

“To get out from underneath these layers of trumped up concerns, the whole safety and toxicity discussion needs to be turned upside down. Instead of perpetuating mantras about imaginary dangers, the inherently benign nature of essential oils needs to be recognized.” – Kurt Schnaubelt, Ph.D., *The Healing Intelligence of Essential Oils*, Healing Arts Press, 2011, p. 75.

If you have spent any time at all researching the use of essential oils on the internet, you have probably encountered a wide range of opinions about how they should be used. On one hand you have experts (including the dōTERRA medical advisory board) emphasizing the “inherently benign nature” of essential oils and the safety of internal use of essential oils and on the other hand you have blog authors and Facebook group administrators stridently objecting to this approach and stating that the only safe way to use essential oils is diluted in carrier oils to a strength of no more than 5% and stating definitively that essential oils should never be used internally. When I first encountered this disagreement I was concerned and a bit overwhelmed — who to believe with two camps advocating such incompatible viewpoints? Are dōTERRA’s detractors “perpetuating mantras about imaginary dangers” or are they performing a public service by alerting us to real hazards?

As I learned more (one of the most helpful resources I came across was *Chemistry of Essential Oils Made Simple* by David Stewart, Ph.D., an 800-page book about far more than just chemistry) I recognized that squabbles going on today in Facebook groups and blog comments have their roots in twentieth century Europe and the differences of opinion and emphasis in the French and British Schools of Aromatherapy. Now that I have a clear understanding of the historical roots of this disagreement, I am able to proceed with confidence in using essential oils according to the recommendations of the dōTERRA medical advisory board (adherents of the French School).

The French School

Some form of aromatic plant oils have been used for thousands of years, but modern “aromatherapy” developed in France during the 1920s. It was developed by medical doctors whose goal was healing disease and maintaining health. Among these early pioneers was Jean Valnet, M.D. During World War II Dr. Valnet saved many lives by using essential oils to treat wounded soldiers and civilians. After the war Dr. Valnet dedicated his career to promoting aromatherapy among his medical colleagues. In this way the French School came to emphasize the “therapy”, rather than the “aroma” aspect of aromatherapy. The French School of aromatherapy relies on scientific research on people using whole, therapeutic grade essential oils. Because oils are used neat and internally and because the symbiotic action among dozens of active components in whole essential oils is considered important, the French School emphasizes the importance of using the best quality essential oils and avoiding perfume and food grade oils. The French School relies heavily on the empirical and anecdotal experience of physicians and other health care providers who use essential oils in their medical practices.

The British School

The British School of aromatherapy is an outgrowth of the French School. It developed out of necessity when a French biochemist named Margeurite Maury moved to England. She was familiar with the medical applications of essential oils she had seen in France, but because she was not a physician (and at that time a medical license was required to use essential oils internally) she developed a model of diluting oils and using them for massage and beauty treatments. She used essential oils in that way, not because it was the best or safest way, but because her lack of a medical license did not allow for anything else. Later, authors such as Robert Tisserand (an expert in the perfume industry) became proponents of the Maury model of aromatherapy. This approach emphasizes the “aroma”, rather than the “therapy” part of aromatherapy. The British School relies primarily on research conducted on animals using oils that are often perfume or food-grade. Because the perfume industry often isolates and/or synthetically produces the chemical constituents from essential oils that give plants their characteristic fragrance (as opposed to using complete essential oils with dozens of chemical constituents, many of which do not contribute to fragrance but nevertheless have important therapeutic properties), the British School is characterized by stern warnings about avoiding the use of undiluted and internal use of essential oils. These cautions are probably warranted when using perfume-grade essential oils, but data derived from exposing laboratory animals to isolated and concentrated chemical constituents of plant oils cannot be extrapolated to humans using whole, intact, therapeutic grade oils.

Aromatherapy in America

For reasons having to do with language, most formally trained aromatherapists in the U.S. come from the British School of aromatherapy. Because the British School emphasizes the hazards and risks that they ascribe to essential oils, many American aromatherapists will state that essential oils should only be used under the guidance of trained and certified professionals. Some even go so far as to call for government licensing and regulation. Unfortunately, many American aromatherapists are staunchly adhering to the old way of doing things, refusing to move forward, refusing to look at research, and refusing to partner with medicine. In contrast, the French School of aromatherapy, although pioneered by medical doctors, has always promoted the notion that therapeutic grade essential oils are safe and can be used (with common sense, of course) by lay people in their own homes. Although internal use of essential oils seems to generate the most controversy,

Robert Tisserand One book frequently cited by alarmist aromatherapists from the British school is *Essential Oil Safety* by Robert Tisserand. To quote David Stewart, Ph.D., writing in his book *Chemistry of Essential Oils Made Simple* about this book:

“This book [Essential Oil Safety] is not recommended for people who use good quality therapeutic grade oils because this book does not contain any information relevant to such oils. However, the unwary reader may not realize this if they don’t study the preface carefully, where the authors state ‘This text was largely an extrapolation of toxicological reports from the Research Institute for Fragrant Materials’. In other words, this is a book on the toxicology of perfume grade oils. Furthermore, as the authors also point out, in all the studies they cite as indications of toxicity of oils, the data are for animals (not people) and/or the tests were not for a whole oil but for isolated compounds of an oil. These types of studies are not valid indicators of the behavior of oils in actual practice. Animals are generally more sensitive to essential oils. For example, the sense of smell of a dog is at least 10,000 times more sensitive than human smell. The skins of many animals are also more absorbent than human skin. In the animal studies often cited as indications of oil toxicity, massive overdoses were administered to determine lethal toxicity. It is not valid to translate such research into guidelines of aromatherapy practice for normal human usage. Clinical aromatherapy is a wholistic modality and the only valid research on an aromatic oil is with the whole oil, not just a fraction. Testing isolated single compounds of an oil would be like testing the toxicity of concentrated doses of pure sea salt (NaCl plus trace minerals) separately from the foods in which it is used. Such a test could cause one to conclude that foods containing sea salt are potentially harmful and ought not be eaten. Properly used in small amounts, salt is a valuable nutrient and can enhance the flavor of food without being perceived as ‘the taste of salt’. The taste of salt varies with the food with which it is combined. Does salt taste the same on grapefruit or watermelon as it does alone or on an egg or potato? While acting as a healthful nutrient in small amounts as a seasoning for food, taken alone and in high doses it can be lethal, as is the case with almost any substance. Dosage can cure. Dosage can kill. Dosage can make a poison, a food, or a remedy. MSG or monosodium glutamate is another example of a substance that is harmless when ingested in small amounts as a natural compound in certain edible plants, but potentially harmful in isolation or in concentrated doses. MSG occurs naturally in mushrooms and a number of other edible plants that cause no negative reactions due to their natural MSG content. But when MSG is synthetically produced and added to foods as an artificial flavor enhancer, it can become a mild poison manifesting as burning sensations throughout the body, mental anxiety, and chest pain. Toxic reactions to MSG are referred to as the ‘Chinese restaurant syndrome’ since it has been a common condiment in Chinese cooking. There are many compounds in oils that, by themselves, are potentially toxic, but when combined in balance and synergy with other compounds, as they are in natural oils, they are not only harmless, but possess healing powers. Some ingredients normally misbehave when alone, but behave nicely in an oil due to the good influence of their companion compounds. In aromatherapy this is called ‘quenching’. In chemistry this would be called ‘buffering’. For example, 1,8 cineole is the major ingredient in several species of eucalyptus oils. When 1,8 cineole is isolated and tested under lab conditions, it proves hazardous. Yet eucalyptus oils are among the safest of natural substances and offer great relief for respiratory difficulties and other conditions. Therefore, I do not recommend the book Essential Oil Safety, since it would tend to fill one with fears that have no basis when

therapeutic grade oils are used. I have met a number of people who, after reading this book, became confused and afraid to use essential oils, thus depriving themselves and their families of opportunities for genuine healing. If you are using cheap perfume grade oils, such as those sold in most retail stores (which are usually formulated from synthetic oils), then you may need to read and heed this book. But if you are using 100% pure therapeutic grade oils, you don't need it."

