The Importance of Sustainable Harvesting: The Case of Chaga

Katie Huckabone, RH RMT
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Traditional herbal medicine is about connecting plants with people, and connecting people to nature. That is at the root of what herbalists do, whether it's through teaching, running a clinical practice, farming/gardening herbs, formulating products and all other tasks herbalists do. Medicine making is not about harvesting and taking whatever we can of what nature has to offer. When a herbalist that practices in accordance with traditional principles harvests plants and fungi to be used as medicine there is a strong respect for nature in the process; the herbalist asks for the plant's permission to be harvested and for it to be used as medicine. This method is taught as an important step at many western herbal medicine schools. An exchange occurs whereby the herbalist offers a gift to the plant as thanks and gratitude. Some herbalists offer tobacco, sage, or even a strand of hair. The practice of harvesting is done in an environmentally sustainable way that takes into account the plant's own survival and our ability to have access to the plant species for years to come. To wipe out every plant seen would be very short-sighted - there wouldn't be any more of that plant for future use and on a larger scale could put the plant on the endangered or at-risk list.[1] As a general rule, herbalists harvest only 10% of a plant species in a single area. If more plants are needed we go to a different area and take no more than 10% from there. When a herbalist is finished harvesting plants the area (whether it's a forest, field, or any other space) looks as though nothing was even touched. It's not a clear-cut zone in a forest. Each plant has its own rule or guideline to ensure its survival so it's important to learn about the specific plant's lifespan and survival needs and how to ethically harvest it beforehand.

I have been in situations when I required an amount of herbs but there weren't enough plants that would allow me to harvest sustainably. A few years ago I desperately wanted St. John's Wort. There were a few plants growing near my house but in low quantity. So I did not harvest any that year. The following year a St. John's Wort plant showed up in my front yard and there were many more plants growing near my house - enough to harvest a little bit from each plant that I could use for a small batch of infused oil. That is one example of building the right relationship with plants with respect for their survival.

Before getting into chaga specifically I thought it best to describe the respectful process of harvesting medicine in general because ethical harvesting doesn't just apply to chaga. Any plant that becomes trendy is susceptible to being overharvested for commercial purposes and becoming endangered. One example is goldenseal and there are several more examples of at-risk species which are listed through the United Plant Savers' website, unitedplantsavers.org. When botanical medicine is harvested on a large-scale as a commodity by large companies it can be questioned whether sustainable and ethical harvesting practices are being done. The risk of overharvesting is that we lose the ability for future harvests and affect the species' survival in the long run. Ok, now onto chaga.

Chaga's scientific name is *Inonotus obliquus* and it is also commonly called clinker polypore. The word chaga comes from the Russian word *tschaga.* In recent years, meaning over the last ten years, chaga has become very trendy and can be found in health food stores and cafes as

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[1] See the United Plant Savers for a list of endangered plants at unitedplantsavers.org

powdered beverages, mostly coffee substitutes and chocolate drinks. Recently I saw a few companies online selling chaga soap bars. I had been aware of the coffee and chocolate chaga for a long time and remained skeptical of how large companies could possibly be ethically and sustainably harvesting chaga at such steady rates to keep their supply going. I am not putting a single brush stroke over all chaga product producers and manufacturers - I know of many herbalists and small companies that use chaga sustainably and respectfully in relatively small quantities for purposes that actually merit its powerful use. The chaga soap bar is what really triggered me into writing this article because it's such a rare and medicinally important species. The idea of it being used as soap and literally watching it go down the drain is really troubling to me.

