[We continue with another foray into the intriguing world of cooking. Rose Marie Gueldner offers us another historic and scientific look into the ubiquitous world of cookie baking. Who would have thought that grandma so and so was so adept at chemistry, with her “pinch” of this and a “dash” of that!]

**Antlers & Ashes: Cookie Chemistry**

*By Rose Marie Gueldner*

_Hirschhornsalz_ and _pottasche_ are listed as leavening ingredients in Old World cookie recipes. What are they and how were they used? Can you work with recipes with these ingredients or should you regard them as memorials to a former time?

Today baking is relatively tidy and simple, but for most of history baking was laborious and results were frequently unsatisfactory because leaveners - agents used to lighten the texture of baked goods - were neither reliable nor convenient. Although our ancestors were experienced with yeast, the natural leavener wasn’t suitable for cookies, so they turned to chemical agents to produce the tiny bubbles that gave enough lift to turn a doughy mass into crisp or chewy cookies.

**Cookies and the Ancestors**

Although the oldest German cookies date to the Middle Ages, it was centuries before they became part of the lives of our ancestors. Baking ovens were found only in royal and monastic kitchens. Eventually our ancestors gained access to an oven, the communal one on the feudal estate or the one owned by the village baker. For a price, the ancestors used the oven for baking bread; cookies were too luxurious and expensive for peasants. Exactly when the ancestors started baking cookies is unclear, but the cookstove oven in German Russian homes on the Great Plains certainly was used to bake cookies which were leavened with antler and ash products.

**Hirschhornsalz**

In Germany, hunting and _Hirschhornsalz_ go back in time to the Middle Ages. The German red deer (_rothirsch_), its graceful head crowned by a majestic set of antlers, impressive in height and width, played a central role in art, culture, mythology, and baking chemistry. While well known to the ancestors, red deer were off-limits: game hunting was restricted to the nobility and feudal lords.

The image of the red deer stag (_Hirsch_) is common in tapestries and paintings that date from that era. The medieval town of Hirschhorn near Heidelberg, bears the name of its founders, the Lords of Hirschhorn, and while their coat of arms features a single antler, that of the town shows a leaping stag. The surnames Hirsch and Hirschhorn endure in Germany and in parts of North America.
Even more common is the image of Saint Hubert, a prince with a passion for deer hunting. During a chase, according to legend, Hubertus (the German spelling), heard a voice admonishing him to change his ways. Widely venerated in the Middle Ages, the image of the patron saint of hunters accompanied by a white stag is found across Europe in stained glass windows, statues, and bas reliefs. A deer head and, in place of Hubert, a white cross appear on the label of Jägermeister (literally “master hunter”), an herbal German liqueur.

The stag horn with its illustrative history became an apothecary item in the 1600s as a source of ammonium for use as smelling salts and a baking leavener. The many names (baking ammonia, baker’s ammonium, ammonium carbonate, hartshorn) for Hirschhornsalz (literally ‘staghorn salt’; hart is an archaic term for stag), the compound known chemically as ammonium bicarbonate, reflect its long history.

**Pottasche**

From baking leaven made using the lofty rack of an iconic red stag, we move to one made from lowly, throw-away wood ashes. Unlike Hirschhornsalz, Pottasche does not have a storied history, but it does have a long, important one: its use dates to 500 AD.

Hardwood forests in the Old World provided much needed building material and fuel, but wood ashes soaked in water also produced useful and related products – lye and potash. Our ancestors, even our recent ones, had considerable experience using lye to make soap. Although only a small amount of potash can be extracted from plant remains, the potassium compound was useful and lucrative enough to support a profession. It was the job of a potash burner (Pottaschbrenner) to gather and burn wood so that the chemical could be extracted for use in agriculture and eventually the kitchen.

**Traditional German Cookies**

The oldest German Russian cookie recipes, Hirschhornsalz plätzchen, Lebkuchen, and Springerle, were made with baker’s ammonia and potash, a practice which continues in some households. Hirschhornsalz plätzchen, ammonia cookies, are cut-out, usually round, sugar cookies, sometimes flavored with lemon or mint, leavened with baker’s ammonium, and often served frosted. Well into the 20th century in German Russian homes, large quantities were baked at Christmas time, stored in crocks, and judiciously served for many weeks. “These keep well and taste better as they age,” is the comment accompanying an ammonia cookie recipe with 10 eggs, 8 cups sugar, and “flour to make a soft dough,” (about 15 cups) in *Food ’N Customs, Recipes of the Black Sea Germans*.

*Lebkuchen*, German gingerbread, is a family of honey spice cookies made especially for Christmas in Germany and German-speaking areas of Alsace, Austria, Poland, Switzerland, and Tyrol. The dough is made into bars, rounds, or fanciful shapes, including people and houses. In addition to recipes that are simply labeled Lebkuchen, varieties include *Aachen Printen*, *Leckerli*, *Pfefferkuchen*, *Honigmachen*, *Magenbrot*, *Biberli*, and *Kathrinchen*.

*Springerle*, another Christmas cookie, originated in Swabia. Flavored with anise, it is easily
identified by its embossed design, created by either pressing the dough into a carved mold (the original practice) or shaping with a Springerle rolling pin.

