the science of beauty

Vol 5 No 1

August 2015

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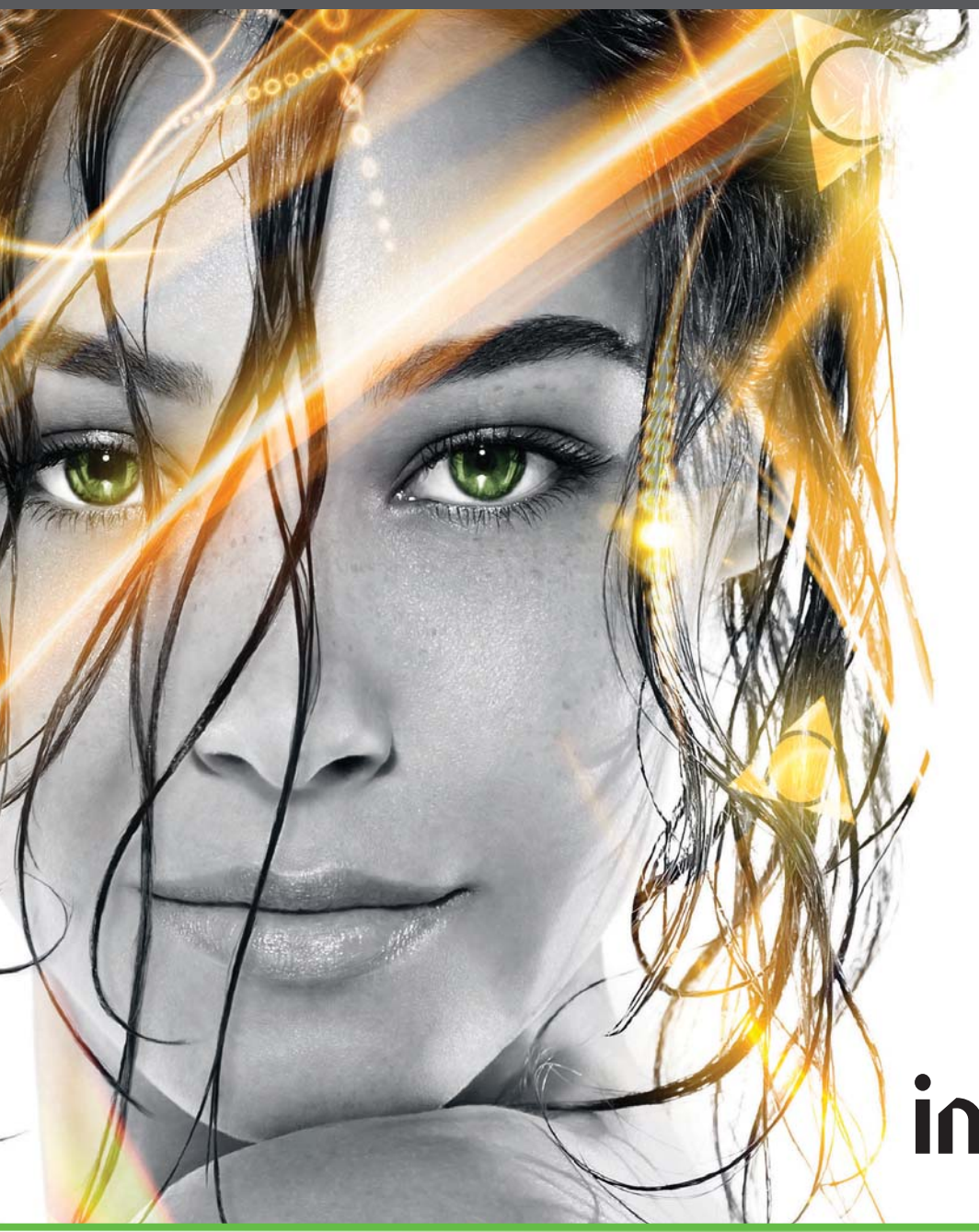
people...product...performance



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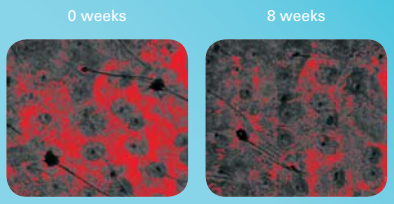

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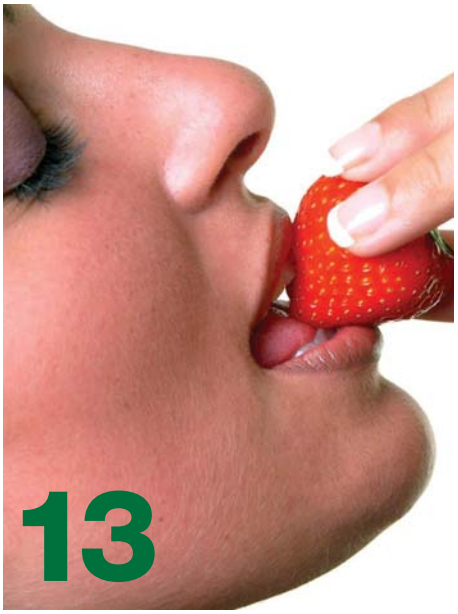

ASCC

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CALL FOR PAPERS

The 2016 ASCC Annual Conference will be held at the Wrest Point Hotel, HOBART on April 27-29, 2016. The Organising Committee invites expressions of interest to present papers and workshops. Papers are requested in the areas of Cosmetics, Toiletries and Therapeutics including the science and their Branding and Marketing, with preference given to relevant and original work that relates to the underlying theme of the conference, **(Get*(ting)* to the Point.) in terms of Compliance, Quality, Performance, Creativity and /or Value.**

ABSTRACT

Abstracts are to be submitted in English and be 100 to 250 words in length.

Submissions should be in Microsoft Word format, double-spaced using Arial font in 10 or 12pt.

Please include the following information:

a) Preference for Platform or Workshop, Presentation Title, Name of Author(s),

b) presenting Author's name to be underlined, Company/Organisation, Postal Address, Phone, Fax and Email Address.

It must be clearly stated if the presenter is not one of the authors.

Please note, the ASCC prides itself on being a scientific organisation. Kindly ensure your presentation does not contain Trade names, but rather INCI names.

