

Spirited Sleuths: Deciphering Congeners in Your Favourite Spirits

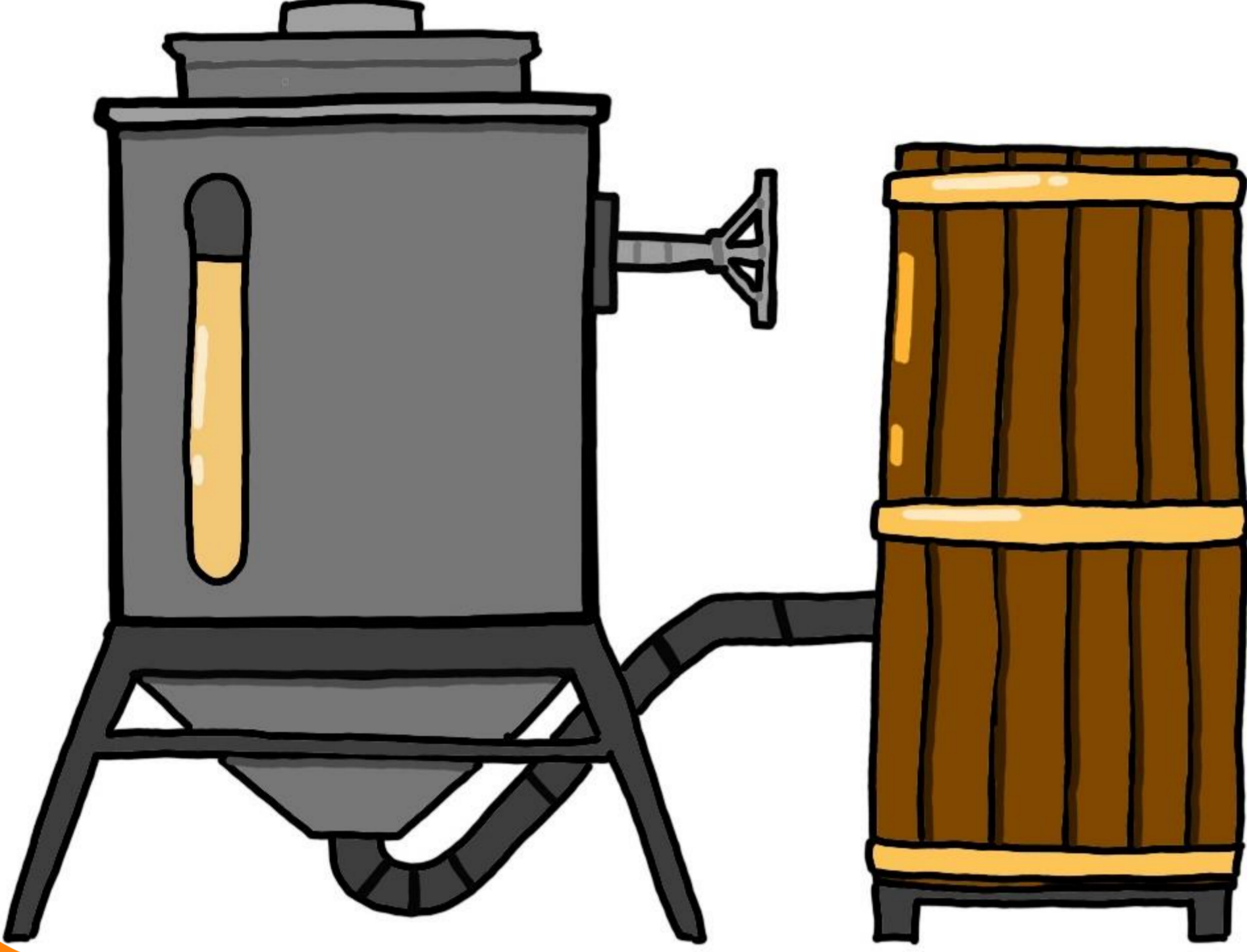
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