- The most common products in the fermented drink category in Australia are:
 - **Kombucha:** a fermented beverage produced from a mixture of steeped tea and sugar, combined with a culture of yeast strains and bacteria. Some kombucha products also have fruit juice or other flavours added during production. *(Definition from USDA)*
 - **Kefir (milk or dairy alternative, water, coconut water):** Starter culture prepared from kefir grains, *Lactobacillus kefiri*, and species of the genera *Leuconostoc*, *Lactococcus* and *Acetobacter* growing in a strong specific relationship. Kefir grains constitute both lactose-fermenting yeasts (*Kluyveromyces marxianus*) and non-lactose-fermenting yeasts (*Saccharomyces unisporus*, *Saccharomyces cerevisiae* and *Saccharomyces exiguus*). *(Definition from Codex Alimentarius)*

- **Ginger Beer:** Brewed ginger beer is a slightly alcoholic beverage prepared by fermenting a mixture of syrup and root ginger. (*Definition from Collins English Dictionary*)
- Recent survey results indicate that fermented soft drink products may contain alcohol formed during fermentation.
 - Kombucha samples tested indicated around 65% exceeded 0.5% Alcohol By Volume (ABV);
 - Water-based kefir samples tested indicated 74% exceeded 0.5% ABV;
 - The majority of the other beverage categories had alcohol levels of less than 0.5% ABV (68.6%) with 21.6% demonstrating levels between ≥ 0.5 and $< 1.15\%$ ABV, and 9.8% $> 1.15\%$ ABV.
 - All dairy-based kefir beverages were below 0.5% ABV.
- Fermented soft drinks undergo a primary fermentation step, traditionally followed by a secondary fermentation occurring after bottling (also known as bottle fermentation or conditioning).
- Secondary fermentation is included in the production process as it produces gas, one of the desired characteristics of the product, but can be difficult to standardise.
- Alcohol can be produced at both fermentation stages. Some businesses choose to use carbonation as an alternative to bottle fermentation to reduce alcohol production, however manufacturers that do not adequately control the fermentation processes may have alcohol produced even if carbonation is used as an alternative to secondary fermentation.
- Factors found to influence the alcohol content of these brewed or fermented soft drinks include:
 - the stage of shelf life when a product is sampled;
 - the process of effervescence development used; and
 - the addition of inclusions and flavours.
- Kombucha samples that underwent secondary fermentation had a statistically significantly higher mean alcohol content than kombucha samples that underwent carbonation. The difference between carbonated water-based kefir samples and those that underwent secondary fermentation did not reach statistical significance, however, this may be due to the low numbers of samples of these products.
- The survey also investigated whether the process of effervescence impacts the alcohol content over the life of the product. To do this, the change in alcohol content from manufacture to retail was compared between carbonated drinks and those that underwent secondary fermentation. The mean alcohol content of matched samples for which secondary fermentation occurs was statistically significantly higher at retail (1.72% ABV) than at manufacture (0.66% ABV). In contrast, there was no significant difference in mean alcohol content between carbonated samples at manufacture (0.33% ABV) and retail (0.50% ABV).

- The addition of flavourings may affect the final alcohol content of a beverage by potentially introducing extra sugars or microorganisms. To investigate whether the type of flavouring can affect the final alcohol content of the drink, matched samples with treated flavourings (such as those that were heat treated to eliminate microorganisms) were compared with samples with untreated flavourings (such as the use fresh herbs or ginger) or additional sugars. The mean alcohol content of samples with untreated flavourings or additional sugar added was statistically significantly higher at retail (2.30% ABV) than at manufacture (0.58% ABV). No significant difference in alcohol between retail and manufacture was seen for samples with treated inclusions for flavouring.

