Herbal Medicine in Apocalyptic Times

Mo Katz-Christy

Editor's Note: This article capitalizes Chinese medical terms to differentiate them from similar scientific or anatomical terms of Western medicine.

Three weeks and 13 inches of rain into July 2021, I look out at our zucchinis. Instead of bursting with summer abundance, the plants are shriveled and rotting. The potatoes are not much better; with no dry days to spray, the Colorado potato beetle decimated the crop. Additionally, we are experiencing deer pressure like never before as the warmer temperatures and more frequent mast years enable them to proliferate (Weiskopf et al. 2019). With more deer, there have also been more ticks, and two members of our farm crew have already taken antibiotics for Lyme disease from tick bites this summer.

How can herbalists support the health of their communities in apocalyptic times? And it does feel apocalyptic–when amidst record rain, our first clear day is tempered with haze blown in from wildfires 3,000 miles away. The health consequences of climate change affect all people, and those with less access to resources and privilege experience these effects most harshly. Intentionally and systematically supporting the health of the most oppressed communities will be key to humanity's overall resilience in these unpredictable times. Herbalists need to stay flexible and ready to address the specific health conditions as they manifest. That said, I believe it is prudent to prepare ourselves to address the likely conditions that a warming planet will exacerbate inequities in who will likely experience them the most. The overarching nature of climate change and the complex physiology of humans means those conditions are many and multifaceted. For this paper, I will focus on the health effects of extreme heat events, wildfire smoke, and grief.

Extreme heat is the foremost cause of weather-related deaths in the United States (Ahima 2020). It manifests in the body as hyperthermia and causes three distinct and increasingly severe stages of heat-related illness: mild heat-induced illnesses, including heat edema, rashes, and cramps; heat exhaustion; and heat stroke (McCance et al. 2019). Heat edema, one of the mildest forms of heat-induced illnesses, is swelling in the legs and feet that typically resolves when the affected limb is elevated. Heat rash most commonly occurs under clothing when pores become occluded or inflamed,trapping sweat beneath the skin and causing irritation (Gauer and Meyers 2019). Heat cramps are generally exercise-induced. Though the causes are not definitively known, there is evidence

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that they are caused by a confluence of factors which may include fatigue, muscle damage, and insufficient stretching that collectively result in increased alpha motor neuron excitability, leading to cramping (Miller 2015). The symptoms are spasmodic cramping in the abdomen, extremities, or both; increases in blood pressure and pulse; and fever. Skin is still moist and flushed, as thermoregulatory mechanisms are still shunting core heat to the extremities, and thus the affected person should recover easily given hydration, stretching (Gauer and Meyers 2019), and rest (Perez et al. 2021). Since there may be different causative factors, a careful case history is necessary to determine appropriate care (Miller 2015).

Heat exhaustion is the next stage of heat illness. The skin becomes paler, which may be more or less apparent depending on skin tone, and it is still moist as sweating mechanisms remain active. By this stage, the hypothalamus has maintained vasodilation and sweating for long enough to cause dehydration, decreased plasma volume, hypotension, decreased cardiac output, and tachycardia (rapid heartbeat). Symptoms of heat exhaustion include faintness, nausea, fatigue, and headache. These symptoms usually prompt the person to lie down and rest, reducing their energy use and thus heat production, as well as redistributing their blood (McCance et al. 2019). If they can rest and rehydrate, the symptoms should be reversible, though they may experience increased sensitivity to heat in subsequent encounters with extreme temperatures.

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If someone is not able to rest and rehydrate, heat exhaustion can progress to heat stroke, which can have irreversible consequences and be fatal unless immediately treated. Thermoregulatory mechanisms reach their limit and sweating ceases, leading to dry, warm skin. The face is the last place to stop sweating because emergency thermoregulatory measures preferentially cool the brain to prevent brain damage. Without sweating, the core temperature rapidly increases and can lead to central nervous system (CNS) degeneration, necrosis of the kidney tubules, cerebral edema, swollen dendrites, and multiple organ failure. Even if treated, the kidneys, CNS, and thermoregulatory mechanisms may be permanently damaged (McCance et al. 2019). Beyond heat cramps, exhaustion, and stroke, conventional medicine is still learning about the subtler consequences of heat on the body. Studies are finding that preterm birth can be induced by heat waves during pregnancy (Smith and Hardeman 2020).

