

# BEER DRINKABILITY: SAPPORO SAYS!

## Sapporo!

**Sapporo:** adsorption of astringent tannins significantly increased in presence of peptides.

**Sapporo:** compounds found to adsorb include hop IAAs, NaCl, tartarate, glutamate & tannic acid.

**Sapporo:** "Full Body" = more adsorption of beer components on tongue and throat.

**Sapporo:** best drinkability occurs with "full body" during drinking and good "smoothness" after drinking.

**Sapporo:** "Body" & "Smoothness" drivers of "Pleasantness" with Japanese consumers. Hence their research interest in these.

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**Sapporo & Drinkability:** "Drinkability" has many phases: starts with appearance, then as the glass is lifted, the aroma and banquet. As liquid flows over the tongue and throat, the "body" of the beer (1st sensation) and the "smoothness" of the beer (second sensation) drive the perception of experience. "Dry" beer brands are very good at "smoothness". Research now focused on identifying component drivers of body (preferred when higher) and smoothness (preferred when receptors are cleansed quickly).

**Sapporo:** use "Lipid Coated Quartz Crystal Microbalance" to evaluate adsorption (and duration) of beer compounds on lipid membranes...with increased adsorption being viewed as good for "body" and short duration good for "smoothness".

**Sapporo:** "Good Smoothness" = less adsorption of beer components on the tongue and throat.

**Sapporo:** di- & tri-hydroxyoctadecanoic acids increased duration of adsorption, decreasing "smoothness", therefore less drinkable beer.

"Biometrics" & measuring swallowing with non-invasive means (e.g. x-rays are invasive!). Based on:

a) **Electromyograms** to measure movement/activity of inframandibular mouth muscles, b) **Pressure sensors** on the larynx to measure up & down swallowing movement of Adam's Apple and c) **Microphone** on the larynx for the sound of swallowing. Results were:

- i) "thicker", less drinkable beers had higher **electromyograms responses and slower larynx swallowing time,**
- ii) thin, more drinkable beers have lower **electromyograms readings and faster swallowing times.**

"Biometrics" & sensory metrics in consumer evaluations:

- a) "Light finish" = ready to drink again,
- b) "Drinkable" = can drink a lot,
- c) "You can gulp" = can drink large single gulps, and
- d) "Thick taste" = rich taste and texture.

"Human engineering studies"

## Beer Drinkability

"% **DOC (Degree of Comfortableness)**".....metric based on measuring fluctuations and localization of human alpha-wavelengths in the 8-13 Hz range in the four brain quadrants. Four are:

- a) Relaxed (front, left),
- b) Excited (front, right),
- c) Irritated (back, right) and d) Bored (back, left).

Combined, brain wave action in the front is considered more of a "pleasant condition", while the back is associated with "unpleasantness". Also, right side of brain indicates state of arousal (low or high), while left side associated with emotion/mood (relaxed vs. bored; positive vs. negative).

Subjects are hooked up in < 1 minute with a circular headband and then sampled beers. Findings were:

- i) canned peaches aroma increases DOC,
- ii) sweaty sock smells decreases DOC,
- iii) hop oils, specifically linalool (but not myrcene or alpha-humulene) increase DOC in 25-30 BU lager, leading to a state/response of increased relaxation and a lower state of arousal.

Sapporo's Kaneda: .... "combining psychology and brain science in order to enhance consumer qualification".... specifically evaluated beer & gustatorial stimulation (i.e. not aromas, textures, colors) by flowing over the tip of the "consumers" tongue inserted into an opening in a Teflon tube different streams of liquid i.e. a taste delivery system that is tactile free. Assessed the effect by using magnetoencephalography (MEG) which measures the magnetic field outside of the scalp with a superconducting quantum interference magnetometer. An equivalent current dipole (ECD) is mathematically calculated from the distribution of the magnetic fields on the scalp (set-up looks like a

1960's Copenhagen ladies hair salon). Practical findings:

- i) no differences in responses between water and beer,
- ii) water spiked with 100-400 ppm of IAA did elicit an ECD signal of @ equal intensity over this range of bitterness, traced to the transition between the parietal operculum and the insular cortex part of the brain.

"Successive swallowing is influenced by the sense of finish".

"Finish" = sense in your throat that you feel when drinking - measure via biometrics. "Light Finish" vs. "Full Finish" - former is more "drinkable".

Biometrics = Hirotaka Kaneda and Hidetoshi Kojima *et al* from Sapporo and Niigata University.

"Light Finish" ..... total nitrogen (over 20-80 ppm) and IBUs (over 5-30 IBUs) negatively correlate with this property of beer ( $r = 0.912$  and  $0.890$ , respectively).....preferred beers lowest in Bus and Total N.

More "drinkable" beers (lighter finish) based on a survey of lager beers revealed that in these beers:

- a) muscular activity is lower
- b) throat movements are quicker,
- c) involve less use of muscles.

**KANSEI** = psychological feeling towards, or image of, a product or brand.

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