

Is It Natural or Chemical?

Myths & Misinformation about Cosmetic Ingredients

How often do we hear such comments as, “I don’t want anything with chemicals in it”? Or maybe, “I only want natural ingredients, no chemicals.”

We live in a chemo-phobic society in which many people believe that natural means goodness, purity and safety, while chemical means nastiness, danger and pollution.

There are plenty of companies who are encouraging such attitudes by the use of misinformation and wild exaggeration in order to sell their own products. It’s called negative selling... putting your competitors down rather than focusing on the benefits of your own products.

Here’s an example from a multi-level direct marketer who trumpets, *“Would you wash your hair, clean your face and body, brush your teeth, shave your face, wear cosmetics with: Brake/Hydraulic Fluid, Resin, Varnish, Garage Floor Cleaner, Engine Degreaser or Industrial Ant-Freeze? You probably are and don’t know it!”* Then they offer a list of harmful ingredients with descriptions that would scare anyone.

Natural is always good?

Each year many people die all over the world from poisoning by plants – leaves, extracts, seeds, or oils. For each person that dies, there are many thousands that suffer rashes, irritations and allergic reactions (think of hay fever sufferers alone) from contact with plants or plant derivatives.

Diphtheria, hepatitis, meningitis, and smallpox are natural. So are salmonella, staph., e. coli, and all the other bacteria, moulds, yeasts, and viruses that may grow in cosmetic and food products. You can get at least a rash, if not very much worse.

If you have ever experienced food poisoning, you know how unpleasant (and dangerous) nature can be with unpreserved or unprotected foods. Ingredients that are closest to their natural state, especially herbs and proteins, are the most susceptible to microbial growth. Just have a look in your refrigerator after leaving a full vegetable bin untouched for a while. Yuk!

Cosmetics containing natural source ingredients must be preserved in some way to last long enough to make it out of the factory where they are made, let alone to sit on a shelf long enough to be bought, and

then used by a consumer. Actually, the most important reason for using preservatives is to prevent product contamination by consumers—by us!

Human skins are teeming with bacteria, as are our surroundings. While some bacteria are harmless, and may even be useful, others such as staphylococcus aureus (staph.), pseudomonas aeruginosa, propionibacterium acnes, and Escherichia coli (e. coli) can be very dangerous and cause infection if they are allowed to multiply and penetrate the skin. The US Federal Drug Administration (FDA) took cosmetics under their protective umbrella in 1938 because 10 cases of blindness had occurred from poorly preserved products during the previous decade.

Each time a finger is dipped into a cosmetic jar, or replaces a lipstick into its tube, millions of potentially harmful organisms are introduced into the product. Preservatives must be used to prevent an outgrowth of bacteria (or fungi and moulds), which could lead to product spoilage, skin irritation and infection.

What about chemicals

Everything in our physical universe, apart from energy (light, electricity, gravity, and magnetism), is chemical!

Chemicals are merely combinations (molecules) of atoms (the most basic elements). Let’s face it, if those atoms didn’t combine virtually nothing we know, including our own bodies, would exist. The air you breathe, the water you drink, the floor you stand on, the car you drive... even the body you live in... are made of chemicals. Plants and their essential oils, vitamins, proteins and enzymes are all chemicals. It is their highly complex chemical structure that in part makes essential oils potent.

Chemistry is the science that investigates the composition and interaction of compounds and elements. It studies the synthesis of compounds, natural and artificial. Plants are literally chemical factories that use water and mineral salts from the soil, air and sunlight to synthesise a variety of chemicals from simple sugars and starches to complex essential oils.

Chemical structure is often conveniently described in a scientific shorthand. For example, we all know that H₂O is water – a compound of two atoms of hydrogen and one of oxygen. One molecule of water is always identical with another, regardless of where it

comes from or how it has been formed.

The same is true for more complex compounds. Vitamin C, known by the chemical name ascorbic acid, is $C_6H_8O_6$. This means that a molecule of vitamin C consists of 6 atoms of carbon, 8 atoms of hydrogen and 6 atoms of oxygen in a particular structure. Now, regardless of where the ascorbic acid comes from, each molecule has the same structure. The ascorbic acid molecules in a lemon or orange are the same as those produced by a commercial process.

Interestingly, the most effective commercial synthesis of ascorbic acid uses a biological fermentation process in which the actions of a bacterium on glucose are used to produce ascorbic acid – vitamin C. In other words, “nature” is harnessed.

If someone offered you geraniol and citronellol in water to spray onto your face, you would probably be rather reluctant to do so. But, if you knew that it was actually ‘rose water’ containing pure rose oil, you would doubtless feel quite different. Geraniol and citronellol are the main natural chemical constituents of rose oil.

