

BJCP CEP Sensory Training Class

Order of samples:

1. Acetaldehyde

2. Acetic

3. Lactic

4. Almond

5. Papery

6. Butyric

7. Mercaptan

8. Spicy

9. Vanilla

10. Ethyl Hexanoate

11. Isoamyl

12. Ethyl Acetate

13. DMS

14. Diacetyl

15. Grainy

16. Metallic

17. Earthy

18. Caprylic

19. Infection

20. Indole

21. Bitter

22. Geraniol

23. Isovaleric

24. hefeweizen

Acetaldehyde



Described as:

- Freshly cut green apples, leaves.
- Also: acetic/cidery
- Both taste & smell

*Appropriate in American Lagers at low levels.

Causes:

- As a natural product of fermentation as yeast rids itself of waste carbon dioxide, precursor to ethanol. (Fruity)
 - As a conversion of ethanol via oxygen or bacteria. (sharper, acetic)
- *also plays a role in the production of some acetate esters (see acetic)

Fix:

- Cold storage (acetaldehyde will convert to ethanol as natural part of fermentation process.)
- Avoid needless introduction of oxygen/practice good sanitation

Acetic/Sour



Lactic Acid: tastes/smells of sour milk

Causes: Produced by Lactobacillus & Pediococcus bacteria introduced through:

- Low mash temp
- Airborne infection
- Unsanitized equipment post boil
- Can be used to lower mash PH

Appropriate in Sour Ales

Acetic Acid: tastes/smells of vinegar

Causes:

- Bacteria (e.g. Acetobacter; Clostridium) introduced through airborne infection typically during fermentation.
- Also produced by certain commercial yeast strains.

*Contributes to the production of certain esters (Ethyl Acetate, Isobutyl Acetate, etc)

Fix: proper sanitation, rolling boil of wort, inspect plastic for scratches. Use clean, healthy yeast, and keep air off fermenting beer.

Nuttiness



Described as: Bitter almond, marzipan, walnut, beany, or sherry like.

Causes:

- Oxidation, frequently in secondary or during bottling.
- Often in higher gravity beers
- Prolonged heat post fermentation
- Byproduct of some yeast strains
- Oxidized melanoidins

Appropriate in Old Ales &
Barley Wines

*not to be confused with nutty malt character
sometimes referenced in the style guidelines

Fix:

- Exclude air from secondary or aging.
- Avoid aeration during bottling
- Avoid prolonged exposure to heat

Oxidation



Described as (aroma & flavor): Cardboard, wet paper, rotten pineapple.

Causes:

- Produced as beer ages
- Hot side aeration
- Aeration introduced post fermentation
- Excessive aging
- High storage temps

Fix:

- Keep extra oxygen out of process. (Bottling/Kegging)
- Control of temp during aging/storage
- Use of airlock to reduce influx of oxygen

Butyric Acid



Described as (aroma & flavor): Rancid butter, putrid in high levels.

Causes:

- Produced by obligate anaerobic bacteria.
- Bacterial infection during production or packaging.
- Naturally occurs in animal fats (i.e. butter), develops in spent grain as well.
- Can play a role in desirable ester formation at low levels.

Fix: Proper and consistent sanitation practices.

Light Struck

Described as (aroma & taste):
Skunk/Mercaptan



Causes:

- Beer exposed to direct sunlight or ultra violet light.
- Use of clear/green bottles
(though brown is susceptible as well)
- Ultra violet light reacting with isomerized hop alpha acids producing sulfur compounds.

Fix: Use brown bottles & keep out of direct sunlight



Phenolic



Described as: Clove like, spicy, smoky, band aid (aroma & flavor). Can also be vanilla.

Causes: Wild yeast, sanitation issues, certain yeast strains. Formed during fermentation from precursor, ferulic acid. Can also be extracted from grain husks due to over crushing, over sparging, or sparging with hot or alkaline water.

Fix: Proper sanitation, change yeast strain, proper sparging, adjust grain mill crush.

Also **chlorophenols**: Plastic; medicinal.

Causes:

- chlorophenols in water
- Chlorine sanitizers
- Over sparging

Appropriate in smoked beers,
German wheat beers, some
Belgian styles.
(chlorophenols never appropriate)

Fix: Filter tap water/campden tablets (potassium metabisulfite), non chlorine based sanitizers, proper sparging.

Estery



Described as (aroma & Flavor):

- Ethyl Acetate: Fruity at low quantities. Solventy/nail polish remover at high
- Ethyl Hexanoate: Apple like
- Isoamyl acetate: Banana/ Pear
- Phenylethyl Acetate: flowery, honey, sweet

Appropriate in Ales,
Dopplebocks, and Eisbocks.