The dōTERRA position Informed by the French tradition, modern research, and its medical and scientific advisory boards, the dōTERRA philosophy of "a healer in every home" has led to hundreds of thousands of ordinary people using Certified Pure Therapeutic Grade essential oils on themselves, their families, and their friends with great success and safety. Of course essential oils should be used according to common sense cautions. Resources such as Modern Essentials provide clear guidelines regarding the safe use of oils, including specific guidelines for diluting oils for children, pregnant women, or other sensitive patients. dōTERRA recognizes the inherently benign nature of essential oils and is blazing a new trail that is characterized by:

- Progression
- Research
- Partnership with medicine
- Cutting edge science

As a licensed health care provider and scientist myself, I own and make reference to numerous texts on essential oils (including Tisserand's book). I am also informed by my extensive study and national board certification in Chinese herbal medicine. The Chinese have recognized for thousands of years that medicinal plants are most effectively and safely administered in the context of whole herbs combined in complex formulas. This is analogous to the French school position, which emphasizes the importance of using therapeutic grade, whole oils (as opposed to isolated components or synthetic oils). Administered in this way, Chinese herbs are virtually free of side effects. This is because of the same "quenching" or "buffering" actions discussed by Dr. Stewart above with reference to essential oils. For those who want to pursue this topic in more depth, please see Toxicity Myths — The Actual Risks of Essential Oils (see below)

~Live Oak Acupuncture and Herbal Medicine

Toxicity Myths - the Actual Risks of Essential Oil Use

By Ron Guba

In the wide variety of Aromatherapy books and periodicals available today, we find many

recommendations regarding the safe, therapeutic use of essential oils, often contradictory and seldom supported by either references, research or actual clinical experience. In this presentation, I will explore the range of recommendations made and address the validity of each, especially addressing the underlying assumptions and reasons for these statements. I have personally been involved in the both the practice and the business of Aromatherapy since arriving in Australia in 1986. Having always approached the therapeutic use of essential oils from the "radical" French "Aromatic Medicine" perspective, I have long noted the many incongruous and exaggerated statements regarding essential oil toxicity. Over these past twelve years, through my involvement with various government and industry bodies, I have specifically focused on this topic of "essential oil toxicity" as one area of study, given the potential "poisons scheduling" of various essential oils by the Australian National Drugs and Poisons Scheduling Committee.

Why is there such a diversity of opinion regarding essential oil toxicity?

Three reasons appear to me outstanding - that of "philosophical" differences, the lack of knowledge amongst practitioners and authors and the fear of public misuse.

Philosophical Differences:

Utilising Dr. Daniel Pénöel's concept of the "Aromatic Tryptic" (1), we can characterise "Holistic" Aromatherapy as fundamentally "energetic" in nature. Originally developed by Maugerite Maury in France during the 1930's (2), this approach has become the dominant form of Aromatherapy practiced in English-speaking countries.

Employing relatively low dosages of essential oils (generally 2.5% or less in massage applications), the majority of therapeutic effects noted appear to be primarily of a secondary "energetic" or "terrain" nature, as in the case of acupuncture or homeopathy, for example, as well as working via the olfactory sphere.

"Holistic" Aromatherapy originally developed primarily in the domain of beauty therapy. Practitioner training, even up to the present day, has tended to concentrate more on massage and other application methods, than on an in-depth understanding of essential oils from both the chemical/pharmacological viewpoint and their full history of use in traditional medicine.

M. Maury also stated her own preference to avoid the more "medical" applications of essential oils, including internal use. Such applications, she felt, were best left to medical practitioners. (3)

Following from M. Maury, the growth of "Holistic" Aromatherapy continued primarily in

England by those influenced by her, such as Marceline Arcier and Daniele Ryman. Developing from the domain of beauty therapy, we can see a particular "dogma" has evolved, one that is "gentle" and oriented from an "energetic" perspective towards both "low-dose" applications and the avoidance of internal and other "high-dose" applications. As such, I suggest that this particular bias has served as the "philosophical base" on which many of the common statements regarding essential oil toxicity are based.

In contrast, we can say the French "Aromatic Medicine" approach that has developed most strongly amongst French medical practitioners (as well as naturopathic and herbal medicine practitioners) since R. M. Gattefosse's work in the 1930's, is more of a "physical" approach.

This "French" approach often utilises comparatively high doses of essential oils both topically and internally, to realise dose-dependent pharmacological effects.

This discipline relies on a greater understanding of the chemical structure and the pharmacological/toxicological effects of essential oils, to suggest safe dosage levels and contra-indications for use.

I can therefore suggest that such dosage recommendations represent a more realistic view of the safe uses and potential toxicity of essential oils for all practitioners.

Limited Knowledge:

As I have mentioned above, "Holistic" Aromatherapy training has not generally taken into account any in-depth training in either the chemistry or known pharmacology of essential oil compounds.

As such, we can notice that many of the dosage recommendations and contraindications mentioned in Aromatherapy literature are based on an incomplete or limited understanding of the issues involved.

What can be noted in many publications are statements that are based on the attitude that if an author does not know about the realities of the possible negative effects of an essential oil, then, if any possible negative effect might be noted, the invariable recommendation is to avoid the use of that essential oil or to use extremely low dosages. To err on the side on caution may be considered laudable. However, we can notice that such exaggerated statements has led to a common perception that the therapeutic use of essential oils can be an extremely risky proposition, even amongst those who are purported to be highly qualified practitioners.

It is my premise, that those who would call themselves "Aromatherapists" should be the most qualified in the actual uses and potential toxicities of essential oils, as we would expect those with either medical training (with pharmaceutical drugs) or medical herbalists (with herbal preparations) to have with their common prescriptions.

Public Misuse:

The vast majority of Aromatherapy books are written for the lay public. In this regard, care is taken to recommend dosages and essential oils that will neither create negative reactions nor lawsuits. Hence, dosages are kept extremely low and any essential oil that

might be construed to have any possible negative effect, such as during pregnancy, is routinely advised to be best left alone.

If we inspect such books, we also find that these publications, easily accessible to the public, are often used as "textbooks" in Aromatherapy practitioner training. If we observe further, we also find that many publications offered for practitioners and health professionals make many of the same recommendations.

Why is this? I suggest that "Aromatherapy" still needs to go beyond being just a "good feeling", fad therapy. As with the standards that have developed relative to the training and practice of medical herbalism, Aromatherapy demands a level of practitioner training that is comprehensive in its scope and knowledgeable in all the effects of essential oils - both positive and potentially negative.