What if you found that a ‘natural’ aromatherapy oil had the ‘methyl ester of anthranilic’ acid in it? You would be relieved to learn that this is a component of ‘neroli’ oil... the one which gives neroli its lovely fragrance. Or, would you be reluctant to apply oil, which contained linalol, cineole, and linalyl acetate, to your skin? What if you knew that the oil was actually pure ‘lavender’ oil?

It is obvious then that to talk about ‘chemical’ versus ‘natural’ ingredients is not very meaningful. All ‘natural’ ingredients are also chemicals – every single one!

Good vs bad ingredients?

Probably what most people really want is ‘safe’ products and it is easy to accept the idea that some ingredients are good and others are bad. Yet every ingredient in a cosmetic has a purpose. For example, is mineral oil good or bad? From a beneficial angle, mineral oil provides a very effective barrier to protect baby skin from wet nappies, or to protect adult from skin drying, chapping cold weather. Would you want it on the skin of an oil-secreting teenager in the middle of summer? Probably not.

As health and safety authorities charged with protecting consumers ban the use of any ingredients (or concentrations of ingredients) that are truly ‘unsafe’, it is much more meaningful to think in terms of appropriate and inappropriate ingredients. This forces us to consider the role of the ingredient in a product, the

quantity used, the effect on and from other ingredients, the use of the product, packaging and storage, shelf life and so on.

Another factor, which can affect ingredient suitability, is the grade, degree of refinement, or purity. Mineral oil, for instance, is available in technical grade, cosmetic grade and pharmaceutical grade. The difference in the three relates to the level of contaminants. Most cosmetic manufacturers now use pharmaceutical grade mineral oil, which is completely non-toxic.

Fear and smear

The best description for some of the language use by certain companies to describe some ingredients is a fear and smear campaign. The multi-level direct marketing company quoted earlier goes on: “*You and your family may be exposed to potential cancer causing agents every time you enter the bathroom*”. And what are some of the ‘deadly’ ingredients on their list? Alpha-hydroxy acids (fruit acids), animal fat (tallow), bentonite (clay), collagen, elastin, glycerine, lanolin, mineral oil, and so on.

Here’s a classic example of why one local company claims it doesn’t use animal ingredients:

“It has consistently been demonstrated that animal products do not add benefit to a skin cream. They are basically DEAD MEAT, which when added onto the skin putrefy.” Can’t you just smell the rotten meat?

The truth of course is that no “dead meat” is put into cosmetics. There are many animal-source ingredients, some very effective in moisturising benefits, none of which remotely resemble meat. Lanolin derivatives, hyaluronic acid, soluble collagen and elastin... these are just some that come to mind.

Their story goes on: “*Having live plant nutrients available as raw materials that the body can absorb and process and use as building blocks is far more beneficial.*”

Plant-source ingredients are no more live than the ‘dead meat’. While essential oils and plant extracts are often very effective and potent, they are not alive. A plant dies and putrefies just as quickly as an animal (just look at your compost heap) and for the same reasons – oxidation and microbial activity. That’s why products with plant-source ingredients need preservatives just as much (if not more) as any others.

Mineral oil “asphyxiation”?

Mineral oil has pride of place on every list of ‘bad’ ingredients. We are told it will clog pores and “asphyxiate the skin”. My dictionary tells me that to

asphyxiate means to kill or cause unconsciousness by stopping normal breathing – choking, drowning or inhalation of non-air gases. Try keeping your nose and mouth blocked and see how much breathing your skin can do. Zilch!

Respiration, the supply of oxygen and removal of waste carbon dioxide, is of course vital to all cells and tissues. The skin, often called the body's largest organ, has virtually half of the body's supply of small blood vessels to ensure efficient respiration.

You can just about guarantee that every one of us has had large areas of our body covered in mineral oil at one stage – when we were babies. Baby oil, used by millions and millions to protect infant skin, is largely mineral oil. One of its benefits is that it leaves a very fine, light water-repellent film that doesn't clog the pores.

Just in case anyone has forgotten, our own bodies produce a key 'animal by-product' called sebum, designed to cover and protect our skin with a thin film or barrier of oil. It is modern living in all its facets that often reduces or destroys this barrier and prompts us to assist with skin care products.

Organic, inorganic and hydrocarbons

Organic compounds are those that exist in or are derived from animals and plants. One of the features of all organic chemicals is that they contain hydrogen, carbon, and oxygen atoms. You might say that these three elements are the true building blocks of life.