All questions can be directed to Marg Smith either by email marg@syndet.com.au or telephone 0397616726

SUBMISSIONS

Submissions as Abstracts or Full Papers should be emailed by December 20th 2015 to Marg Smith *marg@syndet.com.au* and Frank Arrigo *FArrigo@fgb.com.au*

Presentations should be of 25 to 30 minutes duration including 5 minutes for questions. Workshops may be of 60 or 90 minutes. Preference is for interactive workshops.

Successful abstracts will be notified by 31st January 2016

Submission of full written papers will be required by 12th March 2016.

AWARDS

To be eligible for the Lester Conrad Award (best original paper presented) or the Jack Jacobs Award (best paper based on original research conducted in Australia or New Zealand) full written papers must be submitted.
Terms and conditions for these Awards are available via www.ascc.com.au.

CONFERENCE UPDATE

The Organising Committee has been busy behind the scenes putting together a special ASCC Conference for you all. We are also in the process of arranging pre-conference workshops. If holding such a workshop appeals to you, please let us know as we'd be happy to hear from you.

Connie Pisa has organised what promises to be a memorable social program which includes a visit to the world famous MONA.

For something a little different, we will have a special focus for Brand Owners to run alongside the Technical Program. We would especially welcome speakers knowledgeable in areas such as insurance, trademarks, packaging and trends to respond to the Call for Papers. The interaction with our customers should allow for an exchange of ideas and mutual learning to try and bridge the gap between the realities of R&D and Marketing methods so we can all Get to the (same) Point!

We look forward to seeing you at the 2016 ASCC Conference.

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meet the team...

LISA DELLA-BOSCA Lisa has been a professional skin therapist working in the industry for over 30 years.
After the first couple of years as a beauty therapist, Lisa had a driving force to understand the cause and treatment for the clients skin disorders she was managing, but at this stage could only treat superficially. The solution was to study natural therapies. For over 25 years Lisa has married the science of natural therapies especially nutrition with skin science with skin therapy to gain solutions for skin disorders and skin conditions.

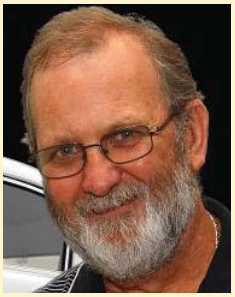
KITTIRAT YOTNANGRONG or Akoi as she is known, is one of the very few people who have been a Buddhist nun and a runner-up in the Miss Southern Thailand Beauty Quest as a "mature" contestant. She is a 'practical' vegetarian who believes in herbs, healthy living, and meditation. An avid yoga fanatic, Kittirat is also an organic farmer. She regularly speaks to community groups in Malaysia and Thailand on empowerment, health through herbs, and spirituality.

WENDY FREE has degrees in science (B.Sc) and Technology Management (M.Tech Mngt) and is an active member of a number of industry associations including Australian Society of Cosmetic Chemists, Australian Society of Microbiologists, Association of Therapeutic Goods Consultants, MediQ and is a Fellow of the Australian Organisation for Quality. With more than 2 decades industry experience, Wendy is currently the Scientific Director of Quality Matters Safety Matters Pty Ltd providing expertise in product and quality systems development, specifically for the medicines and personal care industries. She specialises in regulatory compliance, commercialisation, troubleshooting and GMP systems. Wendy has participated in the development and successful launch of hundreds of products, and is passionate about everything she does.

PAM STELLEMA is the Principal Coach and founder of SalonSavy, and provides specialised industry based phone coaching to her clients. Pam has owned and operated several highly successful salons, and specialises in maximising salon productivity and profits. She has also authored the book "3 ½ Secrets to Salon Success"
Pam can be contacted via her website www.SalonSavy.com.au or phone 011 617 5529 6467 or 0431 975 515.

JOHN STATON has a background of over 40 years experience in the pharmaceutical and healthcare industries. John is a life member of the ASCC and serves in a number of industry representative roles with ASMI, ACCORD, TGA and Standards. He is the Australian representative to the ISO Committee on Sunscreen Testing-TC 217. (The committee for development of sunscreen standards). John is also in demand as a speaker on the International Conference Circuit.

WENDY LOCKYEAR founder and principal of Advance Massage Australasia has been in the natural and remedial therapies industry since 1972 and is an accredited member of the Australian Traditional Medicine Society, and an accredited training provider with over 26 years clinical experience and over 18 years in education, training and instructional skills, teaching a wide variety of remedial modalities from general interest and post graduate workshops to accredited units up to an Advanced Diploma level, Wendy travels extensively and delivers regular annual seminars. Wendy specialises in delivering her courses and workshops one or two on one and recommends this for any one seeking a maximum level of competency based training.



RIC WILLIAMS was educated in Sydney obtaining his Bachelor of Science in Pure and Applied Chemistry from the University of New South Wales (1980) and a Diploma of Environmental Studies from Macquarie University in 1983.
Ric has had 40 years experience in the industry working for many companies and operating his own consultancy business for many years.
He has presented many lectures and workshops at national conferences for the Australian Society of Cosmetic Chemists (ASCC), the Association of Professional Aestheticians of Australia (APAA), Cosmetic and Pharmaceutical Special Interest Group (CAPSIG) and also beauty colleges nation wide.

TINA ASPRES has worked as a Pharmacist for almost 20 years in retail, industry and academia as well as being a Cosmetic Chemist. Currently she works in industry and has vast experience in both the pharmaceutical and healthcare arenas. In addition to this she is a casual academic at UTS, School of Health, (Faculty of Pharmacy in Pharmaceutics). Tina has a great interest in clinical research in dermatology and the treatment of skin disease and conditions and is Clinical Trial Coordinator at South West Sydney Dermatology. She is a keen researcher in transdermal drug delivery systems. Tina is a Member of the Pharmaceutical Society of Australia and a Member of the Australian Society of Cosmetic Chemists. She regularly consults pharmaceutical companies in the area of acne, eczema and skincare especially in the area of cosmeceuticals and has devised and written numerous support, training and education material for companies aimed at both professionals and consumers. Tina consults for the Eczema Association Australasia and is on their Integrity Assessment Panel and has worked with Choice Magazine on numerous reports. Tina has presented at the Annual Scientific Meeting of the Australasian College of Dermatologists and has published within the pharmacy and medical literature in the area of sun protection, Vitamin D, skin cancer prevention and eczema as well as co-authoring the book 'All About Kids' Skin – The Essential Guide' published by ABC Books

MARG SMITH is the owner of Syndet Works – an Australian company established in 1984 to formulate and produce soap free skincare bars. Syndet has developed an enviable reputation for custom formulated and manufactured skincare that now extend well beyond the origins of the business.