Toxicity Issues:

The most common test of potential human toxicity is that of the "LD50" test or the "median lethal dose". This test is routinely applied to laboratory animals (humans do not usually volunteer) in the testing of compounds used in pharmaceuticals, agricultural chemicals, flavours, fragrances and cosmetics, to name a few.

In this testing procedure, laboratory animals, usually rats, are given measured doses of compounds until approximately half of the test population die. The "median dosages" are then generally given in the ratio of grams of test compound per kilogram of bodyweight. Hence, a LD50 rating of 1.0 represents that 50% of the test animals died on a dosage of 1 gram per kilogram of body weight. If we consider ourselves to be large rodents, this would translate to 60 grams of a particular compound would be the likely lethal dose to an adult weighing 60 kilograms.

We should consider (outside of ethical considerations - but no effective substitute has yet to be found) that such tests generally are based on either acute oral (by mouth) or injected lethal doses.

This means that the LD50 dose represents the median toxic dose taken all at one time, either by ingesting or by direct injection of the test compound.

Chronic (long term) toxic doses and dermal (high-dose topical applications) have also been studied with laboratory animals. Toxic chronic doses are always less than the corresponding acute dose. Dermal studies have produced conflicting results that do not appear to be very relevant to human exposure. (4)

In terms of the most common uses of essential oils in Aromatherapy, it is the acute LD50 dose that is most relevant in this consideration.

The Mistakes in Applying LD50 Values to Aromatherapy Applications

Animal LD50 values can be a useful guide to potential essential oil toxicity when we are considering the acute toxicity of essential oils, such as Wintergreen (mostly methyl salicylate) or Eucalyptus species (those with a high 1,8 cineole content).

For example, an essential oil, such as Thuja (*Thuja occidentalis*), with an animal LD50 rating of 0.83, would translate to approximately 50 grams being a median lethal dose for an adult weighing 60 kilograms.

Of course, this would be a huge dose and severe toxic effects would still be seen (and have been) at lower doses like 10 grams.

The point to make is again, the values we are considering here are based on acute oral toxicity, that is, the lethal dose that would be ingested all at one time.

There are two areas where mistakes relative to Aromatherapy "toxicity statements" are made:

Dosages: Essential oil dosages, such as applied in preparations for massage, in baths or for inhalations (or simply to fragrance an environment) are generally of a minute fraction of the acute toxic dose.

Let us take Wintergreen oil as an example. The acute oral rat LD50 is 1.2. In humans, however, methyl salicylate does appear to be more toxic. Given the numbers of fatalities in years past, with the amount ingested being known in a number of cases, we can estimate a human LD50 of 0.3. For a 60 kg adult, this would translate to the ingestion of about 18 grams. (5)

Now, let us say that we want to apply a 2.5% dilution of Wintergreen oil to our sore lower back. We then apply 1 mL of this preparation...

$1\text{ mL} \times 2.5\% = \text{approximately } 0.025 \text{ grams of methyl salicylate.}$

$0.025 \text{ gms} \div 18 \text{ gms (LD50 dose)} = 0.00139 \text{ or } 0.139\%.$

Hence, the applied dose is only 0.139% of the lethal dose - or more than 700 times less!

Of course, if we increase the amount applied of the 2.5% formula, we increase the dosage received. Hence, if we applied 10mL of the formula all at once, the dose would now be 0.25 grams or 250 milligrams. Putting this into perspective, even if the methyl salicylate was totally absorbed, this dose would represent the same amount of salicylate compounds as found in one tablet of aspirin...

Wintergreen and Sweet Birch essential oils are routinely mentioned as oils to avoid in Aromatherapy, even for trained practitioners. Members of the International Federation of Aromatherapists take a "vow" not to use Wintergreen essential oil. (6)

Yet, we have the strange contradiction of many methyl salicylate-containing topical products (containing from 10% to 30% methyl salicylate) being readily available to the untrained public - with very few negative side-effects reported (methyl salicylate, even used topically, is contraindicated in people taking the anti-coagulant drug, warfarin). (7)

Even with this relatively toxic compound (as I would suggest that any essential oil with an LD50 of less than 1.0 is), an effective anti-inflammatory preparation can be used with no potential for toxic effects.

Method of Application: Not only should we consider the dosage given, but also account for how the essential oil is applied.

We can say that the oral ingestion of an essential oil is generally both fully and rapidly absorbed into the portal blood circulation. However, all other types of applications do

not represent the same level of absorption and dosage.

The following chart details the potential toxicity of each method of application. This accounts for both the amount of absorption as well as the amount of the typical doses given.

Via oral ingestion +++++

Rectal ++

Vaginal +

Topical (skin) +

Inhalations 0

(8)

In this light, we can then understand why the relatively toxic essential oil of Pennyroyal, can be a safe and effective addition as a mucolytic used in an inhalation. With inhalations, absorption is quite high, but the typical dose is always small.

With topical applications, we cannot assume full absorption of applied essential oils. If we do not occlude (or cover) the site of application, as is generally the case with topical Aromatherapy applications, the dose is significantly lessened by evaporation.

One American study found that 75% of an applied dose of various fragrance compounds were absorbed through human skin when the skin was covered after application. When the skin was left uncovered, the total amount absorbed dropped to only 4.0%. (9)

It is clear that topically applied essential oils will penetrate the epidermis of the skin.

However, it is an area that still requires further research to understand how a variety of different factors (such as the type of essential oil compounds, the excipient or "carrier" base used, temperature, etc.) affect the amount absorbed through the skin.

Available studies suggest a wide range of absorption amounts. d-limonene, the major constituent of most citrus oils, was demonstrated to only have an absorption rate of 2.0% when applied to human tissue samples. (10)

A 2.0% dilution of True Lavender (*Lavandula angustifolia*) oil applied to the abdomen of a volunteer, showed that approximately 10% of the Lavender oil was absorbed into the general blood circulation, showing a relatively rapid absorption rate that peaked 20 minutes after application. After 90 minutes, both linalool and linalyl acetate (the compounds tested for) had dropped almost to zero, showing almost complete metabolism. (11)

Lastly, a study testing percutaneous absorption with rhesus monkeys, tested three compounds, benzyl alcohol, benzyl acetate and benzyl benzoate (all naturally occurring in Ylang Ylang essential oil, for example).

When applied in a moisturising lotion base, with the skin uncovered, the total absorption rate varied from approximately 20% for benzyl acetate, up to 70% for benzyl benzoate.

(12)

The assumption is that essential oils and like compounds are more easily absorbed through the hair follicles than just the stratum corneum or "horny layer" of the skin.

Hence, it appears that monkey skin, covered in hair follicles, would more efficiently absorb essential oils.

Taking the available research into account it would be fair and conservative to state the following when figuring the absorbed dose of an essential oil applied to unbroken skin in some form of an excipient or "carrier" (vegetable oil, cream, gel, etc.) and left uncovered:

Only up to 50% of a topically applied dose is absorbed.

Hence, in the Wintergreen oil example given above, instead of the low amount of 0.025 grams being absorbed, the amount can be figured at half that value, or 0.0125 grams - less than 1400 times the toxic oral dose.

This covers both the typical applications applied in Aromatherapy treatments, as with massage, as well as topical OTC preparations, such as methyl salicylate containing "liniment" products.

