Oak and Mead

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If George Washington made mead, he'd have chopped down an Oak Tree!
Throughout history, humanity has been fermenting just about anything we can get our opposable-thumbed mitts on for everything from the frenetic Dionysian rites in ancient Greece to a Saturday night Toga Party in the OC. Along the way we have used many different types of storage vessels to protect and age our prized meads, beers and wines along with a ubiquitous host of other alcoholic beverages. Somewhere, sometime, we decided to put mead into oak barrels, and since then no one has looked at certain oak trees quite the same.

What makes oak desirable in mead?
Exposing your mead to oak imparts structure, complexity, additional sensory elements and of course new and exciting flavors. While oak adds many different elements to mead and wine (a study published in May, 2005 identified more than 70 volatile aroma and flavor compounds) many of the recognizable aromas and flavors are identified with vanilla, spice, sweet, spicy and "woody" characteristics. Breaking it down a bit we can group oak into its basic aroma and flavor and composition.

CIS and Trans Oak Lactones are characters imparted by the un-toasted oak (yes, even though the wood is toasted on the surface there is still the soft white-oak underbelly lurking below the toast) Trans Oak Lactones impart a woody, earthy almost chocolaty aroma and some flavor characters, while the more intense Cis Oak Lactones impart more of a coconut floral aroma and some small taste. If you've ever chopped down an oak tree you'll recognize these aromas very distinctly.

Furfural and 5-Methylfurfural contribute wood sugars and in turn body. As the oak is seasoned (exposed to air) those natural polymers begin to breakdown into simple sugars. When oak is exposed to higher temperatures (about 300 degrees F) during the process of toasting, more simple sugars are formed. These sugars become caramelized and caramel, butterscotch and mocha like aromas emerge. Smokey, toasty characters develop as the oak passes 420 F.

Vanillin and lignin As lignin is degraded by heat it releases vanillins, which are a group of mead and wine complimentary chemical compounds. Predominately, vanillin (yup, that's that nice vanilla like flavor) is released during oak lignin breakdown. During the seasoning process, lignin is broken down by the sun, rain, and various microflora. The process of breaking down the lignins is also speeded up by the heat applied during the barrel toasting process. In the wine industry there has been extensive time and research devoted to the scientific analysis of this process in order to impart more and richer flavor attributes.

Eugenol and Isoeugenol are related to both raw oak (eugenol) and the degradation of lignin by heat (isoeugenol). Another reduction of the lignins by heat leads to spicy flavors apparent in the aroma and the flavor. Once toasted the Isoeugenol imparts a clove flavor and aroma.

Guaiacol and 4-Methylguaiacol impart a smoky, charred character as part of the process of the pyrolysis of the lignins in the oak. As the oak is more toasted the smokier, and more charred the flavor becomes.

Cellulose and Hemicellulose are natural polymers, and comprise about half of the total solids in white oak. Cellulose provides the structural integrity of the wood and participates only minimally in the actual influence on the character of the wine during

aging in the barrel. That's a good thing because you don't want your chips, cubes, staves, etc. falling apart and dissolving into your mead. Hemicellulose contributes significant vanillin during the breakdown of lignin as described above in the Vanillin and Lignin section. As the wood is heated the action on the hemicellulose forms wood sugars which contribute sweetness and caramelized flavors. As the heat rises and persists toasted flavors are released.

Tannins comprise about 1% of American oak and 8% of French oak. Tannins also are a key player in the aging process. Tannins live in the radial rays of oak trees and are governed by seasoning, stave shaping, toasting times and temperatures (tannins are heat sensitive and undergo cellular lysis when exposed to water.

What kinds of oak can I use in my mead?

There are several species and sub-species of oak that are used in cooperage and oak alternatives around the world, but for those of us in the fermented hooch making world there are four Genus and species generally used for cooperage and oak aging. The species most widely in use are: the American oak, *Quercus alba*, and three European species, *Q. robur, Q. petraea and Q. sessilis* (the latter of which is arguably the most sought after oak for aging and cooperage).

For the home mead and wine makers there are generally three types of oak available at many Local Home Brew Stores (LHBS), they are: American, French and Eastern European (mostly Hungarian-ish oak). Because barrels are expensive, and the footprint for storage is considerable, most home mead makers use oak chips, cubes, dominos, and staves.

