



BC Centre for Disease Control  
Provincial Health Services Authority

# Ethanol levels in kombucha – a concern or a KALAMITea?

NCCEH Environmental Health Seminar Oct 22, 2020

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*We respectfully acknowledge that we live, work, and play on unceded Coast Salish Territory, the traditional territories of the xʷməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and Səlilwətaʔ (Tsleil-Waututh) Nations.*

# Acknowledgements

- Dr. Paula Brown, Dr. Michael Chan & staff  
BCIT Natural Health & Products Group  
NSERC research chairs program
- BCCDC Foundation for Public Health
- BC Liquor and Cannabis Regulatory Board
- Regional Health Authorities
- University of British Columbia Masters Food Science Program (Sally Chen)



Vancouver Coastal Health



Fraser Health



Interior Health



Island Health



## Kombucha Alcohol Levels Affecting pregnant Mothers Infants & Toddlers

### Study Objective

- To assess the levels of alcohol in kombucha products at retail and food premises in British Columbia

### Rounds Objectives

- Explain the public health significance of low levels of alcohol as a health risk
- Recognize alcohol as a health hazard (i.e. chemical hazard) in fermented beverages
- Discuss potential mitigation roles for public health and industry

### Partners

- Health Authorities, UBC, BCIT, and BCCDC

### Funders

- BCCDC Foundation for Public Health / Liquor & Cannabis Regulation Branch (LCRB) / BCIT NSERC

- Sweetened tea fermented with **SCOBY**  
**S**ymbiotic **C**ulture **O**f **B**acteria and **Y**easts
- A fermented, **slightly alcoholic**,  
lightly effervescent, sweetened black or green  
tea drink
- Also known as tea mushroom, tea fungus,  
or Manchurian mushroom
- Described as a functional beverage for its  
supposed health benefits containing probiotics,  
organic acids & other healthy metabolites.



[kuhm·**boo**·chuh]



## Low levels of alcohol are a risk

In children

# Weight and dose relationship

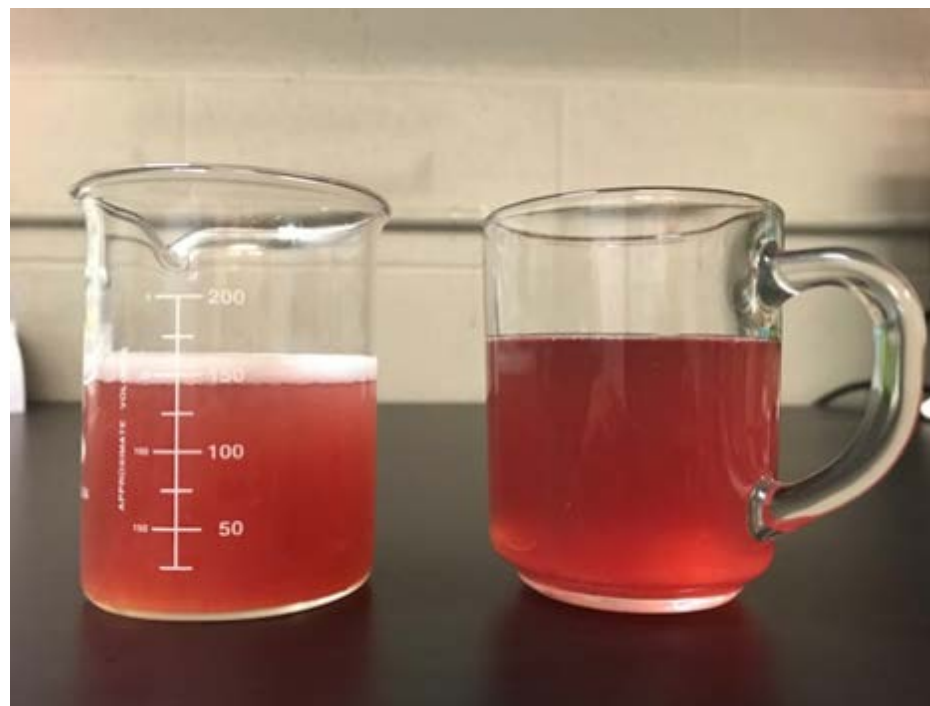
Children: ethanol dose 50 – 100 mg/dL

- Higher metabolic rate
  - Children overheat rapidly
- Underdeveloped liver enzymes to process alcohol
- Initial screening of blood alcohol at hospital may increase 2-3X ↑
- Sx: lethargy, hypoglycemia, seizures (death)



## Ethanol content

Weight (kg)		10	20
% ABV	0.5	6.7 mg/dL	3.3 mg/dL
	1	13.3 mg/dL	6.7 mg/dL
	2	26.7 mg/dL	13.3 mg/dL
	2.5	33.3 mg/dL	16.7 mg/dL



For any toddler weighing 10 kg or less

- as little as 150 mL would be of concern (i.e. reach a 50mg/dL dose)
- 330 mL would be of concern at regulatory limit of 1%

ABV = alcohol by volume (%)

Source: Dr. David McVea, resident



There is no safe exposure level for alcohol and kombucha may expose pregnant women to non-trivial amounts of alcohol





## Low levels of alcohol are a risk

Life time risk of one drink per day increases lifetime cancer risk







## Other risks?

### Other issues linked to high acid levels in kombucha

Metabolic acidosis and lactic acidosis

- 10 illnesses in total reported
- Underlying conditions reported in most illnesses

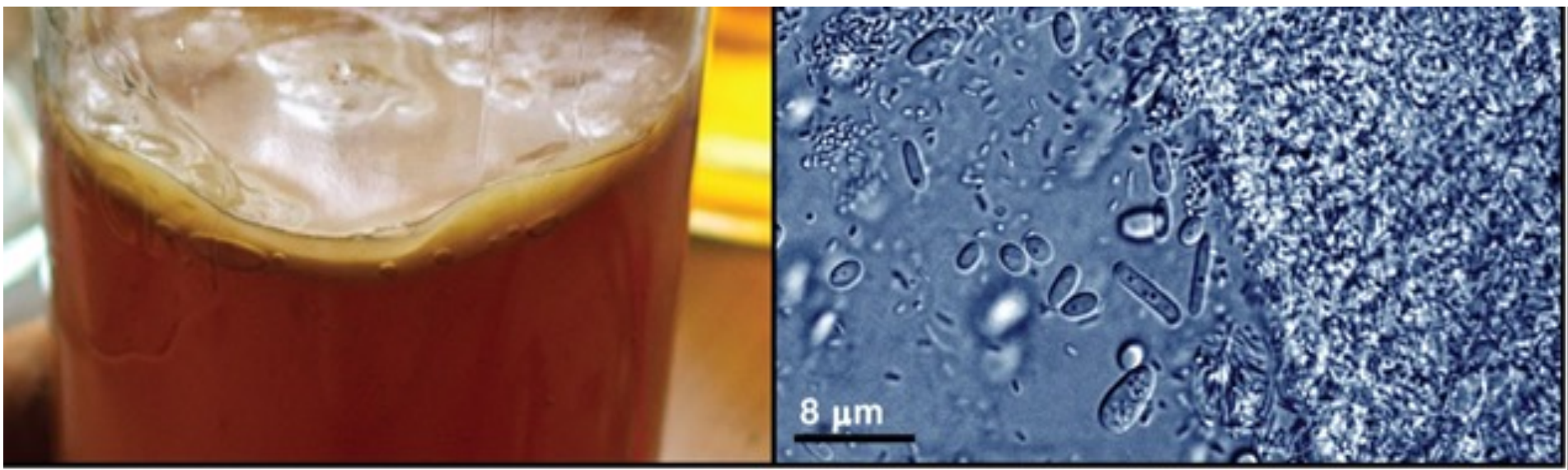
Murphy, Walia, Farber (2018) Food Protection Trends 38(6):329-337



# Strategies to address alcohol risk

- Labelling
  - Informed consumers
- Availability
  - Restrict access to alcoholic product
- Informed consumers
  - Media campaigns to raise awareness
- Product stability
  - Ethanol will not increase during consumer handling





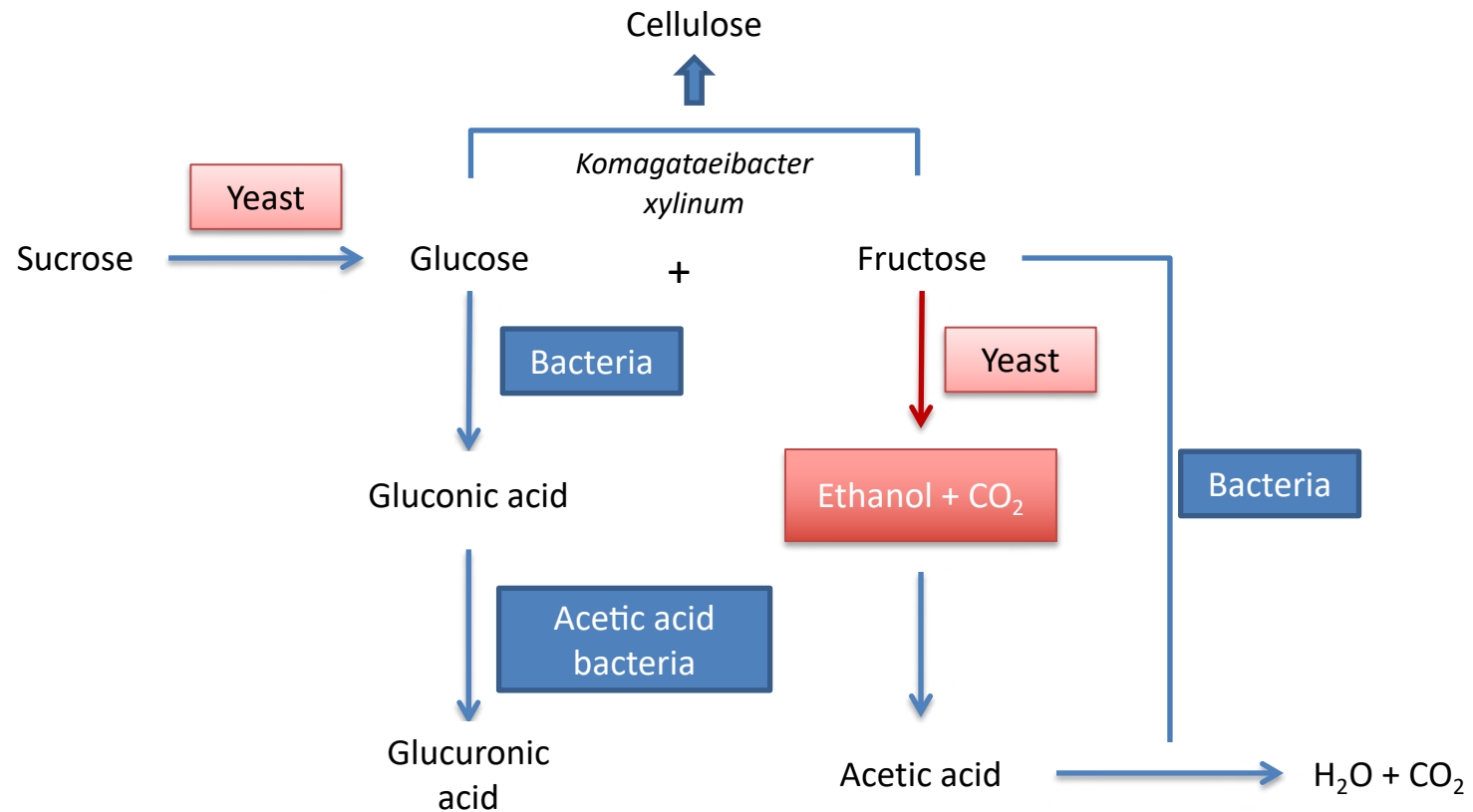
Symbiotic Culture Of Bacteria and Yeasts  
(SCOBY)