However, in the case of broken skin, where the stratum corneum is compromised or not present (as in wounds, burns and various forms of dermatitis), it would be more prudent to figure a 100% absorption of applied essential oils. (13)

"It's all dose-related": Therefore, we can look at a number of the essential oils mentioned in Aromatherapy books "never to be used in therapy", such as Hyssop, Pennyroyal, Tansy, Thuja, Wintergreen and Wormwood for example. (14)

We can understand, however, that such essential oils can be used safely, if one simply respects the dose given and the method of application used.

Essential Oils and Pregnancy

The use of essential oils during pregnancy is perhaps the most emotive area of Aromatherapy, giving rise to a variety of highly conservative statements. This ranges from recommending that no essential oil be used during pregnancy (15) to the more common suggestion of using very low doses of only the most non-toxic essential oils; any "emmenagogic" essential oil (those with any possible effect on the menstrual cycle) should definitely be avoided.

This appears again to be due to the "when in any doubt, don't use it" philosophy, the misuse of toxicity values and the fear of public misuse and subsequent lawsuits. As well, there appears to be a general misunderstanding of the hormonal and physiological processes that occur during pregnancy.

There are three areas of concern:

1. Some essential oils could damage the developing foetus (known as teratogenicity), causing either resorption of the foetus or birth defects.
2. Some essential oils could cause abortions, miscarriages or premature birth.

3. Essential oils with suggested "hormone-like" effects could either disturb fertility or otherwise affect a healthy pregnancy.

Dosage concerns:

There are a number of reported cases of large oral doses of essential oils causing either severe toxic effects or death in unborn children. (16) These cases are almost exclusively due to pregnant women taking large, toxic doses of essential oils, notably Pennyroyal (rich in the ketone, pulegone, which is metabolised to the highly toxic furan epoxide, menthofuran) and Parsley Seed (rich in the dimethyl ether, apiol) in an attempt to abort the foetus. Such compounds are very poor abortifacients indeed; the woman would be severely poisoned, often fatally, sometimes without aborting the unborn child.

It should be noted that studies utilising isolated samples of the human uterus were exposed to the essential oils that have attempted to be used as abortifacients in the past (Juniper, Pennyroyal, Rue, Savin and Tansy). The essential oils did not directly stimulate the uterine muscle (which would cause spasm and possible expulsion of the foetus). (17) Other studies have also shown that such essential oils also do not create spontaneous abortion by causing the death of the foetus. (18)

Certainly in the case of pulegone, it is only abortifacient in large quantities. By causing acute hepatotoxicity (liver damage), the body is unable to maintain the pregnancy. (19) In the case of Pennyroyal, ingested doses as high as 7.5mL and 10mL have failed to create an abortion. (20)

With apiol, the lowest dose that induced abortion was equivalent to the ingestion of from between 1.5mL to 6mL of Parsley Seed oil daily, for eight consecutive days. (21)

Therefore, when many Aromatherapy authors extrapolate the use of doses that are a small fraction of such huge ingested toxic doses, this is simply a wrong interpretation of the facts.

For example, I have seen some suggested protocols recently concerning the use of vapourising essential oils in the general environment of a nursing home setting. It is suggested that any essential oil with possible toxic or "emmenagogic" effects not be used if any of the staff is pregnant. (22)

Let us look at the example of using Pennyroyal oil in inhalations again. We will use a 10% concentration of Pennyroyal oil with other essential oils, such as Eucalyptus radiata and Sea Pine.

Using an aerosol generator that disperses approximately 1.0mL of essential oil per hour, we will have a 15 minute inhalation session, three times per day. We will over-compensate and assume a very high degree of essential oil absorption at 50%. We then have:

15 min. x 3 sessions = 45 minutes x 1.0 mL per hour = 0.75mL dispensed.

0.75mL x 50% absorption = 0.375mL possibly inhaled and absorbed.

0.375mL x 10% (Pennyroyal content) = 0.0375mL or approximately 35 mg of Pennyroyal oil.

The LD50 of Pennyroyal oil in humans is 0.4. For a 60 kilogram adult, this would

represent
about 24 grams of essential oil.
35 milligrams ÷ 24 grams = 0.14% of the median lethal dose.
This is almost 700 times less the toxic dose...

Of course, this is a tiny dose. If such an essential oil blend were simply to be vapourised into the general environment of a room, the dose inhaled would be a small fraction of the 35 milligrams of Pennyroyal oil possibly absorbed by a direct inhalation.

Many such examples could be given, from the use of one-half to one drop (12.5 to 25mg) of Thuja oil applied to a wart to kill the Papilloma wart virus, to Rosemary CT camphor and Basil CT methyl chavicol used as a 5.0% dilution to be used for the relief of low back pain in the third trimester of pregnancy. In both cases, the applied dose is far below any toxic levels, acute or chronic.

Birth defects:

The only essential oil compound that has been shown to have strong teratogenic effects in laboratory animals, is that of sabinyl acetate. The essential oil tested was *Plectranthus* (*Plectranthus fruticosus* - not available commercially), with a sabinyl acetate content of more than 60%. (23) Other sabinyl acetate containing essential oils are Savin (*Juniperus sabina*, 20% to 53% sabinyl acetate), *Juniperus pfitzeriana* (not available commercially) and Spanish Sage (*Salvia lavandulifolia* - generally less than 10% sabinyl acetate, but can be as high as 24%). Savin oil has also been shown to have abortifacient effects and to be toxic to early embryos in laboratory animals. (23)

Hence, of all the essential oils, Savin and Spanish Sage seem most indicated to be totally avoided in pregnancy, at any dose.

Safrole-rich essential oils (most commonly Brazilian Sassafras, *Ocotea pretiosa*, and Chinese "Sassafras" oil, the safrole-rich fraction of *Cinnamomum camphora*) do not create birth defects per se, but has been demonstrated to produce both kidney and liver tumours in the offspring of mice fed safrole while pregnant. (24)

Whether safrole poses such a risk to humans is still debatable. Although safrole is now banned both as a food additive and as a therapeutic agent in Western countries due to its carcinogenic effects in laboratory animals, there is real room for debate relative to the applicability of such studies to humans, relative to the large dosages tested and the theoretically non-carcinogenic metabolites produced in humans versus the carcinogenic metabolites produced in laboratory mice. (25, 26)

"Emmenagogue" essential oils and pregnancy:

A number of essential oils are stated as having "emmenagogic" or menstrual regulating effects in Aromatherapy, such as Clary Sage, Rose, Jasmine absolute, Juniper and Sweet Fennel, to name a few. Such essential oils are then often suggested not to be used during pregnancy because of their reputed "hormone-like" properties and uterine stimulant effects.

There are two apparent mistakes made in the translation of "emmenagogic" effects to pregnancy:

Uterine stimulation:

The actions of some herbs have been suggested as being uterine stimulants, specifically by creating uterine hyperaemia (increased blood flow). (27) Some of these herbs, most notably Pennyroyal and Parsley Seed, are certainly contraindicated in large oral doses, due to their systemic toxic effects. Uterine contractions are secondary to the toxicosis. Juniper (*Juniperus communis ssp. communis*) essential oil appears to have been originally mentioned mistakenly in place of Savin (*Juniperus sabina*), which is an abortifacient. (28) Although the total water/ethanol extracts of Juniper (*J. communis*) have shown an anti-fertility effect in laboratory rats, this effect does not appear to have any bearing on the essential oil constituents, when compared to essential oils, such as Nutmeg, with similar constituents, even when used at high dosages. (29)

Other herbs with significant essential oil concentrations, notably Angelica Root, Fennel, Garlic, Jasmine, True Lavender, Lovage, Sweet Marjoram and Thyme are "extrapolated" by one author (30), using the "energetics" of traditional Chinese medicine, to suggest they are contraindicated in pregnancy as "uterine stimulants".

