Essential Oil Therapeutics

Volatile Oils
Internal Use, Chemistry, Pharmacology, Toxicology

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Presenter
Recommended Books

- *Essential Oil Safety* by Robert Tisserand and Rodney Young
- *The Aromatherapy Garden* by Kathi Keville
- *Evidence-Based Essential Oil Therapy* by Dr. Scott A. Johnson
Essential Oils (= volatile oils)

• Complex mixtures
  – Green leafy volatiles
  – Hydrocarbons (“high notes”)
  – Monoterpenes (middle notes, moderately volatile)
    • Esters, alcohols, ketones, phenolics
  – Sesquiterpenes (low notes, not too volatile)

• Essential oils can contain several hundred identified compounds

• Plant families known for their essential oils include Apiaceae, Lamiaceae, Lauraceae, Myrtaceae, and Asteraceae
Mono-, Sesquiterpenes
Observed Functions in plants

• Protection
  – Antifeedants mammals, insects, aphids, etc.
  – Allelopathic, Anti microbial, antiviral, antifungal properties
  – Seed germination inhibitors
  – Seedling inhibitors
  – Pheromone mimics to interfere with mating

• Signaling
  – plant behavior changes when exposed to airborne volatile compounds on a gradient
Predators cause change in EO composition
Essential Oils

• Complex mixtures of monoterpenes—some essential oils contain several hundred identified compounds
• Families commonly containing essential oils include the parsley family (Apiaceae), mint family (Lamiaceae), laurel family (Lauraceae), and the eucalyptus family
• Essential oils penetrate the skin, are used topically as antiinflammatory and antimicrobial agents
• Internally as mild sedatives (lemon balm, chamomile), antiinflammatory and antispasmodics (chamomile, yarrow) and flavor ingredients
• Many more uses as aromatherapy, cosmetics, perfumes, and for internal use, food and flavor, and medicine
Essential Oil Products

- Oral, Skin Applications
- Addition to tablets, capsules
- Tinctures
- Syrups
- Throat lozenges
- Oral irrigators
- “Cosmedics”—i.e. mouth rinses, shampoos
- Salves, creams
- Medicated fixed oils (SJW oil + lavendar)
Quality

• Distilling oils damage or eliminate “high note” compounds
• Consider a vacuum chamber
• Some commercial products are overheated, solventextracted (hexane), become much less complex (GC/MS)
• Some are spiked with synthetics
• Some might contain lipophilic or volatile contaminants (herbicides)
Quality Issues

• Identity, purity, spiking, analysis, organic
• Safety issues
• Applications
• Materia medica (top 20 oils)
• Setting up a home business
• Resources
Other Quality Issues

- Organically-grown
- Fair trade
- Testing
- Organoleptic (smell, taste)
- The standard is the fresh plant (lavendar, rosemary)
- GC/MS
- LC/MS
- HPLC
• Different population of the same species vary widely in composition—standardization desirable

• Achenes from 11 indigenous populations of fennel were studied by GC/MS

• Estragole, trans-anethole, fenchone, limonene, and alpha-pinene

• Four different groups were seen
  – Hi estragole (63%) and low trans-anethole (3%)
  – Estragole (ca. 43% and trans-anethole (ca. 22%)
  – Estragole (ca. 23%) and trans anethole (ca. 64%)
  – Low estragole (ca. 8%) and high trans-anethole (64%)

Variation—Chemotypes

- Variation—Chemotypes
- Chemotaxonomy
- Variation within a species in different parts of their range
  - Hybridization, polyploidy
  - Phenotype, genotype
  - Predators, browsers (leaf hoppers)
  - Manufacturing methods
  - Valerian
  - Lack of standardization
Four Major Chemical Pathways

- Phenyl Propanoids
  - Cinnamic acid
  - Phenolic acids
  - Quinones
  - Coumarins
  - Flavonoids
  - Anthocyanins
  - Tannins
  - Lignin

- Terpenes
  - Sesquiterpenes
  - Diterpenes
  - Monoterpenes

- Fatty Acids
  - MeJA (cis-jasmone)
  - GLVs (e.g., hexenal)