**Hirschhornsalz and Pottasche Use**

Cookies leavened with *Hirschhornsalz* emit a distinct ammonia aroma while baking, but if fully baked, they neither smell nor taste of the gas. However, dough thickness interferes with the chemical process, so baker’s ammonium use is limited to thin, flat baked goods with low moisture content and relatively large surface area, cookies such as *Hirschhornsalz Plätzchen*, *Lebkuchen*, and *Springerle*. Bakers use this traditional leavener to produce a tender, porous crumb with a crispness that lasts.

*Hirschhornsalz* must be kept in a tightly sealed container: If it loses the small amount of moisture it naturally has, it becomes rock solid and loses some potency. Consequently, the first job of ancestral bakers was often to pulverize *Hirschhornsalz* by wrapping a lump of it in cloth and pounding it with a rolling pin or heavy pan. Working this closely with sizeable amounts is likely why our mothers and grandmothers remarked about its pungency – its smell during baking, combined with the fragrance of cooking dough, is just not that objectionable.

*Pottasche*, an odorless white alkaline powder, breaks down during baking, producing carbon dioxide gas which creates tiny air pockets, making cookies light and crisp. It remains odorless during baking. Because the chemical is not very reactive at room temperature, Old World *Lebkuchen* bakers used it to improve both product and bakery management. In the fall, dough was mixed and then stored in wooden troughs in the bakery’s cool basement. During the rest period, starches and proteins underwent subtle chemical changes and spice flavors melded. When the busy Christmas season arrived, *Lebkuchen* dough was ready to be shaped and baked. Cookies made from stored *Lebkuchen* dough were slightly darker and more flavorful than those made without extended storage. To home bakers, however, the benefits of potash were not sufficiently unique to warrant loyalty: They readily accepted a more convenient replacement when it became available.

To facilitate distribution and to dissolve any small lumps, both baker’s ammonium and potash were traditionally dissolved in a small amount of liquid before use in a recipe. If both are used, they were dissolved separately.

**Modern Baking Chemicals**

Baker’s ammonia and potash (both now produced chemically) continue to be used by home and professional bakers in Germany, Holland, Poland, and Scandinavian countries. North American home bakers who use baking ammonium and potash believe there are no good substitutes, especially for the former. When the country store closed or became part of a chain, traditional home cookie bakers relied on small town drug stores and bakeries for their supply of baker’s ammonia, an unadvertised service still available in some locations. Specialty vendors, baking
supply companies such as King Arthur Flour, and the online general store known as Amazon are also sources.

Baker’s ammonium, formerly sold in bulk, is now packaged in glass or plastic jars or a sealed plastic bag. Even in secure packaging it has a tendency to dry out and lose potency if kept for months. Potash is sold in 20 gram paper packets, enough to leaven 4.4 kilograms (generous 14 cups) of flour. Once opened, the excess potash should be stored in an airtight container.

Baking ammonia is also used by professional bakers in Europe and North America in twice-baked cookies (Italian biscotti and German-Jewish Mandelbrot, for example) and pâté a choux, the dough used to make éclairs and other cream-puff type pastries.

Baking soda (sodium bicarbonate, Natron in German) was introduced in 1820 as a replacement for potash. Besides giving a little rise to cookies and other baked goods, baking soda assists in the browning process and is sometimes added solely for that purpose.

Baking powder (Backin in German), essentially baking soda and an acid (originally cream of tartar, potassium bitartrate, a byproduct of winemaking), was introduced in the US during the second half of the 1800s. At first the components were sold in separate envelopes to prevent the chemicals from reacting, but by the 1880s, cornstarch, a moisture absorbing buffer, was added, which allowed baking powder to be sold as one easy-to-use ingredient. Marketing (including printed materials with usage and recipes), door-to-door sales, German-language labels targeting that community, and the product’s reasonable cost and effectiveness, made it a commercial success and a staple in every kitchen. In 1891, Dr. August Oetker, working in his Bielefeld pharmacy (North-Rhine Westphalia), introduced Backin, a product that was so well received by homemakers, it launched what is now a huge international general food company.

Modern versus Traditional Baking Chemicals

Although food scientists differ somewhat in the recommended conversion rate, baking powder can be substituted for baking ammonia, and baking soda for potash measure for measure. The problem arises with the measurement given in old recipes such as “50 cents worth cooking ammonia,” as found in the heirloom recipe for Ammonia Cookies in Food ‘N Customs.

If you’re thinking, after reading through the array of chemical compounds mentioned above, that only ancestors with an understanding of chemistry worked with these leaveners, remember the terminology and the understanding is relatively recent. Foods are mixtures of different chemicals, and the qualities we strive to influence not only in baking, but in all cooking -taste, aroma, texture, color, appearance, nutrition - are all expressions of chemical properties. With or without a formal study of chemistry, every cook and baker is a kitchen chemist.

Ancestors learned and passed on knowledge orally without necessarily understanding the why of processes. They used whatever was available so weren’t put off by antlers and ashes in their cookies. They were superb bakers who left a legacy of recipes - thankfully some were written down - so that we can appreciate and duplicate their art.