However, it should be noted that such herbs, as commonly used and as reported in contemporary medically oriented phytotherapy texts, do not suggest any contraindications in pregnancy. (31, 32)

Thyme (*Thymus vulgaris CT thymol, carvacrol*) is one such herb mentioned. In reviewing some of the available literature, the real reason that appears is because of the use of pure thymol as a vermifuge internally. (33) At a suggested dose of up to 1.0 gram per day, this level of thymol represents a dose of approximately 2.0 grams of a high-thymol containing Thyme essential oil - a very large internal dose.

Concerning the previously mentioned author (30), a number of the contraindicated oils in pregnancy appear to have been "lifted" from current Aromatherapy texts, without a full consideration of their attributes.

Speaking with one Traditional Chinese Medicine practitioner, who specialises in gynaecological treatments, only the essential oil-bearing herbs of Frankincense and Myrrh appear as "forbidden" for use during pregnancy (there are other herbs, not available as essential oils), specifically due to their capacity to "vitalise the blood, pull blood down and circulate the Qi". (34)

In all due fairness, such contraindications are given for the internal use of such herbs. It is suggested that all such "extrapolated" herbs (to a traditional Chinese "energetic" perspective) as essential oils are not contraindicated for use in topical applications (at a suggested 2% dilution for general massage use). (35)

"Emmenagogic" effects:

Essential oils with suggested menstrual-regulating or "hormone-like" effects include quite non-toxic essential oils such as: Cedarwood (*Juniperus virginiana* - mistakenly suggested that it has similar effects to *Cedrus atlantica*, rich in the sesquiterpene ketone, atlantone),

Clary Sage, Jasmine, Sweet Marjoram (*Oreganum majorana*), Peppermint, Rose (*Rosa damascena*?) and Rosemary (no chemotype given).

As well, essential oils with "oestrogen stimulant activity" are mentioned: Anise Seed, Fennel and Basil. (36)

Such essential oils, and more, have been advised in some Aromatherapy books to be completely avoided during pregnancy. (37)

However, I suggest that such recommendations are based on a wrong understanding of the processes that occur during pregnancy.

Menstruation "versus" pregnancy:

Menstruation is most specifically controlled via the hypothalamus/hypophysis axis. The anterior pituitary releases gonadotrophic hormones. In the first half of the menstrual cycle, FSH (follicle-stimulating hormone) stimulates the growth of the developing Graafian follicle, which is responsible for the production of oestrogen. This oestrogen controls the changes in the secondary sex organs, including the proliferation of the endometrium or lining of the uterus.

After the ovum is released, the anterior pituitary releases an increased amount of LH (lutening hormone), which stimulates the corpus luteum to develop. The corpus luteum now secretes progesterone (and oestrogen) which stimulates further changes in the secondary sex organs and prepares the lining of the uterus for the reception of a fertilised ovum.

If the ovum is not fertilised, the corpus luteum shrinks; the production of progesterone and oestrogen falls, and menstruation begins.

Herbs such as Chaste Berry (*Vitex agnus castus*) and Black Cohosh (*Cimicifuga racemosa*) are known for their menstrual-regulating effects. Both herbs have been shown to work, not by "adding" sex hormone-like compounds to the body, but by stimulating and/or decreasing the production of follicle stimulating and lutening hormone by the anterior pituitary, with its consequent effects on the menstrual cycle. (38)

The only essential oil compound found in research studies to have a mild "oestrogenic" action in laboratory animals is that of anethole, a major constituent of Anise Seed, Star Anise, Fennel and *Ravensara anisata* essential oils. (39)

Other essential oils that have suggested menstrual-regulating effects, through a long history of traditional use and/or significant results in clinical experience include: Clary Sage, Sage (*Salvia officinalis*), Lovage, Angelica Root, Niaouli and Cypress.

In all such cases, the effects appear due to a secondary effect via the anterior pituitary, not by the addition of "hormone-like" compounds.

The reported effects of the essential oil of Clary Sage (*Salvia sclarea*) bear this out. Many anecdotal reports have been given to the effects on menstruation by only inhalation of the essential oil. (40)

It is interesting to note that inhalation of such volatile and lipophilic compounds as found in essential oils may not just affect the central nervous system via the olfactory nerves. Compounds of a larger molecular size have been found to be able to actually travel via the olfactory nerves to make their way in measurable amounts into the limbic regions of the brain.

It is as yet unproven, but given the absorption into the brain of both small particles of gold and NGF (nerve growth factor), the absorption, via the olfactory nerve, of essential oil compounds is quite likely. (41)

Now, if we look at what occurs if an ovum is fertilised and is embedded in the lining of the uterus, a much different process occurs.

When pregnancy occurs the usual ovarian cycle is suspended. The corpus luteum, instead of shrinking, now grows until it comes to occupy up to 50% of the ovary. The corpus luteum secretes a large amount of progesterone, which serves to maintain the pregnancy in the early stages of development and promotes the development of the placenta.

As the placenta develops, the corpus luteum begins to shrink, becoming inactive by the fourth month. The placenta now produces progesterone, supporting the pregnancy until birth.

Hence, the mistake made in giving contraindications for "emmenagogic" essential oils, is that if such oils have an effect on the anterior pituitary to produce FSH (follicle stimulating hormone), there are no Graafian follicles to stimulate (which secrete oestrogen).

The process of pregnancy specifically overrides the menstrual cycle, both physiologically (via the growth of the corpus luteum) and hormonally.

Therefore, respecting those with potential toxicity (such as large oral doses of Rosemary CT camphor), these "emmenagogic" essential oils are quite safe to use during pregnancy.

"Essential oils not to be used on the skin"

Most Aromatherapy books and training courses routinely give a listing of essential oils "not to be used on the skin".

One such IFA (International Federation of Aromatherapists) recommended list includes the essential oils of: Ajowan, Cinnamon Bark, Cassia, Clove, Oregano and Mountain Savoury (in the "not to be used at all" list). (42)

This appears to be based on the "philosophical bias" that has developed in "Holistic" Aromatherapy, where generally only up to a 2.5% concentration of essential oils will be used on the whole body, often including the face. Yes, a 50% concentration of Red Thyme oil would not be suitable for facial treatments!

However, we then observe the conundrum whereby trained Aromatherapists are "forbidden" to use such oils, yet any untrained public person can purchase and use products such as "Tiger Balm", which contains a 60% concentration of essential oils, including large amounts of the "banned" oils of Cassia, Clove and Camphor.

The oils listed above all contain either phenols or aromatic aldehydes with a definite "dermo-caustic" or skin-irritant quality.

But in truth, such essential oils can be used safely on the skin, if one respects the dose, sensitive skin areas and avoids the use of such oils on those with skin reactions such as eczema or on young children, under twelve years of age.