Risks to Public Health and Safety

- The issue poses a public health and safety risks, particularly to the following population groups:
 - pregnant women and people using prescription medicines where alcohol may interfere.
 - drivers (including probationary drivers) and workers requiring a zero blood alcohol reading in order to operate public transport vehicles and/or machinery.
 - under-age drinkers/minors, recovering alcoholics and those living in 'dry' indigenous communities who may inadvertently consume alcohol.
 - People with aldehyde dehydrogenase deficiency: an inherited deficiency in one of the enzymes involved in the breakdown of alcohol (common in people of East Asian ethnicity).
- There is a risk that public health communications on the potential presence of alcohol in fermented 'soft' drinks may motivate increased consumption of these products by minors and others who would normally not consume alcohol.
- However, moderate consumption of very low alcoholic beverages (<0.5% ABV) are unlikely to cause a detectable rise of a person's blood alcohol level. Researchers in 2012 measured the blood alcohol levels of 67 subjects after they had consumed 1.5L of 0.4% ABV beer in one hour.¹ Blood alcohol was detectable in only 20 of the subjects [limit of detection 0.0005 g/L], and the maximum blood alcohol reading recorded was only 0.0056%.
- In a similar study, researchers examined the effect of very low alcohol beer (0.41-0.43% alcohol by volume) on breastmilk. Following the consumption of 1.5L of very low strength beer, alcohol was only detectable in two of the participants immediately following beer consumption, and only at trace levels (<0.001g/L and 0.0021g/L).² No alcohol was detectable in the breastmilk of the other participants. Based on the alcohol levels detected in the study, the authors concluded that a mother's consumption of 'non-alcoholic' beer can be regarded as innocuous for the breastfed infant.

¹ Thierauf A, Große Perdekamp M, Auwärter V. Maximale Blutalkoholkonzentration nach forciertem Konsum von alkoholfreiem Bier. *Rechtsmedizin* 2012; 22: 244-7. <https://doi.org/10.1007/s00194-012-0835-8>

² Schneider C, Thierauf A, Kempf J, Auwarter V. Ethanol concentration in breastmilk after the consumption of non-alcoholic beer. *Breastfeeding Medicine* 2013; 8: 291-3. <https://doi.org/10.1089/bfm.2012.0156>

Liquor licencing in Australia

Liquor Licensing Acts vary across the states and territories. In the majority of jurisdictions, liquor is defined as being a beverage that contains more than 1.15% ethanol by volume. In Queensland, Tasmania and Victoria the regulation is more stringent, with beverages containing more than 0.5% ethanol by volume considered alcoholic.

In Queensland, Tasmania and Victoria, where beverages containing more than 0.5% ethanol by volume are considered alcoholic, 64.8% of Kombucha surveyed would be defined as alcoholic. Whereas in the jurisdictions where beverages must contain more than 1.15% ethanol by volume to be deemed alcohol, only 22.9% of Kombucha surveyed would exceed this.

	Kombucha	Water-based Kefir	Dairy-based Kefir	'Other'
<0.5% ABV (QLD, Tas, Vic)	35.2%	26.7%	100%	68.6%
<1.15% ABV (NSW, ACT, SA, WA, NT)	77.1 %	63.5%	0%	90.2%
>1.15% ABV	22.9%	36.7%	0%	9.8%

There are also differences in the legislation regarding where liquor can be sold. In the ACT, NSW, NT and Victoria, packaged alcoholic beverages can be sold from designated areas within supermarkets. While in SA, WA and Tasmania, these beverages can only be purchased from liquor stores.

Labelling requirements under the Food Standards Code

- The Food Standards Code sets out requirements for labelling of alcoholic beverages
- Beverages with an alcohol content of $\geq 0.5\%$ with no statement of the alcohol content are in breach of the Code. Compliance and enforcement initiatives have highlighted some difficulties:
 - Alcohol content of brewed 'soft' drinks can increase over time, so a product may be compliant at production, but become non-compliant during transport and storage at the retail and consumer level; and
 - A number of new producers operate from home businesses and are hard to identify and reach for education or compliance activities.
- The terms 'alcoholic beverage' and 'beverage' are not defined in the Code and there is variation in the requirement for labelling alcohol for each of these foods when the alcohol content is less than 0.5% ABV.
- The term 'brewed soft drink' is defined in Standard 2.6.2- *Non-alcoholic beverages and brewed 'soft' drinks*, but is not considered by all jurisdictions to include kombucha, which is prepared from fermented tea (defined elsewhere in the Code), nor does this Standard cover dairy and water-based kefir.
- Products making health claims also need to adhere to Standard 1.2.7 - *Nutrition, health and related claims*.
- Health claims refer to a relationship between a food and health rather than a statement of content.
- Health claims and nutrition content claims, other than nutrition content claims about energy content or carbohydrate content, are prohibited on alcoholic beverages (and other foods) that contain more than 1.15% alcohol by volume.

Key references from the Food Standards Code

Standard 2.6.2 Non-alcoholic beverages and brewed soft drinks

2.6.2 - 1 Interpretation

In this Code –

brewed soft drink means a food that:

- (a) is the product prepared by a fermentation process from water with sugar and one or more of:
 - (i) fruit extractives or infusions; or
 - (ii) vegetable extractives or infusions; and
- (b) contains no more than 1.15% alcohol by volume.