As the planet continues to experience higher-than-average baseline temperatures and more frequent extreme heat waves, people living without air conditioning (AC), especially those in urban areas, are significantly more vulnerable to adverse health effects of heat (Gronlund 2014). In many cities, the prevalence of AC in Black homes is significantly less than in white homes (Mann and Schuetz 2022). Additionally, many jails and prisons lack AC, with fatal consequences. In Texas, an average of 14 people die each year of heat-related effects in prisons without AC, while no increase in mortality has been associated with heat waves in prisons with AC (Skarha et al. 2022). Indeed, this is murder by neglect. Unhoused people also have less access to AC. At the soup kitchen in Boston where I work, up until this year we had no AC and limited airflow, and the temperature inside was often significantly hotter than outside and maintained high heat throughout the night. Many of our guests spend hot days in the library and nights at an air-conditioned shelter, but others feel uncomfortable or are not welcome in those spaces due to their mental health or other needs.

Individuals are more susceptible to heat illnesses due to both physiological and socioeconomic reasons. Herbalists can improve the health outcomes of their clients and communities in extreme heat by supporting the underlying health conditions that cause physiological vulnerability to heat and by organizing to dismantle the injustices that cause socioeconomic vulnerability. Cardiovascular and metabolic conditions are often cited as increasing susceptibility to heat and

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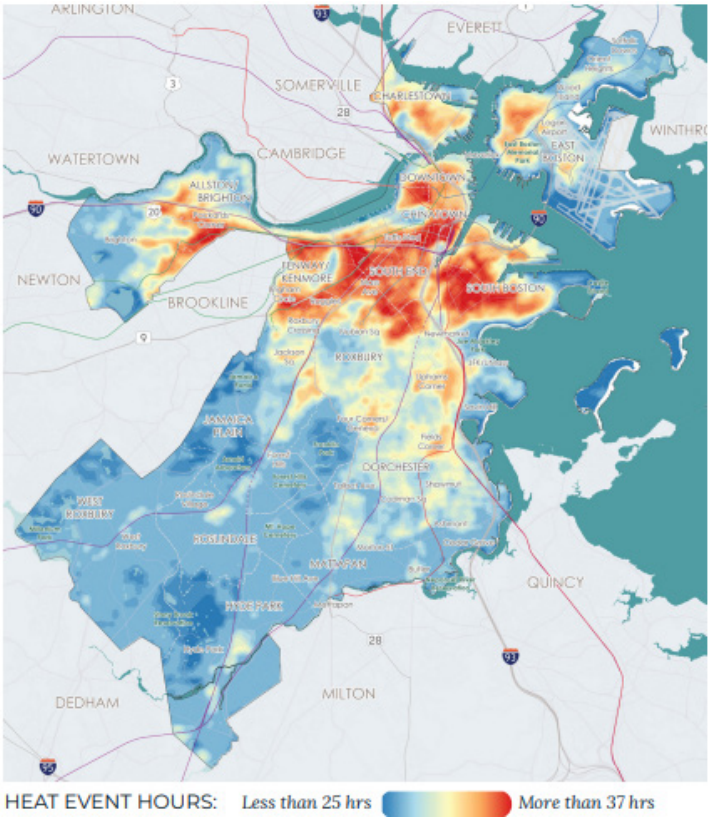
indeed, hypertension, heart disease, and diabetes increase the risk of heat-related complications (Rossiello and Szema 2019). However, respiratory diseases, including asthma and kidney conditions such as urolithiasis and acute renal failure, are also associated with heat waves (Rossiello and Szema 2019). Whether the heat is causing the conditions or the conditions are causing the heat (or both), caring for clients' body systems over the long term and supporting good hydration can help improve resilience during heat waves.

While the energetics of food and herbs can have powerful effects, access to cooling centers may be necessary to enable people to reduce their body temperature rapidly in extreme heat. Increasingly, many major cities are setting up cooling centers, or spaces with AC where people can go to cool down. AC is a bit of a paradox, as access to it improves health outcomes, and yet it has a high carbon footprint and thus contributes to accelerated climate warming. Thus, the wealthy, who have access to AC, are directly contributing to the increased warming that poor people have to disproportionately endure. Additionally, AC is vulnerable to power outages and may put residents whose bodies are not acclimated to the heat and who do not have other cooling strategies at an increased risk in those instances (Gronlund 2014).