- Alkaloids
  - MeSA
  - SAMT
  - SA
  - Benzenoids

- Non-mevalonate pathway
  - Pyruvate

- Mevalonate pathway
  - IPP

- Primary metabolism
  - Acetyl CoA

- Secondary metabolism
  - Fatty acids

- Enzymes and pathways:
  - Lipoxigenase (LOX)
  - Lipase (DAD)
  - AOC
  - AOS
  - HPL
  - OPDA
  - JA
Isoprene: Basic Building Blocks

Many terpenes are built up from the isoprene or iso-pentane units (C5) linked together in various ways with different ring closures, degrees of unsaturation, and functional groups.
Terpenes Built from Isoprenes

- Monoterpenes (C10)
- Sesquiterpenes (C15)
- Diterpenes (C20)
- Triterpenes (C30)
- Carotenoids
- C5 isoprene units
Monoterpenes

- Molecules containing 10 carbon atoms
- Monoterpenes are volatile, slightly water-soluble, more soluble in alcohol
- They are a main constituent of many essential oils
- They can occur as an open chain, single ring, or double ring structure
  - Can occur as esters, alcohols, ketones
- Many are aromatic, effect the nervous system, and relax smooth muscle like the bowel; other effects
Sesquiterpenes C15 Compounds

- Sesquiterpenes: C15 compounds
- Component of essential oils
- Examples are the chamazulenes
- About 5,000 have been reported
- Most produced through the mevalonic pathway
- Antispasmodic, antiinflammatory
- Sesquiterpene lactones:
  - Over 4,000 reported
  - Especially common in Daisy family
    - Feverfew (Tanacetum parthenium)
    - Yarrow, chamomile
  - Tend to be bitter
  - Can cause allergic reactions
  - Usually crystalline compounds that are not particularly volatile
**Artemisia vulgaris Chromatogram**

**Sesquiterpenes**

**Monoterpenes**

**Camphor**

**Higher retention time**

- (E)-\(\beta\)-Ocimene
- Artemisia ketone
- \(\gamma\)-Terpinene
- trans-Sabinene hydrate
- 1-Nonen-3-ol
- p-Cymenene
- p-Mentha-2,4(8)-diene
- cis-Sabinene hydrate
- Linalool
- ISOAMYL 2-METHYLBUTANOATE
- ISOPENTYL 2-METHYLBUTANOATE
- Thujone
- 1-Oct-3-enyl acetate
- trans-p-Mentha-2,8-dienol
- (E)-4,8-Dimethylnona-1,3,7-triene
- Camphor
- Mentha-2,8-dien-1-ol\(\text{trans-para}\)

- Pinocarvone
- Borneol
- Lavandulol
- Viridene
- trans-1-Phenyl-1-pentene
- Methyl salicylate
- a-Terpineol
- 2-(2-PYRIDYL)-3-(TRIMETHYLSILYL)-5,6,7,8-TETRAHYDROQUINOLINE
- Myrtenol

- trans-Carveol
- cis-Carveol
- Carvone
- 3-HEXENYL 2-METHYLBUTANOATE
- Bornyl acetate
- (+-)-LAVANDULOL ACETATE

- Cubebene\(\alpha\)
- Cyclohexasiloxane, dodecamethyl-
- Copaene\(\alpha\)
- Bourbonene\(\beta\)
- Isodauca-4,7(14)-diene
- b-Elemene
- Cubebene\(\beta\)
- Isocaryophyllene
- b-Copaene
- Copaene\(\beta\)
- Aromadendrene
- Cadina-3,5-diene
- Humulene\(\alpha\)
- cis-Muurola-4(15),5-diene
- Muurolene\(\gamma\)
- g-Muurolene
- Selinene\(\beta\)
- g-Amorphene
- Bicyclogermacrene
- Muurolene\(\alpha\)
- Farnesene\((E,E)-\alpha\)
- d-Amorphene
- g-Cadinene
- d-Cadinene
- Cadina-1,4-diene
- Germacrene B
GC/MA for Detection and Identification of Terpenes
Gas Chromatogram Diagram
Combi-Pal Autosampler
SPME
Small polymer micro-extraction
Mass Spectrometer