Chaga grows on living birch (white and yellow) trees in northern Europe, Asia, Canada and northeastern United States. Chaga is found on only one in 20,000 birch trees[2]. It can grow on other species but it tends to grow on birch trees and is more medicinal on birch than other trees. It is a very slow growing fungus and even though it can be cultivated (with difficulty) it is medicinally more potent in the wild[3]. Chaga doesn't grow like other fungi on trees, such as reishi (*Ganoderma spp.)*, birch polypore (*Fomitopsis betulina)*, or turkey tail (*Trametes versicolor)*, for some examples, which grow relatively quickly and abundantly. Chaga can take twenty years to mature. It is a parasite that, via its spores, infects the birch tree heartwood through wounds (causing the tree to eventually die from white heart rot in 10-80+ years). It begins growing on the inside of the birch tree and then protrudes on the outside and looks like a burnt black conk at maturity - not like a mushroom at all. The fungus conk is a hard mycelial mass - not a fruiting body of a mushroom. When we see typical mushrooms growing on a tree we are looking at the fruiting body (including its reproductive part known as spores) while the mycelium lives deeper within the tree and can recreate the fruiting body if it's harvested. Chaga is the mycelium mass without a fruiting body. Chaga's fruiting body, its spores, is very rarely seen and occurs only once in its lifetime, after its host birch tree falls and dies and the chaga spores infect a new birch tree. It is the sterile black conk (more scientifically called the Sclerotium), which looks like burnt charcoal, that is harvested for medicine. The inside of the conk is a rusty brown colour, which is the part usually dried and ground to a powder for 'coffee' and hot 'chocolate' drinks but the black sclerotium is medicinal too.
It is actually the sclerotium that contains high amounts of betulin, a triterpene, and betulinic acid which is a triterpenoid (a derivative of a triterpene). Both of these molecules are best extracted in alcohol or vinegar. Betulinic acid is antibacterial, antiviral, anti-inflammatory, anti-HIV, antimalarial and antioxidant. Betulin, what betulinic acid is derived from, has anti-tumor and

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[2] Rogers, Robert Dale. "The Two Sides of Chaga." *United Plant Savers,* 14 Feb. 2014, unitedplantsavers.org/the-two-sides-of-chaga. Accessed 18 April, 2020.

[3] Vertolli, Michael. "Chaga and the Wild Harvesting Dilemma." *Being Herbalism,* 28, Sept. 2013, michaelvertolli.blogspot.com/2013/09/chaga-and-wild-harvesting-dilemma.html. Accessed 18 April, 2020.

anticancer properties.[4] [5] Chaga is not the only species that contains betulin and betulinic acid - they can be found in the outer bark of birch trees (*Betula species)*, birch sap, birch polypore, alder bark, chicory seed, sage, heal-all, and rosemary.

Chaga must be collected from living trees. It is a parasite that infects host trees, so when the host tree falls and dies, so does the chaga growing on it, and as it dies chaga becomes susceptible to mold, parasitic infection and toxins. If a birch tree with chaga on it has fallen it's crucial to leave it alone because this is when the chaga has a window to release its spores into the air or via insects to infect new host birch trees.

Chaga must be harvested in the fall once there are 20 straight nights of 5℃ or lower and throughout the winter, until before sap starts running.[6] This is when the birch tree has gone dormant and the chaga has highest nutrient and medicinal value. When the sap starts running and through the summer months there is too much water content in the chaga and the medicine potency is diluted, and the tree is more susceptible to injury. In order for the chaga to continue growing (although very slowly) it is important to leave enough on the birch tree when harvesting. It is best to take no more than 30-50% of the chaga conk. Leave small chaga on trees and harvest from only those that are larger than a grapefruit.[7] As with all herbal medicine harvesting practices it is important to harvest from unpolluted areas, away from roadsides and from soil that wasn't previously industrial or contaminated. With chaga, it is best to go as far into the forest as possible because there will be cleaner specimens in the interior. Another point to consider is to not harvest from areas where someone has already harvested to avoid overharvesting.

My herbal teacher, Michael Vertolli of the Living Earth School of Herbalism, has written amazing articles about chaga and is an excellent resource. He writes that due to the diminished availability of wild chaga he has reduced usage in his clinical practice, focusing on only a few conditions where chaga excels over all other herbs: conditions of the bone marrow and autoimmune conditions.[8] Michael uses chaga in tincture form only at a maximum of 20% of a herbal formula. Chaga is traditionally consumed as a general tonic tea but per dose a lot less chaga is required for a tincture than a tea. "*Using it as a tea requires that it be used in much larger quantities compared to using it as a tincture because the amount of herb required per unit dose is much larger for teas. With the amount of chaga that will keep someone in tea for a few weeks, I can make enough tincture to supply my entire herbal practice for several months!"*[9]

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[4] Haritan, Adam. "How to Receive the Benefits of Chaga Without Consuming Chaga." *Learn Your Land,* learnyourland.com/how-to-receive-the-benefits-of-chaga-without-consuming-chaga. Accessed 21 April 2020.

