

### The chemistry of grilling

Why is steak red? And why does charcoal really make a difference?

**Is that blood in your steak? No.** – Steaks color comes from a protein called myoglobin, which has a pronounced red color. Myoglobin is found in muscle cells, where it stores oxygen to help provide energy.

State comes from slow-twitch cow muscle. These muscles are used for extended activity, rather than short bursts, so they have a lot of myoglobin to meet that continuous energy demand. Any red fluid you see coming out of your steak is likely water and myoglobin, not blood.

**What happens when you cook meat?** – Myoglobin is made of a protein and a heme ring, which contains an iron atom, both of which change when meat is cooked: The protein denatures, and the state of the iron changes. These transformations shift the color of meat from purplish/pinkish/reddish to tan/brown. Rare or medium-rare meats retain pink or red color because the myoglobin has not fully denatured.

Maillard reactions contribute to cook Meats color, too and its flavor. This complex set of simulate this complex set of simultaneously reactions between amino acids and sugars and pear a golden brown color and hundred of flavor compounds.

**Charcoal vs. gas** - Though gas grilling might be more convenient, it doesn't give you that classic "grilling" flavor that charcoal and woodchip barbecues do. For example, lignin – a structural molecule in woodchips – breaks down to form guaiacol, which helps impart a rich, smoky flavor. And in charcoal grills, sizzling drippings drippings from the meat can fall and rise back up as different flavor molecules.

\* Don't char your grilled meats!

Source:

<https://www.exploratoruim.edu/cooking/meat/INT-what-meat-color.html>

<https://cen.acs.org/articles/90/i40/Maillard-Reaction-Turns-100.html>

<https://guenuineideas.com/ArticlesIndex/srmeatmyoglobin.html>

<https://www.wired.com/2013/07/charcoal-grilling-is-objectively-scientifically=better-than-gas-2/>

[https://www.beefresearch.org/CMDocs/BeefResearch/PE\\_Fact\\_Sheets?Color\\_Changes\\_in\\_Cooked\\_Beef.pdf](https://www.beefresearch.org/CMDocs/BeefResearch/PE_Fact_Sheets?Color_Changes_in_Cooked_Beef.pdf)

Created by ACS with assistance from Shannon Ryan, ACS Productions.

**American Chemical Society**

1155 Sixteenth Street, N.W. Washington, D.C. 20036 T [202] 872-6042 F [202] 872 4370 [www.acs.org](http://www.acs.org)