

Essential oil safety The known and the unknown.

By Martin Watt

Updated 2010 with new information added in brown text.

RISKS

It is important for you to appreciate that most essential oils can be hazardous **if they are not used correctly.**

Most essential oils are perfectly safe for the general public, but there are a few with well-documented dangers. Regretfully, many essential oils suppliers do not provide adequate safety information with their oils. There are many around who will sell anything to make a fast buck!

Most adverse effects resulting from essential oil use are skin reactions rather than toxicological effects. Toxicity is only of much relevance if someone were foolish enough to consume certain oils to excess. However, the adverse effects on the skin should never be underrated as these can be severe and long lasting. Oils such as expressed bergamot can cause a lifelong condition known as photosensitisation. Oils like peppermint and cinnamon bark can actually burn the skin if they come in contact for too long. So the lesson to this is ensure you acquire sound information before using any essential oils, and never be tempted to use more than advised. Be wary of safety advice in the popular aromatherapy books, much of this is badly flawed.

For many years a large volume of scientific information has been available on the safety of essential oils. Many essential oils have been used for over 100 years as ingredients of: medicines; food; drink; perfumes; cosmetics; soaps; detergents; candles; industrial applications, etc. Due to this widespread use, various authorities around the world have investigated the safety of essential oils in most of their common uses.

Sources of information:

The World Health Organisation publishes papers on the maximum levels recommended in foodstuffs. Their deliberations are ongoing and from time to time new reports are issued. The Council of Europe has published similar guidelines. The FDA in the United States has lists of GRAS status [\(1\)](#) ingredients for foods which include some essential oils. Most countries have their own legislation regulating the most dangerous oils and in that regard the UK's 1968 Medicines act does that. (See later).

How do organisations assess the safety or otherwise of essential oils?

They have many sources of information to draw on, or if they are uncertain, they will commission research. Many essential oils were listed in several National pharmacopoeias around the turn of the Century because they were commonly used in medicinal preparations. However, subsequently a significant amount of scientific investigations have been undertaken, particularly in universities around the world. Some of this work has been co-ordinated for regulatory authorities, and some experiments are done simply for academic research.

The best source of safety information of **relevance** in aromatherapy **was** the R.I.F.M. (Research Institute for Fragrance Materials) and their sister organisation the I.F.R.A. (International Fragrance Research Association). These organisations collect data in a number of ways: they gather scientific information and assess it, member companies report adverse reactions to fragrance materials to them, and if necessary, they in turn circulate member companies with warning notices. Finally, they have commissioned significant research evaluations of fragrance materials. For well over 30 years these organisations have published their findings in an extensive series of monographs in the journal Food and Chemicals Toxicity. **Unfortunately, in the last few years, these organisations have been overtaken by fragrance chemists who only understand organic chemistry. Now their safety guidelines are highly suspect in regards the use of essential oils. The reason for this is because rather than assessing side effects by the use of a whole essential oil on**

humans and animals, they now make wild guesses based on the occurrence of a single chemical in an essential oil. That is unreliable as essential oils contain hundreds of chemicals with interactions that change the nature and activity of individual chemicals in it. Only tests on the whole oil should be considered valid.

The fragrance trade organisations **did** vital work gathering data from adverse reactions reports and from testing the material in clinics around the world. **The aromatherapy trade is a cottage industry - despite what the public may think - and it has no co-ordinated system to monitor adverse reactions to the products they use.**

How is testing done:

Testing for toxicity is done on animals or in cell cultures. Most of the testing was done in the early 1970s. However, animal testing of essential oils and their components still does happen, mainly in Universities. The toxicity of a few oils in humans has been documented from past cases of poisoning.

Skin adverse effects:

Some of these tests were done on animals, but the final testing was on humans. These kind of tests are still conducted on volunteer panels of humans. In addition, specialist dermatology clinics around the world test people they think may be allergic to fragrance compounds as part of their routine testing procedures. These results are often published in International dermatology journals and add to the wealth of knowledge on the side effects of essential oils.

