



## **Essential Oils and Contagion: Facts and Fantasies**

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### **Introduction**

Long before the development of microbiology, aromatic plants were used for their anti-contagion powers. Modern research has extensively documented the antimicrobial powers of essential oils, the primary medicinal compounds of aromatic plants.

One of the most highly concentrated forms of botanical extracts, essential oils carry a high risk of causing adverse reactions, yet are widely available to the public with little to no education about their safe uses. In the U.S., the primary channels for distribution of essential oils have been Multilevel Marketing companies that have based many of their therapeutic claims on interpretations of in vitro studies. Unfortunately, because of their concentration, toxicity and other problems of biocompatibility, in vitro studies of essential oils do not translate into safe or effective in vivo applications.

The confusion between the clinically important findings of in vitro research and the in vivo therapeutic claims made by MLM companies has led to widespread misuse of essential oils and increasing numbers of injuries, sometimes serious. Recently, the FDA issued warnings to Young Living and DoTerra, the two largest distributors of essential oils in the U.S., for claiming that essential oils could prevent and treat a wide range of serious and life threatening illnesses including Ebola, cancer, autism, Alzheimer's and Parkinson's.

In light of these complexities, how are essential oils to be used, and what role can they play in clinical practice and the home pharmacy? It appears that on the one hand their uses are more limited and potentially dangerous than most people are aware of; on the other hand, with some simple guidelines they can be safely and effectively used for numerous important therapeutic purposes. Ultimately, essential oils represent a huge opportunity for the development of new botanical remedies for serious illnesses, especially drug resistant microbial infections, once the methods of safe biocompatible delivery of exact dosages targeting specific pathogens have been developed.

### **Ancient Understanding Of Contagion and Uses Of Aromatic Plants**

Traditional medical systems such as TCM and Ayurveda did not know details of microbiology, but they had a conceptual understanding of pathogens and microbes. Tibetan medicine, for example, uses the term "wind worms" to describe airborne pathogens. The

term "krimi" in Ayurveda is both specific to worms and generic for pathogens. Chinese medicine also has concepts of airborne pathogens, as 'wind heat and wind cold.'

Even though traditional medical systems did not know about specific species of microbes as we do now, they understood contagion. They saw that epidemics spread through the population, and they made a strong association between the contagion of illness, wind and atmospheric conditions, and bad smells.

Sewage, rotting garbage, sick people, environmental pollution, and other sources of unpleasant smells reveal the presence of proliferating microbial toxins. Without knowing the details of what pathogenic agents were present, people understood that where there were bad vapors, diseases lurked. Bad vapors, therefore, became synonymous with the "evil spirits" of disease and misfortune.

Aromatic plants have been one of the primary antidotes for 'evil spirits' for millennia. Using aromatic plants in various ways is more than a cosmetic treatment of bad smells: produced by plants as biochemical defenses, essential oil compounds can destroy a wide range of microbial pathogens.

The use of aromatic plants by humans is extremely old, and has many forms; it is likely that plants with pleasant fragrances were among the first that early Homo sapiens began using as medicines. Bedding in Stone Age settlements from 77,000 years ago was made with aromatic plants that had insecticidal properties. Evidence of frankincense use in African caves dates back over 10,000 years.

Throughout old Europe, and probably in many other parts of the world, strewing herbs such as lavender were put on the floor. Camphor was burned during plagues in Medieval Europe. In South America palo santo has been burned daily for thousands of years, for repelling mosquitoes, environmental purification and psychoactive effects during healing ceremonies.

In many cultures there are various forms of the sweat lodge, which typically uses aromatic plants such as sages and conifers in the water and on the rocks. Bathing with aromatic plants is undoubtedly very ancient. In many parts of the world aromatic plants were planted around homes to repel insects.

Before distillation, essential oils were extracted from aromatic plants primarily by soaking the plants in carrier oils; these preparations give a large number of medicinal and cosmetic products such as unguents, lotions, massage oils, and perfumes. With the invention of distillation perfumed waters and essential oils came into increased use. Starting with the distillation of rose oil 700 years ago essential oils became part of apothecaries and pharmacopeias, and were highly esteemed by the classical physicians.