↑  
Biofilm  
(SCOBY)

*Fermented Foods as Experimentally Tractable Microbial Ecosystems*

Benjamin E. Wolfe, Rachel J. Dutton

*Cell*  
Volume 161, Issue 1, Pages 49-55 (March 2015)  
DOI: 10.1016/j.cell.2015.02.034



## Pathways to Kombucha tea products

Adapted from Journal of Food Science, 83(3):580-588



# What did we find?



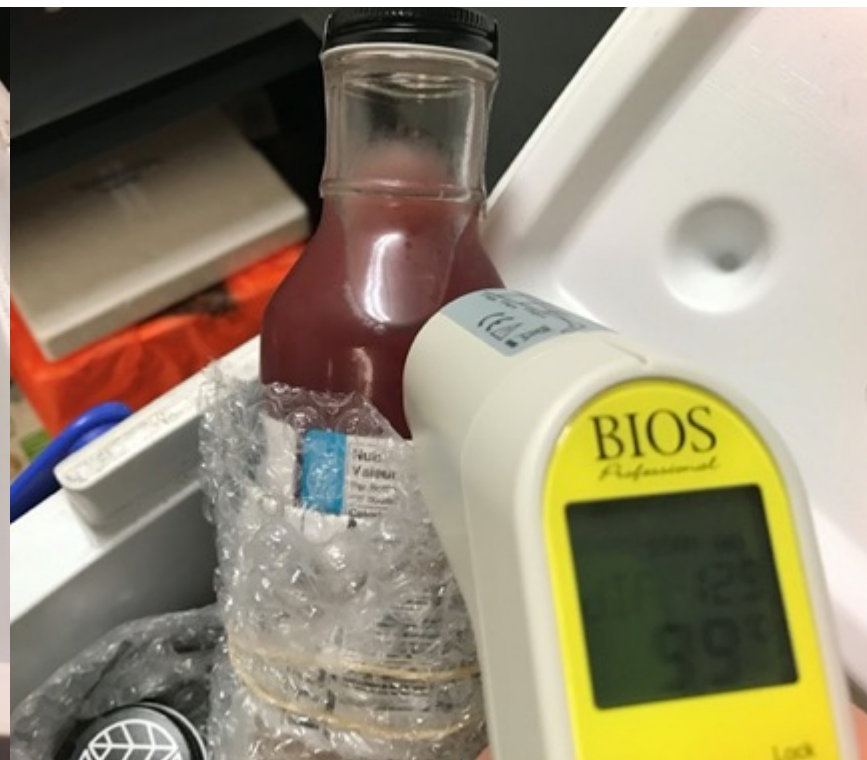
## Can & Bottle



## Bulk Sample

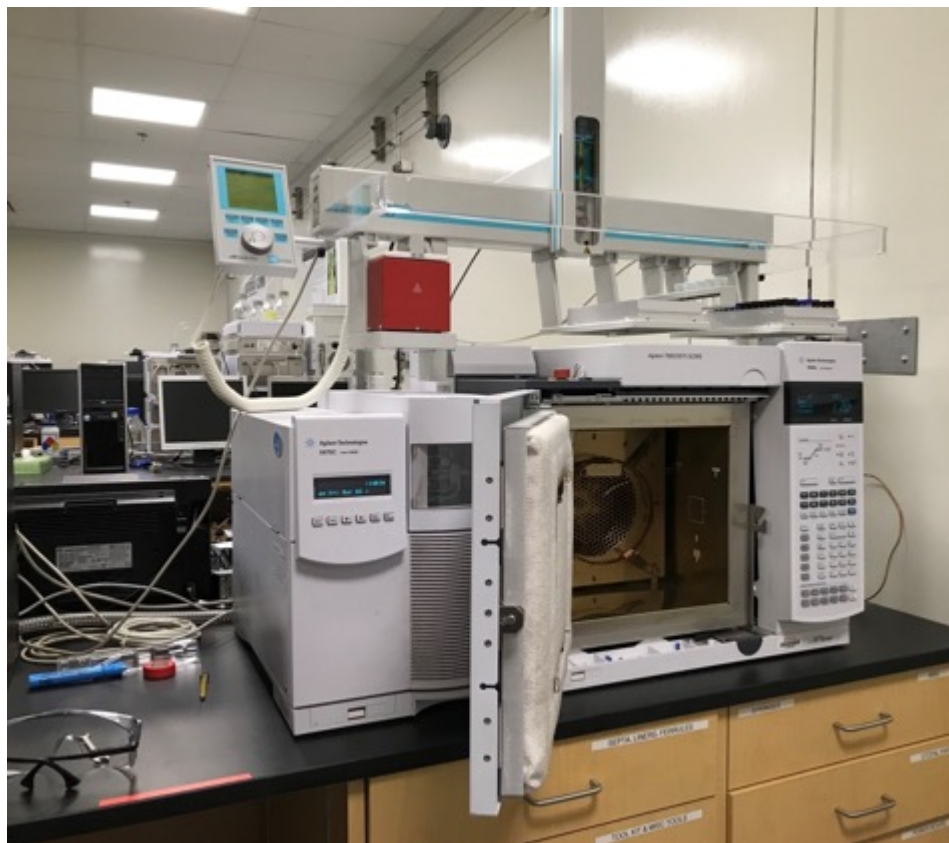






# BCIT Natural health products laboratory

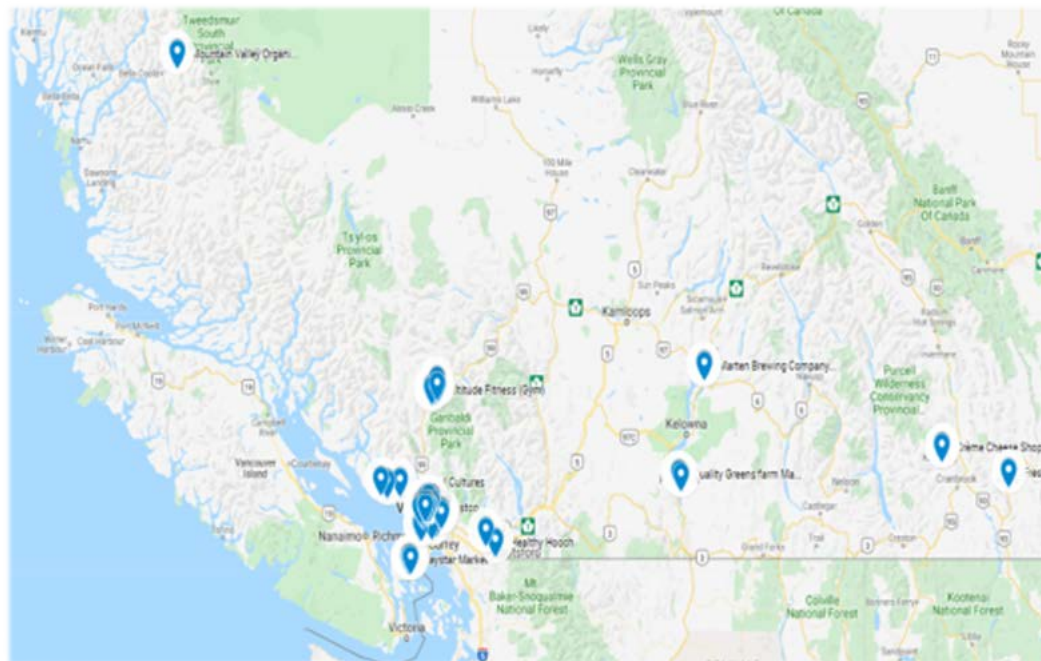
## Dr. Paula Brown / Dr. Michael Chan



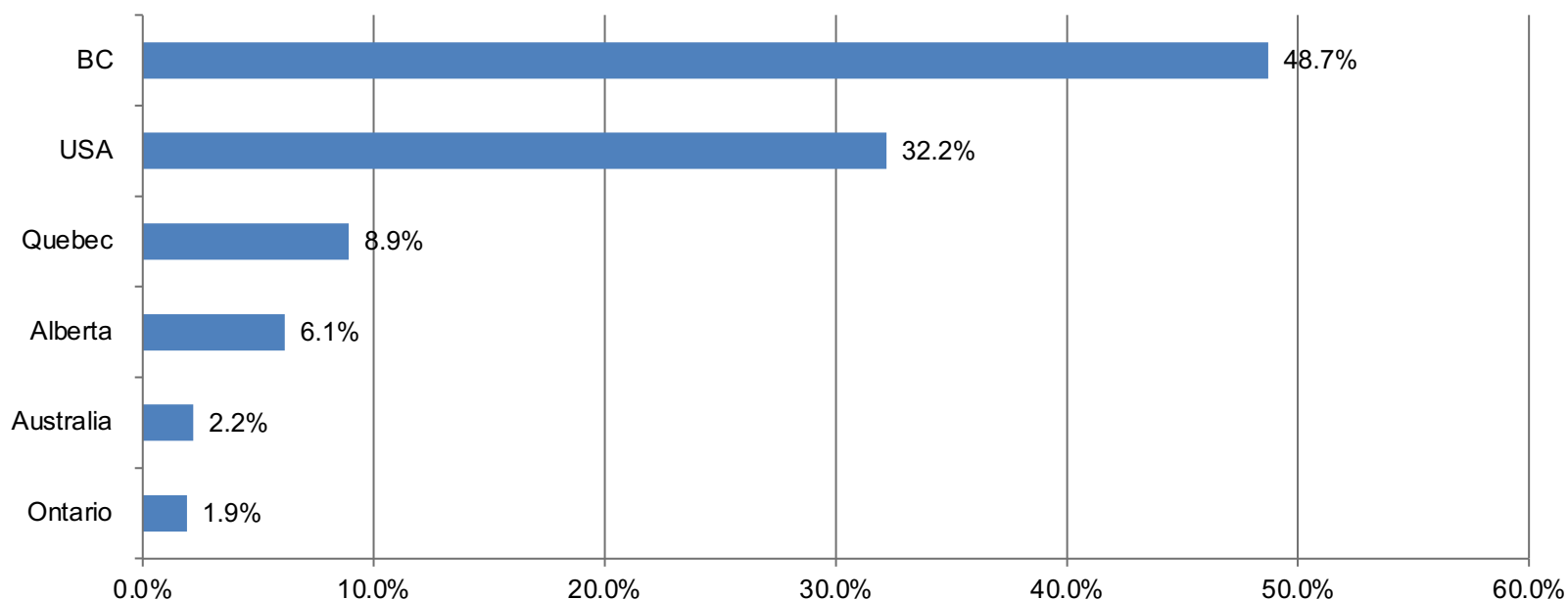
- GC/MS headspace method
- LOD provided for each sample; sensitivity to 0.001% ethanol
- Validated using AOAC guidelines

