

Beer Off-Flavor Guide

How many times have you ordered a beer, or tasted one of your own, and thought "that tastes funny?" How do you know if that flavor is one you simply do not like, or if it is an off-flavor that is not supposed to be anywhere near the beer? Countless off-flavors are caused by all kinds of incorrect brewing and handling practices. We have put together a list of some of the most common off-flavors and their causes below.

Off-Flavor List

These are all of the off-flavors we have included. Their causes and descriptions are in separate subsections below.

- Acetaldehyde (Green Apple)
- Astringency (Puckering)
- Butyric Acid (Baby Vomit)
- Diacetyl (Buttered Popcorn)
- Dimethyl Sulfide or DMS (Canned Corn, Cabbage)
- Hydrogen Sulfide (Rotten Eggs)
- Isovaleric Acid (Cheesy, Goaty)
- Mercaptan (Rotten Vegetables, Skunk)
- Metallic (Metal, Blood)
- Oxidation (Cardboard)
- Sour (Tart, Peppery)
- TCA (Musty)

Acetaldehyde (Green Apple)

Acetaldehyde is present in all beers at low levels, but at high levels, it will impart a green apple flavor. It is produced by the yeast during fermentation as a precursor to ethanol. Oxygen can also convert ethanol back into acetaldehyde when it is present in packaged beer. Acetaldehyde can be avoided by pitching enough plenty of yeast, preventing any additional oxygen from entering the beer after fermentation, and utilizing a diacetyl rest to finish off the fermentation.

Astringency (Puckering)

Astringency is more of a sensation than a flavor, and you can describe it as puckery and tannic. It is a dry, almost powdery sensation, and altogether very unpleasant. It is caused by mashing grains for too long, allowing the mash pH to venture outside of 5.2 - 5.6, over-sparging, and excessive dry hopping. Astringency can be avoided by mashing for the correct time at the correct conditions and determining an effective hopping rate.

Butyric Acid (Baby Vomit)

This is as unpleasant as it sounds. If you ever order a beer and encounter this off-flavor, the brewery made a huge mistake in letting this go into distribution. Butyric acid is caused by a bacterial infection and can be avoided with proper sanitation practices.

Diacetyl (Buttered Popcorn)

Diacetyl smells like butter or buttered popcorn and can taste caramel-like in some cases. During fermentation, yeast produces vicinal diketones (VDKs), which the yeast reabsorbs at the end of fermentation. If fermentation is cut short and cannot absorb the VDKs, they will turn into diacetyl. This is why you will often see recipes call for a "diacetyl rest," which is when you raise the temperature at the end of fermentation to allow the yeast to clean up after themselves. Diacetyl is also a byproduct of bacterial infection, which can occur in draft lines if cleaning and sanitation are not as they should be. Diacetyl can be avoided with proper aeration during knockout, proper fermentation times, a good diacetyl rest, and proper cleaning and sanitation practices.

Dimethyl Sulfide or DMS (Canned Corn, Cabbage)

Dimethyl Sulfide, or DMS, comes from a compound (SMM) that is produced when the grain germinates during the malting process. It adds a sweet corn and cabbage flavor and is an off-flavor in most beer styles. DMS is more prevalent in lightly kilned pilsner malts and corn adjuncts and is released during the boil. DMS can be caused by a high moisture content in the malt, a weak boil, or slow cooling during knockout. It can be prevented by a vigorous boil of at least 60 minutes, rapid chilling of the wort after the boil, and good sanitation practices.

Hydrogen Sulfide (Rotten Eggs)

Hydrogen sulfide is present in all beers at differing levels, but too much will cause a rotten egg flavor and aroma. It is produced during fermentation, but the carbon dioxide that is also produced during fermentation carries away the hydrogen sulfide through the blowoff tube. This is why lager fermentation, which produces more hydrogen sulfide than ale fermentation, can sometimes smell like rotten eggs. Hydrogen sulfide can be controlled by ensuring a complete and healthy fermentation. It also helps to rack the beer to the secondary vessel as soon as fermentation is complete.

Isovaleric Acid (Cheesy, Goaty)

Isovaleric acid adds a cheesy, goaty flavor. It can be caused by a bacterial infection but is most commonly added when old hops are added to the wort. These old hops have had their alpha acids oxidized and instead of adding the bittering you'd expect, it adds a cheesy, musty flavor. This can be avoided by adding fresh hops, or at least hops that have been properly stored.

Mercaptan (Rotten Vegetables, Skunk)

Mercaptan forms at the end of fermentation when the yeast begins to metabolize. It can become even more pronounced if too many yeast cells begin to kill themselves off and will produce a skunk-like smell. It is more commonly known as the smell that is produced when beer is exposed to light. Even though some very large breweries distribute beer that has this characteristic (think green bottles), it is absolutely an off-flavor. It can be prevented by canning, bottling in a brown bottle, or keeping it out of light.

Metallic (Metal, Blood)

This off-flavor is most commonly caused when the beer comes in contact with metal components. If the brewery's water source comes in contact with non-inert metals or travels through old water pipes, it can transfer the metallic flavor into the beer in that way. This off-flavor can be prevented by treating brewing water, or by using stainless steel throughout the brewing process.

Oxidation (Cardboard)

Oxidation has been mentioned a couple of times above but on its own, has its own off-flavor. It causes a papery, cardboard-like flavor that is very undesirable. Oxidation is part of the aging process and cannot be completely avoided, but it can be slowed by keeping the product cold and rotating the stock often. In the brewing process, oxidation can be minimized by avoiding any additional oxygen and purging any packaging that comes in contact with beer with carbon dioxide.

Sour (Tart, Peppery)

A sour, tart, peppery flavor is added when there is bacterial contamination. This can be prevented by using good sanitation practices and ensuring healthy fermentation.

TCA (Musty)

TCA is always an off-flavor and has a damp, earthy, moldy character. It is usually caused by contaminated raw materials, or by brewing with equipment that has been improperly cleaned and stored. This can be avoided by using high-quality materials, properly cleaning and sanitizing equipment, and ensuring that nothing moldy comes into contact with brewing equipment.

Closing

This list is not exhaustive, but it does contain the most common off-flavors. Hopefully, you never come across any of these flavors, but if you do, now you will know what causes them and how to avoid them. If you would like training in detecting off-flavors, both BJCP and Cicerone have excellent beer judging courses and include off-flavor training. Cheers!