Legal considerations:

Before embarking on the known hazards of using essential oils, we should look at existing law relating to the sale and supply of essential oils.

Under UK and EEC law, it is an offence to place any product on the market if known hazards may be associated with misuse or inappropriate use of the product. That is unless "appropriate warnings" are attached to the product. Despite that, many traders in the UK still ignore this important piece of consumer protection legislation.

The European Union (EU) are constantly producing the most idiotic recommendations and laws on the use of natural botanical extracts. These are nearly all based around the single chemical principal and are crazy pseudoscience.

In the USA there are strict laws over labelling for products that may present a risk to health. The vast majority of aromatherapy suppliers in the USA do not comply with those laws. Again in the USA, numerous home cosmetics and soap producers are completely ignorant of safety issues. **The FDA is very likely to follow the EU over these issues.**

'Appropriate warnings' is the most important issue. There is nothing wrong with selling many of our most hazardous oils for non-contact uses, i.e. in fragrance heaters, pot pourri, candles, etc. However, it is unscrupulous to not warn people that these products should not be applied to the skin, and also probably illegal. Expressed bergamot and lime oils are good examples of where dangers are well documented and therefore the products must by law bear warnings.

The legal position of anyone that uses oils with **known dangers**, in a professional setting, such as in an aromatherapy treatment, requires examination. If someone used such a substance, and their client suffered a side effect as a result. Such a client would have an extremely powerful legal case to argue, if a major trade organisation such as RIFM has advised the large fragrance companies against the use of such materials for years. In such circumstances, a court might deem it unreasonable, for a qualified aromatherapist to use the material in an 'inappropriate manner'. Here I am particularly thinking about oils like expressed bergamot, where if used in a health club, before someone goes under the sun bed, could cause a very severe skin reaction.

It is also highly likely, that if the therapist did this, then their insurance company would refuse to stand by them and cover any subsequent damages awarded.

Adverse Skin reactions:

The 3 main kinds of reactions that can occur from essential oils applied to the skin are:

Irritation:

This is where a substance comes into contact with the skin, and causes anything from a mild itch to burns. The important thing is it that once the substance is removed and healing takes place, there should be no more problems.

Sensitisation - a FAR MORE SERIOUS SITUATION THAN IRRITATION:

Once the substance has been introduced to the skin, it can cause permanent changes in the immune system in a similar manner to a vaccination. On first use no adverse effects may be seen. However, the body has been sensitised, and next time the same or a similar substance is used, a reaction **may** occur. The severity can again be just a mild itch, through to the extreme of severe anaphylactic shock. However, the later in aromatherapy is almost unknown. Sensitisation in aromatherapy is something to be on constant alert for. If after using any essential oil or absolute, an irritating or burning sensation, or a blotchy irritable skin rash are noticed, then that particular oil or chemically similar ones should not be used again. This type of reaction is far more likely to occur with therapists rather than their clients.

Photosensitisation (sometimes referred to as phototoxicity):

This is where a substance coming into contact with the skin can react with ultra violet light. This reaction may cause anything from mild brown blotches through to severe burning of the skin. The condition can be long lasting and subsequent exposure of the skin to ultra violet light can trigger a reaction. It is vital to remember that it is ultra violet light which causes the problem and this can occur even on relatively dull days. Therefore it is **not** as many aromatherapy authors say "caused only by bright sunlight". The main essential oils to avoid in this respect are expressed Bergamot and Lime. The Bergamot grade known as FCF is perfectly safe. *See other articles on Photosensitisation in the archive.*

Miscellaneous claimed adverse effects:

Pregnancy:

The vast majority of claims made in aromatherapy books about not using certain oils during pregnancy are unfounded. Many such claims are based not on the essential oil concerned, but are from the traditionally claimed effects of the water soluble herbal extracts when taken internally. Such extracts are frequently totally different to the same plants oil.