EMANUELA ELIA is the Director of Ozderm, which specialises in *in vivo* testing and clinical trials for cosmetic and personal care products. Emanuela Elia has a law degree from Rome and a Master of International Business from the University of Sydney. She had collaborated with Australia's longest serving Contract Research Organisation Datapharm for a few years before setting up a cosmetic and personal care products testing facility in 2009. Emanuela is enthusiastic about improving the quality of cosmetic and personal care products' research in Australia through science.

EMMA SUTHERLAND is a successful naturopath and TV presenter, her mission in life is to inspire women to get their "Mojo" back. She is the expert nutritionist on the Logie nominated "Eat Yourself Sexy" on LifeStyle You. She is also a key contributor and expert panellist for the recently launched Woolworths Baby & Toddler Club. With over 10 years experience working with women, Emma is the woman to turn to if you want your Mojo back!

MURRAY HUNTER has been involved in Asia-Pacific business for the last 30 years as an entrepreneur, consultant, academic, and researcher. His first venture into the personal care industry was a joint venture with the Andrew Jergens Company in Australia in the late 1970s, later setting up a manufacturing plant, and marketing operation in Indonesia during the early 1980s. As an entrepreneur he was involved in numerous start-ups, developing a lot of patented technology, where one of his enterprises was listed as the 5th fastest going company on the BRW/Price Waterhouse Fast100 list in 1992 in Australia. Murray is now an associate professor at the University Malaysia Perlis, spending a lot of time consulting to Asian governments on community development and village biotechnology, both at the strategic level and "on the ground". He is a visiting professor at a number of universities and regular speaker at conferences and workshops in the region. Murray is the author of a number of books, numerous research and conceptual papers in referred journals, and commentator on the issues of personal care, psychology, entrepreneurship and development in a number of magazines and online news sites around the world.

JAMES GILLARD is the Principal of Insurance Made Easy whose services include – business insurance, travel insurance and financial services. Insurance Made Easy has a client list of over 2000 businesses from all industries. The relevant major insurance schemes are – Hair and Beauty, Pharmaceutical Companies and Natural Therapists.

business

double

your profits through better client retention

by Pam Stellema

Given the choice, most salon and spa owners will jump at the opportunity to learn how to attract more clients into their business. After all, thats how their salons will grow, *right?*

In fact, this isn't the case at all.

Each time I work with a new client and I ask them what their business goals are, at least 90% tell me that getting new clients is at the top of their wish list. The funny thing is that when we monitor the intake of new clients without any kind of promotional activity, we find that there is generally good organic growth that requires next to no financial outlay.

This means that a lack of growth isn't necessarily due to a lack of new clients; instead it's more likely to be caused by the inability to keep them. And if that's the case, shouldn't the top goal of every salon owner be finding ways to keep the clients she already has, instead of constantly chasing new ones?

Perhaps so, but how do you achieve that?

Well, your clients are just like you and me. When they come into your salon or spa, they want to be treated like a VIP – whether it's their first or fiftieth visit. When clients start to notice that their loyalty is being taken for granted, you risk losing them. From this point on, the client can be stolen away from your salon quite easily by another salon that looks like it might have something better on offer.

Many business owners mistakenly believe that their clients will remain loyal to them forever because they never complain. In fact, when clients do complain it's generally with their feet and without any forewarning at all. And when this happens, there's a good chance you've lost them forever.

You may think that clients leave because the salon down the road has newer equipment, cheaper prices, whiter walls or fluffier bed linen, but in fact the majority of clients who leave, do so because your salon doesn't make them feel unique and special anymore.

As an example, I was working with a struggling salon owner recently who wanted to improve her low client retention rate. I suggested that every treatment should begin with a short consultation to make sure she understood exactly what her clients wanted from her and to ensure they didn't have any issues after their last treatment.

This salon owner couldn't believe that spending a few minutes of her time making sure her client was going to be happy was worth the effort. She didn't

see the necessity of 'wasting' her time this way, when the client 'always had the same thing every time she was in anyway'. The rot had well and truly set in, but yet she didn't see the relationship between this and her client retention problems.

> *Excellent firms don't believe in excellence – only in constant improvement and constant change.*
>
> ~ Tom Peters

What are the benefits of increasing your client retention rate?

Research into the benefits of retaining more of your clients shows that it's substantially cheaper to keep an existing client happy than to source a new one. To add to that, existing clients are likely to spend more money during each visit to your salon because they're more likely to purchase additional services and products.

Also the expense of constantly sourcing new clients can end up costing your salon many thousands of dollars each year; all money that comes straight off your bottom line, whereas keeping your existing clients is a much more economical option.

However, this doesn't happen by accident, but rather by design and unfortunately, just being technically good at what you do is not enough by itself to keep your clients returning to you.

Once you understand this, you'll realise that instead of continuously looking for ways to entice new clients into your salon, you really need to be looking for ways to improve your existing clients' experiences instead.

With this in mind, it's very obvious that you must become more client-focused. No longer should you ask yourself the question, 'What do ***I want*** to offer my clients?' but instead, 'What do ***my clients*** want from me?' and 'What will ***improve the client's experience*** in my salon?'

Now this may seem to be over-simplifying the secret to business success, but in fact, if you can stay focused on what your clients want and find ways to not only meet, but exceed their expectations, your ability to retain your clients is going to dramatically improve. And with that improvement will come greater client retention and greater profits.

Every financially successful business operator understands that without clients who remain loyal, they are constantly chasing their tail and starting from scratch over and over again.

It's only when clients remain with your salon and then new clients join their numbers and also remain, can you grow your business. Client retention is an important part of business growth and is 100% dependant on their satisfaction, not only with the service that they receive, but even more importantly, with how they are treated.

The really good news is that changing your mindset around how to treat your clients costs you nothing. Not one cent! The answer lies in the consistent attention to detail, the friendly welcome and farewell, and the willingness to really listen to what they're asking for.

So if your salon is constantly chasing new clients, you may want to stop for a minute to ask yourself why you need to keep doing that. Why do you always need new clients, when if you could just hang on to the clients you already have, your business would soon be flourishing?

