

Volume 1: Light-Struck Defect

What is light-struck defect?

Light-struck defect is a distinctive sulfide-like aroma. Affected wine loses its aromatic complexity, smells like leek, onion, cooked cabbage and other unpleasant aromas; its overall quality is reduced.

How does it happen?

Actors:

- *Light*: The blue part of the visible light spectrum is the most efficient at generating light-struck flavors, although ultraviolet light (below about 380nm) is capable of initiating this process as well. The critical wavelengths have been identified at 340, 380 and 440 nm.
- *Riboflavin= vitamin B2*. Riboflavin is naturally present in grapes (around 50-70 µg/L), as well as produced by yeast and released during cell wall autolysis. Concentrations in finished wines after fermentation rise to 110-250 µg/L and can go much higher for wines aged on lees.
- *Amino acids containing sulfur*: cysteine and methionine. These amino acids, naturally present in grapes, can be added as nutrients for yeast and are released by yeast during autolysis (lees ageing).

Reaction:

Light-struck flavor is due to volatile sulfide compounds produced by a photochemical reaction.

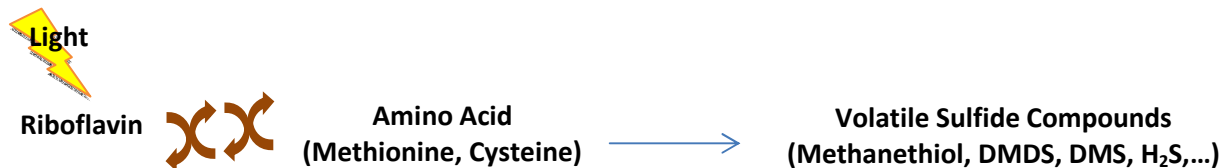


Figure 1: reactions of light-struck defect

Light stimulates riboflavin by putting it in an energetic state (excited). When the excited riboflavin reverts back to its normal (unexcited) state, it transfers its excess energy to sulfur containing amino acids causing oxidation, degradation and production of volatile sulfide compounds such as methanethiol and dimethyl disulfure (DMDS). Dimethyl sulfur (DMS) and hydrogen sulfide (H₂S) can also be generated under these conditions. All these molecules, which have a very low threshold, are responsible for skunky odors, cooked cabbage, onion and wet wool flavors. A relatively short exposure to light (few minutes) is sufficient to damage wine.



Table 1: threshold of sulfide compounds responsible for light-struck defect

Compound	Structure	Sensory Description	Threshold (ppb)
Hydrogen Sulfide	H ₂ S	rotten egg, drains	1
Methanethiol	CH ₃ SH	rotten cabbage, burnt rubber	1.5
DMDS	CH ₃ SSCH ₃	vegetal, cabbage, onion	10
DMS	CH ₃ SCH ₃	canned corn, cooked cabbage, asparagus	25

How to prevent light-struck defect?

Limiting the presence of riboflavin and sulfur containing amino acids, plus bottling in anti-UV glass will reduce the risk of the appearance of light-struck flavor.

The choice of the glass bottle is determinant; amber glass provides the best protection, followed by green then clear glass. In a clear glass bottle, light passes through the bottle and activates the reactions responsible for light-struck defect.

Reducing the amount of riboflavin, methionine and cysteine involves the full winemaking process:

- At clarification, the amount of riboflavin present in must can be reduced by bentonite fining. The most effective bentonite for reducing riboflavin is PLUXBENTON N. The reduction of the riboflavin content is proportional to the dosage of bentonite used.
- The yeast used during alcoholic fermentation has a strong impact on the level of riboflavin. ENARTIS FERM AROMA WHITE is a low producer of riboflavin.
- The nutrition strategy can impact the amount of aminoacids residual in the wine. After 4%(v/v), yeast does not consume aminoacids; any addition later than 1/3 of sugar depletion will increase their residual amount in wine.
- During lees ageing, the autolysis of yeast cell walls releases riboflavin and aminoacids. In order to prevent light-struck defect, lees ageing can be shortened and/or simulated it by adding yeast polysaccharides (which don't contain methionine, cysteine and riboflavin). ENARTIS SURLI ONE is an alternative to lees ageing and improves mouthfeel and smoothness of wine.
- Tannins can bind riboflavin and limit the sensitivity of wines; an addition of ENARTIS TAN BLANC before bottling helps prevent light-struck defects.



How to correct light-struck defect?

Some sulfide compounds, such as H₂S and methanethiol can be removed by copper addition. DMS and DMDS are not responsive to copper. However, ENARTIS TAN MAX NATURE can reduce some of these aromas and clean up wine flavors.

Which wines are sensitive?

White and rosé wines are most sensitive to light-struck off flavors. These wines are bottled in transparent glass that let light pass through and activate reactions. Their composition, especially with low tannin content, increases their sensitivity.