The facts are that most common essential oils are permitted food flavourings. If there were the slightest evidence that using essential oils **externally** was any threat to the health of a foetus, then the oils concerned would have been restricted by legislation long ago.

If suffering from severe morning sickness early in pregnancy, then the smell of something like peppermint or spearmint oil may well subdue the nausea. In a case of constant vomiting, the implanted foetus is far more likely to be dislodged by the traumatic muscular contractions of the uterus, than from the effects of the inhalation of ANY essential oils.

The **birch** and **wintergreen oils** are best avoided during pregnancy. This is because indications are that the main chemical may be absorbed by the skin. High levels of methyl salicylate in the bloodstream are not desirable in pregnancy.

Clary sage is perfectly safe in a normal pregnancy, but should perhaps be avoided by anyone with a history of early miscarriages.

The main contra-indication of essential oils use during pregnancy is the heightened chance of causing skin irritation. It is quite common in late pregnancy for the skin to become very itchy and sometimes inflamed. In such circumstances essential oils in massage or the bath might make the condition worse.

Epilepsy:

There is no sound scientific evidence that any particular essential oils can trigger an epileptic incident. In fact it is well documented that any powerful smell can initiate such an attack. Therefore, the only general advice might be to avoid the pungent oils like camphor, eucalyptus, tea tree, rosemary, etc. On the other hand, some trials have indicated that the traditionally relaxing oils can substantially reduce the incidence of attacks. ([See more in letter below](#)).

High or low blood pressure:

There have been no comprehensive trials published where blood pressure has been monitored after the external application of oils on humans . There are no proven cases of anyone who has suffered ill effects from an escalation of blood pressure caused by aromatherapy. Indeed the opposite is likely, which is that a nice relaxing massage, or the use of the oils as room fragrance, will decrease a blood pressure if that is stress related.

The use of little known 'chemotypes' & completely untested essential oils:

The vast majority of our commonest essential oils have been well tried and tested and safety levels have been ascertained. However, when an aromatherapist uses oils whose safety has not been adequately ascertained, they are actually using their clients as human guinea pigs. Unless a client is told that the safety of such oils is unknown, then this is certainly unethical and possibly could leave the therapist open to legal challenges if things went wrong.

Many of the 'untested' oils are said by some people to have been "used traditionally". However, when this statement is carefully checked this is often found in error. The reason is that what has been used traditionally is the HERB not the oil. **This is one of the biggest errors in aromatherapy.** Herbal preparations contain totally different chemicals, with often totally different actions, to those occurring in a distilled oil from the same plant. See 'hyped oils' article in the archive for more details.

There are some compounds occurring in plant oils that can cause sensitisation reactions when only occurring at a few parts per million. Therefore, chemical analysis of the major compounds occurring in the oil can give absolutely no guide as to its safety. This misguided chemistry forms a major part of the teachings of certain aromatherapy teachers. If it were possible to judge safety by such means, then large organisations specialising in safety would not need to have spent millions on safety trials.

In relation to the above, below are some essential oils which you should be cautious about:

The following list is incomplete because there is a never ending flow of 'new' oils being pushed into aromatherapy. It is common to find that scientists have found very good therapeutic properties in some newly discovered plant oil. These scientists then publish their findings. The next thing is everyone wants to buy this new magical oil. No one, the scientists concerned included, pause to give a second thought to the potential side effects of this wonderful new discovery. Unfortunately, it is not until some poor individual has been harmed that someone gives safety a second thought. So the moral of all this is to be safe, **stick to those oils the safety of which has been well documented.**

Specific oils on next page.

All the below refer to essential oils and related extracts, not the use of the herb.

Alant Root (Inula helenium)

Never use this on the skin, it is **a powerful sensitiser with no known antidote.**

Almond bitter

The unrectified oil is highly toxic. Rare but you may come across it.

Amni visnaga

No formal safety trials are known.