Management Liability – *Why every business should have it?*

by James Gillard

Big business aren't the only ones that face the prospect of long, drawn out court battles over everything from unfair dismissal and regulatory discrepancies to occupational health and safety concern. Small to medium enterprises are being drawn increasingly into the contest of litigation business downtime and the quickly escalating legal cost.

From as little as $700, small businesses, can cover themselves against such potential problems. When considering as the standard business insurance of fire, theft, and public liability, whether your business be small, medium or large, Management Liability should be on the priority list.

Once a business starts employing staff, a director or shareholders should take out Management Liability insurance. Local, State and Federal legislations and regulations that govern how your business should be conducted are becoming increasingly more complex, leaving not just bosses at risk of exposure but employees as well.

Management liability insurance includes things such as unfair dismissal, lack of advancement or even sexual or workplace discrimination. Anyone who operates a business is exposed to over 800 pieces of legislation, from Local, State and Federal Authorities. Businesses are becoming more aware of the sheer breadth of exposures they face in the daily operations of running their business. Management Liability policies often extend to cover such thing as crisis management, theft of company funds (fidelity) and pollution defence costs.

Surveys have shown a low percentage of businesses adequately protect their owners, directors and management from the legal consequences of liability risks that may arise from their daily actions. Most companies insure the tangible exposures of property damage and bodily injury but neglect to insure against economic loss. Any business can experience unwelcome surprises that could potentially threaten their financial position, and in some instances this creates possible personal exposure for the owners and managers.

Management Liability Insurance is not Professional Indemnity Insurance – Why not?

The purpose of Professional Indemnity (PI) Insurance is to response to claims from third parties in respect of professional, specialist services including advice you provide not for claims that you mismanaged your company and caused loss to others. You have to take out separate insurance for this exposure.

Where professional indemnity insurance covers the 'activities' of the company,

management liability insurance focuses on the 'act' of running a company.

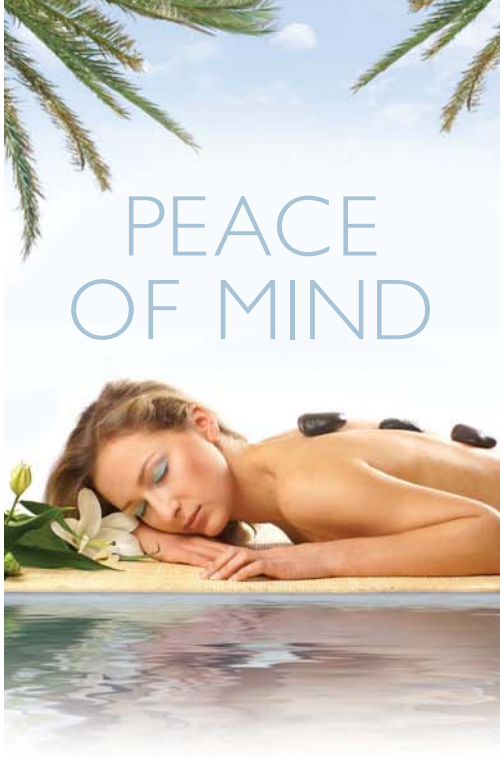
Who can bring an action against a company, its director, officers and employees?

- Regulators (The ATO, ACCC & ASIC)
- Employees
- Clients
- Competitors
- Creditors
- Shareholders
- Liquidators or Administrators.

The Major Components and Covers of Management Liability

Insured Persons Liability

Covers, loss arising from claims brought against the directors, officers



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Statutory Liability (Usually Fines & Penalties imposed by Government Department and Authorities)

Covers, Claims from actual or alleged breach of Local, State or Federal Law made against the company, its directors or officers

Crime (Fidelity)

Covers, Claims for loss of Company Funds arising from any fraudulent or dishonest act committed by an employee and in some circumstances even a third party

Internet Liability

Covers, Loss arising from websites, emails and other electronic communications actual or alleged. This includes claims, again actual or alleged for Infringement of Copyright, libel, slander, violation of privacy/right

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James Gillard
Managing Director

do you have a **food allergy** or **intolerance**?

by Emma Sutherland

Food allergies are increasing at an alarming rate. Did you know that Australia has one of the highest reported incidences of food allergies in the world? Today, one in ten babies born in Australia will develop an allergy to food.

Food intolerance is even more prevalent, with surveys indicating that 25% of Australians experience symptoms of a food intolerance. In clinic I successfully treat so many clients for food intolerances and they always feel so much better afterwards.

Both allergies and intolerances are extremely common, but what is the difference between food allergy and food intolerance? They sound as though should be very similar in meaning though they are in fact very different.

Food Allergies

It involves the immune systems reaction to a food which forms IgE antibodies. The immune system responds to the protein in a food that it mistakenly registers as a threat to the body. This reaction often presents itself with immediate symptoms such as itchiness, rashes, and swelling.

Other symptoms can include

- low blood pressure, dizziness, faintness or collapse
- swelling of the lips and throat, nausea and feeling bloated
- diarrhoea, and vomiting
- dry, itchy throat and tongue, coughing, wheezing and shortness of breath and a runny or blocked nose
- itchy skin, hives and sore, red and itchy eyes

A food allergy can also be so severe that it triggers anaphylaxis, which if left untreated, can be fatal. There are more than 170 different foods that are known to have triggered an allergic reaction. Generally the most common are:

- Crustaceans
- Milk
- Eggs
- Fish
- Peanuts
- Sesame seeds

- Tree nuts and,
- Soybeans

There is currently no cure for food allergies, and the only way to prevent a reaction is by avoiding those foods.

Food Intolerance

Unlike a food allergy, a food intolerance is generally not life threatening. It involves the inability to digest a food or the formation of IgG antibodies.

Symptoms that can be associated with a food allergy include:

- stomach and bowel upsets
- bloating
- headaches and migraines
- wheezing and a runny nose
- hives
- fatigue

Again, like an allergy, there are many different foods that a person can be intolerant to, however, here a few of the most common:

- **Lactose intolerance** - caused by a shortage of the enzyme lactase in the body.
- **Milk intolerance** - most common in children under 2 years.
- **Food additive intolerance** - The additives that are often linked to food intolerance are artificial colours such as tartrazine, sulphites and benzoates.
- **Sulphites** - are found in wine and dried fruit. They now have to be declared on all packaged products under the Food Act 2003 (NSW).
- **Gluten Intolerance** – which can refer to Celiac disease, non-celiac gluten sensitivity and wheat sensitivity.