[5] Dehelean, Cristina A et al. "Study of the betulin enriched birch bark extracts effects on human carcinoma cells and ear inflammation." *Chemistry Central Journal.* Vol. 6,1 137. 19 Nov. 2012, doi: 10.1186/1752-153X-6-137. Accessed 20 April 2020.

[6] "How to Harvest Chaga - The Ultimate Guide." *ChagaHQ,* 4 Mar. 2020, chagahq.com/harvest-chaga. Accessed 21 April 2020.

[7] ibid

[8] Vertolli, Michael. "More on Chaga." *Being Herbalism, 4 Dec. 2013,* michaelvertolli.blogspot.com/2013/12/more-on-chaga.html. Accessed 21 April 2020.

[9] Vertolli, Michael. "Chaga and the Wild Harvesting Dilemma." *Being Herbalism,* 28, Sept. 2013, michaelvertolli.blogspot.com/2013/09/chaga-and-wild-harvesting-dilemma.html. Accessed 21 April 2020.

There are different medicinal benefits of extracting chaga as a tea (water extract) vs tincture (alcohol extract) because different chemical constituents are either water soluble or alcohol soluble (polar vs nonpolar molecules). In one study from 2009[10] chaga was extracted at various temperatures of water (50℃, 70℃, and 80℃) and ethanol. The ethanol showed the strongest superoxide dismutase (an enzyme that prevents tissue damage) activity, antiproliferative activity on human colon cancer cells and apoptosis (killing) of cancer cells. No apoptosis action was shown in water extracts. Water extracts at 70℃ had the strongest radical-scavenging activity (antioxidant activity) whereas the ethanol extract had the weakest radical-scavenging activity. This is all to highlight that the best way to use chaga both medicinally and sustainably, for conditions like cancer, is in tincture form to get the most out of it.

I believe it's best used for conditions it is strongest at treating and not to be consumed as a general tonic. There are several other mushrooms and herbs that can be sustainably and effectively used as a general tonic - either as teas or tinctures. These are in the category of herbs called adaptogens. Ashwagandha, holy basil, reishi mushrooms, turkey tail mushrooms, wild sarsaparilla, and Eleutherococcus are some examples of adaptogens. An almost interchangeable species to chaga would be birch polypore since it also grows on birch trees.

Birch polypore, *Fomitopsis betulina,* is an annual mushroom, which grows easily and abundantly on decaying birch trees, fruiting in spring and summer. The same tree will keep producing mushrooms year after year. Its medicinal properties are very similar to chaga. It also contains betulin and betulinic acid, which is not surprising because both compounds are formed in the outer bark of birch trees. It is an immune tonic (contains polysaccharides, mostly glucans), anti-inflammatory, anti-tumour (inhibits angiogenesis and keeps normal cells healthy), antiparasitic, antiseptic, antiviral, antibacterial and styptic.[11] Styptic means it helps stop bleeding and there are videos on YouTube that teach you how to use birch polypore as a self-adhesive band-aid in emergency situations. Probably due to its highly medicinal value, pieces of its fruiting body were carried by the famous Ötzi the Iceman who lived 5300 years ago. He carried pieces of the mushroom strung on two strips of leather. Modern research confirms the health-promoting benefits of *F. betulina*. Pharmacological studies have provided further evidence supporting anticancer, neuroprotective, and immunomodulating activities of *F. betulina* preparations.[12] One

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[10] Hu H, Zhang Z, Lei Z, Yang Y, Sugiura N. "Comparative study of antioxidant activity and antiproliferative effect of hot water and ethanol extracts from the mushroom *Inonotus obliquus*." *Journal of Bioscience and Bioengineering*. 2009 Jan;107(1):42-8, doi: 10.1016/j.jbiosc.2008.09.004. Accessed 25 April 2020.

[11] Lucinda. "Birch Polypore - Medicine Ancient and Modern." *Whispering Earth,* 15 Feb. 2015. whisperingearth.co.uk/2015/02/15/birch-polypore-medicine-ancient-and-modern. Accessed 21 April 2020.