Another long-term solution to reduce heat is by planting trees. In my neighborhood in the South End of Boston, with tall buildings that reduce airflow, lots of impermeable surfaces that capture and store heat, and little vegetation, the daytime and nighttime temperature are significantly higher than in my parents' neighborhood in Cambridge, a mere four miles away (City of Boston 2022). Lack of tree coverage often correlates with tall buildings and more impermeable surfaces and is an indicator of how hot a neighborhood gets. Instead of releasing carbon into the atmosphere, as AC does, trees take carbon from the atmosphere and store it in their wood and the soil. In this way, trees are a carbon sink instead of a carbon output (Moseman 2022). Unfortunately, formerly-redlined areas (redlining is a discriminatory practice originating in the 1930s where loans in Black neighborhoods were refused or restricted [Jackson 2021]) like the South End (Leydon 2019) are hotter and have less tree coverage than non-redlined areas in most major cities (Yurk 2020). Planting trees in low-income neighborhoods can help to remedy this disparity over time; however, cooling centers may be necessary to reduce adverse health effects in the short term.



This map shows the discrepancies in how long heat events last in different neighborhoods in Boston.
Credit: City of Boston, 2022.

While scientists do not know exactly how air quality will be impacted by climate disruption, the planet is already experiencing the negative atmospheric effects of wildfires, which are partially induced by climate change itself (Pausas and Keeley 2021). The fires also cause more warming directly (EPA 2023). It is prudent for herbalists to start giving more attention to their community members' lungs and respiratory health and to prepare for more

lung support to become necessary. As I learned this summer, even living thousands of miles away does not separate one from the effects of smoke. However, just as privilege can help mitigate the adverse health effects of heat waves, people with more resources may be able to shift their lives to avoid smoke by working indoors, moving away from smoky regions, etc., whereas people with fewer resources may bear the brunt of the pulmonary consequences. California has relied on prisoners to fight its wildfires since World War II by offering them minor incentives while requiring them to work for up to 72 hours straight (Neklason 2017). Additionally, Black, Indigenous, and people of color (BIPOC) and people in low-income communities are more likely to have preexisting health conditions that put them at higher risk for the consequences of smoke exposure. For example, Black people are nearly three times more likely to die from asthma-related complications than white individuals (Office of Minority Health 2021).

The adverse pulmonary effects of wildfire smoke are well documented. While it can be harmful to healthy adults, those at the most risk for the serious effects of wildfire smoke include elders, pregnant people, babies, and people who suffer from health disparities due to systemic oppression (Chen et al. 2021). Children are also at risk because they breathe in more air per pound of body weight and are often more active outside (CDC 2021). Wildfire smoke contains many different pulmonary irritants: particulate matter, ground-level ozone (Reid et al. 2019), carbon monoxide, and hazardous air pollutants from the burning of plastic and other materials. Particulate matter is the primary contaminant for the lungs. Around 90% of particulate matter emitted from wildfires is fine particles, defined as less than 2.5μm in diameter. Exposure to fine particulate matter can cause elevated susceptibility to respiratory diseases, including acute respiratory distress, asthma, pneumonia, bronchitis, chronic obstructive pulmonary disease (COPD; Cascio 2018), and lung cancer (Li et al. 2018). Additionally, any of the above pre-existing conditions increase the consequences of exposure to smoke, creating a vicious cycle.

The cardiovascular effects of wildfire smoke do not have quite as much research, but there is growing evidence that exposure to smoke is associated with the development of cardiovascular diseases such as ischemic heart disease and stroke (Chen et al. 2021). Even healthy people can develop inflammatory responses systemically and in their vasculature. Exposure to smoke has been found to trigger cardiac arrhythmias, atherosclerotic and ischemic cardiovascular complications, and worsen heart failure. There are possible ways that wildfire smoke can cause cardiovascular damage. First, neural receptors in the respiratory tract can be triggered, leading to autonomic nervous system dysregulation of heart rhythm and blood pressure. Second, pulmonary irritants can cause oxidative stress in the vasculature. Finally, the smallest air pollutants can directly enter the vasculature through the alveolar membranes (Chen et al. 2021). Most of the research so far on the health consequences of wildfires has focused on short-term exposure. The limited research on long-term exposure has focused on firefighters, and while it shows a cumulative effect, more research is needed to learn if the consequences persist when the exposure ceases (AirNow 2019).

