

PeriodicGraphics

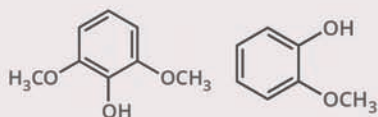
With Compound Interest

A collaboration between C&EN and Andy Brunning, chemistry educator and author of the popular graphics blog Compound Interest. To see more of Brunning's work, go to compoundchem.com.

THE CHEMISTRY OF BARBECUE

It's summer, so many of us are dusting off the grill and salivating at the thought of barbecue. Here, we take a look at the chemistry and compounds behind that delicious smoky flavor.

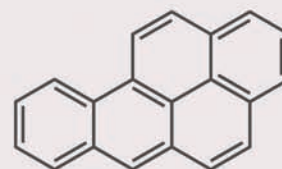
SMOKY TASTE & FLAVOR



When charcoal burns, phenolic compounds form. Syringol (left) is a major contributor to barbecue's smoky aroma, and guaiacol (right) plays a big part in its smoky taste.



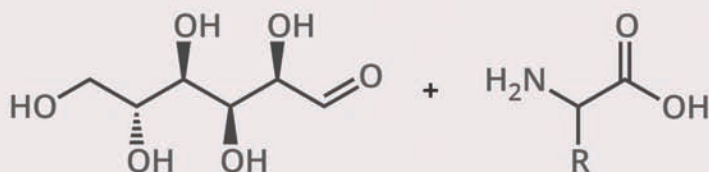
CARCINOGENS



AN EXAMPLE PAH

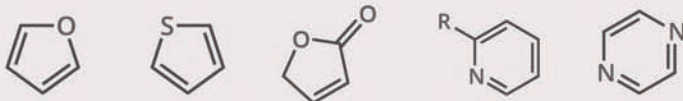
When meat cooks on a barbecue, fat drips onto the hot coals and forms polyaromatic hydrocarbons (PAHs). There are a number of different PAHs that can develop, including carcinogens such as benzo[*a*]pyrene (shown above).

THE MAILLARD REACTION

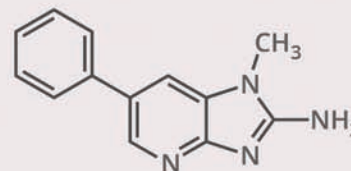


IN THIS REACTION, SUGARS (LEFT) REACT WITH AMINO ACIDS (RIGHT)

The Maillard reaction is responsible for the delicious flavors of barbecued meat. Sugars and amino acids in the meat react to form a range of products. Temperature, acidity, and type of meat all affect the compounds produced. Base structures of some general families of these compounds are shown below.



L TO R: FURANS, THIOPHENES, FURANONES, ALKYL PYRIDINES, PYRAZINES



AN EXAMPLE HCA

Heterocyclic amines (HCAs) are another class of carcinogenic compounds that form as meat cooks. These molecules concentrate especially in charred areas of the meat. Research has shown that marinating meat in beer can dramatically reduce the concentration of HCAs.



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