1. Inject sample
2. Heater to vapourise sample
3. Electron beam ionises sample
4. Particles accelerated into magnetic field
5. Magnetic field separates particles based on mass/charge ratio

Detectors:
- Lightest
- Heaviest
47.38  Verbenone
47.92  Butanoic acid, 2-methyl-4-methylpentyl ester
48.09  trans-Piperitol
49.75  2,3-Dehydro-1,4-cineol
49.89  Neral
50.47  (Z)-3-HEXENYL ISOVALERATE
50.61  Hexyl 2-methyl butanoate
51.43  Geraniol
51.64  Ascaridole
51.99  Geranial
52.96  trans-Sabinen hydrate acetate
53.45  Cuminic alcohol
53.71  Thujanol acetate<iso-3->
53.88  Bornyl acetate
53.96  Isopropyl phenylacetate
54.16  trans-Sabinyl acetate
54.60  Carvacrol
56.10  Sabinyl acetate<trans-> (Ac vs. IPP)
57.90  Silphiperfol-5-ene
58.06  Eugenol
58.81  exo-Isocamphanyl acetate
59.51  Cubebene<alpha->
59.61  Cyclohexasiloxane, dodecamethyl
60.06  (E)-Jasmone
60.37  Benzyl 2-methylbutyrate
60.49  Neryl acetate
60.71  (Z)-Jasmone
61.46  Copaene<alpha->
61.65  Modheph-2-ene
61.91  Bourbonene<beta->
62.13  b-Cubebene
62.19  Shiwaene<trans->
62.36  Calpodene<trans->
62.65  Methylen-2-one
63.19  Butyrolactone-beta
64.01  Neocubebone-beta
Detection, Determination

• Software
  – MassFinder 4
  – NIST MS search software
  – AMDIS

• Databases—Mass Spectral Libraries
  – Wiley 8 (399,000 spectra)
  – NIST 05 (532,000 spectra)
  – Adams, MF4 (about 3,000 spectra (fragrance))
Determining Identity of Peaks

- Two separate experiments

- Retention time is adjusted to an international standard based on lab’s particular GC/MS machines

- Mass spectral data is matched to large databases (> 400,000 compounds)

**Spec 14696 (60.08 min):**
- 2-Cyclohexene-1-methanol, 2,6,6-trimethyl-
Is EO chemistry tied to phylogeny?

• Defence compounds, signaling compounds are more tied to environmental influences
  – Differences in EO composition even in the same genus is caused by gene expression →protein production (enzymes) →terpenes
• Structural compounds (like cellulose, lignin) are more tied to phylogeny (conserved)
• Nutrition (carbohydrates, proteins, fatty acids)
60.00  Isobornyl propionate  60.61  Neryl acetate  60.90  Cyclosativene  61.08  Cyclosativene  61.41  Copaene<alpha->  61.90  Bourbonene<beta->  62.12  a-Funebrene  62.61  b-Cubebene  63.20  Italicene  63.65  cis-a-Bergamotene  64.22  Caryophyllene(E-)  64.78  Copaene<beta->  65.06  b-Copaene  65.24  Bergamotene<alpha-trans->  65.47  Sesquisabinene A  65.76  Cadina-3,5-diene  66.04  4aH,10aH-Guaia-1(5),6-diene  66.32  Humulene<alpha->  66.59  Nerylpropionate  66.81  Cadina-1(6),4-diene<cis->  67.37  4,5-di-epi-Aristolochene  67.79  Neocallitropsene<alpha->  67.97  Curcumene<gamma->  68.21  Germacrene D  68.43  Amorpha-4,7(11)-diene  68.79  Zingiberene<alpha->  69.05  Bicyclogermacrene  69.17  Muurolene<alpha->  69.35  (Z)-a-Bisabolene  69.60  d-Amorphene  69.78  b-Curcumene  69.99  g-Cadinene  70.34  Cadine-1(4)-diene  71.12  Cadina-1,4-diene  71.47  Cadine-4(5)-diene  73.84  á-CARYOPHYLLENE OXIDE