After reading that list you might now be wondering why gluten is not on it? This is because there is an entire category of gluten issues, which do not necessarily fall into intolerance or allergy.

These include:

Celiac Disease – an inherited autoimmune disorder that affects the digestion process.

Non-Celiac Gluten Sensitivity – which many refer to as gluten intolerance, and can cause damage to your intestinal tissue.

Remedial therapies and massage for aged care Part 2

by Wendy Lockyear

Through a program that I personally delivered during 1990s which involved a case study with doctors and with clients in aged care facilities throughout the Gold Coast, Queensland and New South Wales. I delivered reflexology sessions with these clients. We encountered some marvelous results working with people suffering with Alzheimer's disease in particular as well as people who had other disabilities. One case study on a group of clients suffering with Alzheimer's disease had shown fantastic outcomes where they could walk easily and without a struggle with one nurse instead of two to the amenities and dining rooms. As a result they were relaxed, calm and not as stiff and were moving more freely. We could tell that they were happier and it certainly helped their family members to understand them better. We as carers felt a deep satisfaction in knowing that massage therapy and reflexology had a very valuable place in overall aged care centres.

Following my work directly with these clients, carers, nurses, occupational therapists and nursing aids became my students and were only too eager to learn and then to work directly on their clients. To this day it has become a most popular therapy treatment in aged care centres.

NOTE: Aromatherapy foot baths are a wonderful adjunct prior to a massage session using three drops each of lavender, lemon, orange and peppermint essential oils, blended with a teaspoon of milk. This blend is then poured into the footbath while filling the bath with warm water.

Three drops each of hypericum, arnica and calendula essential oils are very good blended with 25ml of almond oil to relieve bruises and help heal the skin.

Six drops of Eucalyptus essential oil blended with 25ml of almond or olive is useful on arthritic joints.

Medications, their side effects and how remedial therapies can help

Elderly people are more likely to have chronic disorders such as arthritis, high blood pressure or diabetes. Most medications (drugs) taken for these conditions are likely to be long term. They may also be taking medication for short term disorders such as some types of pain, digestive ailments, constipation or infections.

Some of the conditions treated with medications are as follows; Antibiotics : Influenza and Pneumonia. Antihyperglycemic: Controlling blood sugar levels to control diabetes and enable people with this disorder to function normally, this also reduces the risk of eye and kidney problems that can be caused by diabetes. Antihypertensive: to help prevent strokes and heart attacks. Antidepressants: for stress relief and to

counteract depression. Antihistamines: for the relief of allergies. Most of these medications have an Anticholinergic effect which also assists with reducing tremors for people who suffer with Parkinson disease.

These Anticholinergic effects can block the action of acetylcholine which is a neurotransmitter – a chemical messenger released by a nerve cell to transmit a nerve signal to a neighbouring nerve cell or cell in a muscle or gland, acting as a communicator enabling cells to talk to one another, assisting with concentration, learning and memory, helping to control the function of the heart, blood vessels, airways, urinary (kidneys) and digestive organs and allowing smooth involuntary muscles cells to contract. However Anticholinergic drugs can disrupt the normal function of these organs therefore side effects will most likely occur, particularly if these medications are taken over a long period of time. It's a catch 22 as the saying goes, although these medications are vital in a lot of situations for many people, the side effects can be detrimental and cause further problems so the person takes another drug to counteract the side effects until they are taking a whole cocktail of medications. Some of these side effects can include: nausea and abnormal heart rhythms, liver or kidney problems, confusion, blurred vision, constipation, dry mouth, light – headedness, difficulty with urination and loss of bladder control.

With age, the metabolism slows down, the kidneys are less able to excrete drugs into urine and the liver is less able to break down most drugs, therefore they will not be easily removed from the body. As people age, the amount of water in the body decreases and the fat tissues increase. Medications that dissolve in water reach higher concentrations because there is less water to dilute them. The medications that dissolve in fat tissues accumulate more because there is more fat to store them in and they are not easily eliminated from the body.

A healthy lifestyle and remedial therapies can assist with the elimination of waste and by-products that have or are building up in the body, enabling a faster process of ridding the drugs from the body. A healthy balanced clean diet of fresh fruit and vegetables, juices and drinking plenty of water, shall assist with both liver and kidney function, enabling the medications to work more effectively thus help prevent the nasty side effects of these medications.

Exercise is very important and we don't mean running a marathon, just light exercises for about half an hour each time, 3-4 times per week at your own pace, such as swimming, walking, cycling, yoga or Pilates etc. This will improve the circulation of the cardiovascular system (heart and lungs) assisting with oxygenating the blood to the heart and removing the waste products via the lymphatic system. Massage, reflexology, foot massage and lymphatic drainage massage are beneficial too for the circulation of blood and lymph and the nervous system.

Other objectives and benefits of massage and aromatherapy

- Relieves pain
- Invigorating skin
- Promoting suppleness, relaxing muscles, soothing muscular aches
- Correcting faults to skeletal system, balancing structure
- Relaxing the C.N.S.
- Stimulating normal function of organs and glands
- Improves metabolism
- Encourages elimination of waste fluids and products Encourages growth of new cells repairing tissues Elimination of old cells
- Promotes healing, internal and external
- Improves venous and lymph flow. Supplying nutrition to and around joints preventing congestion, inflammation and swelling
- Relaxes the nerves, relaxes body and mind
- Stimulates body and mind
- Improves balance of physiological harmony, relieves tension, anxiety and grief
- Restores and repairs health and function, aids rehabilitation.

Contraindications with massage

This means where NOT to massage.

1. Directly onto open or infected wounds, inflamed tissues or operations or contagious conditions such as tinea, rashes, etc.
2. Severe heart condition.
3. Freshly torn ligaments or tendons.
4. Where it can stretch scar tissue.
5. Broken or fractured bones.
6. On bacterial inflammation.
7. On varicose veins.
8. In any situation that could irritate or aggravate conditions, i.e.; acute bursitis, etc.
9. Massage can be applied around wounds to promote blood circulation and nutrition to help the healing process.