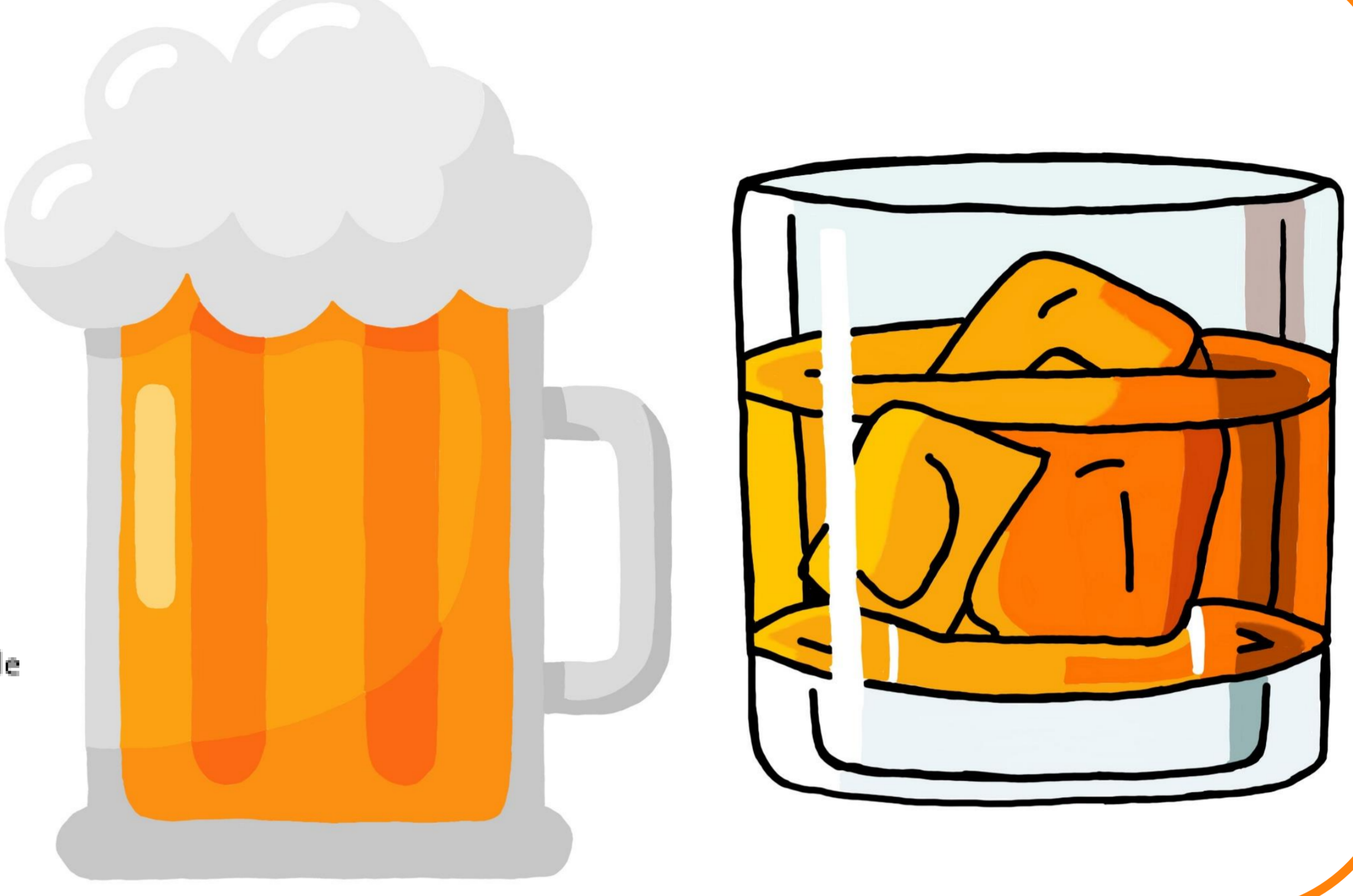
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What are congeners?