Benzoin

A well documented **sensitiser** - RIFM recommend only grades processed to remove the allergens should be used in consumer products. These grades are not generally available via aromatherapy suppliers. See the article on 'benzoin'.

Bergamot expressed

This unmodified oil is a powerful **photosensitizer**, to be safe only use the FCF version.

Birch sweet and Birch Tar oil

There are many reports in the literature about birch tree extracts causing dermatitis. This oil is NOT a natural extract, it is a chemical even if it is extracted from the bark, most however is 100% synthetic.

Boldo leaf

Very toxic if consumed, so best avoided.

Calamus

A carcinogen in animal studies, and banned in cosmetics.

Cade

A powerful sensitizing agent, reported to cause skin irritation, dermatitis and acne-type eruptions.

Catnip

No formal safety trials are known.

Camphor brown, yellow or unrectified only

These unrefined grades may contain high levels of undesirable safrole.

Cassia bark

An extremely powerful irritant and an even worse **sensitiser**.

Cinnamon bark

An extremely powerful irritant and an even worse **sensitiser**.

Chamomile moroc

This oil has not undergone any Internationally acceptable safety testing.

Chenopodium (Wormseed)

Is listed as a "prescription-only" medicinal substance in the UK. It is highly toxic.

Colophony

A cause of dermatitis and eczema. Not to be used in cosmetic products.

Copaiba or copahu

Can cause sensitisation reactions if it is old and oxidised.

Costus root

It is **a powerful sensitiser** and should never be used on the skin.

Fennel bitter

Not widely available, but old samples of the oil have induced sensitization.

Eucalyptus chemotypes

The only types that have been tested are the E. globulus types and Eucalyptus citriodora.

Fig leaf absolute

This is **a powerful sensitiser with no known antidote**. Most sold as such is a perfume compound.

Horseradish

A powerful vesicant which will burn the skin.

Inula graveolens

A related species Inula helenium root oil, is one of the most hazardous essential oils available. Therefore, until such time as formal testing has been done, it is unwise to use this oil on the skin.

Lemon expressed

Can be a photosensitiser given the right circumstances-See article 'Factors Affecting Photosensitisation'.

Lime expressed

A powerful photosensitiser which is best avoided for skin application, distilled is far safer.

Kanuka

This oil has not undergone safety testing published in the accepted journals.

Manuka

This oil has not undergone safety testing published in the accepted journals.

Mustard volatile

A powerful vesicant which will burn the skin.

Niaouli

The pure oil has not undergone Internationally acceptable safety testing.

Ocotea - O. cymbarum

It can contain up to 93% safrole bringing it under the same legislation as genuine sassafras oil which is banned in cosmetic products in Europe.

Opopanax

A suspect sensitiser and cross reactions to similar oils are recorded.

Peru balsam

A powerful sensitiser. RIFM recommend "not to be used as a fragrance ingredient". The oil may be safer than the balsam, but those reacting to similar chemicals may still cross react.

Ravensara aromatica and similar names

None of the oils bearing the Ravensara name have undergone any formal safety trials.

Rosemary chemotypes

Only the common cineol types have been tested.

Rue oil

A terrible photosensitiser and sensitiser.

Sassafras

This oil is restricted to such low levels in cosmetic products throughout Europe, that it effectively bans its use. Tests have shown it is possibly carcinogenic.

Spikenard

These oils have not undergone Internationally acceptable safety testing.

Tagetes

A powerful photosensitiser. Therefore, to use it on skin exposed to the light would be foolish.

Tansy oil (T. vulgaris)

Extremely toxic. All other oils sold as "Tansy or Tansy blue" are untested for safety..

Tolu balsam

If someone has become sensitive to other fragrance ingredients, they may cross-react.

Turpentine unrectified

This is rare to find now, but it is a known **sensitising agent**.

Thyme chemotypes

Only the common phenol types have been tested.

Verbena

An extremely powerful sensitiser - Do not use it on the skin.