2.6.2 - 8 Non-alcoholic beverages not to be labelled or presented as alcoholic beverages

A non-alcoholic beverage or brewed soft drink must not be labelled or otherwise presented for sale in a form which expressly or by implication suggests that the product is an alcoholic beverage.

There is a lack of clarity about the requirements for labelling with a statement of alcohol content of fermented soft drinks with an alcohol content <0.5% ABV. In this range, 'alcoholic beverages' must be labelled with a statement of alcohol content (Standard 2.7.1-3(1b)), but 'beverages' do not need to be (Standard 2.7.1-3(1c)). Clarification should be sought as to whether a fermented soft drink that contains alcohol <0.5% ABV is simply a 'beverage' or whether it is an 'alcoholic beverage'. Moreover, the terms 'alcoholic beverage' and 'beverage' are not defined in the Code.

Standard 2.7.1 Labelling of alcoholic beverages and food containing alcohol

2.7.1—3 Statement of alcohol content

- (1) For the labelling provisions, a statement of the alcohol content is required for:
 - (a) a food (including an alcoholic beverage) that contains more than 1.15% alcohol by volume; or
 - (b) an alcoholic beverage that contains 1.15% or less alcohol by volume; or
 - (c) a beverage that contains not less than 0.5% but not more than 1.15% alcohol by volume.

Standard 1.2.7 Nutrition, health and related claims

1.2.7—4 Nutrition content claims or health claims not to be made about certain foods

A nutrition content claim or health claim must not be made about:

- (c) a food that contains more than 1.15% alcohol by volume, other than a nutrition content claim about:
 - (i) energy content, carbohydrate content or gluten content; or
 - (ii) salt or sodium content about a food that is not a beverage.

Table 1: Labelling requirements under Standard 2.7.1

Statement of alcohol content		
<0.5% ABV	≥ 0.5% to ≤ 1.15% ABV	>1.15% ABV
<p>2.7.1-3(1b) (Applies to 'alcoholic beverages') The statement of alcohol content must be expressed in words to the effect 'CONTAINS NO MORE THAN X% ALCOHOL BY VOLUME'</p>		<p>2.7.1-3(1a) (Applies to 'food including alcoholic beverages') The statement of alcohol content must be expressed in one of either: mL/100 g mL/100 mL % ALCOHOL BY VOLUME</p>
	<p>2.7.1-3(1c) (Applies to 'beverages') The statement of alcohol content must be expressed in words to the effect 'CONTAINS NO MORE THAN X% ALCOHOL BY VOLUME'</p>	
Statement of the number of standard drinks		
	>0.5% ABV	
	<p>2.7.1-4(1) (Applies to 'beverages') Must include a statement of the approximate number of standard drinks</p>	

Enforcement of food standards in Australia

Australian state and territory government agencies are responsible for implementing, monitoring and enforcing food regulation through the Australia New Zealand Food Standards Code (the Code) and their own legislation (and the Department of Agriculture and Water Resources is responsible for enforcement of the Code at the border).

International regulations

The US is the only country to specifically regulate the alcohol content of kombucha. The US regulations are outlined below.

US Regulations

Kombucha

Under US regulations, if the alcohol content of kombucha is 0.5% or more alcohol by volume, at any time during production, when bottled, or at any time after bottling, the kombucha is an alcohol beverage and is subject to federal level Tax and Trade Bureau regulations.

Kombucha that is never above 0.5% alcohol by volume during production, at time of bottling, or after bottling must comply with all applicable Food and Drug Administration (FDA) regulations.

All kombucha also must comply with any applicable state and local requirements.

Important

TTB regulations on alcohol beverages DO APPLY to any kombucha that has less than 0.5% alcohol by volume when bottled BUT the alcohol content increases to 0.5% or more alcohol by volume at any point afterwards as a result of continued fermentation in the bottle.

Failure to comply with federal laws and regulations governing the production, bottling, labelling, and distribution of alcohol beverages, including kombucha that contains 0.5% or more alcohol by volume, may lead to enforcement actions, such as the assessment of tax, penalties, and interest, in addition to potential civil and criminal penalties.

European Union

Labelling of alcoholic beverages in the EU

In the EU, Regulation (EU) 1169/2011 ([EU 2011](#)) on the provision of food information to consumers requires that the 'actual alcoholic strength by volume' of an alcoholic beverage containing more than 1.2 % by volume of alcohol is given. The figure given should have no more than one decimal place, and be followed by the symbol % *vol*. It may be preceded by the word *alcohol* or the abbreviation *alc*.