Inorganic is clearly then any compound or chemical which does not contain hydrocarbons and is not of animal or plant origin. This includes the many minerals, which are sometimes found in pure form (gold, silver, iron, etc), but are often found or used in a variety of salts.

Common table salt is an example we all recognise. It is a combination of sodium (Na), which is a quite volatile metallic compound, and chlorine (Cl), which is a corrosive poisonous gas. Combined into sodium chloride (NaCl) molecules, these elements perform a safe and critical role in our cellular metabolism.

So once again, just because a compound – a chemical – is not derived from living materials doesn't make it a 'bad' ingredient. Without it we wouldn't be here. And in any case, isn't salt derived from the sea 'natural'?

Petrochemicals

Mineral oil gets some of its bad or inaccurate press from its name and source. It is a product of the petrochemical industry, whose raw material is petroleum.

And it has 'mineral' in its name as opposed to vegetable or essential.

Petroleum comes from the Latin *petra* – rock and *oleum* oil. That's suitably descriptive because we extract it from upper strata or rock formations of the earth as a thick, black, oily liquid.

Where did this material originate? From animals and plants that lived millions of years ago... in other words essentially an organic hydrocarbon material. Having been compressed in pockets between layers of rock, crude petroleum is often contaminated with metallic elements leached from the surrounding strata.

Because metallic and other natural elements in the earth's crust are mostly extracted from the ground by mining, the word mineral has become attached to them – it simply means derived by mining.

As drilling for oil and natural gas is a form of mining, the term mineral has been applied to some of the petroleum products, such as mineral oil. However, 'mineral' oil as used in cosmetics is just as much an organic hydrocarbon oil as any vegetable oil.

Similarly the natural gas, which the petrochemical industry extracts from the ground and we burn in our homes, methane has the same CH₄ structure as the 'natural gas' released by the cows in our farmers' paddocks, which is a focus of some of the 'hot house gases' climatic discussions.

Those other "nasty" ingredients

Earlier we discussed the "Is it chemical or natural?" debate and the amount of misinformation that exists. With the increasing worldwide use of and access to the Internet, such misinformation spreads more quickly, widely and often without challenge. Even the mainstream media can get caught up in completely unwarranted hysteria.

Here is a frightening example. "*Men being emasculated by toiletries*" screamed a headline in the UK's 'The Independent' newspaper. The opening paragraph goes on, "*A toiletries ingredient has been found to produce 'feminising' effects that might contribute to the drastic decline in sperm counts and the increase in male reproductive disorders.*"

Scary stuff! So what is this nasty ingredient? It is in fact the group of preservative ingredients known as parabens.

Paraben preservatives

Parabens (methyl, ethyl, propyl, and butyl parabens) are found in almost all skin products and have been used as food preservatives for more than 60 years.

The parabens have a broad spectrum of antimicrobial activity, are safe to use - effectively non-irritating, non-sensitising, and non-poisonous – are stable over the pH range of cosmetics and sufficiently soluble to be effective in liquids.

They are often accused of being the most common preservative allergens, but the opposite is actually the case. In a 5-year joint study by US dermatologists under the auspices of the FDA, involving over 280,000 people with highly sensitive or allergic skin, only 149 people reacted to preservatives – any preservatives.

This is really a very small number (1 in 2000 of highly allergic people), considering the many millions of people who use cosmetics. And further, the parabens actually have by far the least incidence of reactions of all preservatives.

In foods parabens are used especially to prevent the growth of moulds and yeasts. They are used in baked goods, sugar substitutes, artificially sweetened preserves, mincemeats, milk preparations, soft drinks, packaged fish, meat and poultry, jellies, fats and oils, frozen dairy deserts, tomato puree and sauces, pickles and relishes, to name some.

Parabens are rapidly hydrolysed and broken down in the body, especially the digestive tract, which accounts for their excellent safety profile. As we have already stated, the infection risks from poorly or unpreserved products are markedly greater, especially with cosmetics.

So what is behind the ‘emasculatation’ story mentioned above? There is no doubt that human exposure to an increasingly wider array and quantity of chemical compounds demands research on a very broad range of safety issues. The possible inadvertent oestrogenicity of certain chemicals is one issue of special interest. As part of such research, some laboratory work has been done on parabens.

In one in-vitro (test tube) study, the effects of parabens on oestrogen-dependent human breast cancer cells (grown in the laboratory) were tested. It was found that competition for the oestrogen receptors of these cells could be detected at a million-fold excess of parabens compared with 17 β -oestradiol (the natural oestrogen).

A similar miniscule effect in the test tube was found in an in-vitro study, with yeast cells genetically engineered to be sensitive to oestrogen.