Chan, M., S. Hong, J. Finley, J. Robertson, and P. N. Brown. 2020. Determination of ethanol content in Kombucha using headspace gas chromatography with mass spectrometry detection: Single-laboratory validation. *J AOAC Int.* In press.

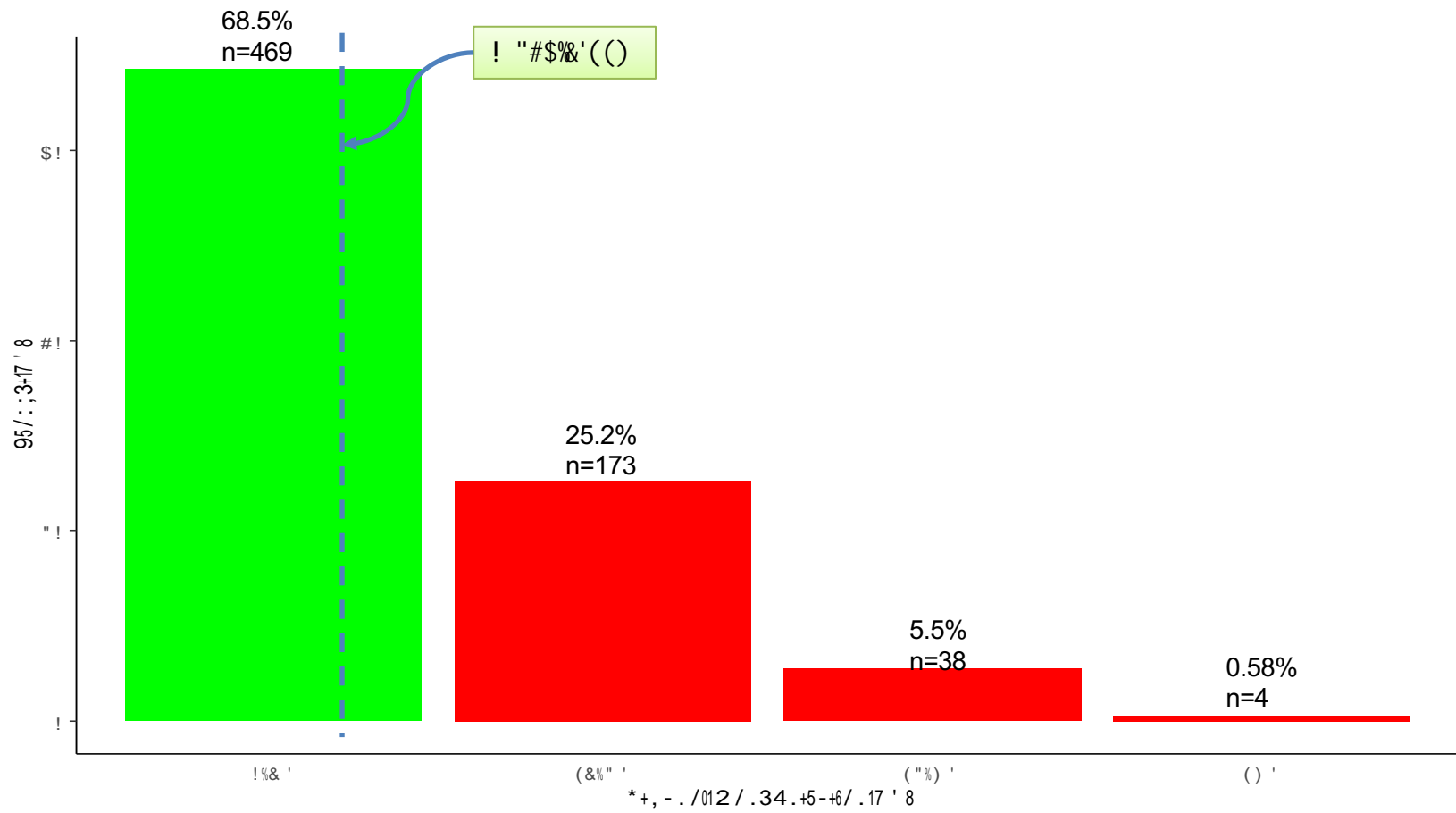
- ❑ 684 samples collected across BC Jun-Oct 2019
- ❑ 142 premises visited;
  - Retail (77%),
  - Restaurant (11%),
  - Processor (9%),
  - Farmers Market/Gym/Rec Centre (3%)
- ❑ 53 processors
- ❑ 31.5% exceeded regulatory limit, 1% ethanol (ABV)



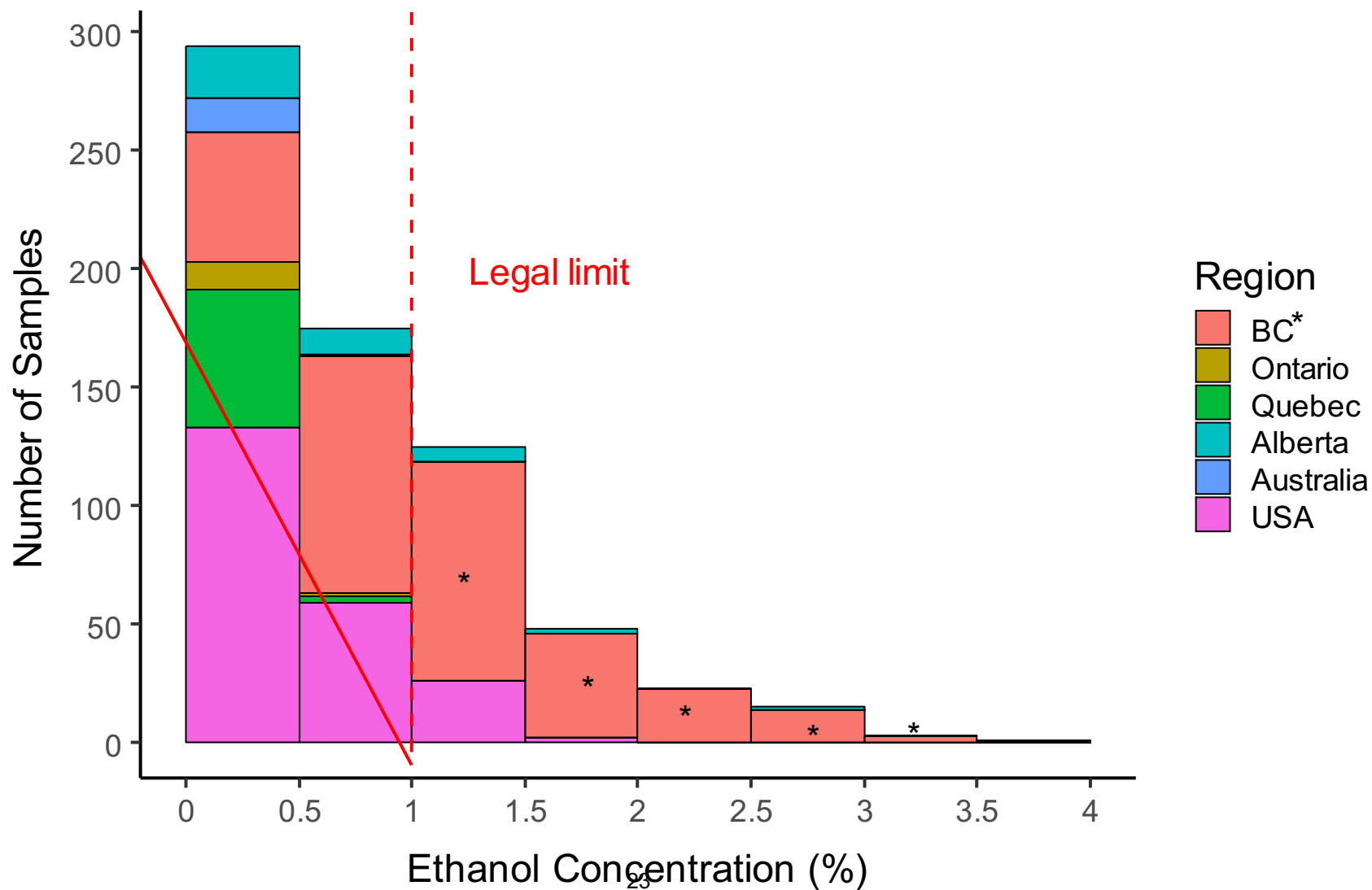
Province/ Country	Alberta	BC	Ontario	Quebec	USA	Australia	Total
#samples (%)	42 (6.1%)	333 (48.7%)	13 (1.9%)	61 (8.9%)	220 (32.2%)	15 (2.2%)	684 (100%)
# processor	4	38	1	1	8	1	53