A. californica

A. chinensis
Commercial Uses

- Essential oils penetrate the skin, enter the circulation
- Topically as antiinflammatory and antimicrobial agents
- Locally-active for relieving pain and stagnation of injuries, neuropathies
- Internally as mild sedatives (lemon balm, chamomile)
- Antiinflammatory and antispasmodics (chamomile, yarrow)
- Flavor, aroma ingredients for foods and drink (orange, cinnamon, mint)
Other Human Value of Volatile Oils

- Antiseptic properties of volatile oils known since antiquity
- Thyme, sage, hyssop, basil, rosemary, ginger all have strong anti-microbial properties, used in cooking, preserves meats
- Enbalming procedures
- Impart flavor, aroma to food, drinks
- “Aromatherapy”
Pharmacological Effects

- Stabilizes mast cells, reducing histamine (pro-inflammatory) release
- Smooth muscle relaxant (trachea, intestine, bronchi)
- Strong inhibitor of TNF-alpha, IL-beta, some effect on chemotactic cytokines
- Reduces inflammation
- Sedative
- Antimicrobial
Safety of Essential Oils

- Dilute in fixed oil if irritation occurs on skin (2-3 drops/ml)
- Check for sensitivity
- Keep out of reach of children, use safety caps
- Be aware of potentially toxic oils
- Pennyroyal, wormwood, mugwort, sage
- Caution in children under 6 years of age
- Skin sensitivity with sun exposure
- Bergamot, grapefruit, angelica
- Don’t use near the eyes or put into ears
- High phenolic oils can irritate the eyes—oregano, thyme, clove, helichrysum
- Caution during pregnancy, especially oils with putative hormone-like activity—clary sage, sage, tansy, juniper, fennel
Potentially Toxic Oils

- Boldo—ascaridole
- Camphor—stimulates nervous system
- Mugwort (and other *Artemisia spp.*)
- Pennyroyal—abortifacient
- Rue—allelopathic (ketones)
- Sage (*Salvia spp.*)—thujone
- Star Aniseed (*Illicium*)—anethole
- Thuja—contains thujone
- Wintergreen—methyl salicylate
- Wormseed—highly toxic (ascaridole)
- Wormwood (other *Artemisia spp.*)—contains thujone
• Geraniol, nerol and trans-anethole show some activity in high concentrations
• Eugenol—antiestrogenic activity
• Anethole has definite estrogenic activity, also antifertility activity; appears to be safe
• 80-90% in *Pimpinella anisum* and *Illicium verum* (star anise) and 50-60% in fennel seed oil
• Estrogenic effects of oils not due to anethole alone
Estragole—Suspected Carcinogen

- Some varieties of fennel
- Much lower
- Basil
- Tarragon (*Artemisia dracunculus*)
- Very low
- Hyssop
Internal Use

- Internal usage comes from the French model of essential oil practices
- In empty capsules as a pill
- Dilute in water, juice, honey, coconut oil, olive oil, or NingXia
- Drop on the tongue or under the tongue
- Check bottle label before consuming. Do not use internally with children up to age 5.

Whole Life Oils
## Diluting Essential Oils

### Dilution Ratios

<table>
<thead>
<tr>
<th>Dilution %</th>
<th>Approximate Number of Drops of Essential Oil Per Teaspoon(s) of Carrier Oil[^1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3%</td>
<td>1 drop per 2 teaspoons</td>
</tr>
<tr>
<td>1.5%</td>
<td>2 drops per teaspoon</td>
</tr>
<tr>
<td>3.0%</td>
<td>4 drops per teaspoon</td>
</tr>
<tr>
<td>5.0%</td>
<td>7 drops per teaspoon</td>
</tr>
</tbody>
</table>

(The number of drops per teaspoon of carrier oil for general use and for those with sensitivities)

Source: Johnson: EBEOT
Irritation from Oral Ingestion of EO

• “Based on current knowledge, and the available literature, oral administration of essential oils does not pose a long-term risk of damage to the oral cavity, esophagus, stomach, or intestines when taken in reasonable dosages and with food.”