- Formed during the fermentation process
- Influence the unique flavour profile of fermented beverages



$$\begin{array}{c} R \\ | \\ H-C-NH_2 \\ | \\ COOH \\ \text{Amino acid} \end{array} \longrightarrow \begin{array}{c} R \\ | \\ H-C-OH \\ | \\ H \\ \text{Higher alcohol} \end{array}$$



$$\begin{array}{c} H_3C-C(=O)-O-R \\ \text{Acetate ester} \end{array}$$

$$\begin{array}{c} OH \\ | \\ CH_2-CH_2 \\ \text{Ethanol} \end{array}$$

$$\begin{array}{c} O \\ || \\ CH_3-C \\ \text{Acetaldehyde} \end{array}$$

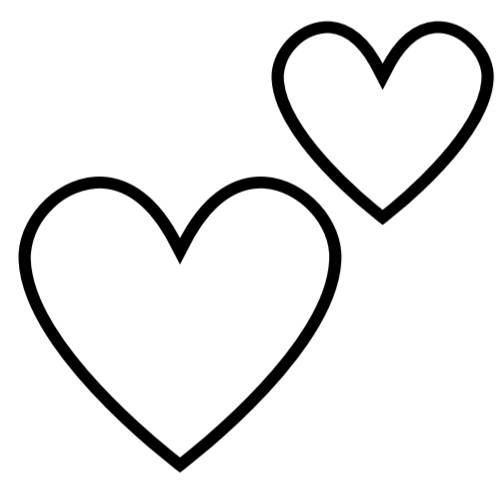
$$\begin{array}{c} CH_3-O-CH(CH_3)-O-CH_3 \\ \text{Acetal} \end{array}$$

Where they show up:



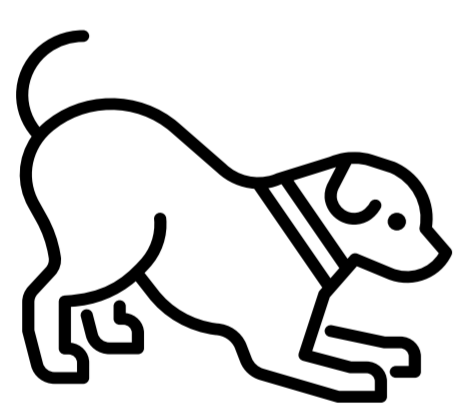
Heads

- Methanol
- Acetone
- Ethyl acetate
- Acetaldehyde
- Acetal



Hearts

- Acetaldehyde
- Acetal
- Ethyl acetate
- Higher alcohols

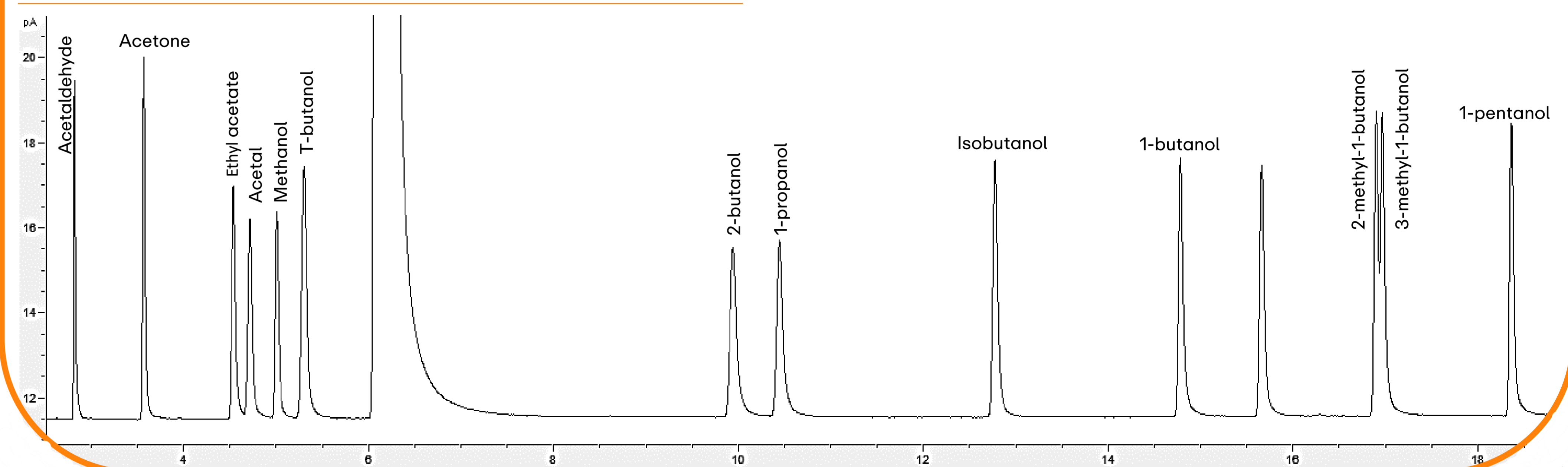


Tails

- Higher alcohols

How do we detect them?