Wintergreen

See birch above, also this chemical oil is highly toxic and can be absorbed by the skin. **Never ever use it during pregnancy.**

Yarrow

Another essential oil used in aromatherapy that has not undergone formal safety testing.

If anyone sees oils on open sale without appropriate warnings, you should tell the vendor that the safety is unknown. Often they may not know, and may have relied for their knowledge entirely on the popular aromatherapy novels, on some of the appallingly poor training courses around, or on artist oil salespeople.

Banned or restricted oils:

The only essential oils that are prohibited for resale to the public under the UK 1968 Medicines Act are: Chenopodium (American wormseed), Savin oil and Croton oil. These oils may only be distributed to the medical profession from licensed pharmaceutical premises. **However, the undemocratic committees in the EU are increasingly placing unjustified restrictions on many oils. Please see this link: [http://www.cropwatch.org/Banned essential oils v1.08.pdf](http://www.cropwatch.org/Banned%20essential%20oils%20v1.08.pdf) for a file with up-to date information on restricted or banned oils and other files.**

Another oil that is 'effectively' banned in cosmetic products is Sassafras oil. By 'effectively' banned this is because the E.E.C. only permit safrol in products at below at 100 ppm. Since raw Sassafras oil contains about 870,000 p.p.m. of safrole, this means that in aromatherapy you would have great difficulty in diluting the oil to a safe and LEGAL level of use.

Countries within the European Community vary considerably in which essential oils can or can't be sold, and how they may be used. However, once the oil is introduced to a product formulation, the laws are almost standardised now.

(1) Generally regarded as safe when used in the volumes normal for that trade.

Other issues affecting safety.

Sell by, or use by dates:

This is an important piece of safety information to take note of. Certain essential oils, particularly those of the **citrus and pine families**, develop skin sensitising chemicals as they age. Without analysis one cannot be certain how quickly the oils have aged. Therefore, as a general rule, I advise people **not to use such oils on the skin after about 6 months of storage**. They can of course still be used for room fragrance purposes. Storing such oils in optimum conditions, such as in sealed containers in a refrigerator will slow down the chemical changes in the oil. It now seems lavender or oils high in linalool may also be a cause of this problem. See article Old Lavender oil.

Epilepsy issues and the trade hype:

Some compilations of my posts to IDMA aromatherapy group about the widely held belief that people suffering from Epilepsy should not be exposed to Rosemary oil.

My comments were based on Dr Betts own acknowledgement of how powerful auto suggestion is, and the fact that maybe years before, this patient may have read that rosemary was contra indicated in epilepsy. This would have been sufficient for a subsequent exposure to cause the recorded increase in brain wave patterns.

I am aware of all the other papers Gabriel/Bob Harris quote. They are a ragbag of stupid experiments on rats where the volumes of chemicals they are exposed to are way above anything that would ever be used in aromatherapy, or prolonged inhalation in humans. They are also based on the internal consumption of chemicals such as synthetic camphor (no, not the same as natural).

Statements attributed to the Dutch herbalist such as "Large doses of rosemary have been shown to cause convulsions in patients", are meaningless unless the dose is provided and a valid checkable reference.

From Dr. Betts new reply to Gabriel, the following very interesting note: "there is also the possible effect of a conditioned response to the smell.... apprehension about using a 'dangerous' oil might also be enough to trigger off a seizure".

Yes indeed, and who is responsible for such effects - unjustified statements made by aromatherapy authors!

I would agree with being cautious about advocating the use of any harsh smelling product for use by an epileptic person. However, a good quality hydro distilled rosemary oil is NOT harsh smelling, it smells like the plant which can have a wonderful fragrance, nothing at all like camphor. However, in aromatherapy there are steam-distilled oils that smell very camphoraceous.

Rosemary oil is a GRAS status permitted food flavouring used in alcoholic and non alcoholic beverages, frozen deserts, candy, baked goods, meat products, relishes, etc. at a maximum use level of 26 ppm and does anyone tell an epileptic person not to have rosemary with their lamb?