• Some EO can have an antiinflammatory, healing effect on mucous membranes (i.e. orange, turmeric, ginger)

• For review of the relevant literature:
Absorption

- 1-2 drops of EO swished in the mouth for oral health
  - Lavender, peppermint, orange oil, lemon oil, etc.
- For treating esophagus or bronchial area, add 1-2 drops to honey
- For delivery to the stomach (*H. pylori*, gastritis, etc.), add 1-2 drops to gel caps
- For delivery to the LI, SI, add to carrier oil (avocado, olive, etc.)
Essential Oils in Tablets, Capsules

- Enhancing medicinal effects (try Counter Attack)
- Sensory appeal—flavor, smell, “compliance”
- Orange, peppermint
- Antibacterial, antifungal, antiviral effects
- Oregano, thyme, tea tree
- Digestive, “Qi-regulating” effects
- Ginger, peppermint, caraway, fennel (help prevent indigestion from dietary supplements—most common side effect)
- Antispasmodic, antiinflammatory effects
- Chamomile, yarrow
- Sedative, calming effects
- Valerian, orange, lemon balm
Antibacterial, Antifungal

- Add to products to treat infections
- Respiratory tract
- Urinary tract
- Apply to soles of feet, in syrups
- Tablets, capsules, teas (Good Earth Cinnamon tea)
- Vaginitis, cystitis, colds, flu, bronchitis,
- Sinusitis
Digestive Aids

• Antispasmodic essential oils for relieving pain, gas, discomfort of overeating, dyspepsia
• For liver products—i.e. liver Qi stagnation
• “free and easy wanderer” (Bupleurum spp. has EO)
  – get it in teas but not extractions?—volatiles lost
• For flavoring laxatives, liver products
• Gas—”4 Seed Tea”
  – fennel, fenugreek, flax, caraway
Sedatives, Calmatives

• Anxiety, nervousness
• Insomnia
  – Lemon balm
  – Valerian
  – Lavender (high linalool)
  – Fleabane (high linalool)
Antispasmodic, Antiinflammatory

- Intestinal cramps, pain, distension
- Bronchial spasms, inflammation
- Sinus inflammation
- Uterine cramps
External Products
Cosmetics

- Perfumes—essential oil blends
- Deodorants—sage
- Creams
- Salves
- Bath salts
- Shampoo and Cream Rinse
Carriers

• Small, highly lipophilic molecules
• Carry other larger or more hydrophilic compounds into the dermis and the capillary system via the blood and lymph
• Excellent for treating local areas
• Pain, spasms, infections, trauma
• Delivery of larger compounds like triterpenes (steroids)
• Essential oils can carry green tea polyphenols—sun protection
Treating Infections

• Add to creams, salves
• Apply diluted—2-4 drops / tsp (1 ml)
• Apply some undiluted (caution)
• Some people develop sensitivity
• Can erode dermis—highly irritating
• Ketones like Thyme oil
• Oregano, thyme, manuka, tea tree oil most active
Treating Pain, Inflammation

- Inflammation (azulenes)
- Chamomile, yarrow, mugwort
- High chamazulene variety of *Artemisia arborescens*
  - (up to 40%), low thujone
- Pain
- Everlasting (*Helichrysum italicum*)
- Roman chamomile
- Blood-movers (ginger, cinnamon)
Mint Family  Lamiaceae

- Many medicinal genera
  - Rosmarinus, Salvia, Thymus, Mentha, Origanum, Scutellaria, Lavandula
- Opposite leaves, bilabiate flowers, aromatic herbs
- Over 200 compounds identified from the essential oil of lavender
Apiaceae

- Parsley Family (formerly Umbelliferae)
  - Fennel seed
  - Angelica spp.
  - Lovage (Ligusticum spp.)
  - Desert parsley (Lomatium spp.)
  - Parsley seed, root
Laurel Family  Lauraceae

- Mainly tropical family
- Several important commercial trees
  - Cinnamon, camphor, bay tree
Thujone: Mutagenic, Hepatotoxic

- Neurotoxic, hepatotoxic, mutagenic in animal tests, bacterial assays
- Found in *Salvia*, *Artemisia* (wormwood, mugwort)
- Not particularly water soluble, so a traditional tea of wormwood is safer than alcoholic tincture
- One active ingredient of the hallucinogenic drink, absinthe
Valerian  *Valeriana* spp.