American oak imparts infuses more quickly and imparts more vanilla, woody, sugary, and toasty characters than it's European cousins and is used mainly in red wines but is growing in popularity with mead makers because it tends to be less expensive, in-stock at the LHBS, and available in a wider range of toast levels. American oak is harvested from several locations including Missouri, Minnesota, Oregon, Virginia and Pennsylvania.

Eastern European oak (including oak trees from Hungary, Slovenia, Slovakia, Croatia, Lithuania, Russia, Romania, and Ukraine) is more expensive than American oak but less expensive than French oak.

Eastern European oak imparts it's flavor more slowly than American or French Oak. Hungarian Oak is much less intense than American or French oak because the trees grow more slowly and are smaller, creating fine grain which in turn lends itself to very subtle extraction. The hemicellulose in Eastern European oak breaks down more easily, and imparts a unique array of toasted, vanilla, spicy, woody, sugary and caramel-like flavors.

French oak is more expensive than American and Hungarian oak. It also sports the highest tannin content of the various oak types used for cooperage, chips, cubes, dominos, staves, etc. French oak is more porous than the American and Hungarian types so it presents more types of extracts for mead and wine. Since there are more extractives such as caryophyllene (sweet, woody, spice, clove and dry flavors) and copaene (dry and spicy kind of flavors)

French oak is highly prized for barrels and aging because of the number of complex characters it adds to the wine. It extracts more quickly than most other oak types, and can quickly overpower mead if not monitored closely. French oak is found in several forests including: Nevers, Troncais, Limousin, Allier, Centre, Vosges, Bertrange and Jupilles located mostly in central and eastern France.

So how do I get the wood into the mead?
The most cost effective and practical method for infusing the oak characters into your mead are oak chips and oak cubes. Oak for mead and wine comes in a variety of shapes and sizes for many different fermentation, aging and storage vessels. For the home mead maker oak chips and oak cubes are the most common form available at your friendly neighborhood LHBS. Oak chips and cubes come in a variety of toast levels and are generally comprised of American, French and Hungarian oak. The toast levels generally include, light toast, medium toast, medium plus toast (also called house toast by many retailers) and heavy toast. There are other variations offered by different manufacturers of oak chips and cubes, but for the most part you'll find one of the toast levels mentioned above.

Stavin, manufacturer of Oak Chips, Cubes, Staves, Mini-Staves, Barrel Replicas, etc. have a lot of mead-makers that use their product (as well as a considerable number of well known wineries that don't fess up to it!) A very popular technique used by mead makers is to add one to two ounces of the cubes in a 5 gallon carboy for a two month period. This way you get maximum extraction of the oak character, along with the integration of the individual oak wood character into the batch.

Layering oak additions in phases is also a common practice in both wine and mead production (that is start with a heavy toast, next a medium toast, next a mix of light and medium toast). Stavin suggested a medium to high toast level for meads because the lower toast levels yield a sweet extraction which is not necessarily complimentary to mead sweet mead. Although for a dry mead it may be a good match.

On oak chips: Stavin indicates that because of the lack of uniformity of thickness, size and shape, the oak character is very much less structured and integrated as with oak cubes or as they call them "beans." The extraction of oak flavor from chips is very rapid because of the saturation rate of the wood by the liquid (since the chips are so thin) surrounding it. The effect is a pretty flat "mono-dimensional" character as opposed to the complexity imparted by the cubes.

Contact time on the oak cubes is recommended for two months. For meads, Stavin recommends that generally if you add about an ounce to two ounces in a five gallon carboy and let it go for two months that you'll get maximum extraction that will add structure and complexity, but not overpower your mead with an oak character. Oak cubes at medium plus toast levels seem to impart a smokier flavor than the chips or the barrel inserts. This is a good thing to be aware of when you use cubes if you don't want to overpower your mead. Another consideration is that makers of Chardonnay who use oak in their aging process say that if the wood is readily noticeable in the nose, then you've already lost your batch for all intent and purpose.

If you're adding cubes to a wine or mead that has already dropped clear they recommend rinsing the oak cubes off with some warm distilled water to remove the wood dust (sawdust) that is produced by the cubes rubbing together in the packaging. Make sure you use distilled or filtered water that has no chlorine in it so as not to impart any chlorine flavor to your cubes. Boiling or simmering in hot water leeches off the oak characteristics and flavor that add to structure and will leave your end product lacking.

Lastly, what to do with your chips, cubes, etc when you're done with them? Take those nicely saturated cubes and put them on the barbeque (you might want to keep them moist to maximize the smoke output) with some good meat (ribs, steak, etc) ice down some mead, and smoke baby smoke!