When in doubt of any situation – Don't

Arthritic conditions can be extremely painful, massaging the surrounding muscles is beneficial however care must be taken and gentle movements applied. At no time should any massage movements be applied if the inflammation is hot and swollen.

Evaluation is most important before applying massage or treatment of any kind.

ROSACEA – ‘Red Alert’

by Tina Aspres

What is rosacea?

Rosacea is a common, persistent (chronic) skin condition that predominantly affects the central area of the face. The condition is characterised by pustules and papules, erythema/flushing and telangiectasia, with flares and remission being a common feature of the condition. Often, it is misdiagnosed as acne and it is not uncommon for people to not know they have rosacea, let alone be aware that the condition exists. It is not an infectious disease and is not spread by contact or breathing in airborne bacteria.

Rosacea is a condition that affects adults (incidence in children is rare, although it has been reported in the literature) – with early signs of the condition being recurrent episodes of blushing that finally become red, erythematous areas predominantly affecting the nose and cheeks. Whilst the condition may occur during the 20’s where persistent flushing and blushing that lasts for extended periods is observed, it commonly occurs between the ages of 30 to 50, peaking by age 60. It is also more prevalent in females than males, although more severe cases of rosacea are seen in males. It is considered to be partly hereditary and can be provoked by various external influences and stresses. Fair skinned, blue-eyed individuals who tend to blush and flush easily are more likely to be affected with rosacea than any other population, with the condition often referred to as the “Celtic curse”.

Due to the highly visible nature of rosacea, the condition can adversely affect one’s emotional, psychological and social well being.

What are the signs and symptoms of rosacea?

The signs and symptoms of rosacea vary from one individual to another.

Initially, the condition presents with intermittent blushing and flushing, especially after exercise or extreme changes in temperature (hot or cold), and may persist for several hours or even days. Progression is then to a more persistent and permanent red facial rash. This is usually the key symptom in diagnosing the condition. It appears almost like a sunburn to the face, which does not go away. Generally, the distinctive red rash is apparent on the nose and cheeks in a ‘butterfly’ pattern. The chin and forehead may also be involved. As the condition progresses over time, enlarged pores, small broken capillaries over the cheeks (telangiectasia) and papules and pustules may appear. There may be oedema, roughness and

scaling of the skin as well as skin dryness and flaking, and an itching, burning, or stinging sensation as the skin becomes more sensitive. In addition, there may also be ocular involvement where the eyes become watery, feel gritty and may even appear to be bloodshot. In progressed cases of rosacea the nose may appear swollen, bumpy and bulbous (rhynophyma) due to thickening of the skin (this however, is more common in males and rarely seen in females).

Often rosacea is misdiagnosed as acne due to the many pustules and papules that may be visible on the face, but unlike acne, comedones (blackheads and whiteheads) are not a feature of rosacea.

What are the causes and triggers of rosacea?

It is believed that both genetic and environmental factors (causing dilatation of blood vessels) play a role in rosacea, although the actual cause still remains unknown. Causes that have been linked to the condition include exposure to ultraviolet radiation (sun) to the skin, and the microorganisms helicobacter pylori and demodex folliculorum. Other contributing triggers include certain skin care products containing fragrances and alcohol, facial scrubs and exfolliants, excessive use of corticosteroid creams, hot water, hot baths, dry winds, hot and cold weather, and extreme hot conditions such as saunas and heavy exercise. Eating hot or spicy food and drinking hot, alcoholic or caffeine drinks and emotional stress can be contributors in worsening the condition also.

How is the condition diagnosed?

There are no laboratory tests to diagnose the condition. Observing and recognising specific features and characteristics of the condition help diagnose the condition.

Is rosacea treatable?

Rosacea is a condition that can be managed and controlled with a combination of dietary and lifestyle changes in conjunction with appropriate medical treatment, although there is no cure for the condition. In treating the condition, it is important to bear in mind, what may work for one person may not work for another.

The aim of treatment is to help control symptoms and minimise the occurrence of flares. The earlier rosacea is identified and diagnosed by a doctor or dermatologist, the greater the probability of preventing the worsening of the condition.

Treatment should commence by avoiding known triggers and irritants and following a gentle skin care routine:

- Use of a gentle, soap free skin cleanser, gentle cleansing gel or cleansing milk
- Showering or bathing with lukewarm water
- Patting the skin dry rather than rubbing vigorously
- Not rubbing the face aggressively or using abrasive facial exfoliants or scrubs – use of BHA – salicylic acid may however, be useful in reducing redness, dryness and flakiness of the skin
- Avoiding the use of chemical peels
- Apply a 30+ mineral sunscreen daily (zinc oxide or titanium oxide)
- Camouflage makeup may help camouflage the appearance of rosacea (eg green tones will help counteract redness)
- Avoiding skincare products with fragrances, alcohol, which hazel and essential oils – (eg peppermint oil, menthol, eucalyptus) or fragrant plant extracts (e.g. lavender, rosemary) as these contains sensitisers that may provoke the condition and trigger a flare
- Avoid toners (especially those that contain alcohol), and oily cosmetics (use oil- free or mineral makeup)
- Use of a moisturiser with ceramides to help build up the skin barrier

Medical treatment:

- In conjunction with following the above, prescription medication is also used in the treatment of rosacea. An oral antibiotic may be prescribed (eg tetracycline, doxycycline, minocycline or metronidazole) as well as a topical medication (eg topical metronidazole gel, erythromycin gel, tretinoin, adapalene or azelaic acid topical preparations).
- Laser therapy is another treatment option that may be considered for certain patients. Lasers may be effective in reducing/removing visible broken capillaries and improve the visual appearance of rhinophyma.
- In persistent, stubborn and hard to treat cases of rosacea, low dose isotretinoin may also be prescribed.

Helpful hints and tips:

Being aware of what may be a trigger and cause a flare of the condition is the key to reducing flares and controlling the condition. Keeping a daily diary will help in identifying triggers. This will help take appropriate measures to avoid triggers and hopefully reduce flares.

- Avoid exposure to sunlight (apply mineral sunscreen)
- Avoid extreme changes in temperature and overheating eg avoid strenuous exercise until the condition is under control
- Keep cool during hot conditions
- Avoid hot drinks
- Avoid drinking alcohol (especially red wine) and caffeine drinks
- Avoid spicy, hot foods
- Avoid saunas
- Avoid emotional stress
- Avoid certain medications (eg corticosteroid creams and certain types of blood pressure medication – vasodilators)
- Minimise the use of skincare products and use products for sensitive skin
- Cosmeceuticals that may of benefit include the botanical anti-inflammatories - ginko biloba, green tea, aloe vera, allantoin, feverfew and glycyrrhiza inflata.