Canada

The Canadian Food and Drug Regulations prescribe quality, composition, and labelling standards which also apply to nonalcoholic beverage manufacturers. According to the Canadian Food Inspection Agency, kombucha is categorised as a non-alcoholic beverage.

"Low alcohol" is an acceptable claim for a product with less than 1.1% alcohol by volume. "Contains less than (naming the percentage alcohol)" is also acceptable on low alcohol products.

United Kingdom (England, Wales and Northern Ireland)

Food Standards Agency UK regulate alcoholic beverages.

- Low alcohol-products must be 1.2% ABV or below
- Non-alcoholic- cannot be used in conjunction with a name associated with an alcoholic drink except for communion or sacramental wine.
- Alcohol-free- product must be 0.05% ABV or below
- De-alcoholised-product must be 0.5% ABV or lower.

Fermentation Process

Kombucha

Kombucha is brewed from a sweetened tea base with SCOBY (Symbiotic Culture of Bacteria and Yeast). The SCOBY typically contains acetic acid bacteria (*Komagataeibacter*, *Gluconobacter*, and *Acetobacter* species)¹, lactic acid bacteria (*Lactobacillus*, *Lactococcus*)², and yeasts (*Schizosaccharomyces pombe*, *Saccharomycodes ludwigii*, *Kloeckera apiculata*, *Saccharomyces cerevisiae*, *Zygosaccharomyces bailii*, *Torulasporea delbrueckii*, *Brettanomyces bruxellensis*)³.

The yeasts ferment sucrose to into glucose and fructose, and then into ethanol and carbon dioxide⁴. The bacteria oxidise the ethanol to acetaldehyde, then to acetic acid⁴. The final composition of the Kombucha is dependent on the sugar and tea concentration^{5,6}, and the fermentation time⁷ and temperature⁸.

Primary fermentation

- Optimum temperature - The optimal temperature to add the SCOBY is between 22°C and 30°C.⁹
- *Fermentation time - The mixture is typically left to ferment for 7-10 days.*
- *Most of the fermentation processes of kombucha are aerobic, so the first stage of the fermentation is done in an open vessel to allow maximum provision of oxygen.*
- *Once the tea has fermented to the desired level (typically to a pH of <4.2), the SCOBY is removed.*

Secondary fermentation

- *The secondary fermentation occurs in bottle – also known as bottle conditioning. This is also the step where flavours are added.*
- *While the SCOBY was removed from the kombucha after the first fermentation, some of the bacteria and yeast are left behind, allowing a second fermentation to occur.*
- *As this second fermentation occurs in a closed system, CO₂ produced from the yeast cannot escape the kombucha as it did during the first fermentation, and the alcohol cannot be converted to acetic acid. As a result, the kombucha becomes carbonated, and small amounts of alcohol may be produced.*
- *After 1 to 3 days, the kombucha is refrigerated at <4°C. This significantly slows fermentation as the microbes enter a dormant state. However, small amounts of alcohol may continue to be produced.*

Kefir

Kefir normally refers to a fermented milk drink that is made from kefir grains. It may also refer to a water-based beverage with added dried fruit. Like the SCOBY used to brew kombucha, the kefir grains are a specific type of symbiotic culture, containing a mixture of lactic acid bacteria (*Lactococcus lactis* subsp. *lactis*, *Streptococcus thermophilus*, *Lactobacillus delbrueckii* subsp. *bulgaricus*, *Lactobacillus helveticus*, *Lactobacillus casei* subsp. *pseudoplantarum* and *Lactobacillus brevis*), acetic acid bacteria (*Acetobacter*) and yeasts (*Saccharomycescerevisiae*, *S.unisporus*, *Candidakefyr*, and *Kluyveromycesmarxianus* ssp. *marxianus*).¹⁰

In a milk-based kefir, the lactic acid bacteria converts the lactose present in milk into lactic acid, decreasing the pH of the mixture. The lactose-fermenting yeast produce ethanol and CO₂, and the acetic acid bacteria will oxidise the ethanol to acetaldehyde, then to acetic acid.¹¹ The fermentation pathway in water-based kefir favours the production of alcohol from sucrose, along with lactic and acetic acid. Milk-based kefir tends to be lower in alcohol than water-based kefir.

Fermentation

- Optimum temperature – The optimal temperature to ferment kefir is between 21-23°C¹²
- *Fermentation time - The mixture is typically left to ferment for 24 hours¹¹*
- *The kefir grains are removed from the liquid to stop further fermentation.*

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