We have already discussed on this list how little essential oil gets into the body during an average aromatherapy treatment. Of course if someone sits sniffing at a bottle they may well get a lot of camphor and the other chemicals in their bloodstream but that is not what happens with an average treatment.

I stick by what I said earlier, which is that there is not a shed of SOUND evidence that rosemary can initiate an epileptic incident any more than numerous other smells.

Pat said: "I am convinced that there is at least the possibility that Rosemary Essential Oil may cause seizures".

ME-So on what basis are you "convinced"? I can see no ethical problem, if there is no good basis for your conviction that rosemary oil can cause the suggested effects.

As to if I would do a trial on epileptic patients using rosemary. Yes, but only if they were first de programmed from possible previous auto suggestion that 'rosemary may be a danger'. A good clinical hypnotherapist could do that.

I hate giving anecdotal cases, but this may be of relevance. I had a student in Florida who told me that rosemary oil was the ONLY thing that prevented a seizure in her husband. He had brain damage following a car smash that left him subject to fitting and the drugs he was given did not help.

He had just a sniff from a bottle (as he felt the aura coming on) and it stopped the fit. I guess this is not the same as those people born with epilepsy, but this is an example of the need not to dismiss a 'potential' treatment using an otherwise perfectly safe product.

In the 1700s Rosemary oil was given internally by doctors to control epilepsy!

As to the case of the dog; well tea tree oil has been reported to have the same effect on dogs. Do we therefore include tea tree in the oils not to be used by epileptics?

In fact I have got several of the references that Bob Harris mentioned. You see I do something most people don't bother about, which is obtain the *whole* research paper rather than just the extracts. When you get the whole papers a very different picture can emerge compared to just reading the abstract. For example, it is extremely common to find experiments on animals where synthetic fragrance chemicals are used. These chemicals are never identical to the equivalent natural one. This may not invalidate results, but does raise huge questions on the accuracy of results obtained.

My comments on the use of rosemary in food are perfectly valid on this issue. This is because several of the experiments on animals have been from the internal administration of the essential oil. In addition, the suggestion is that it is the SMELL of rosemary that can cause a problem, in which case even cooking with the herb creates a strong smell of rosemary.

There are several errors in the suggestions that inhaled camphor or 1,8-cineole might cause seizures when used as part of an average aromatherapy treatment. Also in the theory of first liver bypass via skin absorption. In a massage the volume of chemicals entering the body is minute. The question of skin absorption should by now be a dead duck. It is not, simply because most aromatherapy teachers do not want to face the truth, which is they have been teaching nonsense for years. The clear evidence is that is *not* a pathway by which pharmacological volumes of oil get into the body. *See the article on 'Skin absorption'.*

From the research I have got, it would appear reasonably large amounts of certain chemicals in essential oils can get into the bloodstream via inhalation. However, during the average aromatherapy massage, particularly with oils like rosemary, only a few drops are applied all over the body. The person *doing* the massage will get far more vapours in their body than the person being massaged. This is primarily because hot gases rise, (another basic piece of science that most aromatherapy teachers ignore). Therefore, the volume of the chemicals getting into the body of the 'client' would be considered by a pharmacologist as of little or no significance.

Yes, of course I agree with you about people using the oil in excess could cause problems. I also believe you may be correct in informing people with a history of seizures about the controversy over rosemary oil. They of course have a right to know. However, in honesty, it should be put to them that the matter is 'not settled', rather than put to them that that they "might get a problem".

Finally, I still cannot see any reason why we should implicate rosemary rather than many other oils, as being contra indicated for epileptic people. You should also consider how well known I am for promoting the safe use of essential oils. If I have the slightest suspicion that something is dangerous then I tell people about it. This thing over rosemary is just a part of the unjustified hype and urban myths that our trade is riddled with.

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