Whilst the same treatment regimen will not suit all rosacea sufferers, following the above simple measures, recognising triggers and making lifestyle changes will help better manage and control the condition and minimise the recurrence of flares.

Demodex mites and human skin

by Emanuela Elia

Demodex is a genus of tiny parasitic mites that live in or near hair follicles of mammals. Around 65 species of demodex are known. Two species living on humans have been identified: *demodex folliculorum* and *demodex brevis*. *d. folliculorum* is found in hair follicles, while *d. brevis* lives in sebaceous glands connected to hair follicles. Both species are primarily found in the face, near the nose, the eyelashes and eyebrows, but also occur elsewhere on the body.

Skin concerns possibly caused by demodex mites

In the vast majority of cases, the mites go unobserved, without any adverse symptoms, but in certain cases (usually related to a suppressed immune system, caused by stress or illness) mite populations can dramatically increase, resulting in a condition known as demodicosis or demodex mite bite, characterised by itching, inflammation and other skin disorders. Blepharitis (inflammation of the eyelids) can also be caused by demodex mites. Evidence of a correlation between demodex infection and acne vulgaris exists, suggesting it may play a role in promoting acne.

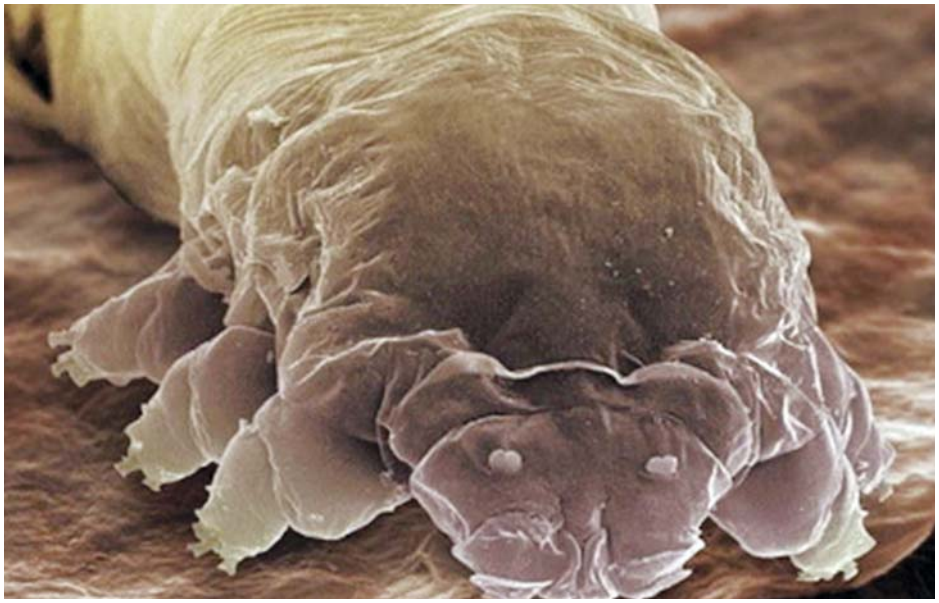
Demodex mites have also been associated with other skin conditions such as rosacea. Rosacea is a chronic inflammatory disease of skin in young to middle aged adults, but can occur occasionally in children. At present, the etiology of Rosacea is not completely understood. Among other factors a causative role has been postulated for the hair follicle mites demodex folliculorum and demodex brevis. Demodex mites are commonly observed in subjects with rosacea.

Research conducted on demodex mites

In a recent study we conducted in Sydney, we adopted a technique called 'skin surface biopsy' (SSB) or 'superficial skin surface biopsy' (SSSB) to detect and quantify the demodex mites present in a skin sample. SSB is a technique that involves the collection of a sample of skin surface and analysis under the microscope at different magnifications. Testing takes just a few minutes and results are available in a few hours. This procedure allowed us to see the demodex mites in their natural environment (the skin) and still alive.

The aim of the study was to assess the efficacy of a topical product designed to stop proliferation of the demodex mites and improve some of the symptoms of rosacea associated with the mites (e.g. redness, itchiness). Therefore, once SSB

EMANUELA ELIA is the Director of Ozderm, which specialises in *in vivo* testing and clinical trials for cosmetic and personal care products. Emanuela Elia has a law degree from Rome and a Master of International Business from the University of Sydney. She had collaborated with Australia's longest serving Contract Research Organisation Datapharm for a few years before setting up a cosmetic and personal care products testing facility in 2009. Emanuela is enthusiastic about improving the quality of cosmetic and personal care products' research in Australia through science.



had confirmed the presence of demodex mites on the skin of trial participants (one of the inclusion criteria for the trial), assessments were reaped after one and two months of treatment with the test product. This was a challenging but also very fascinating trial. We soon realised that if on one hand there is very little knowledge about the mites (even dermatologists are not always familiar with this issue), on the other end there is a lot of interest from the general public.

New market for cosmetic and pharmaceutical industries?

Although there are only a few products, mostly sold on line, that claim to be effective against the mites, some of the issues associated with demodex mites are slowly gaining momentum on the internet as more people talk about their skin and their symptoms. Not many people know about this mite who lives on our skin. But once they learn more about it through the internet, some rosacea or acne patients are relieved, to an extent, to know that some of their symptoms (for example intense skin redness and itchiness) maybe associated with demodex proliferation.

Further research is warranted to establish the effect of certain products on demodex mites associated with some common skin concerns. At the same time, product formulators are presented with the opportunity to work on new preparations designed for people affected by demodex mites. The effectiveness of such products can either be addressed from a cosmetic point of view (product designed to improve the appearance of skin) or therapeutic (remedy to treat demodex mites). Anyone up for a challenge?