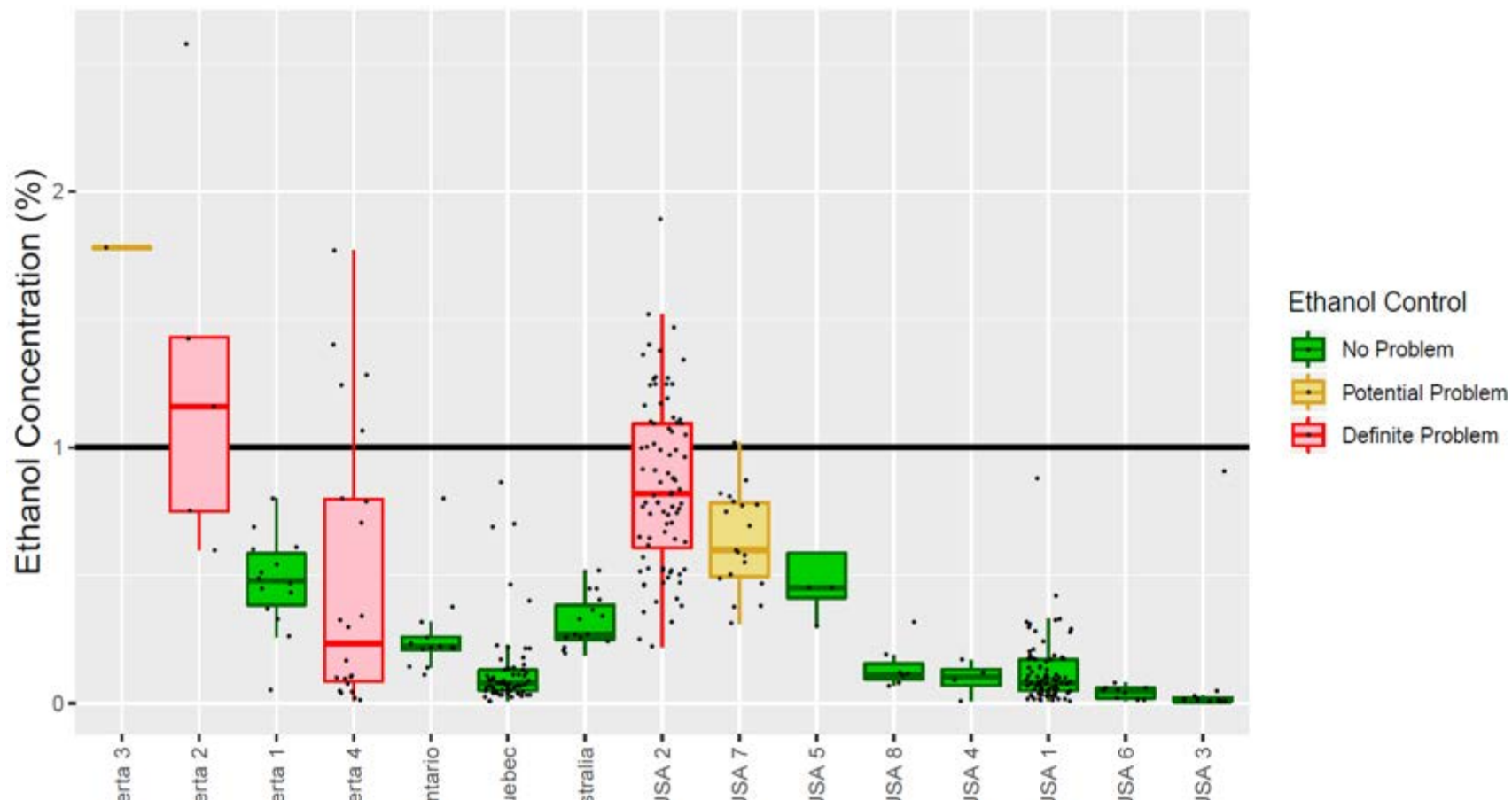


# Summary of Ethanol results

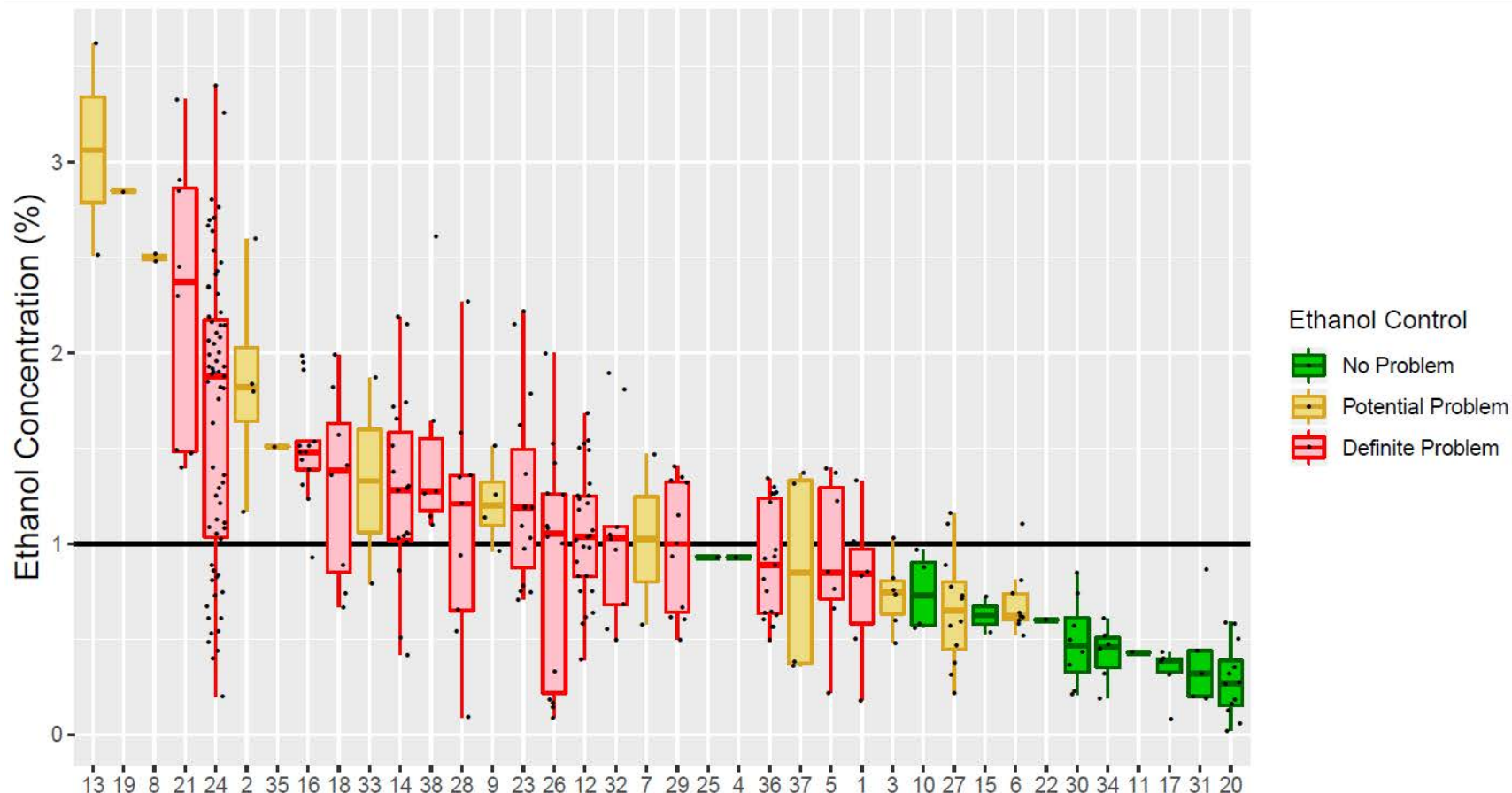








- ❑ No Problem: ethanol concentration is always below 1% ABV;
- Potential problem: Less than 20% of samples are above 1% ABV;
- Definite problem : More than 20% of samples are above 1% ABV.
- ❑ For processors with sample sizes of less than 6, any value over 1% ABV resulted in coding with yellow



