

dōTERRA's CPTG Certified Pure Therapeutic Grade<sup>®\*</sup> quality protocol employs five different analytical methods to ensure dōTERRA's essential oils are both pure (extracts contain only the volatile aromatic compounds of a plant), and potent (extracts have consistent chemical composition from batch to batch). The CPTG quality protocol requires the use of independent laboratories for standardization and testing.

### Test 1: Gas Chromatography

After the aromatic compounds (also called essential oils) are carefully distilled from plant material, samples are tested for chemical composition using gas chromatography. In gas chromatography, volatile essential oil compounds are vaporized and passed through a long column called a gas chromatograph. Each individual compound travels or “elutes” through the column at a different rate and is measured as it exits the column during the testing period. Using gas chromatography, quality control engineers can determine which compounds are present in a test sample and, as importantly, at what levels.

### Test 2: Mass Spectrometry

In addition to gas chromatography, essential oil samples also are tested for composition using mass spectrometry. In mass spectrometry, samples are vaporized and then ionized and each individual compound in a sample is measured by weight. Mass spectrometry provides additional insight to the purity of an essential oil by revealing the presence of non-aromatic compounds, such as heavy metals or other pollutants, which are too heavy to elute along a gas chromatograph. The combination of gas chromatography and mass spectrometry is sometimes referred to as a GC/MS test.

### Test 3: FTIR Scan (Fourier Transform Infrared Spectroscopy)

After an essential oil passes the gas chromatography and mass spectrometry tests, it is transported to a manufacturing facility for filling. Before being released into the facility, the essential oil “batch” is held in quarantine while additional quality tests are performed. Those tests include an FTIR Scan which, similar to GC/MS testing, is also a analysis of material composition. In an FTIR Scan, a light is shown at the material sample and the amount of light absorbed by the chemical constituents of the sample is measured. Results are then compared against a historical database to ensure adherence to composition standards.

### Test 4: Microbial Testing

Before a batch of essential oils can be released from quarantine to manufacturing, it must be tested for the presence of bio-hazards such as bacteria, fungus, and mold. In microbial testing, samples are drawn from each batch of essential oils and applied to growing mediums in dishes or “plates.” After an incubation period, each plate is analyzed for growth of microbes. This test is performed on all incoming material to the manufacturing facility, and also performed on finished product to ensure no harmful organisms have been introduced to the product during the filling and labeling process, and to ensure shelf-life stability.

### Test 5: Organoleptic Testing

Organoleptic testing brings a human touch to each step of the CPTG quality control process. Organoleptics include those attributes of an essential oil that can be tested with taste, sight, touch, and smell. From growers and harvesters to essential oil chemists; from manufacturing engineers to essential oil practitioners; dōTERRA's global network of essential oil providers carefully monitors the quality of each CPTG Certified Pure Therapeutic Grade essential oil. The extraction of essential oils is very much an art form that can be enhanced by, but not replaced with, mechanical analytics. The wisdom and experience of dōTERRA's essential oil experts are an indispensable part of the CPTG quality control standard.

\*CPTG Certified Pure Therapeutic Grade is a registered trademark of dōTERRA Holdings, LLC representing internal standards of quality assessment and material control. The CPTG testing protocols require the use of independent laboratories for CPTG standardization and quality testing. The CPTG protocol is not administered by government or industry regulatory agencies and does not imply regulatory approval of dōTERRA products.