Gas Chromatography Methodology		Beverage	Range (mg/L)	LOQ (mg/L)
Instrument	Agilent G1530A	Beer	15-1000	15
Detector	Flame Ionisation Detection	Spirits		
Injection type	Liquid			
Column	CP-Wax			



Thresholds:



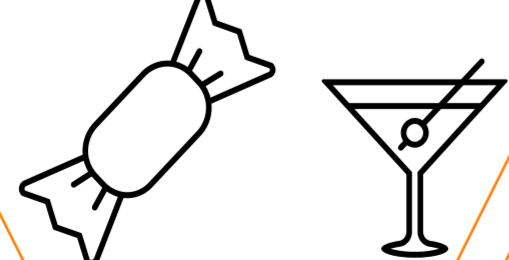
1-Butanol

Beer ST = 450 mg/L
Spirits ST = 2.7 mg/L



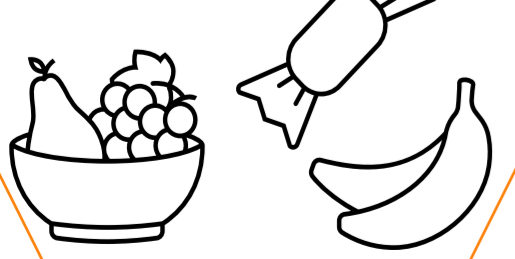
1-Propanol

Beer ST = 600 mg/L
Spirits ST = 54 mg/L



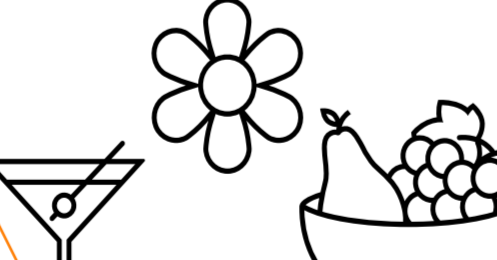
Isobutanol

Beer ST = 100 mg/L
Spirits ST = 75 mg/L



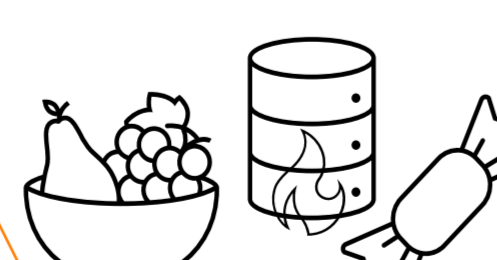
2-Butanol

Beer ST = 16 mg/L
Spirits ST = 50 mg/L



Ethyl Acetate

Beer ST = 25 ppm
Spirits ST = 8 - 33 mg/L



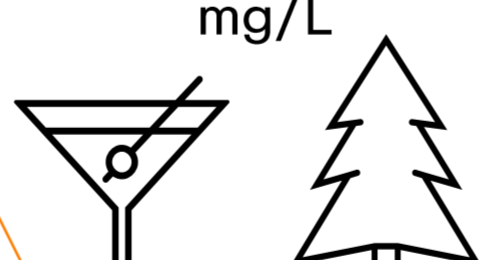
1-Pentanol

Beer ST = 80 mg/L
Spirits ST = 4 mg/L



Methanol