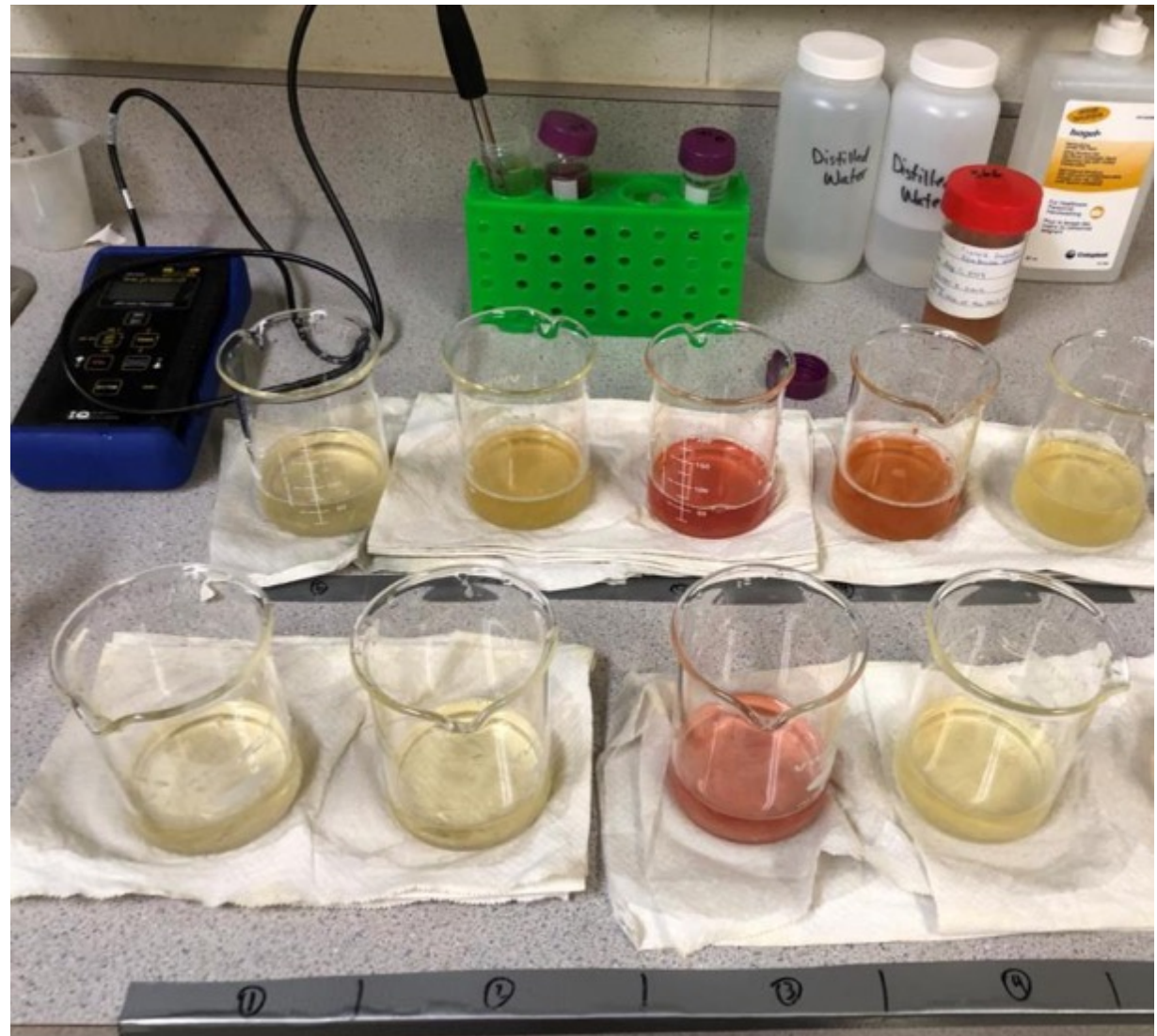
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All samples were negative (n=47)

Petrifilm™ plates (3M Company)

- Safe range is  $2.5 < \text{pH} < 4.2$  ([Nunmer, 2013](#))
- No samples had pH above 4.2  $\rightarrow$  no *E. coli* tests done
- 47 Kombucha samples  $< \text{pH } 2.5$  (~7% failure rate).





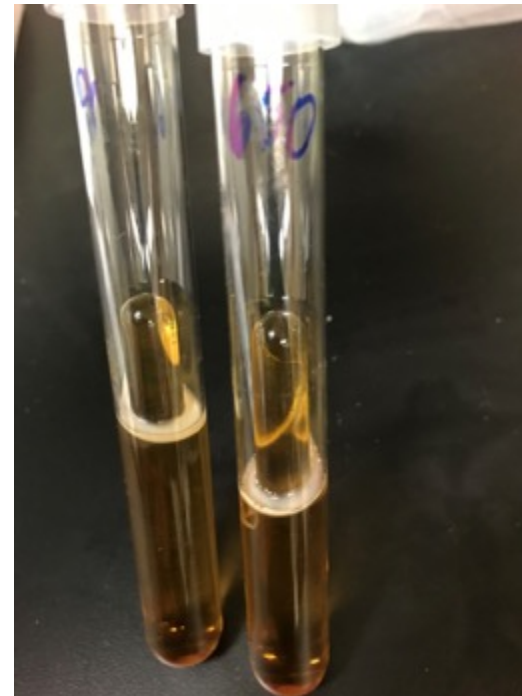
# Kombucha samples stored at room temperature



# Room temperature display?







## Yeast Activity

Many samples quickly show production of gas. Others develop gas after two weeks (slowly). Some never.

## Labelling assessments

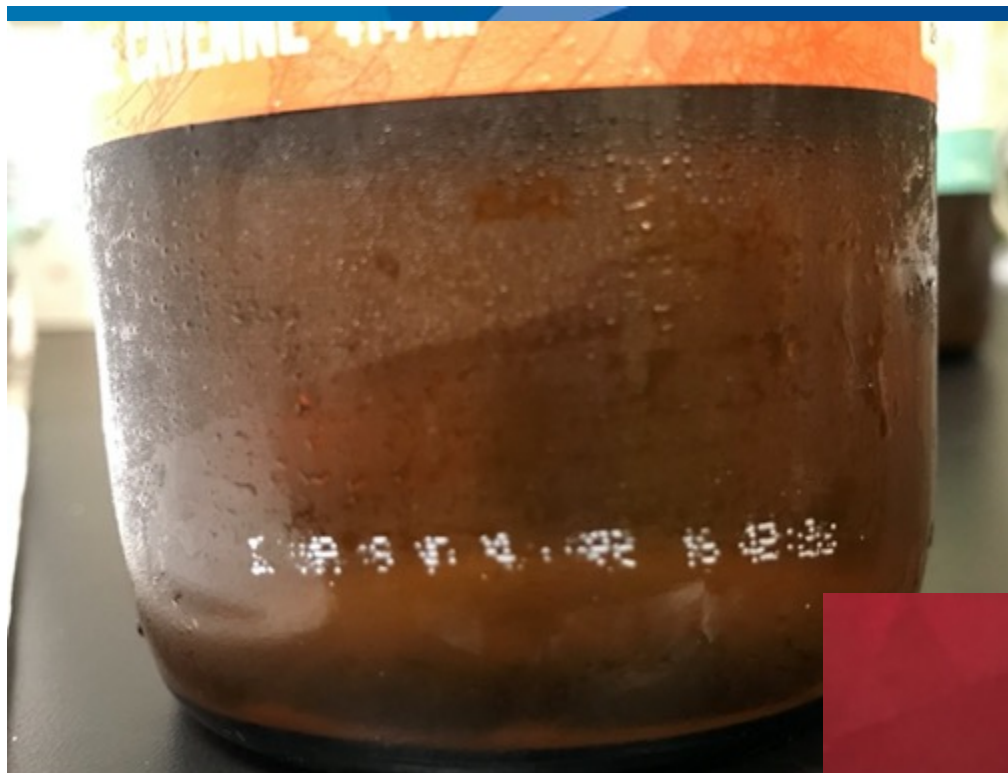
1. Precautionary  
Statements for Alcohol  
Content
2. Handling information
3. Federally required  
labelling
4. Market advertising labels

## Results

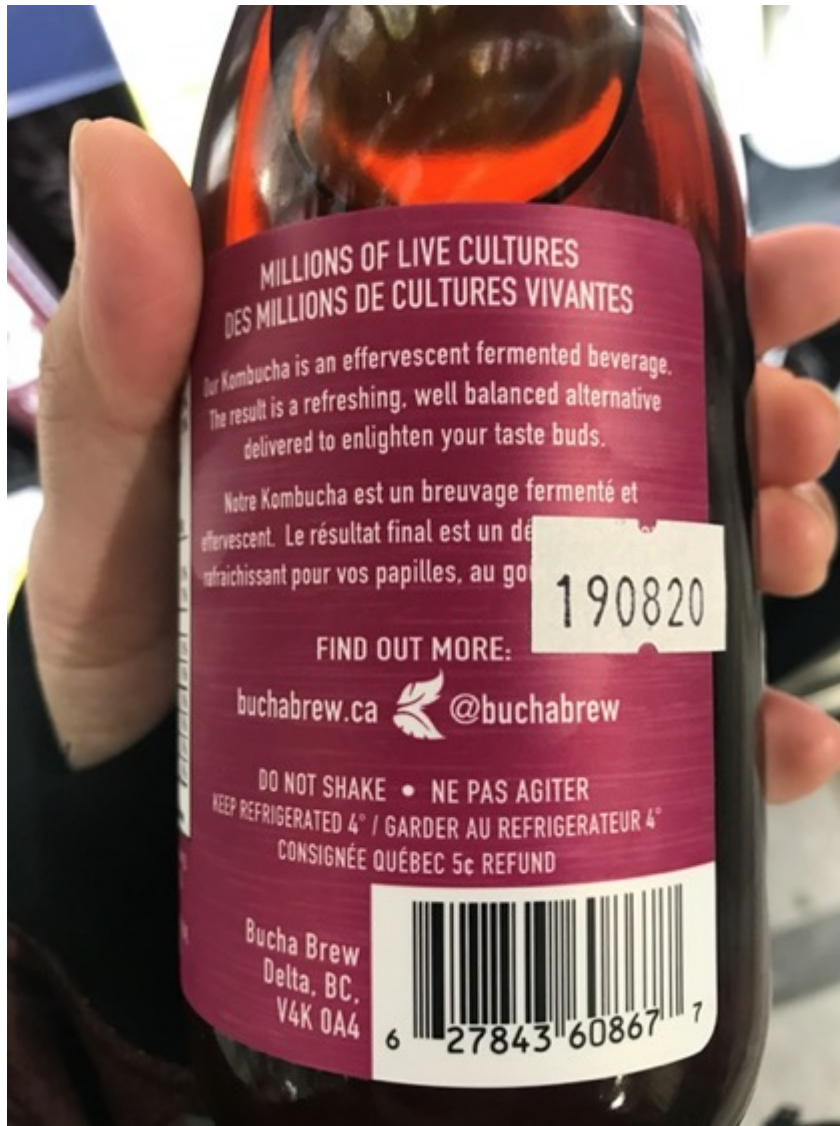
1. Found in 54% of brands
  - 25% of BC brands
2. Found in 92% of brands  
“keep refrigerated”  
53% “do not shake or “contents  
under pressure”
3. Found in 100% nutrition  
facts & ingredient lists.  
Issues in some BBD and  
address labels
4. Most common (72%)  
“raw and living”

Noticeably, some alcohol labels are too small to be read/found











# WHAT DO WE DO NOW?

How do we know “non-alcoholic kombucha” IS *non-alcoholic* and is meeting the regulations?

