Charcoal and How to Make It

By Dan Gill, Ethno-Gastronomist

Way, way, way back even before modern man evolved, our precursors discovered fire. After a few painful encounters, they learned how to manage, preserve, transport and rekindle fire and how to cook meat. Along the line they also discovered that if they covered live coals with dirt, thereby excluding air, they could make charcoal. It was light, easy to transport and store and easy to relight. They soon realized that charcoal is a concentrated source of heat that is better for cooking than raw wood because it gets hotter and there is very little smoke. Charcoal can even be used in a shelter or cave provided there is enough ventilation to avoid a buildup of deadly carbon monoxide gas. This is why teepees and yurts work so well. As man learned to control fire and smoke, barbecue, the epitome of Neanderthal cuisine, became a possibility.

Charcoal is simply wood, or other organic matter, burned to coals and then deprived of oxygen to stop pyrolysis, or raw organics heated in an oxygen-deprived retort until nothing is left but char (carbon). Properly made it burns hot and clean with little smoke, ash or flavor as most of the volatiles associated with harsh smoke have been burned off: Therefore it is the best heat source for grills, smokers and barbecue pits. Primitive man also learned that if air is forced through burning charcoal, it can produce enough heat to melt some rocks and separate metals. Gold, silver, copper, bronze, iron and steel were all initially extracted from rocks in charcoal-fired furnaces. Metals were then softened in charcoal-fired forges to be worked into useful or artistic objects.

Until the Industrial Revolution, charcoal was the primary and preferred fuel for metalworking. Vast forests were cleared in Europe and then America to feed furnaces and forges. *Colliers* made charcoal by arranging wood in large piles and covering them with soil or sod, leaving some holes at the bottom for air and a chimney in the middle for combustion gasses to escape. These piles or *clamps* were then lit from the top and the burn controlled until the wood became charcoal. This was dirty and dangerous work. The pile had to be *jumped* during the burn to compact the coals and if the collier broke through the soil covering, he could also become charcoal. Back in the ‘50s, when I was coming along and outdoor cooking was getting popular, there was an old man up the road from us who still made hickory charcoal the old-time way and sold it in burlap bags. Charcoal clamps are now things of the past in the United States and most of Europe but can still be found, contributing significant amounts of greenhouse gasses, in many developing areas around the world.

Though the best charcoal for cooking is made from hardwoods such as hickory, cherry, oak or mesquite, it can also be made from practically any organic matter: Agricultural waste, bones, coconut shells, bagasse (sugar cane stalks), waste wood or logs and even the occasional dead cat, though they tend to be somewhat difficult to relight. Each type of charcoal has specific uses: Amazonian natives created rich, productive soil (*terra preta do índio* or Indian black earth) by charring agricultural waste and household refuse in trenches; Charcoal can be powdered and used as a dietary supplement for digestive

ailments; Activated charcoal is used to absorb and remove ingested toxins; Ground charcoal is mixed with sulfur and potassium nitrate (saltpeter) to make gunpowder [Historical note: *Early settlers in Virginia were required by law to save urine to be shipped back to England for making gunpowder*]; Amateur and professional pyrologists use grapevine and willow charcoals for sparkling displays; Blacksmiths and steelmakers still prefer charcoal over coal or coke because it burns hotter, is low in sulfur and is a good source for carbon in making steel; and less-than-perfect moonshine can be run through an activated charcoal filter to remove impurities, then stored in glass jars filled with under-cooked charcoal to mellow and polish (don't ask).

Good charcoal is hard to find but easy to make at home. There are two methods for making it: direct and indirect. The direct method uses heat from the incomplete combustion of the organic matter that is being charred. The rate of combustion is controlled by regulating the amount of oxygen allowed into the burn and is stopped by excluding oxygen before the charcoal itself begins to burn. This is the ages-old method used by colliers to make charcoal in a pit, pile or clamp, or more recently in metal or masonry chambers (kilns). The easiest way to make charcoal at home is simply to burn wood down to coals and then to exclude oxygen by covering with soil, or by placing the hot coals into an airtight container until cool. When camping, I will collect good hot hardwood coals from the campfire and put them in my smoker with the dampers closed until they cool. Larger quantities can be made in a 55-gallon drum using the "top down burn" method. [Note: *Whether burning wood in a campfire, wood stove, fireplace or masonry heater, the top-down fire building technique is far superior to the traditional bottom-lit method in that it is easier, more reliable and cleaner-burning. It enables more complete combustion of the gases, resulting in less smoke, less wasted heat energy, and faster, hotter burns. If regulated properly, the burn zone advances slowly down through the wood using the available oxygen and thus preventing the coals above from burning to ash.*] Remove the top of the drum and knock a few holes in the bottom for air, fill with split wood up to three inches thick, top with kindling and light with newspaper or hot coals. Once the fire is going good, replace the top loosely (a chimney with a damper is helpful here) and let it burn until there is no more smoke, only clear shimmering waves of heat. Cover the bottom holes with dirt to stop the burn, tighten the top or close the damper and allow the drum and contents to cool several hours or overnight to prevent re-ignition.

