Acetaldehyde

Minnesota Home Brewers Association: Sean P. Hewitt 1/26/06

Edited by David Teckam and Brian Cooper 2009

Alcoholic

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Troubleshooting Characteristics- Acetaldehyde
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- Green apples -Jolly Rancher® candies - Grassy - can taste and smell acetic (vinegar)/ cidery - like latex paint at higher levels	Yes, at low levels	Light, Standard, Premium, and Dark American Lagers (from yeast character, and this is optional)	- Premature removal from yeast - Premature flocculation -Oxygen depletion - Bacterial spoilage - Oxidation	- Contact with yeast (avoid premature removal of yeast from beer) - Appropriate yeast strain - Aerate wort more prior to pitching - Practice good sanitation - Beer handling to avoid O2 contact - lagering reduces

Question T1 possibility

Troubleshooting Characteristics- Alcoholic
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- Hot, Spicy - Vinous aroma - A warming, prickling sensation in the mouth and throat -Can be harsh at higher levels (fusel)	Yes, but not fusel	Stronger ales and lagers. Specifically: - Barleywines - Doppelbocks - Eisbocks - Belgian Tripel - Belgian Golden - Strong Ale - Belgian Strong Dark - Old Ale - Russian Imperial Stout	- High amount of fermentable sugars - High fermentation temperature - Low mash temperature - Underpitching yeast - Low O_2 or FAN - Yeast strain	- avoid large amounts of kettle sugars - Lower fermentation temperature (below 70° F) - Increase mash temperature (for body fullness) - Pitch sufficient yeast quantity - Aerate wort more when pitching

Question T1 possibility

Astringent

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Bitterness

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Troubleshooting Characteristics- Astringent
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- Dry, mouth puckering, unpleasant - in mouthfeel - tannic sensation, reminiscent of grape skins or tea.	Acceptable to a low extent in some styles	- Dry Stout, Am. Stouts due to roast barley -Flanders Red and Lambics to a wine-like extent	- Extraction of tannins (overcrushing, oversparging) - Alkaline mash or runoff water - excessive hopping - dark grains - Polyphenols from acetobacter - Spices	- Don't overcrush grain - Keep sparge temp below 170° F - Keep mash/runoff pH below 6 - Reduce hop immersion times - Practice good sanitation - Reduce spice additions

Question T1 possibility

Troubleshooting Characteristics- Bitterness
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- will be tasted on the back of the tongue and the roof of the mouth for the most part - one of the five basic tastes	Yes	-IPAs - American and English Pale Ales -Stouts and Porters (due to roasted malt/grains)	- High hopping rates - Lengthy hop boiling times - roasted barley/malt	- Use less hops or hops with lower alpha acids - Reduce hop boil times - Reduce roasted grain/malt additions- filtration reduces bitterness

Question T1 possibility

Buttery

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Cardboard

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Troubleshooting Characteristics- Buttery
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma, Flavor and Mouthfeel - Diacetyl - High: Butter, Butterscotch - Mouthfeel, a slickness on the palate -A natural by-product of fermentation	Yes, at low levels	- Scottish Ales - Bitters - Czech Pilsner - Flanders Red -Oud Bruin	- Premature racking/fining/ lagering (removal from yeast before absorption) - Low ferment temperature - Certain yeast strains produce more, especially highly flocculent strains - Lactic acid bacteria (e.g. Pediococcus in presence of O2 - Underpitching of yeast	- Allow ferment to complete - Diacetyl rest following primary fermentation to absorb diacetyl (67 – 70℉ for 2-3 days after fermentation is complete - Good pure yeast strain - Practice good sanitation - Avoid oxygen after fermentation begins - Adequate yeast starter amount

Question T1 possibility.

Troubleshooting Characteristics- Cardboard
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
Oxidation A staleness - in Aroma and Flavor Initial: Cardboard, paper, wet paper Later: Wet cardboard, pineapple, rotten vegetable	No	N/A	- Aeration of hot wort - Aeration of beer during bottling - excessive age - High storage temperatures -Storage temperature fluctuations - excessive head space in bottle or secondary fermenter	- Quiet transfer of beer when siphoning or transferring - Purge fermenter, kegs, or bottles with CO2 before transfer / bottling- Serve beer in appropriate amount of time -Cool (<55F) storage temps -Proper head space in bottle or secondary fermenter

Question T1 possibility

Cloudiness

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Cooked Corn

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Troubleshooting Characteristics- Cloudiness
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Appearance - Cloudy, hazy	Yes	All Wheat Beers, Lambics - Roggenbier	- Poor, wrong, weak, low flocculating, or mutated yeast strains - Bacterial/ wild yeast contamination Chill haze: - Insufficient conversion time Permanent Haze: - excessive or high temperature sparge	- Lagering, recirculation before sparging, better racking procedures - Use well-flocculating yeast strain - Use fining agents - Use protein rest - Practice good sanitation - Reduce sparge temps - Use filtration

Question T1 possibility. Question T2 possibility.