Study design:

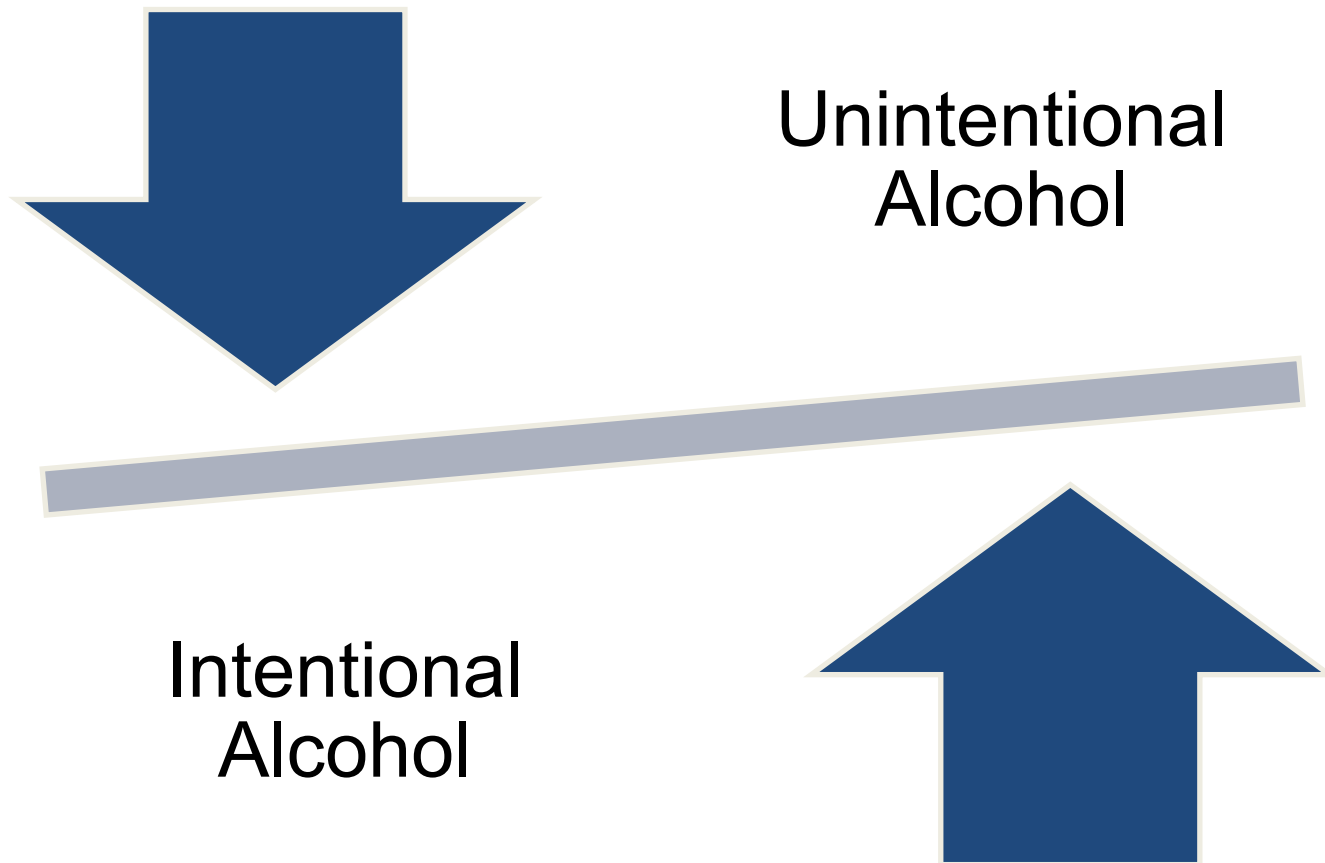
# RISK COMMUNICATION STRATEGY

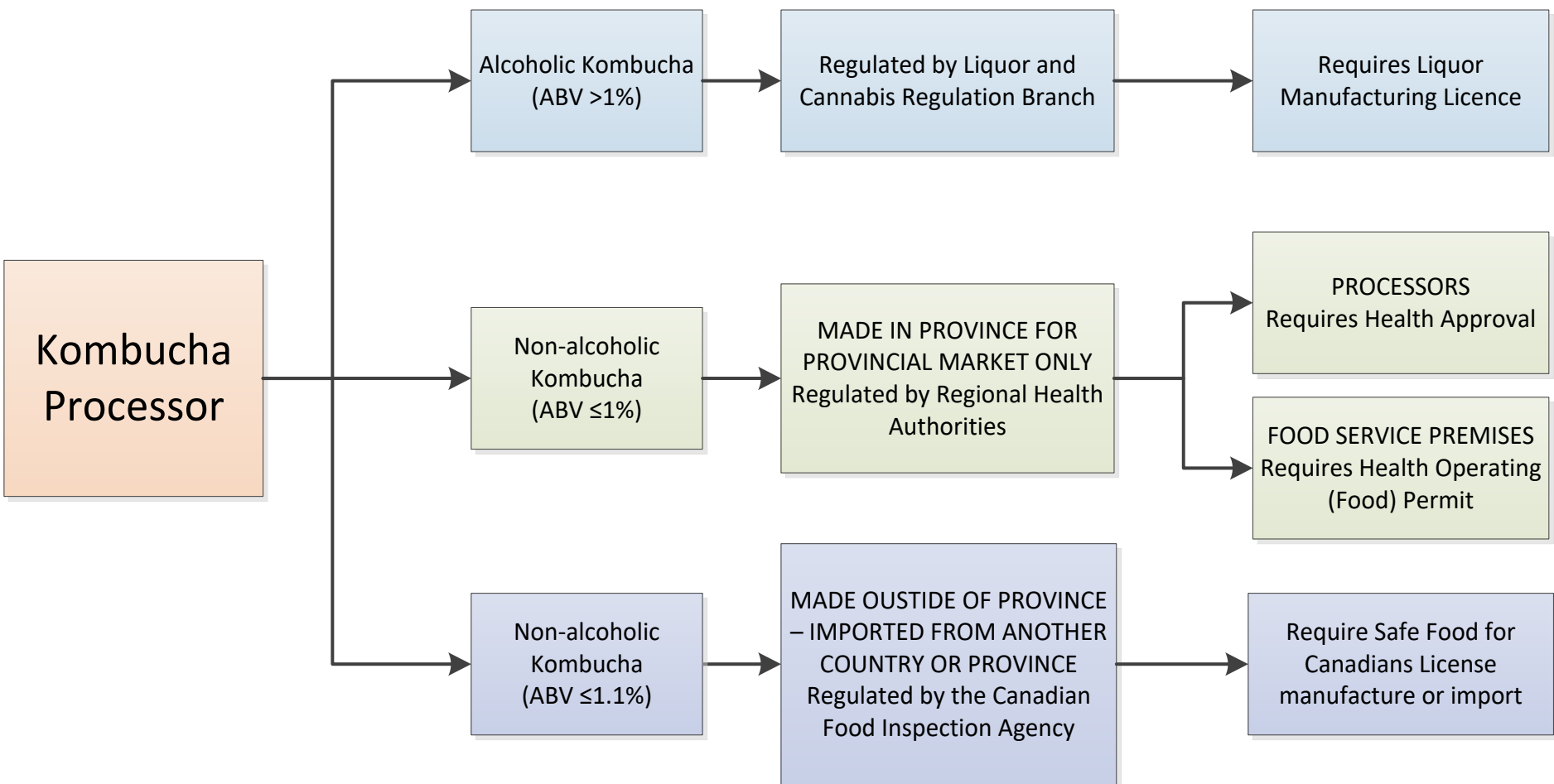
→ developed threshold triggers for rapid communications

WERE NOT MET in the first 150 samples

1. If >50% of samples tested above 1% ethanol
2. If >10% of samples tested above 2.5% ethanol
3. If any sample tested above 5% ethanol