Deleted: basic

The indirect method uses an external heat source to "cook" organic matter contained in a closed, but vented chamber (retort). This is usually carried out in a metal or masonry chamber (furnace). The indirect method results in a higher yield of high quality charcoal with less smoke and pollutants and requires less skill and attention than direct burns. When I got serious about barbecue and needed good, clean charcoal, I developed a procedure to make my own using a 30-gallon drum as the retort and a 55-gallon drum for a furnace. This arrangement is environmentally sound because all of the volatiles and pollutants are directed into the fire and burned, providing additional heat to drive the reaction. Alternatively, they may be captured and separated for other uses. In more permanent configurations, waste heat may also be recovered in the form of hot air or water with a heat exchanger or water jacket.

The basic procedure is quite simple: Drill five or six 3/8” holes in the bottom of a 30-gallon drum (retort, small drum). Larger or smaller drums may be used for the retort, but the larger the drum, the lower is the surface to volume ratio and the longer it takes to burn, requiring much more energy. The relationship is not linear so a 30-gallon drum is optimum and a 55-gallon drum is the practical maximum. Cut a hole about 8” high by 12” wide in the bottom side of the 55-gallon drum (furnace, large drum) for stoking the fire – save the cutout for controlling airflow during the burn. Optional – attach a three foot section of 4” stovepipe with damper to the furnace lid. Prepare the wood so that billets are less than four inches thick – length is not important as long as the billets can be packed into the smaller drum efficiently. Pack the small drum with wood and secure the top (it is helpful to leave the lid off or cracked on the smaller drum during the first third of the burn while white water vapor is being released). Place the retort on three firebricks laid on edge in the larger drum. Place the lid on the furnace and open the damper – or leave the lid askew or slightly raised if you do not use a chimney. Lay a fire under the retort and light it – I also slip pieces of wood between the two drums initially. As the wood heats in the retort, the smoke will be white from water vapor, then mostly clear as the wood starts outgassing. If everything is right, combustible gasses will be forced out under pressure into the fire. When it really gets going it sounds like a jet engine. When outgassing stops and no flames are coming out of the holes in the bottom of the retort, the burn is complete. If the top fits tightly, the retort can just be left in place to cool – not enough air will enter the bottom holes to ignite the charcoal. Alternatively, the retort may be removed and placed on dirt to block the holes. When cool, dump the charcoal into a wheelbarrow or whatever. It should be uniformly black with no brown centers and should tinkle loudly when handled. If you have any brown centers save them for polishing moonshine.



Timing is important. Plan to start your burn on the hottest, muggiest day of the year with a comfort index of at least 105 and air quality just above the minimum to sustain life. These conditions won't affect the charcoal process at all but will ensure that the experience is memorable.

Note: *Since I initially published my web pages on “How to Make Charcoal at Home” back in 1998, they have become cult classics steadily attracting ten times as many hits as any of my other writings. Visitors come from all around the world, mostly from the United States but also many from China, Asia, Africa, Russia and South America. There are now large numbers of web pages, including university studies, describing systems suspiciously similar to my original work, but no credits. I went on to design a system*

based on 55-gallon drums and I fabricated interchangeable steel bases and lids with detachable legs, gas burners, and provisions for gas recovery, all made from readily available materials. The invention was aimed at developing countries where there was a need for efficient and portable charcoal production equipment that could be used in the field. I seriously considered patenting and marketing the system in South America, Asia and Africa, but decided that I did not want to spend the rest of my life defending patents for a process as basic as charcoal making.

Charcoal, as used to make barbecue, is primarily a source of consistent heat. Therefore, if you purchase commercial charcoal, you are really buying BTUs (British Thermal Units), a measure of heat content determined by the percentage of fixed carbon. Natural briquettes and lump charcoals contain significantly more BTUs per pound, burn considerably longer and produce much less ash than the commonly available and cheaper "formulated" briquettes, which usually contain non-organic fillers. There is also a wide variation in the quality of natural lump. Some popular, readily available brands are not cooked enough, have a relatively low carbon density (heat index) and retain enough volatile compounds to look like roman candles while being lit in a chimney. If you can't make your own, at least buy a good quality charcoal. After much research, we have decided to use and sell the "Wicked Good" brand of natural charcoal. Popular on the competition circuit, Wicked Good is made with a high quality blend of five South American hardwoods selected for long burn times, high BTUs per pound and low ash content. All of the wood is grown on plantations and does not contribute (further) to rain forest destruction. Their kilns are state-of-the-art: Pollutants normally associated with charcoal production are captured and processed rather than being allowed to escape into the environment. The producers also take charcoal-making one step beyond and remove most of the remaining volatiles, thus minimizing sparking, a common and aggravating problem with some natural charcoals. Independent tests indicate that Wicked Good lump charcoal burns almost twice as long as the most popular manufactured briquettes, producing about 40% more heat and leaving only 10% as much ash. Wicked Good all-natural briquettes stack up even better – proving, once again, that it "always pays to go first class." So stop by *Something Different* for some wicked good charcoal, wicked good barbecue and wicked good company.

See also: http://www.nakedwhiz.com – Independent evaluation of charcoals
http://www.wickedgoodcharcoal.com – Where we get the good stuff
http://www.pine3.info/Barbecue 101 Part II.htm – The Fuel
http://www.pine3.info/Charmake.htm – How to make charcoal at home – more details