

## Essential Oils: Their use, storage and chemical makeup

The essential oils used in canine scent work have varying rates of evaporation (the rate they change from a liquid to a gas). While we don't need to be chemists to be successful at scent work, as the handler, having a bit of knowledge about this process, or volatility of the oils we use, will help you in your training and trialing.

Volatility is the rate the oil evaporates. Sounds simple enough. But we must factor in the surrounding environment to get a complete and accurate picture of what that oil is doing at the moment and how it is dispersing in the search area.

All essential oils have the same basic physical properties. The odor is strong when undiluted, lipid-soluble (can dissolve in fats, oils, and other non-polar solvents, allowing it to easily pass through the fatty cell membranes and be absorbed), they cannot be dissolved in water, and are very volatile. What we smell when we remove the lid of a bottle of oil is the substance becoming airborne as those volatile molecules are evaporating. The amount of odor available is dependent on the ambient temperature, the size of the oil molecule, the surface area of the bottle, and the moving air around the bottle.

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Indoors, a placed hide will start dispersing odor immediately. The process of aging reaches a peak until the surrounding area is saturated with that odor. At that point the odor molecules in the air have stabilized and you hit maximum saturation. This depends on a number of environmental conditions such as the vapor pressure of the oil, the temperature/humidity and its fluctuation, and the ventilation(heat/AC/windows/doors) present in the search area.

Let's look at those factors.

- Air circulation- air movement, the relative humidity in the search area, and the temperature will affect evaporation and dispersal. Saturated air will reduce the rate of evaporation. This is why putting tins in boxes or containers makes it easier for the dog to locate the odor as it is contained and saturates, or fills the vessel with only a small part of the odor pool leaking out through seams or cracks. Areas with more air movement will also cause the source to evaporate quicker as the surrounding area around the source is not saturated.
- Oil composition- just like everything else in our world, oil is also made up of molecules. These molecules have different weights so the different oils will have different evaporation rates as some are heavier than others. Myrrh is the heaviest oil of the scents commonly used in scent work, while birch is the lightest and thus the most volatile. The speed at which molecules move determines how much energy they have. To evaporate, molecules require energy. When the oils have produced enough energy, they overcome the oil's surface tension, and the process of evaporation begins releasing the molecules as vapor.
- Temperature- the temperature the oils are stored and used in will affect their availability for the dog. Anise seed oil will crystallize at about 55° reducing the evaporation rate and making less available to the dog. The ambient temperature will increase or decrease the kinetic energy and speed of the molecules. At the right temperature (remember it's different for each oil) the molecules will move faster and overcome surface tension and escape as a gas.
- Surface area- the surface area of the bottle of oil as well as the surface area the oil is placed on (in most cases a Q-tip) will affect the evaporation rate of the oil. A bottle with a wide mouth will have a greater surface area, thus will release more molecules into the air when opened.
- Vessel the oil is stored in- clear vials will allow more light and thus break down the oil quicker, plastic containers will degrade when in contact with oils and change the chemical composition (the odor the dog is looking for), and vials that are less than 50% full will allow more air to be stored with the oil and that air in the vial will be evaporated oil molecules (releasing a burst of molecules when you open the vial). Best practice is to store your oils in amber vials and don't purchase large amounts of oil as you won't use them in a year's time and will end up tossing it out.

Since oils are the critical component of our sport, it is necessary to store them in a way that will preserve them for as long as possible and keep them from degrading. Some simple practices to implement are:

- Store your oils in a cool, dry place, preferably in amber vials. Most companies will ship your oils in amber vials so as long as they arrive that way you can store them in a suitable place away from the common areas of the dog. Heat and light will degrade your oils so make a note of heat registers and windows when choosing a spot.
- Work quickly when using your vials. Have all your supplies out and ready when scenting Q-tips so that you can minimize the time the lid is off the vial, reducing the amount of time your vial is exposed to air. Evaporation leads to concentration, and thus, a different odor profile.
- Wear gloves when working with vials, EVEN IF THEY ARE CAPPED! Oils are absorbed into your skin (they are lipid-soluble) and not all are safe for human absorption/consumption. Also, it will reduce the likelihood that you will inadvertently contaminate the area you're working in by touching surfaces around you.
- Purchase only what you will use in one year (remember a drop goes a long way) and date your vials. I err on the side of caution and replace my vials every January. As an instructor I am opening and using my vials more than the average person, but a year is a nice conservative goal to implement. A one dram (1/8 fl oz) bottle will likely not be used up in a year's time by the average student.
- Oils will react to oxygen (oxidation) and that will change their odor profile as it affects their composition. Open vials can also allow moisture to enter the vial and water will also affect the oil. Even though oil and water will not mix, it still can alter the odor profile.
- To prevent oxidation, evaporation, and contamination (with moisture or elements in the preparation area) make sure you only open the vial when extracting oil and replace the cap securely when finished.
- It is okay to transport and travel with oils properly contained, however do not store them in your car as it is too unstable temperature wise. It is also not recommended to store them near a heat source as bottles that overheat can explode as the oil becomes unstable and the evaporated oil in the vial increases building pressure.
- It is recommended to prepare scented swabs 24–48 hours in advance, allowing them to "cook" in a sealed container, preferably glass.