Althaea officinalis (marshmallow) leaf and root can be supportive to a dry, irritated respiratory system. *Credit: Wikimedia Commons*

Therapeutics

It is key for herbalists to support the respiratory health of people in their communities as respiration is the primary interface with the outside world and the means of entry for smoke. Energetics are important to consider here as well because the lungs are especially sensitive to changes in energetics–they need to stay warm (but not too warm) and moist (but not too moist) (Bancroft 2020a). Maintaining the

Rosa spp. (rose) can be a plant ally as we deal with the grief of the climate crisis. *Credit: Wikimedia Commons.*

mucociliary escalator is crucial to moving particulate matter upwards and out. Since smoke is drying and wildfires are endemic in dry environments, demulcent herbs may be indicated to maintain the mucus part of the mucociliary escalator, as well as to stimulate the body's endogenous mucus production. *Althaea officinalis* (marshmallow) leaf and root are a great choice as they are demulcent and mildly expectorant (Hoffmann 2003; Bancroft 2020b), can moisten mucus, reduce inflammation, and gently support mucus elimination. As marshmallow is very mucilaginous, it is indicated when there is a very dry and irritated tissue state. The throat will feel scratchy and inflamed, and if there is any mucus, it will be sticky or crusty and difficult to expel. Marshmallow leaf is more specific for the respiratory tract, but the root is more demulcent, so it should be used in more extreme dryness (Hoffmann 2003; Bancroft 2020b). The root is powdered and 2-6g is taken as a cold infusion daily (Hoffmann 2003), while the leaf is best drunk as a hot tea (Bancroft 2020b) dosed at 5g daily (Hoffmann 2003). Tincture is not very useful because the polysaccharides are water-soluble and it is hard to get enough mucilage to be effective in a tincture dose (Bancroft 2020b).

Expectorants are herbs that specifically assist the mucociliary escalator in removing foreign substances and may support the respiratory tract removing particulate matter. Expectorants should be chosen depending on the constitution of the person (Bancroft 2020a). That said, wildfires themselves are hot and dry, so moistening and cooling expectorants will likely be indicated. *Inula helenium* (elecampane) root is a stellar expectorant and can be used in children (Ody 1993) and elders (Bancroft 2020a), two groups especially susceptible to wildfire smoke. It is slightly warming and drying (Easley and Horne 2016) so may need to be combined with a demulcent. It is specific for expectorating stubborn phlegm, either from chronic irritation or infections (Ody 1993; Easley and Horne 2016).

Lung tonics are the third category of herbs important to include in a formula for preventing damage from wildfire smoke. Lung tonics are herbs that, over time, support the lungs' capacity so that the lungs remain resilient even if the herbs are discontinued. In Chinese medicine, *Astragalus membranaceus* (astragalus) root is considered a Lung tonic (Cohen 2015). The Lungs (indicated by a capital L) in Chinese medicine are different from the physiological lungs (lowercase L) in biomedical Western medicine. While Lungs are related to the physiological lungs, the organs in Chinese medicine have a wider scope than the scope of the physiological organs (Kuhn 2009). They are responsible for where the exterior meets the interior (Kaptchuk 2000)—where the breath enters the body—and receive and circulate Qi (life force) (Beinfield and Korngold 1992). As a Lung tonic, astragalus stimulates immune function and strengthens the Lung Qi, and is specifically indicated when someone has low vitality and is especially susceptible to respiratory infections (Kaptchuk 2000; Cohen 2015).

In Chinese medicine, the Lungs are associated with the feeling of grief (Cohen 2015). When my friend calls me crying to tell me the mountains are burning above the valley of her home, I can see the connection. Along with supporting the physical hearts and lungs of their communities inundated by wildfire smoke, herbalists must also support their emotional

Hypericum perforatum (St. John's wort) has been extensively studied for its anti-depressant actions. *Credit: Wikimedia Commons*

hearts and Lungs – their ability to breathe and flow through the stages of grief. While living beings are united by the collective grief of the loss of ecosystems, the ways it manifests in bodies are manifold, and thus require different support strategies. Plant allies that someone already has an affinity for are often most helpful in grieving–when so much is uprooted, the familiar grounds and comforts.