Other essential oils, such as Costus, Elecampane, Massoia and oxidised terpenic oils, such as *Pinus ssp.* and citrus oils do have significant skin sensitising potential and are best avoided for topical use.

The "French" approach has long used such "dermocaustic" oils on the skin, even in high concentrations, as we can see in the work of Dr. Jean Valnet and others. (43, 44)

Dr. Daniel Pénel introduced me to the practice of "Aromatic Perfusion" some years ago. In this application, I have used up to 20ml of undiluted essential oils on the skin of many clients, for specific conditions.

As part of this work with clients, I have developed and tested what I would call the "Phenol Rule". This "rule" is for the use levels of phenolic oils (mainly Red Thyme, Ajowan, Clove Bud, Oregano and Savoury) as applied in a whole body massage (excluding the face). In my practice, I utilise up to a 10% concentration for massage, generally for the treatment of more "physical" conditions, such as muscular complaints, fatigue states, pre- and post- illness symptoms and the like.

"The Phenol Rule"

For use in up to a 10% concentration for topical applications:

Use 90% of non-irritant essential oils (such as True Lavender, *Eucalyptus radiata*, Tea Tree, etc.) to 10% of phenolic essential oils. Hence, the concentration of phenolic oils will not exceed 1.0%.

The exception to this is Cinnamon Bark and Cassia (high cinnamic aldehyde). If used, the proportion should not exceed 5.0% and should be used in conjunction with Clove Bud (or other high eugenol containing oils) or Citrus oils (with high content of *d*-limonene), which will "quench" the potential sensitising effect of cinnamic aldehyde. (45)

I have used this type of application on many clients, with no skin reactions reported.

Over the past nine years, I have tested the undiluted concentrate of 90% "mild" oils/10% phenolic oils on over 500 people attending seminars. I can report only four cases of any reactions to the concentrate. All involved only transient irritation and mild skin reddening, which resolved in 10 to 20 minutes. Neither lasting negative effects nor sensitisation have ever been observed.

For application to small, specific body areas, the concentration of phenolic oils can be raised considerably. As in "Tiger Balm" and similar products, the total essential oil content can be up to 60% (even 100%) with perhaps 30% of the essential oils being phenolic. Such "irritant" effects can be very useful. By increasing blood supply to an area, by decreasing the production of the inflammatory series 2 prostaglandins (46) and by promoting the induction of the antioxidant enzyme, NADPH quinone reductase (47), local pain and inflammation can be reduced, as in the case of an arthritic joint or menstrual cramps, as examples.

"Untested Essential Oils"

Some authors have suggested that essential oils that have not undergone formal scientific testing (generally via the fragrance industry, as through the Research Institute for Fragrance Materials for testing relative to toxicity, dermal irritation and sensitising effects on laboratory animals and human volunteers) should therefore "not be used on the skin". (48, 49)

Such statements then create more contradictions. For example, both Alpine Juniper (*Juniperus communis ssp. alpina*) and "Spanish" Lavender (*Lavandula stoechas*) essential oils are suggested in one text as: "Untested Oil. Avoid Use on Sensitive or Damaged Skin." (50)

However, both oils are also listed as having beneficial properties for the skin; "Spanish" Lavender for wounds and cuts and Alpine Juniper for acne and wounds. This is a definite "Catch-22" situation.

Yet, both essential oils have been "tested" on numerous clients, by French practitioners and other therapists, like myself, who have become familiar with many of these unique "untested" oils.

A number of such essential oils may never be "tested" formally, because they have no use in the flavour or fragrance market; they are more to be used by practitioners for their therapeutic benefits.

I would suggest that such cautionary statements are more than prudent; they can be suppressive in nature. The great tradition of botanical medicine certainly never would have developed, if healers and physicians had not experimented and worked with medicinal plants, without the benefits of many dead laboratory animals.

Based on a history of safe use already by practitioners and an understanding of the effects of individual components (sensitising compounds, such as lactones and potentially toxic compounds, such as the ketones, pulegone and pinocamphone, are well known), I can see no reason to not examine the potential therapeutic qualities of these more unique essential oils.

Essential Oils and Medical Conditions:

There are other, oft-repeated statements about the use of essential oils in certain medical conditions (it does seem that many Aromatherapy statements are copied from author to author to author...):

"Essential oils not to be used with high blood pressure"

The essential oils of Hyssop, Rosemary, Sage and Thyme are most often listed as oils "not to be used in high blood pressure" (51, 52). I am not certain where these statements originated from, but there is no support to be found anywhere in available literature. No such contraindications appear in herbal texts (53, 54), in more scientifically based phytotherapy texts (55, 56) nor in French Aromatherapy texts. (57, 58)

Some essential oils have been shown to have hypotensive effects in laboratory animals, such as Garlic, Tagetes, Geranium and True Lavender. (59) Only one essential oil, Clary Sage, was shown to produce a slight increase in both systolic and diastolic blood

pressure. (60)

However, these effects generally take huge dosages, Clary Sage required a dose of 1.0 gram per kg - about 70 grams for an average adult!

In summary, neither evidence nor experience supports the above statements. Such essential oils will not create negative effects in either low or high blood pressure conditions.

"Essential oils not to be used in epilepsy"

The essential oils of Sweet Fennel, Hyssop, Sage and Wormwood are often listed as contraindicated in the case of epilepsy. (61) In this case, such contraindications do have a basis in fact. Large doses of monoterpenic ketones, notably pinocamphone, thujone, camphor and pulegone, have been found to create epileptiform seizures in both animals and humans. (62)

This would include, then, the more common essential oils of Wormwood, Mugwort, Buchu, Hyssop, Pennyroyal, Sage and Thuja.

Hence, those with epilepsy (as well as people with high fevers) have a lower threshold to CNS (central nervous system) stimulant effects of oils containing large amounts of these ketonic compounds.

How Sweet Fennel entered the picture, I am not sure. Dr. Jean Valnet mentions in his book, *The Practice of Aromatherapy*, "In high doses, fennel causes convulsions (in direct contrast to aniseed). (*I assume in animals - italics mine*) The essence makes animals timid." To comment, firstly no dosages are mentioned (I would assume a large dose).

Interestingly, both Sweet Fennel and Anise Seed oils contain high amounts of *trans*-anethole (up to 70% and 96%, respectively). If anethole were the responsible agent, similar actions would be seen.

I theorise that a "Bitter" Fennel (*Foeniculum vulgare var. vulgare*) may have been used. The ketone, fenchone, with potential epileptic effects at high doses, is present at up to 18% in the essential oil, whereas Sweet Fennel (*Foeniculum vulgare var. dulce*) contains generally less than 3%. (63)

No other study suggests this potential effect of either Sweet or Bitter Fennel oil. Given the available information, there is no reason to not use Sweet Fennel, certainly, even in those with epilepsy.

Lastly, people whose epileptic seizures are under full control by medication, do not then appear to any more sensitive to such essential oils than those without epilepsy. Low-dose topical uses of such essential oils should be without incident. (64)

Such contraindications (even for low-dose topical use) would most specifically be true for those with uncontrolled epilepsy, or those with high fevers.