Beer ST = 100 mg/L
Spirits ST = 100 mg/L



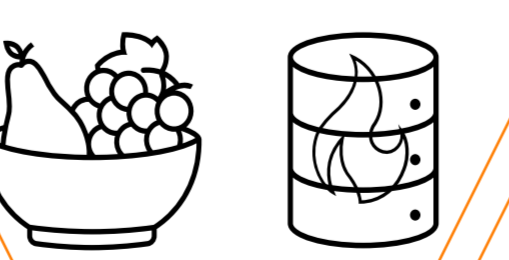
Acetal

Beer ST = NA
Spirits ST = 50 - 100 mg/L



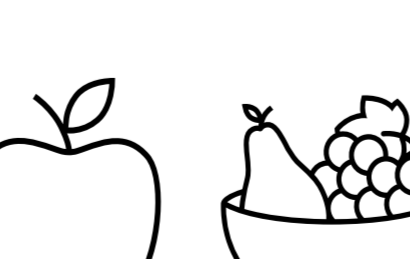
2-Methyl-1-Butanol

Beer ST = 50 mg/L
Spirits ST = 45 mg/L



Acetaldehyde

Beer ST = 10 mg/L
Spirits ST = 19 mg/L



Acetone

Beer ST = 200 mg/L
Spirits ST = >200 mg/L



3-Methyl-1-Butanol

Beer ST = 50 mg/L
Spirits ST = 56 mg/L



T-butanol

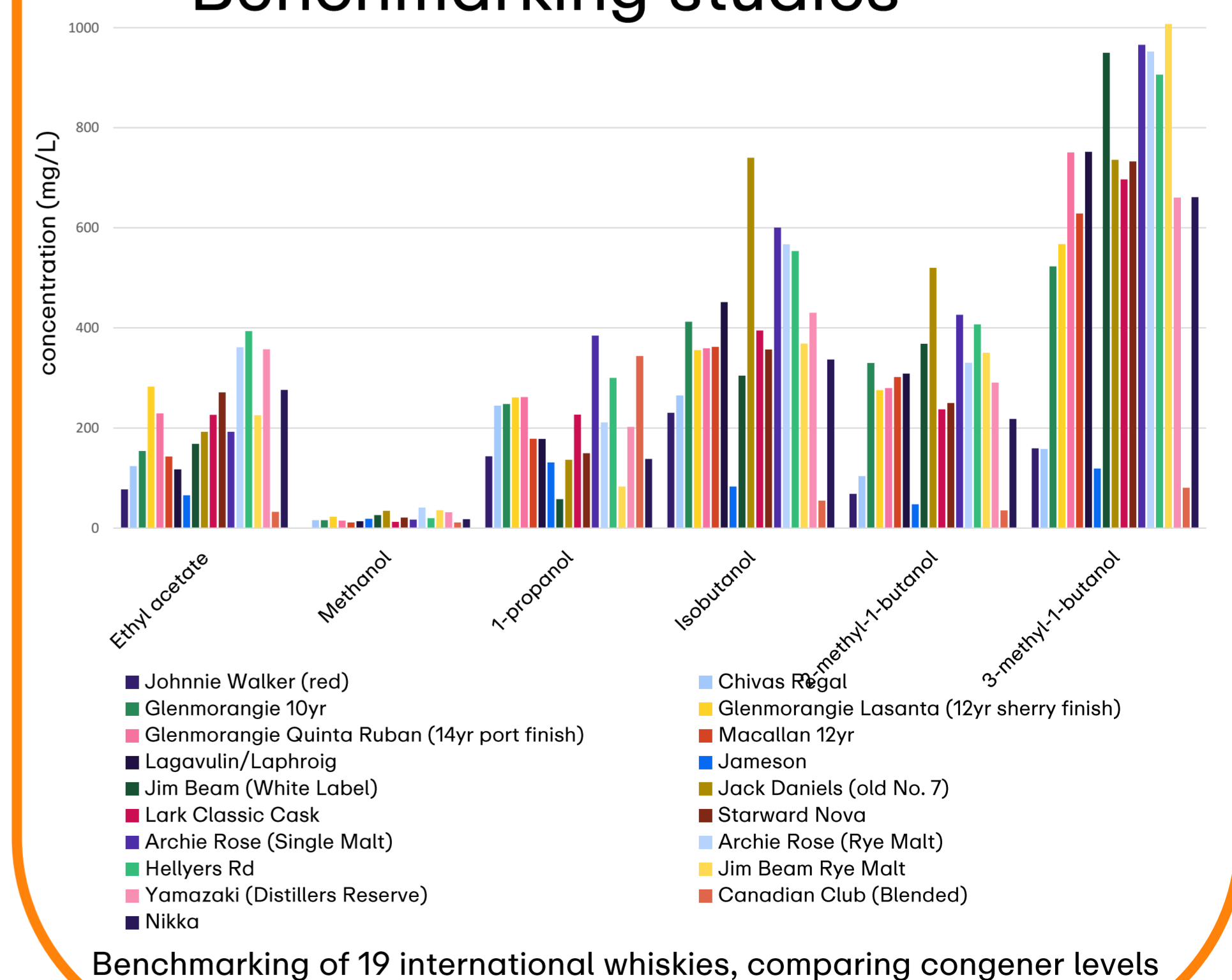
Beer ST = 1600 mg/L
Spirits ST = NA



ST = Sensory detection threshold

Applications:

- Regulatory requirements
- Product profiling
- Authenticity studies
- Benchmarking studies



Benchmarking of 19 international whiskies, comparing congener levels

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