How does one love a forest that may burn next summer? How to tend a sugarbush as the maple trees march north? Grief is not a one-time act, it is a relationship that humanity will need to build to be resilient and flexible in the coming decades. E. B. White (1969), author of *Charlotte's Web* and other children's books, reminds readers:

> *"If the world were merely seductive, that would be easy. If it were merely challenging, that would be no problem. But I arise in the morning torn between a desire to improve the world and a desire to enjoy the world. This makes it hard to plan the day."*

How can herbalists support their communities to connect with both the ecstatic joy of being alive on this beautiful planet and the heartbreaking grief of watching ecosystems die? I believe plants have a lot to teach about how to bear witness. *Rosa* spp. (rose) petals in particular may be appropriate for climate grief with the euphoriant aroma that comes along with its sharp thorns. Rose petals are specific for maintaining the flexibility and structure of emotional membranes–if you get too close, you get pricked, but if you do not get close enough, you cannot take in the medicine. When I smell the smoke from out west, I can get pricked by the thorns and wallow in the despair of it all. I can avoid the scent entirely: keep my head down and distract myself. Or I can take in the medicine of rose: feel the grief and not let it take over. Rose petals are cooling and astringent (Culpeper 1960), and help heal heartache (Easley and Horne 2016). They soothe without sedation and heal both topical and emotional wounds. A small dose can have a profound effect (Bunce 2020). Thomas Easley's dose is five drops to 2ml thrice daily of a 1:5 40% tincture of dried rose petals (Easley and Horne 2016). A glycerin-based preparation would also be appropriate, at 1:8 and 80% glycerin.

Plants have been giving lessons about grief through their resilience for thousands of years. The global climate catastrophe that humanity is currently causing and experiencing is certainly unprecedented. Cowie, Bouchet, and Fontain argue in their 2022 paper that humans are currently causing the sixth Mass Extinction in human history (Cowie et al. 2022). However, humans

have been changing and destroying ecosystems from time immemorial, and plants have learned to adapt and thrive. Some plants, especially the beloved weeds, are adapting to the changing ecosystems. Even as acres of Western forests burn, *Hypericum perforatum* (Saint John's wort) flourishes under the blackened remains of the old-growth trees, a "noxious weed" (King County Noxious Weed Control Board 2018) that can nourish nervous systems experiencing the grief of it all.

Saint John's wort found thriving in the newfound sunshine on a freshly charred forest floor may be another important ally in these times. Well-studied for its antidepressant effects, Saint John's wort flowers have been found to be comparable to selective serotonin reuptake inhibitors (SSRIs), with a lower or similar occurrence of adverse effects, in people with mild-to-moderate depression (Linde et al. 2008; Apaydin et al. 2016; Ng et al. 2017). The exact mechanisms of action of Saint John's wort are not known. It has been shown to impact glutamate, acetylcholine, serotonin, dopamine, and possibly noradrenaline levels. However, the roles of neurotransmitters involved in depression are complex, and Saint John's wort's effects on neurotransmitters are inconsistent (Kholghi et al. 2022). St John's wort is especially useful when depression presents with anxiety and digestive symptoms or insomnia and is contraindicated with many medications, including SSRIs (Easley and Horne 2016). Outside of pharmacology, St. John's wort is in the dominion of the sun (Culpeper 1960). Its lovely yellow color when flowering as well as the stunning red of its extract lend it energetic warmth and sunshine for cloudy and smoggy days. Easley's dose is five drops to 3ml of fresh plant tincture (95% 1:2) thrice daily (Easley and Horne 2016).

Sad zucchini plants after a rainy July, Natural Roots 2021. *Photo courtesy of the author.*

Humanity, like St. John's wort, is often called an invasive species. What would it look like for humans to also blossom and offer medicine, sitting at the feet of charred elders after a forest fire? How do herbalists spread care like the gentle aroma of rose while maintaining boundaries, or thorns? These are questions communities need to answer collectively because, like ecosystems, communities need each other to thrive, always, and especially in apocalyptic times.

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