"Essential oils as kidney irritants"

Juniper "Berries" (*Juniperus communis ssp. communis*) and the essential oil derived from them, have long been indicated as a useful diuretic. (65)

However, since the late 1800's onwards, Juniper essential oil (and other high-terpene

hydrocarbon containing essential oils, such as in various *Pinus* species) has been suggested to be a kidney irritant, that should not be used on a long-term basis nor during acute kidney disease. Such statements are still mentioned in a number of Aromatherapy texts.

It appears that the origin of these statements came from the use of large, fatal doses of Juniper oil being given to dogs. Such high doses cause clouding of the urine, which was then assumed to be due to kidney damage. It appears, though, that such cloudiness was simply due to the presence of large quantities of Juniper oil metabolites.

More recent studies using laboratory rats have found no kidney damage, even when high oral doses of Juniper oil were given.

The authors hypothesised that the reputation of Juniper oil as a kidney irritant may have come from the use of essential oils containing high levels of the monoterpene hydrocarbons, α & β -pinene. The Juniper oil used in the study was said to have low levels of pinenes. (66)

This study does highlight the non-irritancy of Juniper Berry oil. But the further hypothesis regarding the irritancy of pinenes does appear to be unfounded.

Both Juniper Berry and Juniper branches/berries essential oil contain significant amounts of α & β -pinene, as well as other terpene hydrocarbons (Juniper Berry - α -pinene up to 46%, sabinene up to 28%, myrcene up to 8% and Juniper branches/berries - α -pinene from 40 to 90%, sabinene from 10 to 40%). (67) Given such similarities in terpene hydrocarbon content, such a hypothesis is not supported.

Further, a number of reports concerning the ingestion of massive amounts (up to 500mL) of Pine essential oil (from *Pinus pinaster* and related species), which generally consists of up to 90% of α & β -pinene, do not show any kidney dysfunction nor damage. Arguably, both gastric lavage and hemoperfusion are generally employed to reduce the quantity of essential oil compounds from both the stomach and the blood circulation (a lethal dose of "Pine" oil is approximately from 60 to 120mL). Nevertheless large quantities of metabolites, such as bornyl acetate are still excreted via the kidneys over a number of days. (68)

Of all the essential oil compounds, only apiol (as in Parsley Seed oil) has been shown to create kidney damage, as observed in post-mortem studies. Obviously, these represented large, fatal doses of apiol; the lowest acute fatal dose was 6.3 grams, while up to a dose of 19 grams has been survived. (69)

Given the comparatively tiny doses that would be used in Aromatherapy treatments, even orally, we can see that such dosages do not pose any threat to the kidneys, even with extended use. Of course, acute (such as glomerulonephritis) or advanced kidney disease (such as requiring dialysis) is where caution must be taken, not just for such essential oils, but for a wide variety of drugs.

Essential oils and other medical conditions:

There are both known and potential contraindications for the use of essential oils in certain medical conditions (such as high-menthol containing essential oils in heart disease with cardiac fibrillation) and combined with other drugs (such as using high-

methyl salicylate containing oils in conjunction with warfarin anti-coagulant therapy). With the exception of the two above examples, such contraindications are for the oral ingestion of essential oils, *not* topical applications. (70)

Essential Oil "First Aid"

As with most medicinal drugs, whether of a "synthetic" or a "natural" origin, the compounds present in essential oils have the potential to create serious, even fatal toxic effects, if ingested in overly large quantities.

There are numerous cases reported in toxicological literature regarding both serious (non-fatal) and fatal outcomes of essential oil ingestion in both children and adults.

These cases are generally due to accidental ingestion by young children, attempts at creating abortions in past years and the use of essential oils for suicide attempts. There are more rare cases of toxic effects due to overly large doses of specific essential oils being "self-prescribed", "prescribed" to children by parents or prescribed to clients by ill-informed therapists.

Most essential oil compounds have a "non-specific" toxic effect, whereby the absorption of these lipophilic compounds into cellular membranes can eventually lead to disruption of membrane permeability. The primary toxic outcome is that of the disruption of ion channel function in nerve cells, first affecting the heart and central nervous system, leading to cardiac and respiratory depression. (71)

To create such effects, however, require huge dosages, in the order of 300mL and beyond.

Certain aromatic compounds, most notably 1,8 cineole (as in many *Eucalyptus* species), camphor (borneone) (as an isolated compound or as in *Rosmarinus officinalis CT camphor* and *Lavandula latifolia*) and methyl salicylate (as a synthetically derived compound or as in *Gaultheria procumbens*) have specific toxic effects at much lower doses. These compounds make up the bulk of both serious and fatal poisonings in children and adults, due not just to their toxicity, but to the common availability of products containing these compounds and their reputed beneficial properties. (72)

Given the rapid and almost complete absorption of essential oils ingested orally, this route of administration has the highest potential for toxic effects.

First aid measures for ingestion of significant amounts of particularly toxic essential oils (such as more than 2mL of high-cineole *Eucalyptus* oils in young children) is straightforward: take the child to the nearest hospital emergency room or at least call or a Poisons Information Centre for instructions. The vast majority of accidental essential oil ingestion in children result in few, if any symptoms and resolve safely with no medical intervention. (73)

It is often difficult to determine just how much of an essential oil (or any product) a young child has ingested. If toxic symptoms do begin to develop, gastric lavage, hemodialysis and other supportive medical measures may well be necessary. To attempt to either dilute the stomach contents by giving burnt toast (or activated charcoal), milk or other foods or to try to induce vomiting is not recommended. Either approach, if *vomiting occurs*, has the potential to allow these volatile compounds to enter the lungs, potentially creating

aspiration pneumonia. (74)

"Aromatic Medicine", or the use of essential oils as ingested herbal medicines by trained physicians and complementary therapists, *has not* been responsible for any severe cases of toxicity. As with any "drug", if an appropriate dose is used (with essential oils, this is often in the range of only 100 to 300 mg per day), toxicity is not an issue.

In the case of the more common practices in Aromatherapy, we are speaking of topical applications - in the form of essential oil preparations used in massage treatments, in baths, etc. or in the form of "low dose" inhalations.

Such applications do not create any acute or chronic systemic toxicity - the amounts absorbed into the body and the dosages used are far too low.

However, such applications do have the potential to create problems, which include phototoxicity, sensitization and irritant reactions.

Phototoxicity is due to the capacity of various furanocoumarin compounds found in small amounts in some essential oils (most notably, expressed Bergamot and Lime oils, Tagetes, Cumin and Angelica Root; to a lesser degree, the expressed oils of Bitter Orange, Lemon and Grapefruit) to absorb and store ultraviolet wavelengths. This UV radiation is then released in a short, concentrated burst.

When essential oils such as expressed Bergamot are topically applied and the skin exposed to significant amounts of UV radiation in the form of sunlight or tanning beds, a bad "sunburn" is the common result. In more serious cases this can lead to quite extensive 2nd degree burns.

Another common outcome is that of berloque dermatitis, where patches of over-pigmented skin develop, which can last for many years.

Lastly, there is evidence to support the promotion of skin cancer, caused by repeated exposure to UV light of mouse skin treated with Bergamot oil (with bergapten as the responsible agent). However, such results required extensive repeated exposures (5 days per week for 75 weeks), with mice thought to be less capable of repairing DNA damage as compared to humans. Hence, given common uses of such essential oils, carcinogenesis is not an area for concern. (75)

On a more positive note, evidence suggests that the use of photosensitizing essential oils such as Bergamot, along with the use of a sunscreen preparation, provides better protection against UV-induced skin damage than the use of a sunscreen alone. (76)

First Aid measures - *first and foremost* should be the provision of appropriate label warnings on packages of any photosensitizing essential oil available for public sale. This is presently far too often not the case.