Caused By:

- Certain yeast strains/yeast stress (present in all beers at some level)
 - Formed from combination of Ethanol and organic compounds during fermentation
- Higher fermentation temps (in certain strains)
- Wild yeast, non food grade plastic (e. acetate)
- Higher wort gravity

Fix:

- Use different yeast
- Lower fermentation temp for certain strains
(Ales: low 60s/Lager: <50)
- Good sanitation practices
- Use food grade plastic
- Lower overall gravity of wort





DMS

Described as (flavor & aroma): Cooked corn, cooked vegetables or shell fish/oyster (high concentrations), also tomato juice (darker beers).

Causes:

- Bacterial infection
- Found in equipment or re-pitched yeast
- Low pitch rate or long lag phase can allow substantial growth.

Fix: Proper sanitation, clean/healthy yeast.

Acceptable at low levels in Light Lagers, Pilsners, Cream Ales, Dark Amer. Lagers

Causes:

- Precursors to DMS naturally present in malted grains. (S-Methyl-methionine/SMM)
- ineffective elimination of natural occurrence during brewing

Fix:

- Open, rolling boil for 1 hour
- Use wort chiller to cool quickly
- Proper pitching rates, clean/healthy yeast.

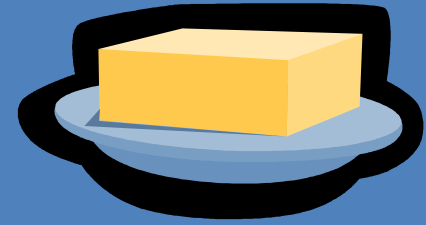
Quiz 1

Please pick any **two** of the following:

- DMS
- Estery
- Phenolic
- Light Struck
- Butyric Acid
- Oxidation
- Nuttiness
- Acetic/Sour
- Acetaldehyde

For each choice please *describe & discuss* characteristics, causes, and suggestions for control.

Diacetyl



Described as(aroma, flavor, mouthfeel): Butter/butterscotch, slickness on palate.

Caused By:

- Natural fermentation product from converted sugars during early stages of fermentation.
 - Yeast strain (amino acid synthesis)
 - Lower fermentation temps
 - More prevalent with high adjunct ratio
 - Premature racking/fining/lagering
 - Mutated yeast strain
 - Dirty draft lines
 - Can be indication of bacterial (*Pediococcus*) spoilage.

Appropriate in lower levels in: Scotch ales, Dry Stouts, English Bitters, Czech Pils, Oktoberfests.

Fix:

- Allow fermentation to complete.
- Adequate yeast starter
- Raise temp after early stages of fermentation.
- Keep yeast in suspension longer
- Good sanitation practices

Grainy/Husky w/Astringent



Described as (aroma, flavor): cereal, grainy, husk.

Astringent: astringent, powdery, dry, grape skin, tea bag.

Causes:

- Excessive grain crush
- High corn/adjuncts
- High sparge temp/excessive sparging
- Boiling grains/improper decoction procedures (grainy/Husky)
- Excessive tannin extraction (astringent)
- Mash PH exceeds 6.0/alkaline water (astringent)
- Hopping rates & low dextrin content may also contribute to perception of astringency
- Bacterial infection (Acebator)-(Astringent)

Fix:

- Proper crush
- Proper sparge
- Lower adjunct ratio
- Sanitation

Appropriate in: Light Lagers, Pilsners, N. German alt, Brown/Robust Porter, Dry Stout, Wheat Beers. (Astringent never appropriate)

Metallic



Described as (taste/odor):

- Metal/tin
- blood like

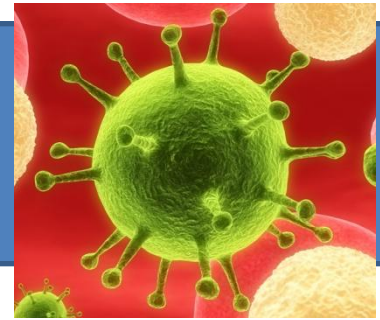
Causes:

- unprotected metals dissolved in wort
- Contact w/iron
- Lipids from malt or adjuncts
- High iron levels in water

Fix:

- Use only stainless steel
- Inspect ceramic coated pots for nicks
- Use high quality ingredients
- Filter/treat water

Infections



Described as:

- Earthy, damp soil, fresh dirt.
- Soapy, fatty, goaty, animal, sweaty. (caprylic)
 - May also be caused by breakdown of fatty acids in the trub, creating “soap”.
- Sour + buttery.