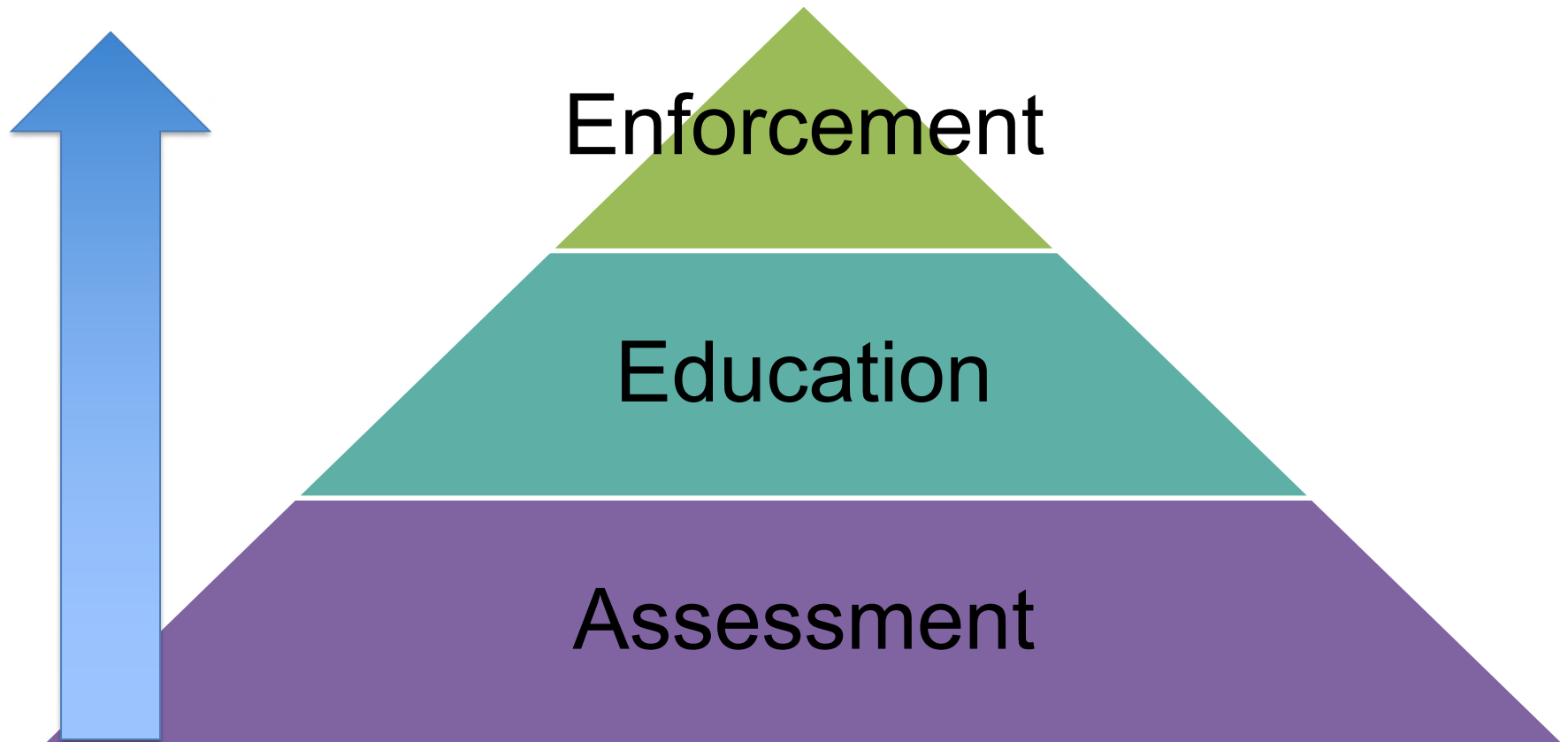




## Kombucha Regulatory Oversight

Products made in the province or imported into the province

# Progressive enforcement model



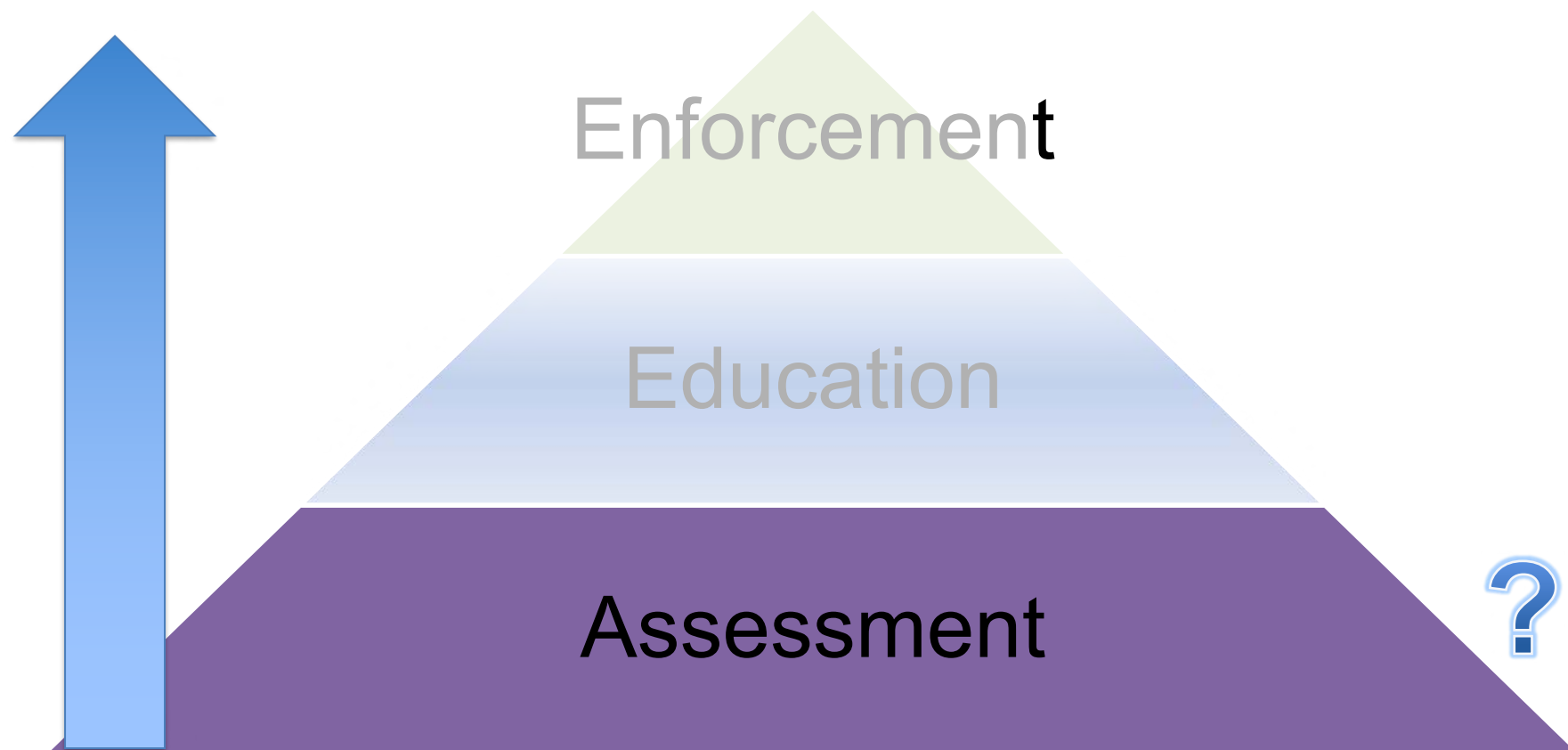
# BC approach: food safety plans (HACCP)

[http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/11\\_210\\_99#section23](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/11_210_99#section23)

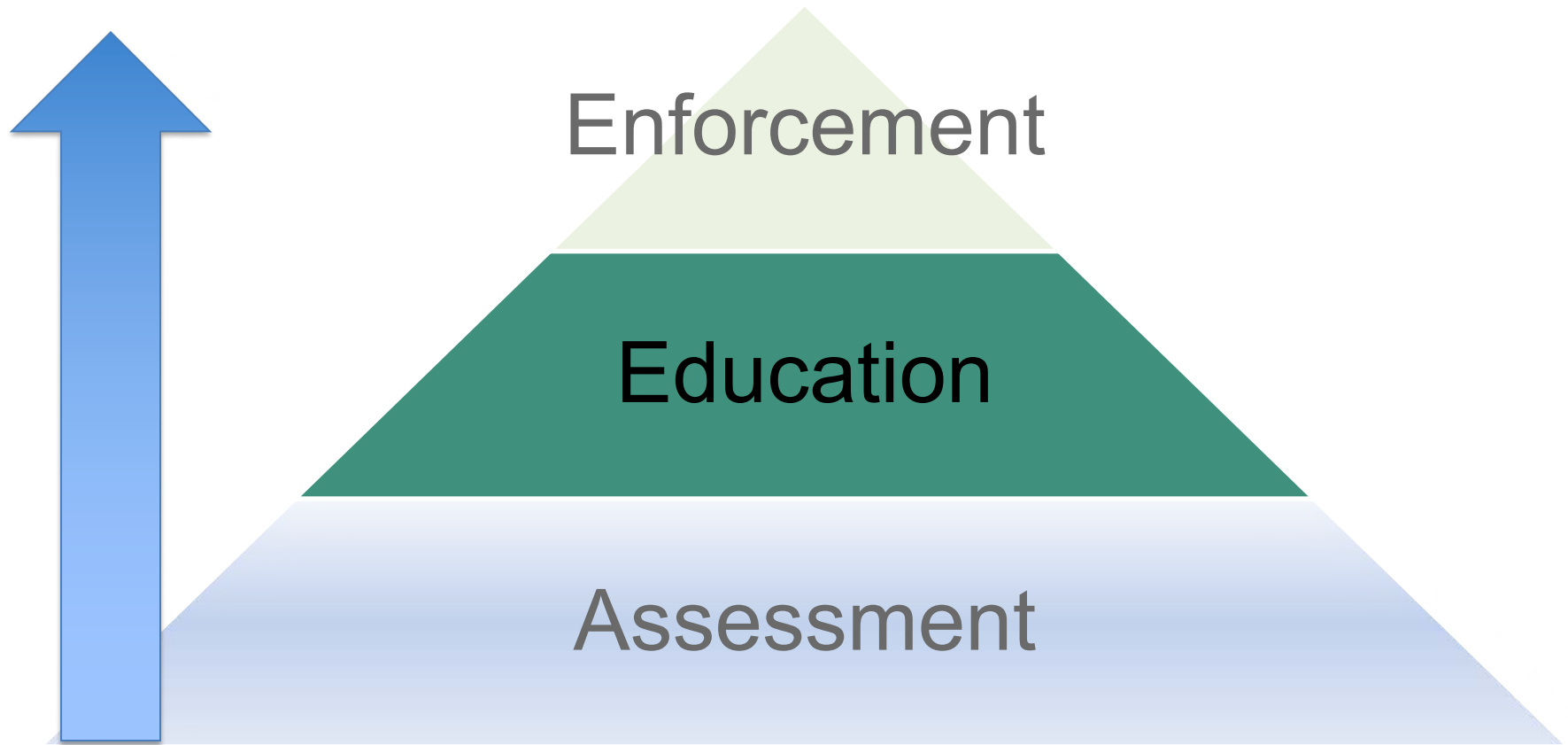
- BC requirements for food safety plans [FPR s. 23(4)]
  - s. 23: identify all health hazards, alcohol meets the definition of a health hazard
- Control of the hazard must be demonstrated
  - Testing of alcohol in product to end of shelf-life must show  $\leq 1\%$  ABV
  - Records must be available to inspectors