By comparison, natural phyto- and myco-oestrogens can be thousands of times more potent. Certain plants and fungi produce chemicals with endocrine effects. Some of these compounds have shown oestrogenic

effects. (Soya and clover, for instance, contain fairly high concentrations of phyto-oestrogens.) The most potent of these natural chemicals have approached the potency of 17 β -oestradiol in some in-vitro tests, in other words at least 10,000 times more potent than parabens.

In living organism studies, the parabens were found to be inactive when given orally to immature laboratory rats and mice. When injected with parabens, no oestrogenic effect was found in mice (even at levels of injecting 1 gram of paraben per kilo of body weight). In immature rats, injections of butylparaben produced a measurable effect, but 100,000 times less potent than 17 β -oestradiol.

Immature laboratory rats and mice are a notoriously poor predictors of effects in humans. So, to use these results as evidence for such claims as “Men being emasculated by toiletries” is a stellar leap to a conclusion which is absolutely unwarranted, and completely misleading. Nor are the attempts by a local manufacturer of “natural” skin care products to link parabens with cancer any more valid.

The real experts tell us that today parabens remain the number one cosmetic preservative because of their very low rate of allergenicity and their favourable preservative profile and efficacy. They are degraded very rapidly in mammalian animals and will not exert any hormonal effect with normal human use of the compounds.

“What’s anti-freeze doing in my cosmetics?”

This is the type of shock headline used by some cosmetic companies, especially direct marketing brands, in introducing another ingredient on the top 10 most hated list – propylene glycol.

A fairer question by far would be, “What’s a widely used foods, medicines and cosmetics ingredient doing in my anti-freeze?”

True, propylene glycol is now found in many anti-freeze products, but the automotive industry only started using this eco-friendly ingredient because the previously used ethylene glycol is toxic for small children and animals, who might be tempted to ingest it because it is pleasantly sweet tasting .

Propylene glycol is used in foods such as confectionary, chocolate products, ice cream, toppings, icings, baked goods, beverages, and meat products to prevent storage discoloration.

It is so safe it is a common ingredient in medicine preparations, including some used for injection and

eye care products. Other than water itself, it is the most common moisture-carrying ingredient in cosmetics.

In earlier days (it has been used for over 50 years) there were suggestions that it might be a skin irritant and sensitizer. As has quite often proved the case, the problem was not so much the propylene glycol itself, but more the quality or grade being used. The more purified pharmaceutical grade (used in quality cosmetics) is free of the contaminants that could be found in the technical grades.

There are many ingredients that have an industrial use (and possible quality or purity standard) as well as a cosmetic or food use.

The number one ingredient in cosmetics is water. It is no more meaningful to point out industrial uses of ingredients as it is to point out that water is used in car cooling systems, sewage systems, car washes, cleaning systems and untold other industrial processes.

In fact, the water used in cosmetic manufacture is as much of a superior quality (distilled and purified) to industrial 'grade' as are many other ingredients.

The panel of the Cosmetic Ingredient Review, reporting to the FDA in the US, studied propylene glycol for possible effects on dermal toxicity, eye and skin irritation and sensitization. The final report deemed propylene glycol safe for use in cosmetic products at concentrations of up to 50 percent. Most cosmetics contain less than 20 percent.

Is Lanolin Bad for Sheep?

Another ingredient that has got bad press over the years is lanolin, the sebum-like secretions of the sheep's sebaceous gland. Obviously lanolin, a moisture-protective compound, doesn't cause the sheep any problems. Yet it has become something of a controversial ingredient for human use.

Less than 1 percent of known allergy sufferers actually test positive to lanolin. Once again we find that the sensitivity ascribed to lanolin in earlier days was largely due to contaminants. Lanolin is derived from sheep wool during the 'scouring' or washing processes.

Without thorough purification, there will be the risk of pesticide and other contaminants. (By the way, is using hot water to extract this beneficial sebaceous secretion from wool any less 'natural' than using steam to extract essential oils from flowers?) When lanolin is highly purified to pharmaceutical standards it is no threat, even to the chemically sensitive.

Lanolin is an emollient with excellent moisturising properties and an emulsifier with high water absorption capabilities. Lanolin has also been accused of being comedogenic, but this is increasingly being repudiated, especially as most lanolin in cosmetics is used in emulsions and forms a fine emollient network on the skin's surface, rather than a film.

Further, newer ingredients have been derived from lanolin that retain the desired emollient and water-absorption benefits, while reducing even further the very small incidence of sensitivity among the chemically sensitive.

The Scent That Irritates?

Fragrances rank among the most common causes of allergic dermatitis (more than 1 percent cosmetic allergic contact dermatitis cases were deemed by the FDA to be due to fragrances).