Fix:

- Proper sanitation
- Keep plastic/wood breathable containers out of moldy cellars.
- Rack beer off trub <4 weeks. (caprylic)
- Avoid use of soap as cleanser. (caprylic)

Fecal/Indole

Described as: Farmyard, fecal, can be jasmine like in smaller amounts.

*not to be confused with farmyard/horsey aroma produced by Brettanomyces yeast.

Causes:

bacterial infection in water, equipment, and/or yeast.
(only perceptible as fecal by half of population).

Fix:

Proper sanitation of equipment, sanitize water supply, use healthy yeast.

Hops



Described as (aroma, flavor, mouthfeel):

Largely dependent on variety. In this case floral.

Aroma hops: late addition hops or dry hopped. Extracted aromatic oils (terpenes, ketones, sesquiterpenes, etc)

Bitter hops: early addition hops, isomerization of alpha acids (humulone, cohumulone, adhumulone, etc.) Should be clean/pleasant w/o harsh or astringent character

Fix: hop aroma, flavor, and bittering can be greatly controlled by many things including: amount, time of addition, variety, wort gravity, and water profile.

Old hops:

Described as : cheesy, sweaty socks.

Cause: organic acids formed during improper hop storage or bacterial infection.

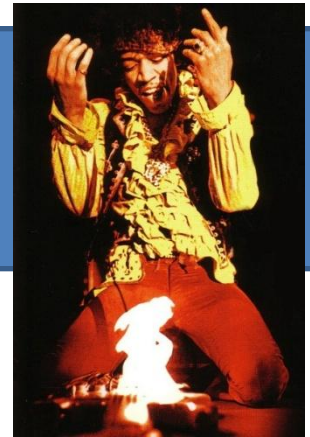
Fix: Throw out or try to age for use in lambics (if not infected).

Hefeweizen



- Top fermenting Bavarian wheat beer which employs a specific yeast species (*T. Delbrueckii*) that produces desirable phenols (clove) and esters (banana, bubblegum)
- Attenuation high/Flocculation low
- Temperature may play a factor in amount of ester/phenols (depending on the strain)
- Low diacetyl levels
- May produce higher sulfur levels
- Similar to Belgian/Belgian Trappist yeast strains in desired phenolic production

Alcoholic



Alcoholic (aroma and mouthfeel/flavor):

Hot, alcoholic, vinous, warming sensation in mouth and throat. Can be solventy at high levels, paint thinner.

Causes: Fusel oils produced during fermentation. Factors include:

- high amount of fermentable sugars
- high fermentation temp
- low mash temp
- yeast strain
- insufficient oxygen levels during yeast adaptation
- High nitrogen levels in wort

Fix: Cooler fermentation temp, aerate prior to yeast pitch, lower fermentable sugars, raise mash temp.

Acceptable in higher
ABV/ABW ales and lagers

Sulfury



Described as (aroma & flavor): Rotten eggs, sewer gas(hydrogen sulfide), burned matches(sulfur dioxide).

Causes: Sulfur Dioxide (SO₂) produced during brewing process, Hydrogen Sulfide mostly produced by yeast during fermentation. Can also be mutant yeast, bacterial infection, interaction with Mercaptans

Acceptable in low levels in some Lagers

Fix: maintain healthy yeast,

practice good sanitation, allow to dissipate through natural release of Co₂ in active fermentation, change yeast strain.

Sweet



Described as (taste): Sugary, cloying, syrupy.

Causes:

- Low attenuation/cold crashing.
- Presence of maltose and maltotriose, may also include glucose and fructose.
- Additions of sucrose, lactose, or dextrin malts can also contribute.
- Oxidation, esters, diacetyl may be perceived as sweet.

Fix:

- Use different yeast strain
- allow for full fermentation
- reduce amount of sugars and dextrans
- oxygen additions
- lower mash temp.

Appropriate in stronger ales and lagers

Brettanomyces

- Yeast strain which produces fermentation compounds described as barnyard, horsey, horse blanket.
- Viewed as negative for many years, but has gained in popularity.
- Spreads easily, recommended to have separate soft rubber and plastic equipment.
- Unique in aerobic fermentation yeast characteristic.
- Can produce high levels of acetic acid and ethyl acetate as well as perceptible levels of ethyl phenol derivatives.
- Recommended pitching rate far lower than ale/lager (200,000 p/ml)
- Increased oxygen key to substantial Brett growth. (12 ppm)
- Use in > 1.050 O.G. gravity beers only.

Quiz 2

Please pick **two** of the following:

- Brett
- Sweet
- Sulfury
- Alcoholic
- Hefeweizen
- Hops
- Fecal
- Metallic
- Grainy/Husky
- Diacetyl

For each choice, please *describe & discuss* characteristics, causes, and suggestions for control.

Sources

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