Now the nerdy portion of this article. Not all oils are created equally. The rates of evaporation are what we need to be concerned with, and each oil has its own rate. This is why it is not recommended to train with a "cocktail" of odors (when we add multiple oils to one source) as the rate of evaporation will vary as the training session progresses. Factor in if the room gets warmer or cooler during your training session the evaporation and availability of the oil will be changeable. The big picture is your dog will be getting a variable, unpredictable amount of source to problem solve and we should strive for consistent criteria when we train.

oil	levels used	evaporation rate	time available (on Q-tip)	volatility notes
Sweet birch oil	novice	medium	up to 72 hrs	top
Anise seed	intermediate and up	fast	up to 96 hrs	top *will crystallize at 55°
Clove oil	intermediate and up	slow to medium	up to 2 weeks	base
Cypress oil	intermediate and up	slow to medium	up to 2 weeks	middle
Myrrh	intermediate and up	slow	up to 2 weeks	base *has longest shelf life of all
Vetiver	intermediate and up	slow	up to 4 weeks	base
Lemongrass	intermediate and up	fast	up to 72 hrs	top

Oils are classified by their volatility: Top Notes (fast), Middle Notes (medium), and Base Notes (slow). Top notes are the most volatile oils. They provide a strong initial impact and evaporate quickly. Middle notes are less volatile. They are not as strong at first, but they take longer to evaporate. Middle notes remain detectable in the air — longer than top notes. Base notes are the least volatile and longest-lasting.

### Precautions, cautions, and things to remember!

Many essential oils are used for human purposes, some topically, some to be ingested, some for inhalation, and some are multi-purpose. When using oils around your dog it is advisable to NEVER allow them direct access to the oil, the Q-tip it is applied to, or the vessels that contain the source.

Many of these oils can cause gastrointestinal upset, reactions with the skin or mucus membranes, or toxicity if ingested by either humans or dogs. Err on the side of caution and set up and store your source items so that your dog will never have direct access to the items.

Some generalities about oils in general are as follows. Keep in mind if you utilize best practices (gloves, minimal handling, and correct storage) you are NOT putting yourself or your dog at risk. Most of these cautions are for human use/contact.

- Vetiver can affect hormone levels, especially in pregnant women
- Birch oil can be toxic if overused because of high methyl salicylate content (the active ingredient in aspirin). It is not recommended for those with liver problems, on blood thinning medication, children or the elderly. Avoid while pregnant or breastfeeding. Considered a skin irritant unless well diluted.
- Anise seed oil should not come into contact with skin or be ingested during pregnancy, breastfeeding, and around young children due to estrogenic activity. It may interact with blood thinners if ingested in high concentrations.
- Clove oil contains eugenol, requiring caution to avoid skin irritation, toxicity, and adverse interactions. It should be diluted with carrier oils, kept away from children, and avoided if you are pregnant, nursing, or have bleeding disorders. Key risks include severe allergic reactions, liver damage, and blood-thinning effects.
- Cypress is generally for external use only, must be diluted, and avoided during pregnancy due to its estrogenic properties. It may cause skin irritation and is not safe for those with bleeding disorders or those taking anticoagulants. Keep away from children and avoid contact with eyes.
- Lemongrass requires strict dilution with a carrier oil to prevent skin irritation, rashes, or sensitization. Avoid using it during pregnancy or on children under 6 years old.

Scent work is a really great tool for dogs of all ages, abilities, and temperaments. As long as you use common sense, work purposefully and carefully with your source oils, you and your dog are not only safe, but will enjoy a sport that feeds your dog's need to hunt and have fun!

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