- Monoterpenes are important part of activity
  - isovaleric acid, 3-methylvaleric acid, limonene, etc.
  - “Valerian monoterpenes produce unprecedented enhancement of GABA action at GABA A receptors” (Johnson, 2004)
- The valepotriates (C15) are known as antidepressant anxiolytics in Germany, where valerian extracts are commonly prescribed by doctors
- Fairly unstable, which partly accounts for the uneven quality of valerian products
- Mutagenic in some assays, but poorly absorbed and breakdown products are not mutagenic, but still active
Sesquiterpenes: C15 Compounds

- Component of essential oils
- Examples are the chamazulenes
- About 5,000 have been reported
- Most produced through the mevalonic pathway

- Antispasmodic, anti-inflammatory
- Sesquiterpene lactones:
  - Over 4,000 reported
  - Especially common in Daisy family
    - Feverfew (Tanacetum parthenium)
    - Yarrow, chamomile
  - Tend to be bitter
  - Can cause allergic reactions
  - Usually crystalline compounds that are not particularly volatile
Chamomile

- German chamomile is *Matricaria recutita* L.
- Roman chamomile is *Chamamaelum nobile* L.
- Both contain monocyclic sesquiterpenes such as bisabolol, bicyclic sesquiterpenes such as chamazulene
- Used traditionally for painful digestion, cramps; antiinflammatory skin preparations
- Safe during pregnancy and nursing
- Traditional teas are active, but ethanolic extracts are more potent
Essential oils

Production

- Essential oils are volatile, b.p. 130-180 f
- Contain esters, monoterpenes, sesquiterpenes
- Families: Lamiaceae, Apiaceae, Rutaceae, Lauraceae, Myrtaceae
- Potent plants containing essential oils: Thymus, Eucalyptus, Salvia, Rosmarinus

Essential oils also have antimicrobial, sedative, antiinflammatory effects, among others
Essential Oil Production

- Enfleurage (flower extraction with cold fat)
- Steam distillation
- Solvent extraction
Materia Medica—Top 20

- Oregano, thyme (antimicrobial)
- Tea tree (antimicrobial)
- Ginger (analgesic, blood mover)
- Lemon balm (calmative, sleep aid)
- Valerian (sedative, sleep aid)
- Chamomile (blue) (anti-inflammatory)
- Mugwort (ext. only-anti-inflammatory)
- Orange (calmative, flavor enhancer)
- Cinnamon (blood mover, pectoral)
- Wintergreen (external) (analgesic)

- Yerba santa (expectorant)
- Eucalyptus (antihistamine)
- Helichrysum (antihistamine, skin)
- Clove (analgesic, antimicrobial)
- Lavendar (relaxant, calmative)
- Rosemary (energizer, antioxidant)
- Juniper (antimicrobial, diuretic)
- Pine (expectorant, mucolytic, antiseptic)
- Cedar (antimicrobial, antiviral)
- Fennel (carminative, digestive aid)
Rosemary
*Rosmarinus officinalis*

- Native of Mediterranean area
- Essential oil contains mainly camphor; 1,8-cineol, pinene
- Besides antibacterial effects, effective against *Candida albicans*, and also a good blood-mover (emmenagogue)
- Also mild nervous system stimulant (camphor), antiinflammatory
- Dose: up to 10 drops/day (diluted)
Thyme and Thymol

- Effective against a wide variety of pathogenic bacteria and fungi, especially *S. aureus*, *Vibrio parahaemolyticus*, *Salmonella typhimurium*, etc.
- Effective against *C. albicans*, *Tinea* spp., *Aspergillus* spp.
- Dilute 1:10 in olive oil for external use; or use 1:5 tincture of recently-dried herb
- Can cause skin irritation
- Toxic internally

Oregano, Thyme Oils

- Thyme—1.0 – 2.5% volatile oil; minimum 40% should be thymol + carvacrol (Ph. Eur.)
- Oregano—thymol (0-21%); carvacrol (0-85%) Quality!
- Quality—synthetic oils vs. natural oils (GC/MS); natural more complex
- Both more effective than either alone
- Carvacrol + thymol less effective than whole oil in vivo
- Action: damage in membrane integrity, which further affects pH homeostasis and equilibrium of inorganic ions
- Strong antioxidant properties of oil + phenolics (rosmarinic acid, etc.)
- Dose: 1-2 drops in tea; gum irrigator; 0.2-0.4 ml enteric
Thyme