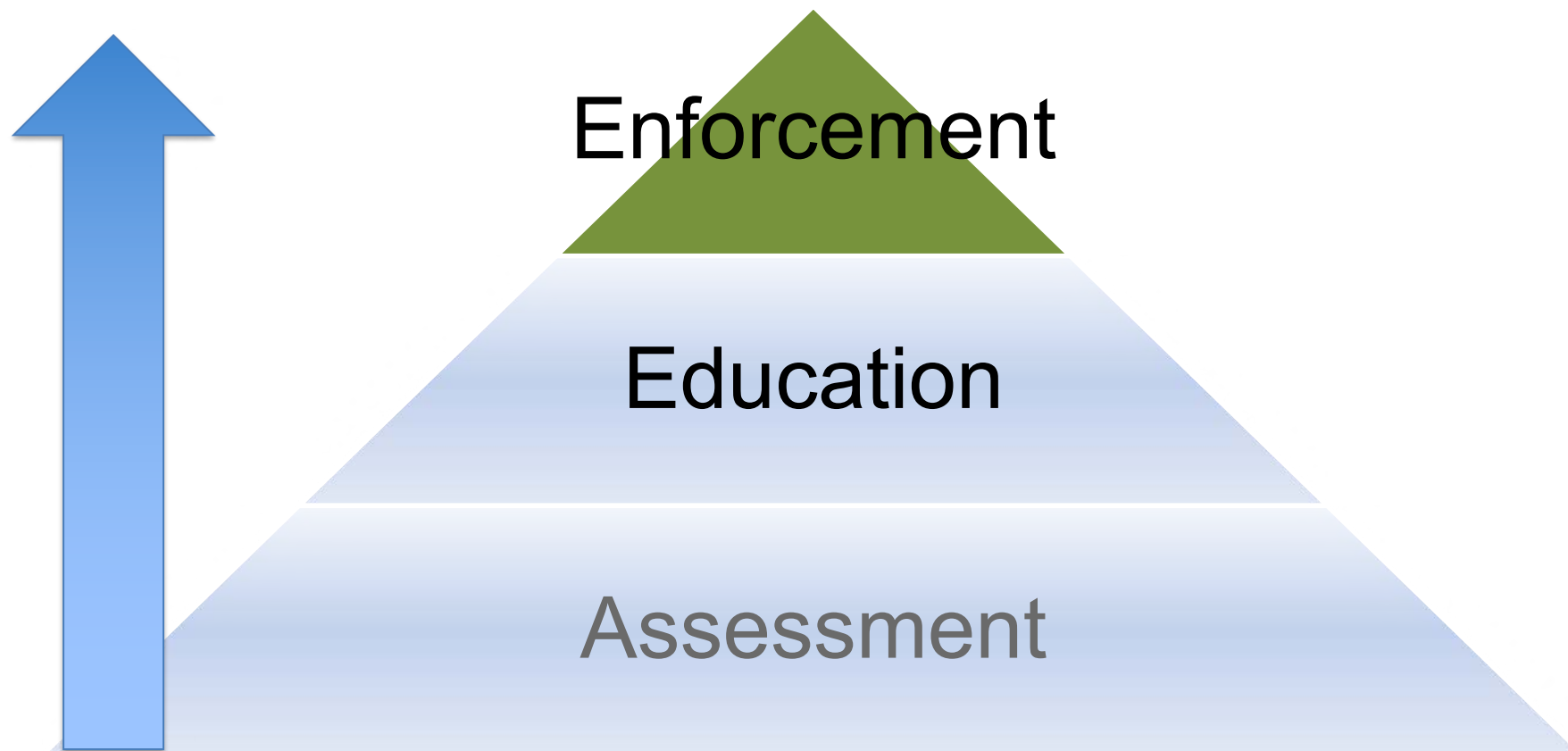
# Progressive enforcement model



# Progressive enforcement model



# Progressive enforcement model



# Kombucha alcohol risk in BC

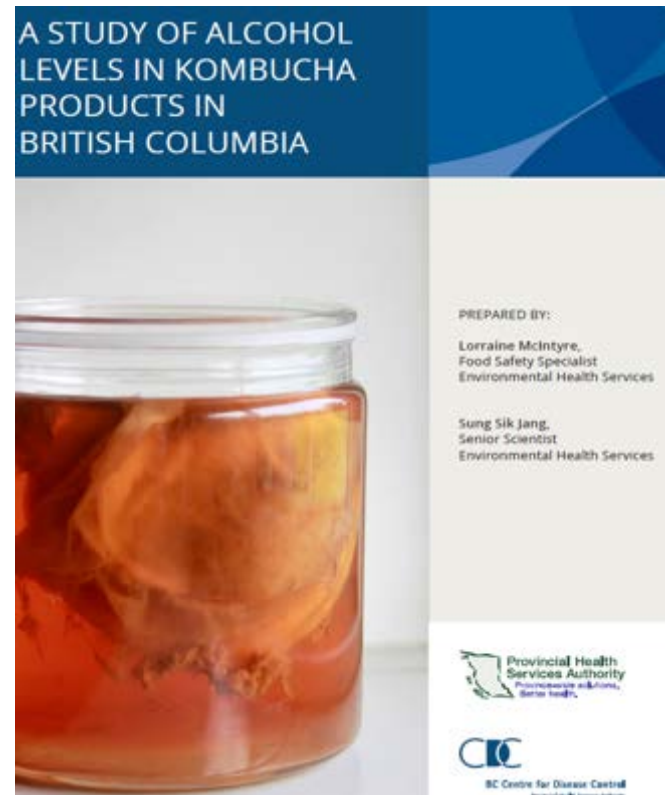
- Labelling
  - Informed consumers US 25% no warning  
BC 75% no warning
- Availability
  - Restrict access to alcoholic product Sold everywhere
- Informed consumers
  - Media campaigns to raise awareness Probiotics in kombucha,  
low awareness for ethanol?
- Product stability
  - Ethanol will not increase during consumer handling Evidence that ethanol increases



# Recommendations

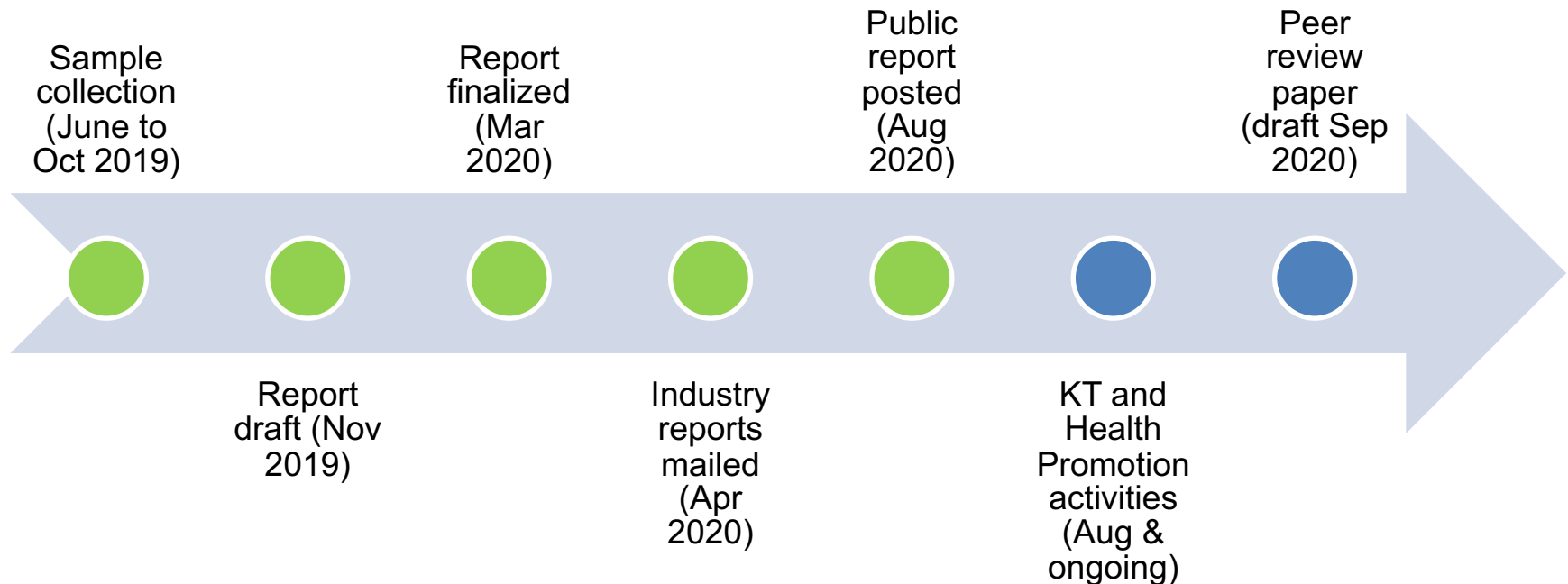
- Improved labelling
  - Consumers right to know what products have alcohol in them
  - Raw kombucha should be labelled “keep refrigerated”\*\*
  - Include precautionary labels
  - Better BBD labels
- Processors must test for ethanol
  - Demonstrate control during shelf-life and in the event of consumer mishandling

\*\* Required for PHF in Quebec



# BC Centre for Disease Control

Provincial Health Services Authority



<http://www.bccdc.ca/resource-gallery/Documents/Educational%20Materials/EH/FPS/Food/Kombucha%20report%202020.pdf>

# Team acknowledgements

Aljosa Trmcic

Sarah Henderson

Leela Steiner

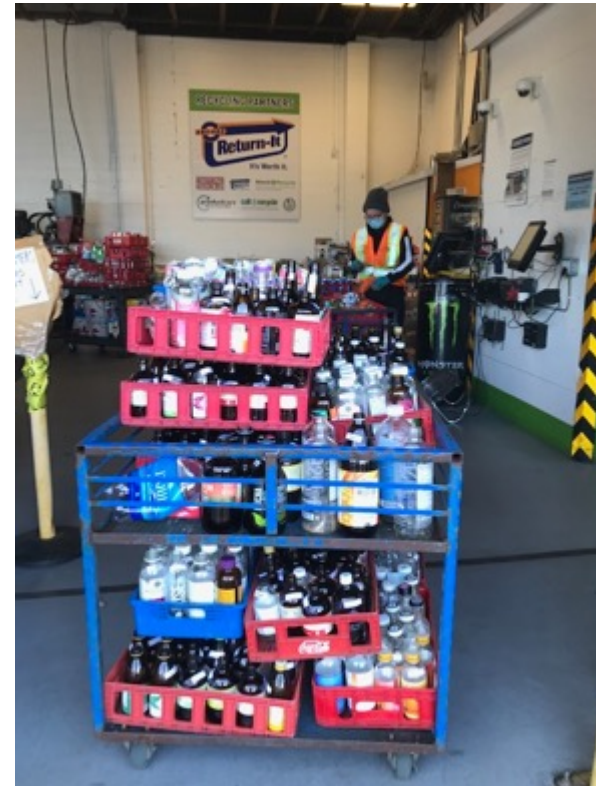
Amani Kafeety

Tom Kosatsky

David McVea

& everyone who purchased  
kombucha for our project!


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Gin Lee, PHSA Labs





FEBRUARY 2020


## A STUDY OF ALCOHOL LEVELS IN KOMBUCHA PRODUCTS IN BRITISH COLUMBIA




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Better health.

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Questions?