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[**Essential Oil Adulteration – Part 1**](http://davinawellness.com/essential-oil-adulteration-part-1/)

**What is Adulteration?**

Essential oil adulteration is when the oil that has been distilled or expressed is changed in some way, either by adding substance or taking them away. Adulterants can be anything from a non-volatile carrier oil, to cheap synthetic chemical fragrances, or anything in between.  As competition in the essential oil heats up, more and more companies are using adulteration to decrease cost.  This problem is so prevalent that one major industry expert, Dr. Robert Pappas, has stated that 95% of essential oils on the market are adulterated. There are four different types of adulteration Dr. Pappas identifies(1). Here, we will discuss the first type and the testing we use to protect you.

**Type 1** is a non-volatile addition, such as a carrier oil, in which the primary oil is mixed. The essential oil is then sold and marked as ‘full strength’ or “100% oil” with the customer having no idea the oil is diluted. This type of adulteration is not as common as it was in the past, and standard GC/MS testing as well as HPLC can catch this type of adulteration.

**GC/MS**

Gas Chromatography (GC) is the process of distributing an essential oil’s volatile compounds into its individual constituents, then producing a graph showing the oil’s components. Mass spectrometry (MS) classifies each constituent along with its percentage of the entire oil’s chemical makeup. This process identifies any potential adulteration and contaminants including carrier oils or other non-volatiles, making GC/MS a commonly used testing method for essential oils. Using this process, compounds are broken down into their individual chemical components where they can be analyzed. Since the therapeutic effects of essential oils are largely dependant upon their chemical content, understanding their composition is vital.

**HPLC**

Reversed-phase high performance liquid chromatography (HPLC) was developed to study the composition of nonvolatile constituents in essential oils of major citrus species, and is very effective at finding non-volatile adulterations. There are oils, primarily citrus, that have naturally occurring non-volatile components, but these should be present within known proportions. For example, the volatile portion of citrus oils should be 85-99% of the oil by weight. The nonvolatile fraction in citrus essential oils ranges between 1% in some sweet orange oils, and 15% in key lime expressed oil [9](2). These constituents are considered non-volatile because regular gas chromatography doesn’t vaporize them. HPLC was developed for this purpose it has become an important tool in the analysis of non-volatile constituents.

Choose a reputable essential oil company that uses both GC/MS and HPLC testing to ensure you have oils that are free from this type of adulteration.

For more information on this subject, continue reading in the upcoming Part 2 of adulteration.

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[**Essential Oil Adulteration part 2**](http://davinawellness.com/essential-oil-adulteration-part-2/)

Another common adulteration is blending with less expensive, lower quality oils. Cinnamon bark, for example, is often mixed with cassia. Cassia is much cheaper, while sharing a similar composition to cinnamon (though inferior therapeutically), which tempts some to mix the cheap cassia oil with the expensive cinnamon bark to maximize profits. Testing with GC/MS and careful analysis will detect the blending of essential oils.

GC/MS along with proper analysis can pick up this type of adulteration due to the presence of constituents that don’t belong. For example, bergamottin and 5-geranyloxy-7-methoxycoumarin, which belong to the furocoumarin family, are not supposed to be present in orange oil. Bergamottin and 5-geranyloxy-7-methoxycoumarin are found in both lemon and lime essential oils and their presence in orange oil suggests interspecies adulteration(1).

**GC/MS**

As we covered in part 1, Gas Chromatography (GC) is the process of distributing an essential oil’s volatile compounds into its individual constituents, then producing a graph showing the oil’s components. Mass spectrometry (MS) classifies each constituent along with its percentage of the entire oil’s chemical makeup. This process identifies any potential adulteration and contaminants, and in this case, identifying the oil’s complete chemical makeup -along with expert, unbiased analysis- is the key. In-house testing, while impressive sounding, can also be biased, especially when there is so much profit to be made from adulteration. The consumer’s best option is to look for companies who use reputable 3rd party testing and analysts, and who readily offer those findings to customers.

**References**

1). Hao Fan, Qingli Wu, James E. Simon, Shyi-Neng Lou, Chi-Tang Ho (2015) Authenticity analysis of citrus essential oils by HPLC-UV-MS on oxygenated heterocyclic components. *Journal of Food and Drug Analysis Volume 23, Issue 1, Pages 30–39.* DOI: <http://dx.doi.org/10.1016/j.jfda.2014.05.008> Retrieved from [http://www.jfda-online.com/article/S1021-9498(14)00149-5/fulltext](http://www.jfda-online.com/article/S1021-9498%2814%2900149-5/fulltext)