Troubleshooting Characteristics- Cooked Corn
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- DMS (dimethyl sulfide) - in Aroma and Flavor - Vegetal (Sweet cooked corn, celery, cabbage, parsnips) - Shellfish or oyster-like in higher amount - Precursor S-methyl- methionine (SMM) occurs naturally in Pale malt, turns into DMS with heat, evaporates in boil	Yes	- American pale lagers - German pale lagers (from Pilsner malt) - Cream Ales	- Covered boil - not boiling wort for at least an hour - Slow wort cooling - Pilsner malt - contaminated yeast - Poor sanitation	- Open, rolling boil for an hour or more (1½ hrs. is typical) - Practice good sanitation - Quick wort cooling - use less corn - Ensure proper sanitation

Question T1 possibility

Fruitiness

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Light Body

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Troubleshooting Characteristics- Fruitiness
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- Esters - in Aroma and Flavor - Banana, red apple, citrus, strawberry, black currant, grapefruit, raspberry and pear, etc	Yes	- Ales (except for Irish Red Ale) - American Dark Lagers (very light) - Doppelbock (in dark versions) - Eisbock	- Alcohols combining with acids at higher temperature. (Ethyl acetate, Isoamyl acetate, Ethyl Hexanoate) - Yeast strain used - Higher fermentation temperatures - Low pitching rate - High-gravity wort	- Lower fermentation temperature (Ales around 65 F, Lagers around 50 F) - Choose a different yeast - Higher pitching rate - Lower gravity wort

Question T1 possibility

Troubleshooting Characteristics- Light Body
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- Watery - Weak - Light Mouthfeel	Yes	- American Light and Standard Lagers - Lambics - Berliner Weisse - Ordinary Bitter - Mild - Saison	- Lack of dextrins - Low-temperature saccharification rest - Large percentage of kettle sugar - Poor quality malt	- High-temperature saccharification rest (above 149° F). The higher, the more body - Use quality malt - Keep percentage of sugars small - Use dextrin, crystal or wheat malt.

Question T1 possibility

Grassy

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Husky-Grainy

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Troubleshooting Characteristics- Grassy
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma and Flavor - Fresh-cut grass - New-mown hay	Yes, as a hop character	- American Pale Ale - IPAs	- Poor quality malt - Poor storage of malt - Cracking grains well in advance of brewing - Some English and American hop varieties - Dry Hopping - Oxidation of alcohols creating hexanal and heptanal	- Good, fresh malt stored under airtight conditions - Cracking grains shortly before brewing - Choose a different hop - Don't over dry-hop

Troubleshooting Characteristics- Husky-Grainy
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma and Flavor - Cereal - Grainy - Huskiness - Spent grains Husky - Tannins from grain husks - 6-row malt can be more husky Grainy - starches in barley malt	No-Husky Yes-Grainy	None - Light Lagers - Pilsners - Northern German Alt - Brown Porter - Robust Porter - Dry Stout - Wheat beers	- Excessive grain crushing - High Sparge temperature - Excessive sparging - High water pH during sparging (above 7.0) - High mineral content in water - Boiling grains - Improper decoction mashing	- Proper crush - Lautering temperatures between 164-170° F - Proper sparge amounts - Monitoring pH of runoff (keep pH below 6) - Water appropriate to style - Steeping adjunct grains below 170° F - Temp. controlled or infusion mash

Low Head Retention

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Phenolic

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Troubleshooting Characteristics- Low Head Retention
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
Head dissipates quickly (to half the size in less than one minute) - Appearance	Yes	High Alcohol Beers such as - Barleywines - Old Ales -Bitters, Mild, Straight Lambic (due to low carbonation) -Berliner Weisse (due to acidity and low hop content)	- inadequate protein rest (excessive times can reduce too much protein) -not using a one-hour boil - insufficient or deteriorated hops - Dirty/oily/soapy glasses/equip-ment - low-temperature saccharification rest	- Adequate protein rest - Use more hops - Use clean well-rinsed glasses and equipment - good one-hour (+) (open) rolling boil (to extract the isohumulones) - Use cara-pils, crystal malt, malto-dextrin, wheat malts - High-temperature saccharification rest - Lower alcohol by lowering the grist bill

Question T1 possibility. Question T2 possibility.