Because of their antimicrobial effects, essential oil-containing spices were one of the primary methods of food preservation, as well as some of the most potent herbal

medicines; the search for those spices led to the so-called discovery of the New World.

## **Antimicrobial Research**

Aromatic plants have an important place in the pharmacopeias of every herbal tradition, where they are used primarily for their antimicrobial and anti-infectious properties. In the Western and European traditions the major plants are those of the Lamiaceae family, which include numerous species of *Salvias*, *Menthass*, *Nepetas*, *Ocinums*, *Origanums*, *Thymus*, and so on. Similar species are found in Traditional Chinese Medicine such as *Schizonepeta*, where they are classified as “wind dispersing” herbs and used for respiratory infections. Ayurvedic medicine also uses species in this general category, with *Ocinum sanctum*, “holy basil,” being the most well known; there is more emphasis, however, on classical spices such as cinnamon, clove, and ginger, which all have strong antimicrobial powers and are used more for infections of the digestive system.

There is a wealth of research and documentation of the antimicrobial powers of essential oils from a large number of aromatic species; if we start reading these reports we might get the impression that essential oils can kill every type of unwanted pathogen or organism.

For example, we find that tea tree oil alone has documentation showing that it is effective against multiple species of fungi, against candida and yeasts, against scabies, lice, mites and ticks, and of course against bacteria and viruses. Not only do these reports show that just this one oil is highly effective against these pathogens and organisms, but that they are effective against the strains that have developed resistance to drugs and treatments, even at low dilutions. (1)

As we look further, we find that hundreds of other essential oils have also been tested with similar kinds of results. For example, one research project in South Africa studying *Cymbopogon validus*, known as African Bluegrass oil, found that the oil not only has the usual antibacterial, antifungal and antiseptic powers, but also has significant powers to repel mosquitoes, kill their larvae, and to repel rodents. Additionally, it was found to have other powers that are commonly found in essential oil research: powerful antioxidant and anti-aging effects. (2)

Other oils such as niaouli, a species of *Melaleuca*, have insecticidal properties that are superior to numerous commercial products. (3)

We can see that essential oils represent a huge and largely underutilized source of products for a wide range of applications, not just for humans but also in veterinary medicine, agriculture, food preservation, alternatives to toxic chemicals, and many others.

So why are essential oils not being used more for these purposes, especially treatments for microbial infections? The simple answer is that essential oils are not user friendly. The entire art and science of aromatherapy is taking a large amount of plant material, distilling

it into a small amount of liquid that is not biocompatible, and then finding ways to dilute that liquid back to biocompatible levels again.

More specifically, there are four complex challenges to the medical applications of essential oils:

1. Essential oils are volatile, unstable, not water soluble, potentially toxic in small doses, and generally not biocompatible.
2. Because of the highly concentrated nature of essential oils, even small doses can cause adverse reactions on the skin if applied externally, or in the GI tract if taken internally.
3. There is a huge difference between in vitro actions of essential oils and in vivo, due to a very narrow margin between a safe therapeutic dose and a toxic dose, and incompatibility with tissues such as mucus membranes.
4. The science of what oil works against what strain of microbe is very specific.

### **Complexities Of How Essential Oils Work Against Microbes**

One of the common misconceptions about essential oils is that since they have been found to have antimicrobial powers, they can be used generically against any strain of microbe. The research, however, shows otherwise; while many oils have broad-spectrum effects against multiple strains of bacteria or viruses, they are not universally effective. There are also differences in the effectiveness of oils depending on the stage of the infectious process, and whether the oil comes in contact directly with the organism or not.

For example, one study examined the antiviral activity of eucalyptus, tea tree and thyme oils on herpes simplex virus type 1 (HSV-1) in vitro, and found that the oils were “able to reduce viral infectivity by >96%.” The mode of action, however, revealed that the effectiveness of the oils was moderate when used on cells prior to infection or after entry of HSV into the cells, but high when used to directly inactivate free virus particles. Similar results were found with the essential oil of lemon balm, which is commonly used for herpes outbreaks. (4) (5)

These examples illustrate one of the reasons that interpretation of in vitro studies into in vivo applications is problematic. It also illustrates that essential oils are probably more effective for destroying pathogens in the environment, such as uses in cleansing agents and aromatic diffusers, than as internal medications, at least at this stage of medical development.