[12] Pleszczyńska, M., Lemieszek, M.K., Siwulski, M. *et al.* "*Fomitopsis betulina (*formerly *Piptoporus betulinus)*: the Iceman's polypore fungus with modern biotechnological potential." *World J Microbiol Biotechnol* 33, 83 (2017). doi.org/10.1007/s11274-017-2247-0. Accessed 21 April 2020.

study shows *in vitro* cytotoxic and anti-inflammatory activity on melanoma and prostate cancer cell lines of the mycelial cultures and fruiting body.[13]
It is a soft white and light brown mushroom when growing fresh on the birch tree. If it's dark brown/dark grey and hard when you find it, it's not good to use anymore. When it's still soft and fresh you can easily cut it off the tree at reachable heights with a knife, or even just with your hands. When dried it gets very tough to cut so it's important to cut it into small thin pieces while it's still fresh and let it dry or freeze if you don't plan on making a tincture right away. If you bring it home and let it sit for a long time it gets too tough to cut later and because of the high water content it will mold. Harvesting and processing birch polypore is way easier than acquiring and processing chaga! Birch polypore is easily identifiable but it's not the only other mushroom that grows on birch trees so do your research and make sure you have the proper identification before processing and consuming.

It's worth noting that throughout my research on birch polypore I came across sources and studies that recognize the mushroom *as a whole* to be more effective than its isolated compounds. This is rare in scientific studies; usually isolated compounds or extracts are tested *in vivo* and then we don't know how this relates to the whole medicine in front of us, but this is not the case with birch polypore, in these studies.

One other note I would like to make is about cancer. When we learn about a herb or mushroom we can get stuck into thinking we should use "this herb for that condition", for example using valerian for insomnia. In herbal medicine we look at the person as a whole, treating the entire being in front of us and we typically use herbs as part of a formula not as a single herb to address the complexity of the person and their condition/concerns. With herbs that show anticancer or antitumor properties it's not enough to think about "this herb for cancer," almost as a magical cure-all. Each cancer shows up differently in different people. Breast cancer won't behave the same way in different people or even the same way twice in the same person. We must learn how the person's particular cancer is behaving at the cellular level and try to block its behaviour and strengthen and heal the healthy cells. So chaga is not The Cancer Mushroom. Chaga is only one of many species in our materia medica that can provide support for people living with cancer - either as treatment or taken alongside chemotherapy and radiation to help alleviate side effects and protect healthy cells. The University of Windsor started the Dandelion Root Project in 2009 with a focus on the effects of dandelion root decoctions on cancer cells. So far there has been promising *in vivo* evidence for effectiveness against human T cell leukemia, chronic myelomonocytic leukemia, pancreatic and colon cancers, with no toxicity to non-cancer cells. The studies have also shown efficacy in animal models (mice) that have been transplanted with human colon cancer cells. The project is now in phase 1 of clinical trials for blood cancers that do not respond to drug treatment.

In summary, I believe chaga is an incredibly useful and powerful medicine but because of its rarity and inability to reproduce more than once in its lifetime it should be harvested responsibly and used in tincture form ideally, only when needed, and definitely not sold as a soap! Many

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[13] Sulkowska-Ziaja, Katarzyna et al. "Chemical composition and biological activity of extracts from fruiting bodies and mycelial cultures of *Fomitopsis betulina." Molecular Biology Reports. 2018; 45(6): 2535–2544,*
doi: 10.1007/s11033-018-4420-4 Accessed 20 April 2020.

herbalists advocate against it being harvested commercially. We have so many other wonderful mushrooms and herbs that can bring us similar benefits and can be harvested more sustainably than chaga. Reishi, birch polypore, turkey tail and oyster mushrooms are a few examples.
For those looking for healthy coffee substitute drinks I have tried a few delicious alternatives. The first is called Bambu and is available in many health food stores and online. It contains rye, chicory, barley, malted barley, figs and acorns. The directions are the same as making instant coffee. Another company which is located in the Ottawa area called Take Charge Tea creates a fabulous tea blend called Roasted Chicory with Barley and Spice. Their website is TakeChargeTea.com.

If you are purchasing chaga already it would be great to find out how it is being harvested so you can make your own decision about supporting that business. If you do not have access to the harvester because the company is so large and they supply multiple stores and cafes with their product you can make your own decision about whether you want to keep supporting that venture, knowing how rare chaga is. This is not an attack on companies trying to get medicine to people. This is about all of us making informed decisions about how our dollar and our actions impact sustainable access to medicine in the future.