

## Barbecuing— A Scientific Technological Effort (BASTE)

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The fragrance of aldehydes, esters, and furans; the redolence of ketones glycerides and phenols—all are permeating the air with alluring promise. And Barry Commoner suggests that we be careful how we cook our hamburgers. Yet who doesn't salivate with Pavlovian response at the thought of denatured myofilaments and collagen and degraded glycogen and lipid. Yes, despite its hazards, scientists, as well as people, are irresistibly attracted to the barbecue. Thus I resolved to use my craft to remove the error—the haphazard component—which, when olfactory and taste organs are titillated to near ecstasy, converts beatitude to abject misery. The ruined barbecue is an affront to mankind. I have employed The Scientific Method to remove apprehension from the barbecue. Why not; after all Newton used it to discover apples; Galileo discovered the sun; Archimedes discovered baths. My conclusions are that the proper application of Scientific Barbecue Techniques will relieve tension, promote successful interpersonal relations, and provide a fuller life. It's also filling.

Bizarre and often contradictory secrets have been promulgated by various barbecue cults. Included are: instant shock heating, cooking for days, charring, dousing flames, marinating, foil encapsulation, and wearing Chef's hats and insulated gloves. Many of these ploys contain a portion of the Truth. But the true Truth is a simple one discovered by studying fire and flame propagation, smoke turbulence, pyrolysis, kinetics, protein denaturation, and of course, thermodynamics.

The author is a graduate of the Federal facilities at Lewisburg where he completed a 4-year rehabilitative program. At that time his epicurean tastes were largely institutional (i.e., dead). The Ph.D. was acquired at Los Angeles by clearing intake tubes leading to a Hyperion activated sludge plant, where his work rapidly caught the eye of administration, who said, "He really does Pile it Higher and Deeper." His unorthodox attitudes toward society are largely responsible for his current work. States the author, "Being on the lam keeps me moving and I find myself compelled to cook outdoors on frequent occasions." In addition to serious subjects such as "Tailoring surfaces with Silanes" (q.v., CHEMTECH, Dec. 1977, p 766), a nominee for the Leo Friend Award for which Barry has gotten some 400 reprint requests.

Appropriate (or otherwise) statistical analysis helps, too. The conclusion can be stated simply in three sentences. I'm not going to do that yet.

As a True Scientist, I'd first like to explain the mechanics of the fire. It is prerequisite to cooking. Its key is control. An hibachi is hard to beat for convenience of control. Coals should be on a grate with controlled draft, not a solid pan. Cooking should be effected on a single layer of coals. However, coals are best lit in a mound. This produces a fire at the level of the coals with a temperature of 1200–1400 °F. When the coals are about a third covered with ash, fire propagation is assured, and sufficient un-ashed coal is present to contribute to the smoking of the delicacy in preparation. The draft should then be reduced and the coals distributed evenly over the grate. This produces a 750–950 °F cooking fire.

For steaks, hamburgers and hot dogs the distance between grill and fire should be adjusted to a point where the grill's surface temperature is 325–375 °F. If you can hold your hand 1 in. above the grill for 4–5 seconds before it's fried, the temperature is right. (The Department will henceforth not consider appropriation requests for pyrometers, thermocouples, etc.) Since the ablative nature of chicken skin is well known, chicken should be cooked at 375–450 °F, i.e., your hand lasts only 1–2 seconds an inch above the grill.

As meat cooks, it undergoes changes in structure, and juices are driven from it. If the juices fall onto a surface sufficiently hot, they break down to good flavored volatile substances. These substances form a "smoke," which permeates and flavors the meat as it cooks. Any cooking

method which promotes the formation of juices, and allows the meat to be smoked long enough, is bound to work.

If the juices ignite when they hit the coals, the combustion products give meat a sour taste.

Marinating and basting helps, since it adds juices. The flavor of the meat will differ from that of the marinade, since the marinade breaks down to smoke, which flavors the meat. Basting is helpful, because it both adds juices and lowers the surface temperature of the meat and extends smoking time.

Now I'd like to present a recipe to illustrate the underlying principles of scientific barbecue technique. Coincidentally, this is the recipe my mother uses.

Sprinkle meat to taste with salt seasoned with dried garlic, onion, sugar, paprika and a touch of turmeric or mace. (Commercial salt blends are OK.) Place the meat in a flat dish and pour over it a marinade prepared by shaking two parts vegetable oil and one part vinegar with some dried garlic, lemon juice, white pepper, cayenne, and celery seed. Most commercial Italian dressings are acceptable for the marinade. Though traditionally quantities used here seemed to have been measured in Schtupps, about 6 oz will do for three 10-oz steaks. The meat should stand for a minimum of four hours at room temperature or a maximum of one day in the refrigerator.

Before placing the meat on the barbecue, *baste the grill with the marinade to initiate the smoking process.* Place the meat on the grill, turning it and basting it every 3–4 minutes. Cooking time for 1/2 in.-thick steak is  $17 \pm 3$  minutes. Cooking time for chicken is  $40 \pm 5$  minutes. Even if you like steak well-done (fool!) don't burn it with flames, cook it with heat. Chicken should be cooked until parts of the skin are deep brown.

As a scientist, I find it important to maintain a professional mystique while cooking, especially if laymen and laywomen are present. Accordingly, I wear a lab coat, goggles, and a chef's hat. The image is amplified by deftly tossing garlic buds or bay leaves onto the coals about two minutes before cooking is complete. And then, when it is, I point a cooking implement toward the sun and chant

IWANNA  
GUDBAR  
BECUTU  
DAY

This enhances aroma.