In the case of a phototoxic "sunburn" developing, it should be treated as any other burn. If applied soon after exposure, both Vitamin E acetate (up to a 25% concentration) and panthenol (up to a 5% concentration) are excellent at quenching the "free radicals" produced by UV exposure, significantly reducing erythema and burning. (77)

In terms of treating a burn, there is a good body of both clinical and anecdotal evidence for the wound healing effects of various essential oils (notably True Lavender - *Lavandula*

angustifolia, Everlasting - *Helichrysm italicum* and the carbon dioxide extract of Calendula flowers - *Calendula officinalis*), polyunsaturated vegetable oils (such as Rose Hip - *Rosa rubiginosa*) and a variety of herbal extracts (such as the infused oil of Gotu Kola - *Centella asiatica*). (78)

Sensitization refers to the development of an allergic skin reaction to certain aromatic compounds present in some essential oils. Responsible compounds penetrate the epidermis, bind to skin proteins and provoke an immune reaction that leads to the production of histamine and other irritant compounds by basophils and mast cells. A skin rash or eczema is the usual outcome and subsequent exposure to even tiny amounts of the sensitizing compound can elicit the same response, as well as creating cross-sensitivities to other compounds. (79)

In sensitive individuals, the skin reaction can create quite extensive skin damage, as I have personally witnessed in the case of a friend applying undiluted Tea Tree oil to a small foot wound - both feet developed extensive lesions and required up to six weeks to fully heal.

The compounds most often responsible for sensitization include sesquiterpene lactones (such as costuslactone in *Costus* and alantolactone in *Elecampane*), cinnamic aldehyde (as in Cinnamon bark - *C. zeylanicum* and *C. cassia*) and oxidized hydrocarbons (such as *d*-limonene in citrus oils; *delta*-3-carene, - & α -pinene as in various *Pinus* spp.).

Of potentially sensitizing essential oils, it is Cinnamon oil, old citrus and old pine oils that are commonly available to the public and present the highest risk. The commonly available oils of Tea Tree, Star Anise, Ylang Ylang and the citral-containing oils of Lemongrass and May Chang pose a slighter risk. (80)

Sensitization reactions (which are relatively rare) can develop in any healthy individual. However, it is clear that individuals already with "hypersensitive" skin and/or present allergies (including those suffering from eczema, psoriasis and asthma) are more prone to allergic reactions with essential oils.

The most prudent approach, especially for those with present allergic conditions, is to do a simple "patch test" with potentially sensitizing essential oils first. This can be done by preparing a 5% to 10% dilution of the essential oil in question in vegetable oil and applying a few drops to the inner forearm, covering with a "band aid".

Generally, any sensitization reaction will occur within 24 to 48 hours. Repeat the application twice to be the most certain.

If a sensitization reaction does occur to any essential oil, obviously its use should be discontinued immediately. Other "risky" essential oils or potential cross-sensitizers should only be used with caution. The allergic reaction to an individual compound *can* disappear over time - but a patch test before using would be highly advised.

The common treatment for an allergic reaction would be the use of either prescribed or OTC corticosteroid preparations.

Alternatively, some practitioners, including myself, have had anecdotal success with the application of essential oils and herbal extracts with anti-inflammatory properties.

I have personally found the application of a 5% dilution of the carbon dioxide extracts of German Chamomile (*Matricaria recutita*) and Calendula (*Calendula officinalis*) in a "hypo-allergenic", vegetable oil-based cream to be useful in quenching allergic reactions.

Irritation reactions are not allergic in nature, but represent a level of direct skin damage, followed by an inflammatory response. Irritation reactions arise quickly and are dependent on the amount of the compound applied.

Of essential oils that are commonly available to the public, those containing large amounts of phenols, aromatic aldehydes and oxidized hydrocarbons pose the most risk. This includes the commonly available essential oils of Cinnamon (bark and leaf), Clove (bud and leaf), Thyme, Oregano, Savoury, Pimento and old, oxidized citrus and pine oils. As volatile, lipophilic compounds, *any* essential oil can be irritating if applied to sensitive mucous membranes or skin - eyes, genitals, etc. The common Aromatherapy application of using essential oils in baths (by "floating" them on the surface of the bath water) also increases the potential irritancy of essential oils.

This is another area where the inclusion of appropriate caution statements, use instructions and realistic expiry dates on essential oil packages for public sale would be highly recommended.

The *first aid* for irritancy reactions is to remove the essential oil as quickly as possible from the skin and/or mucous membranes.

The common method suggested is to wash the affected skin with soap and water and then rinse with water liberally. It has been found with essential oils, however, that the use of water can often *increase* the skin irritation initially.

I have found a more effective method is to use a vegetable oil. In this method, apply any vegetable oil to the affected area. Remove with an absorbent towel or cloth. Apply the vegetable oil again and remove, from three to six times. The vegetable oil removes the essential oil with no irritation.

This method also is excellent for mucous membrane irritation, such as in irritation of the eyes. A bland vegetable oil is used as an eye bath, instead of water or saline solution. I have had the occasion to use this method myself, accidentally having a large amount of Red Thyme oil splashed into my eyes. The vegetable oil method was very effective, with any eye irritation abating without ten minutes of use.

Summary

In this presentation, I have attempted to cover the fundamental "toxicity myths" that appear in Aromatherapy literature and training courses. There are other topics that can be considered further, such as the appropriate use of essential oils with children and issues concerning carcinogenic potential.

I personally see no problem in authors and trainers suggesting cautious levels of use. However, I would hope to see such statements given be based on the actual known facts of potential toxicity.

Such statements and recommendations would then be given, not as an "absolute" or as a

"forbidden", but based on personal preference and philosophy.

The present Aromatherapy recommendations commonly given are more than cautious. I sense they are creating more a mood of fear amongst both practitioners and public.

The results in public perception are more prone to the attraction of lawsuits (what do you do if a pregnant client wants to sue you after having received a massage with True Lavender oil and then had a miscarriage?).

There is also then, a level of suppression of the free and discriminative exploration of the therapeutic possibilities of essential oils, which, we must be clear, are *not* going to be studied by large pharmaceutical corporations anytime in the foreseeable future. Essential oil compounds are too "simple" and cannot be patented. Hence, there is no present incentive for serious research money to be expended on "Aromatic Medicine".

In contrast, there are certainly negative, toxic aspects to the misuse and overdosing of essential oils.

For products available to the public, clear instructions and appropriate cautions should be given. As well, the inclusion of "dropper inserts", so that liquids are only dispensed slowly as measured drops, should be the requirement for all undiluted essential oils and "fragrance" oils ("perfume" oils - mixtures of essential oil isolates, synthetic fragrance compounds, etc.).

Experience strongly suggests that these types of "restrictive flow" inserts would do more to prevent accidental childhood poisonings than child-resistant closures alone.

For those who would use essential oils as a form of complementary therapy, I suggest that training should take into account all aspects of the safe use of essential oils. The common "myths" should be excluded and the real potential for negative effects should be fully understood.

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