The problem is that instead of being one ingredient, a fragrance is a mixture of ingredients. These may be of natural (essential oils and extracts) or synthetic origin. A fragrance may often contain a mixture of both.

By their very nature, fragrance ingredients are more volatile (their molecules are readily released into the air, where they can make their way to the olfactory nerve endings in our noses to create the experience of a pleasing smell).

Compounding the issue is that 'no added fragrance' cosmetics may rely on plant extracts and essential oils to provide a pleasing odour (usually as well as therapeutic benefits).

All plant extracts and essential oils hold potential problems for the fragrance-sensitive person. However, having a problem with one cosmetic doesn't mean people will automatically have a problem with fragrances in other cosmetics.

Can all alcohols make you drunk?

Intoxication is the end product of too much of one alcohol, ethyl alcohol. It is obtained by the fermentation of fruit (especially grapes), sugar, grain and potatoes. It is the one alcohol with which we are all familiar in one way or another.

Ethyl alcohol is also one of the smaller alcohol molecules that is less desirable if dry hair or skin are a concern. However, not everything with alcohol in the name is the type of alcohol that we tend to think of as drying.

The term 'alcohol' encompasses a vast range of or-

ganic compounds and forms, many of which are actually quite beneficial.

For example, cetyl and stearyl alcohols are fatty compounds with moisturising, lubricant and emulsifying properties used in many skin and hair care products.

They can be derived naturally (from coconut oil) or synthetically. (But as we've stated before, the source doesn't change the molecular structure or properties of compounds – they're identical).

The mistake a lot of people make (one which is encouraged by extravagantly negative claims by some competitors in the cosmetic market) is to try and avoid all alcohols, even though most of them are perfectly fine.

Sodium lauryl sulphate

Sodium lauryl sulphate is a soapy surfactant that has been used extensively for decades. Its younger cousin, sodium laureth sulphate is similar, but not the same and the two are different ingredients with different use/safety profiles. Lauryl is the stronger of the two.

Both ingredients have been widely used in shampoos and cleansers to dissolve oil from the skin and hair, removing the grime and make-up trapped in the oil. When left on longer than one hour, they can dissolve the glue-like lipids holding skin cells together.

When these lipids are dissolved, irritation may follow. However, shampoos and cleansers - in which the two are most commonly found in any significant quantity – are not intended to be used much longer than 60 seconds, so irritation is not a risk for most people.

Where trouble can occur is with very dry skin that cannot afford to lose even a drop of precious lipids. If skin feels tight after cleansing or washing with products relying on either of these surfactants (shampoos, liquid soaps, and to a much smaller extent cleansers), people should switch to a cleansing system that leaves the skin comfortable and supple.

There have been reports that sodium lauryl sulphate can penetrate the skin, or around the eyes, when left on the skin for longer periods. It may be retained in the body for days, or with larger amounts even weeks.

However, the doctor who reported on the original eye penetration studies says that any panic over the penetration of the ingredient, which has been on the market for over 50 years, is uncalled for.

“If there had been a problem with its use in shampoos over the years, then it would have been seen by now. One should be judicious about the use of this material

in younger eyes.”

In summary

By now you'll be aware that the topic of cosmetic ingredients is an enormous one and subject to a great deal of competitive misinformation. When a company focuses more attention on what it has purportedly left out of its products than on what it has put in, then a good pinch of salt is often indicated.

Reputable companies making quality products have nothing to gain from using inappropriate ingredients. They are constantly looking for ways to improve the efficacy and value of their products for their customers – and comfort and safety are always a prime concern.

Looking at ingredients in isolation is also not automatically meaningful, especially when their only use is in complex combinations of ingredients in creams and lotions, where the interaction of all the ingredients will inevitably alter their effect.

Using large quantities and high concentrations of a sole ingredient in laboratory or animal testing is not a useful indicator of the effects when used in very small amounts in a multi-ingredient emulsion.

For example, parabens are used as cosmetic preservatives at a level of only some 0.2%. Bound into an emulsion such as a moisturiser, of which maybe 5mls are used per application, the amount in contact with the skin is miniscule and penetration non-existent.

Nature continues to give us new solutions to old problems, so we will continue to see more natural-source ingredients in products, but these are still chemicals and will rely on existing preservatives, emulsifiers, texturisers, and surfactants to make the creams, lotions, and liquids for effective delivery.

We must think of the appropriateness of an ingredient for a particular product, rather than try to categorise it emotively (and often ignorantly) as good or bad.

After all, probably the world's most essential ingredients, water, can be both good and bad. It sustains life in food and drink, yet a few litres of it can snuff out life by drowning. It's not so much what you use, but how you use it.