In another study by the same institute, the oil of *Leptospermum scoparium*, also known as lemon-scented tea tree or manuka oil, was found to have an inhibitory effect on HSV-1 once it had penetrated into the cells, but not on HSV-2. (6)

What this tells us is that essential oils can have very specific effects against specific microbes and not others, even though they might be closely related. Oils tested against multiple bacterial or viral pathogens typically indicate that some strains are highly

susceptible, some are moderately susceptible, and some are not susceptible. For example, the essential oil of *Eucalyptus globulus* was found to be most effective for *Haemophilus influenzae* and *Haemophilus parainfluenzae*, followed in effectiveness by *Streptococcus pneumoniae*; the oil's anti-viral actions against mumps, however, was weak. (7)

In my opinion, this information does not discredit the use of essential oils in home pharmacies for grassroots level healthcare. The therapeutic abilities of commonly used oils are well established as immensely helpful for many kinds of infections, especially upper respiratory. What it does reveal, however, is why some cases respond better than others to generalized aromatherapy treatments.

This information also reveals two very important medical and political issues. The first is that there are two distinct levels of healthcare that need to be more clearly defined when it comes to essential oils: their uses in folk medicine, and their applications in medical aromatherapy. For example, essential oils such as eucalyptus and conifers can be safely and effectively used in a home pharmacy for uncomplicated upper respiratory infections, but the treatment of MRSA belongs in the realm of trained medical practitioners.

The second is that it reveals the great need in the U.S. for healthcare practitioners who are well trained in the uses of essential oils, and a political and economic system that supports them; this broader failure of our national healthcare system to provide anything other than pharmaceutical treatments is a vacuum into which untrained laypersons representing multilevel marketing companies have stepped into, endangering themselves, the public, and the unregulated access to these important botanical remedies.

### **In Vitro Versus In Vivo**

Now we come to the most complicated aspect of applying the antimicrobial powers of essential oils for medical purposes, and the root cause of their misuse: confusion between in vitro studies and in vivo applications.

The majority of studies published about the antimicrobial effects of essential oils are from in vitro tests. The method generally used is to cultivate a standardized strain of microbe in a petri dish, then expose it to a source of essential oil such as a soaked blotter paper and measure the inhibition zone and die off rate.

No matter how effective an essential oil may be against pathogens in a petri dish, the information derived from in vitro testing doesn't tell us what the oil will do in the body, or how to reach the levels necessary to effectively inhibit or eradicate an organism. Claiming that because a particular oil kills a particular microbe in a petri dish means almost nothing when that microbe is replicating in the body; it means even less if we do not know the species of microbe causing of the infection.

Here is a simple example of the confusion that arises between in vitro studies and in vivo applications, from personal experience.

A number of in vitro studies have found that oregano oil is highly effective against several organisms that cause intestinal infections; based on those studies, oregano oil is marketed as being effective for treating intestinal infections. This prescription is based on the effect of the oil on the pathogens, but overlooks the role of mucus membrane inflammation that intestinal pathogens cause.

Over the years, I have accumulated some experience treating my own intestinal infections with both botanical and allopathic approaches, as a result of living in Asia and South America. I heard about the antibacterial and anti-parasitic effects of oregano oil. I took some capsules of it to attack the microbes and parasites, which had been identified. Instead, it attacked my already inflamed GI tract, which needed soothing demulcent anti-inflammatory herbs rich in mucilaginous compounds like licorice and marshmallow and aloe vera, not caustic essential oils full of irritant phenolic compounds.

Essential oils may have profound in vitro antimicrobial effects, but because microbial infections tend to cause inflammation, essential oils coming in contact with inflamed tissues have a high likelihood of increasing the inflammation further. We can say that using essential oils for certain types of infections can be like treating fire with fire.