- Spasmolytic, antimicrobial, expectorant
- Bronchitis, colds, pneumonia
- Coughs in syrups, mouthwashes, toothpastes
- Easily toxic with overdose
- 1-2 drops in syrup or lozenges; tincture, 10-25 drops several times daily; tea, ½ tsp dried herb/cup (infusion)
- As a tea, tincture for worms
Oregano

- *Oreganum vulgare*
- Often contains more thymol, carvacrol than thyme
- Quality varies widely
- Commercial oils often synthetic
- Commercial products often diluted with fixed oils
Eucalyptus globulus

Eucalyptus oil

- *E. globulus* native to Tasmania, widely planted as wind breaks, etc.
- Essential oil contains about 85% 1,8-cineol
- Essential oil and 1-8-cineol has proven antibacterial activity (*E. coli*, *Streptococcus*, *Mycobacterium*, etc.)
- Also antiinflammatory (prostaglandin-inhibitory), antisecretory, expectorant
- Dose: 1-3 drops (diluted) or in steam
Eucalyptus

- Effective for helping to relieve symptoms
- Colds, flu, sinusitis
- Decongestant (mast cell stabilizer)
- Use in inhalers, 1-2 drops /ml in tinctures
- Candies, syrups
- Mouthwashes
Essential Oils in Dentistry

- Study found that manuka, tea tree, or eucalyptus oils were bacteriocidal for a variety of oral pathogens
- Effective at 0.2%, exposure of 30 seconds
- No cytotoxicity was found
- Applications in oral irrigators
- Takarada et al, 2004
Myrtaceous Oils

- Members of the Myrtaceae
- Eucalyptus, cajeput,
- manuka, kanuka, niaouli, tea tree
- All oils are active, especially against gram positive bacteria
- Manuka and tea tree oils may be most potent (Harkenthal et al, 1999)
• Many medicinal genera
  – Rosmarinus, Salvia, Thymus, Mentha, Origanum, Scutellaria, Lavandula
• Over 200 compounds identified from the essential oil of lavender
• Parsley Family
  (formerly Umbelliferae)
  – Fennel seed
  – Angelica spp.
  – Lovage
    (*Ligusticum* spp.)
  – Desert parsley
    (*Lomatium* spp.)
  – Parsley seed, root
Laurel Family  Lauraceae

- Mainly tropical family
- Several important commercial trees
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  - Bay tree
Thujone: Mutagenic, Hepatotoxic

- Neurotoxic, hepatotoxic, mutagenic in animal tests, bacterial assays
- Found in *Salvia*, *Artemisia* (wormwood, mugwort)
- Not particularly water soluble, so a traditional tea of wormwood is safer than alcoholic tincture
- One active ingredient of the hallucinogenic drink, absinthe
Volatile terpenes are known as antidepressant anxiolytics in Germany, where valerian extracts are commonly prescribed by doctors.

- Valerenone, valeric acid, etc. are active sedative compounds.
- GABA A receptor agonist.
Chamomile

- German chamomile is *Matricaria recutita* L.
- Roman chamomile is *Chamamaelum nobile* L.
- Both contain monocyclic sesquiterpenes such as bisabolol, bicyclic sesquiterpenes such as chamazulene
- Used traditionally for painful digestion, cramps; antiinflammatory skin preparations
- Safe during pregnancy and nursing

Sesquiterpenes

Traditional teas are active, but ethanolic extracts are more potent
Plants produce monoterpenic glycosides

- The group of Croteau (1988) found that monoterpenes can be converted to water-soluble glycosides, that may be freely transported throughout the plant, for instance the rhizomes or roots.
- Roots produce volatile terpenes, significant in root-rhizosphere interactions (Flores et al, 1999).
Resources

• Simpler’s Botanical Company
  – 1 800 652-7646 Sebastopol, CA

• Original Swiss Aromatics
  – 1 415 459-3998

• Pacific Institute of Aromatherapy
  – 1 415 479-9120

• Oak Valley Herb Farm (Kathi Keville)
  – 1 530 265-9552