Troubleshooting Characteristics- Phenolic

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma and Flavor - Clove-like - Black pepper - Smoky - Vanilla	Yes	-Belgian Tripel, Strong Golden, Blond (clove) -Belgian Dubbel, Strong Dark (spiciness) - German Weisse Dunkelweizen, Weizenbock, Roggenbier (clove-like) -Smoked beers (smoky due to smoked malt)	- Belgian and German wheat beer strains - Wild yeast - Smoked malt - Some yeast strains - Poor sanitation (bad phenolics) - Non-food grade plastic - Chlorophenols in water - Improper rinse of chlorine sanitizers - Oversparging; sparging above 170° F	- Use yeast less prone to phenolic production - Use proper yeast strains and malts - Use pure yeast strains - Practice good sanitation - filter tap water - Use non-chlorine sanitizers - Proper sparging while monitoring temperature and pH
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- Band-aid - Plastic - Medicinal Chlorophenolics -Chlorine	No			

Question T1 possibility

Lightstruck

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Musty

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Troubleshooting Characteristics- Lightstruck
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma and Flavor - Skunky - Mercaptan - Sulfidic (H2S) - Ultraviolet light reacting with isomerized alpha acids This is avoided in some macro-brews due to the use of isomerized hop extract	No	None	- Beer stored in clear or green glass bottles - Beer exposed to direct sunlight or ultraviolet light	- Store beer in brown bottles - Keep beer and wort out of direct light

Troubleshooting Characteristics- Musty
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
Oxidation of malt compounds - in Aroma and Flavor - Musty - Cellar-like - Earthy	Yes	- Bière de Garde (typically due to corking)	- Aeration of hot wort - Aeration of beer during bottling	- Quietly transfer of wort/beer when siphoning or transferring

Sherry-like

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Sourness

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Troubleshooting Characteristics- Sherry-like
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
Oxidation **- Sherry** **- Vinous** **- Wine-like** **- Old** **- Often accompanied by hazelnut or almond notes**	**Yes**	**- Barleywines** **- Old Ales** **- Weizenbocks** **- Oud Bruin** **- Wood-Aged Beers**	**- Oxidation of melanoidins** **- Long aging**	**- Create less alcohol by lowering grist bill** **- Serve beer younger** **-Store cooler**

Question T1 possibility

Troubleshooting Characteristics- Sourness
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- basic taste sensation **- in Aroma and Flavor** **-perceived on sides on the tongue** **- vinegar-like (acetic)** **- sharp (lactic)** **also** **-malic** **-citric**	**Yes**	**- Lambics** **- Flanders Ale** **- Berliner Weisse** **optional sourness:** **- American Wheat or Rye** **- Dry Stout** **- Witbier** **- Saison**	**Poor sanitation** **Acid-creating Bacterias (Lactobacillus, Pediococcus, Acetobacter)** **- Some yeast strains** **- Excessive acid rest** **- Mashing too long** **- Scratched plastic fermenter**	**- Practice good sanitation** **- Choose a different yeast** **- Shorter acid rest** **- Mashing for less than two hours** **- Use glass carboy or stainless steel fermenters** **- avoid excessive use of food-grade acids (e.g. lactic acid)**

Question T1 possibility

Solvent-like

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Sulfury/ Yeasty

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Troubleshooting Characteristics- Solvent-like
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma and Flavor - Pungent, acrid aroma - Harsh, burning sensation on the tongue, back of the throat - Acetone-like - Lacquer-thinner like - Turpentine - Ethyl acetate	No	None	- Wild yeast contamination - High fermentation temperatures - Lack of oxygen - Underpitching - Non-food grade plastic equipment	- Good sanitation of equipment - Cooler fermentation temperatures (below 70° F) - Proper wort oxygenation - Pitch sufficient yeast quantity - only food-grade plastic used

Troubleshooting Characteristics- Sulfury/Yeasty
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- in Aroma and Flavor - Rotten eggs - Yeasty - Meaty <u>Sulfitic- SO2</u> Struck match <u>Sulfidic</u> Hydrogen sulfide (H2S) Low level: Garlic, onion High level: burnt rubber, shrimp-like	Yes, although not really desirable	acceptable to a low extent in: - German Pils (can be from the water or the yeast - Dortmunder - Kölsch - ESB	- Lack of lagering - Lower fermentation temperature (Ales around 65 F, Lagers around 50 F) - Bacterial contamination - Wild yeasts - Yeast strain. Typical of lager strains -- old beer (yeast autolysis) - Rapid temperature changes to fermenting wort	- Lagering beer longer - Good yeast strain - Racking off sediment - Practice good sanitation

Sweet

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Troubleshooting Characteristics- Sweet
Most likely causes and best controls listed first

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
- Basic taste sensation - taste perceived primarily at the tip of the tongue - Due to the presence of reducing sugars - Sugary - Syrupy - Worty	Yes, but never at a cloying level	- desirable in most strong ales and lagers Moderate to high levels in: - Doppelbocks -Eisbocks - Strong Belgian ales - Low levels in American light lagers and Lambics	- Quick flocculating or Low attenuating yeast strain - High-temperature mash - Addition of dextrin malt, malto-dextrin, crystal malt - Addition of lactose or licorice - Poor yeast health - Premature lagering	- Yeast strain with good attenuation - Low-temperature mash - Reduce the grain - Reduce the amount - Add yeast nutrients, Proper wort oxygenation - Lagering, after primary fermentation

Troubleshooting Characteristics- x

Describe/Discuss	Ever Appropriate?	If so, what styles?	How is it caused?	How can it avoided/ controlled?
-			-	-