Smoke Is A Seasoning

Meathead, AmazingRibs.com

Smoke is the spice that is not on your spice rack. There are three sources of smoke in outdoor cooking: Drippings, fuel, and wood.

Drippings of juices and fats, often laden with spices, vaporize when they hit hot surfaces, fly up, and land on the food, imparting aroma and flavor.

Fuel is the material that combusts to produce the heat. An electric grill produces no smoke or gases. A gas grill, when properly adjusted, produces water and carbon dioxide but no smoke. Charcoal is wood that has been preburned and converted to carbon. When it is just firing up it can produce a lot of billowing smoke, but when it is fully engaged and burning hot there is only a little smoke, unless the wood was not fully carbonized in the production process.

Wood pellet cookers burn pure wood sawdust compressed into pellets and they produce wood smoke, more at lower combustion temperatures.

Finally, there are logs, which produce the most complex and interesting aromas and flavors. Wood smoke is the essence of barbecue. When we aren't burning logs as fuel, we can get wood smoke by throwing wood onto our grills and smokers, even if they use electricity or gas.

How Smoke Flavors Meat

Wood combustion starts to take place in the 500 to 600°F range and requires significant amounts of oxygen. The actual temperature depends on the type of wood, how dry it is, and other variables. Let's call the average combustion point 575°F for the sake of discussion. The heat of ignition drives water and flammable gases out of the wood, and many of them burn if there is enough oxygen. The combustion of these gases is what produces flame. If all the gases combine with the oxygen, the flame appears blue, as in a well-tuned gas grill, and there is no smoke. If the gases don't burn completely, the flame glows yellow or orange. If unburned gases escape, they cool and turn into part of the smoke.

Smoke is complicated stuff, and there are different types. Smoke from burning wood contains as many as 100 compounds in the form of microscopic solids, including char, creosote, ash, polymers, water vapor, and phenols, as well as gases such as carbon monoxide, carbon dioxide, and nitrogen oxides. When these compounds come into contact with food, they can stick to the surface and flavor it. Most of the flavor comes from the combustion gases, not the particles, and the composition of the gases depends on the composition of the wood, the temperature of combustion, and the amount of available oxygen. As smoke particles and combustion gases touch the surface of wet foods like meats, they dissolve, and some are moved just below the surface by diffusion and absorption. Building up smoke flavor on the surface of food takes time. A thin skirt steak cooks in minutes, so it will take on less smoky flavor than a 2-inch thick ribeye steak will. A ribeye will have a less smoky flavor than a 3-inch thick turkey breast, and a 4-inch thick beef brisket cooked low and slow for 12 hours will pick up a ton of smoke.

Smoke And Food

Think of smoke as a seasoning, like salt. Use too much, and you can ruin the meal. In a smoker or grill, after combustion, the smoke rises and flows from the burn area into the cooking area. Some of it comes into contact with the food, but most goes right up the chimney and very little deposits on the food. Around every object is a stagnant halo of relatively cooler air called the boundary layer. Depending on airflow and surface roughness, the boundary layer around a piece of meat might be a millimeter or two in thickness. When smoke particles approach the meat's surface, small ones follow the boundary layer and go up the chimney. Only a few of the larger ones get through and touch down. We've all encountered a similar phenomenon while driving: Gnats follow the airstream over the windshield, while larger insects leave sticky green splats at the point of impact. To demonstrate the way smoke sticks to food, we did some experiments. We painted three empty beer cans white. We filled one can with ice water and left another empty, and both went into the smoker. The control sat on my desk.

After 30 minutes, both cans in the cooker had smoke on the surface, but the colder can had a lot more. That's because cool surfaces attract smoke, a phenomenon called thermophoresis. This is the

same phenomenon you see every morning after your shower. Small particles of moisture (steam) precipitate on the cool glass of the mirror.

Another factor was at play. The cold can also attracted water in the atmosphere and in the combustion gases, which condensed and ran down the can. Smoke particles stick better to wet surfaces. Similarly, if meat is cold and wet, it will hold more smoke. As the meat warms and the surface dries out forming bark, smoke bounces off.

Smoke Flavor Is Almost All On The Surface

Smoke particles glom on to the surface of foods. They may dissolve and penetrate a bit below the surface but rarely more than 1/8 inch into the microscopic fissures and valleys of the meat, because their molecules are too large. Meats are especially hard to penetrate. Taste the center of a pork butt and you will not taste smoke.

The Smoke Ring

Smoked meats often have a pink layer directly below the surface, nestled neatly under the crust. This is called the smoke ring. Alas, every year thousands of restaurant customers send back meat, especially chicken and turkey, claiming it is undercooked because it is pink. It is not underdone. Smoke rings have long been emblems of authentic wood-smoked barbecue. Backyarders know they have arrived when they make their first smoke ring. Barbecue aficionados look for smoke rings to prove the meat was wood smoked.

No matter what cooker you use, the secrets to a great smoke ring are all related to moisture.

1. Maintain high humidity in the cooker to keep a moist surface on the meat that will attract smoke. A water pan helps.
2. Maintain a steady, low temperature of about 225°F to minimize drying on the surface of the meat.
3. Add water manually by basting or spritzing the meat. Spritzing with apple juice or vinegar is a popular method.
4. Start with cold meat. Water vapor will condense on the cold surface like it does on a beer can on a sultry July day.

Myth: A Smoke Ring Is Caused By Billowing Smoke

Busted! You can actually make a smoke ring without smoke. Myoglobin, a pink pigment is meat, often turns gray when heated. But some compounds can prevent myoglobin from changing color. Curing salts, which have nitrites and nitrates, make corned beef and hams permanently pink. When smoking meats, invisible gases nitric oxide (NO) and carbon monoxide (CO) mix with wet meat juices and basting liquids and lock in the color of myoglobin. However, the dissolved gases cannot diffuse very far beyond the surface of the meat before the interior heats up. This dooms the myoglobin in the interior to its usual gray fate. As a result, pink smoke rings usually go only about 1/8 to 1/4 inch deep. As the meat cooks, the surface of the meat begins to dry and less smoke sticks to the surface. That's why putting a pan of water in a smoker helps create a smoke ring by giving the gases more moisture to stick to. In fact, some smokers, called water smokers, have built-in water pans.

For More

For more on what causes smoke rings, combustion and smoke, the different types of smoke, and charcoal, visit AmazingRibs.com

Meathead is the barbecue whisperer who founded Amazingribs.com, by far the world's most popular outdoor cooking website. He is the author of "Meathead, The Science of Great Barbecue and Grilling," a New York Times Best Seller that was also named one of the "100 Best Cookbooks of All Time" by Southern Living magazine. This article was excerpted and modified from his book. More on his book here: https://amazingribs.com/book. For 3,000+ free pages of great barbecue and grilling info, visit AmazingRibs.com and take a free 30 day trial membership in the Pitmaster Club.