My story is not unique: I have heard countless stories about how essential oils have caused inflammatory responses. At the same time, many people swear that they consume them internally with nothing but beneficial reactions. How do we explain this paradox? The answer is simple: the same dose can cause a wide range of reactions in different people, depending on their sensitivity. One drop of undiluted oregano oil ingested orally may be wonderful for one person getting a sore throat, but cause horrible problems for someone with gastritis.

In order for essential oils to be safely and effectively utilized for more complex medical problems, numerous factors other than in vitro tests must be taken into account, including diagnosis of specific pathogens, method of administration, proper dilution in specific carriers, length of time of administering the medication, levels of inflammation and other parameters of tolerance in individual patients, and so on. In other words, this level of treatment constitutes practicing medical aromatherapy, something that untrained and unlicensed representatives of MLM companies are not qualified to do.

### **Toxicity and “Detox”**

Very small amounts of an essential oil can cause intense reactions on the skin and mucus membranes. Toxic reactions to essential oils can range from mild transient rashes to esophageal damage to liver and central nervous system toxicity. The most commonly reported reactions are due to applying the more caustic oils directly on the skin, causing dermatotoxic inflammation.

Of all the misinformation being propagated by MLM companies about essential oils, the most dangerous and medically fraudulent is that inflammatory reactions from misuse are in fact a “detox” reaction. Whether these claims are being taught to distributors as a way to sell more oils or are simply ignorance, the end result is that essential oil marketing has become a public health hazard.

## **Home Pharmacy Versus Medical Aromatherapy**

Understanding how to safely and effectively use essential oils for contagious microbial conditions requires a systematic organization of different categories of functions and applications; misuse of oils has resulted from attempting to use oils according to the principles of one modality when they should actually be used according to another. Clarification of these distinct approaches to using oils will go a long way toward eliminating misuse and adverse reactions, improving outcome, protecting the reputation of these botanical remedies and ensuring their continued unregulated access.

Essential oils can be, and should be, easily used at home following basic safety guidelines and methods of applications. A simple method such as using respiratory-benefiting essential oils in a diffuser in the winter to reduce airborne pathogens and support mucus membrane immunology represents a level of folk medicine that is immensely beneficial and cost effective. This level of grassroots healthcare is also effective for a number of other common problems such as sleep and stress disorders, especially when combined with dietary and herbal regimens. There are a number of oils that are prime candidates for the medicine cabinet that do not require much training to be utilized, such as *helichrysum* for soft tissue injuries.

We should remember that folk medicine also includes the uses of aromatic plants that reach far back through history. Using the *Lamiacea* herbs from the garden for tea and cooking, incorporating a wider range of traditional spices in the diet, and regular fumigation of the home with frankincense resin or palo santo wood are all enjoyable ways to get the benefits of essential oils without any of their complications.

Folk medicine uses of essential oils can become more sophisticated if families have a higher level of knowledge about the safe uses of oils for more complex conditions. For example, knowing how to safely use tea tree or holy basil oils in steam treatments increases the potency and effectiveness of treatments for more serious sinus infections, but they also require more care. For situations such as this, licensed holistic practitioners as naturopaths can play a crucial role in providing education and guidance.

Adverse reactions to essential oils appear to be coming primarily from attempts to use oils for more complicated conditions without proper medical training. It is therefore important to understand that more serious infections require specialized approaches for the proper administration of the oils, and should be done under the guidance of those who are fully trained.

The use of essential oils can therefore be broken down into three levels: general folk medicine applications, educated home pharmacy applications, and medical aromatherapy applications.

### **Pharmaceutical Applications**

Most of the research into the antimicrobial effects of essential oils is seeking to discover active ingredients that can be either extracted or synthesized for pharmaceutical applications. The method of delivering essential oils to targeted tissues and specific organisms remains the primary obstacle to their widespread use in medical applications.

The basic challenges to using oils in the body are to increase water solubility, increase their stability, increase their bioavailability, and decrease their volatility. This is obviously a fairly complicated technical and chemical challenge, but some interesting developments are taking place that might soon give us some essential oil products that could become widely used in medical practice. Similar research is taking place in the larger field of botanical and nutraceutical products, such as encapsulating curcumin in liposomes to prevent its degradation and enhance its uptake in the gut.

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