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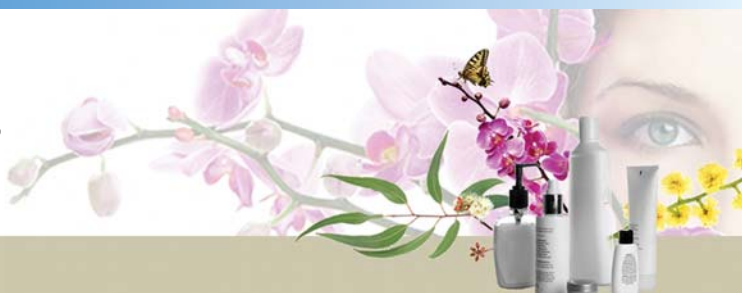
Australian Society of Cosmetic Chemists

cosmetics, fragrances & toiletries



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Membership

The benfits of membership are:

- Connection to the international cosmetic science network through the ASCC's affiliation with the International Federation of Societies of Cosmetic Chemists (IFSCC) and the Asian Society of Cosmetic Chemists (ASCS).
- Members' rates for regular lectures, seminars, workshops, networking functions and internationally attended annual conference.
- Complimentary subscription to The Science of Beauty magazine and the SCC E-Newsletters.
- Direct access to the latest news on relevant products, services and technologies.
- Tapping into a veritable expertise database from formulating to packaging, to product testing to marketing to fragrances.
- Eligibility for various education and travel awards where the prize includes travel to present at the IFSCC conferences or congresses (held on alternate years around the world).
- So much more . . .

Membership is open to individuals working in/or interested in the cosmetics, toiletries and perfumery industries. Our members branch beyond Formulation Chemists to include Brand Owners, CEOs, Marketers, Sales Professionals, Students, Claim Substantiation Experts, Academics, Production Personel through to Business Advisors. All new members are invited to attend their first lecture diner free-of-charge, so visit www.ascc.com.au to join now.

Barbara Filokostas

From an early age, Barbara Filokostas was especially fascinated by the radiance of her grandmother's skin, who was an avid olive oil user and had few wrinkles even in her 70's, stating: *"I have always had a connection to olives from my youth – I was bathed in olive oil as a baby, consumed it daily and in my hair at night".*

"I knew in my heart and spirit there was a secret ingredient found in the humble olive that would keep my skin youthful, soft and supple. By the age of 10, I was helping Yiayia make compresses and tonics with an olive base. This inspired me to study science at university and later naturopathy."

While most 20 year olds enjoy exploring the world, Filokostas spent her youth exploring the chemistry of her 'humble' olive to inevitably discover a key constituent of olive oil, **Olive Squalene** – the perfect skin moisturising companion that replicates the molecular structure of the human sebum.

In her own **Naturopathy** clinical practice, clients repeatedly presented with 3 major skin issues: acne, fungal infections and dehydrated skin.

Acutely aware of the physical and psychological impacts of these skin conditions made, **Botani** was created to promote healthy skin to support one's happiness, self confidence and wellbeing, inspired by the healing properties of the olive.

Pioneering in the natural skincare sector, the **Botani** range was founded on **Hippocratic medicine** (vis medicatrix naturae – healing powers of nature), and Botani is derived from the word 'botanical', which in Greek means 'plant' or 'herb'.

In 2001, Barbara's use of Olive Squalene combined with the purest and high grade natural ingredients saw the multi-purpose serum and anti-irritant released on the Australian market – quickly establishing Botani in the Australian marketplace as a leader in high performance natural skincare, with growing export demand and committed national stockists.

Today, Barbara's commitment and passion has delivered a tailored range of over 20 items - including TGA approved anti fungal and antiseptic products, and it is sold in Australia, Hong Kong, Malaysia, Russia, Germany and Poland.

The skin care range now includes over 20 products.

Made in Australia – Premium Plant actives and Organic Certified ingredients.

No Animal testing, vegan friendly, nut free.

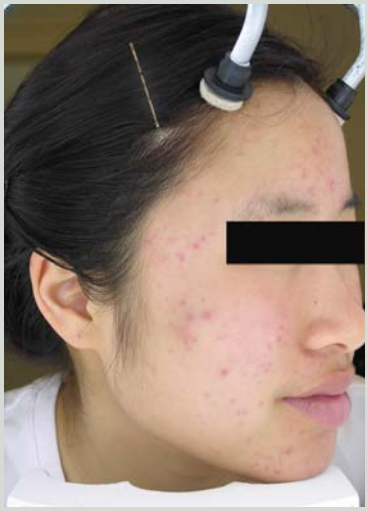
SUPPORTING SKINCARE CLAIMS

John Staton
Dermatest Pty Ltd
Sydney, Australia

STEPS

No. 19 Acne Study Comedone Count and Classification

1. Measurement



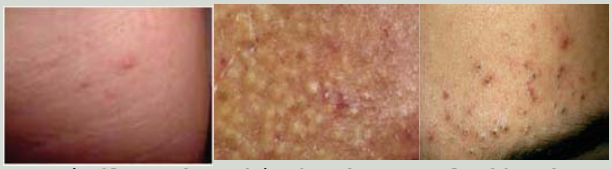
Supportable Claims

- Reduction in Severity
- Acne Treatment
- Non-comedogenic Claim

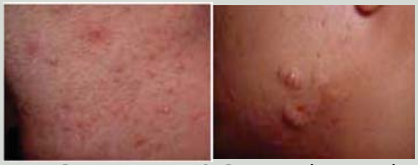
Subjects: Panels of subjects, male and female, professionally assessed as exhibiting acne conditions. Parental consent of minors is obtained.
Prior to initiation of a test, each subject will complete a medical history form.

Subjects are asked to apply the product on affected area as per sponsor supplied directions. Visual counts and classifications of lesions will be done, typically at day 0 (pre-treatment), 2 & 4 weeks.

2. Comedone Grading



Non-inflammed Whiteheads Blackheads



Papules Nodulocystic Lesions

Measurement by Grading

0 = Normal, clear skin with no evidence of acne vulgaris
1 = Skin is almost clear: rare non-inflammatory lesions
2 = Some non-inflammatory lesions are present, with few inflammatory lesions (papules/pustules only;
no nodulo-cystic lesions)
3 = Non-inflammatory lesions predominate, with multiple lesion
4 = Inflammatory lesions are more apparent:
5 = Highly inflammatory lesions predominate: variable number of comedones

Percent difference (reduction) in separate types (comedones, papules & pustules) and total count of lesions are calculated. The skin condition is evaluated in terms of adverse reactions, such as erythema, itching, burning, scaling, and irritation.
The overall improvement in skin condition is graded using evaluation indices. The grading of efficacy is expressed as 0 = excellent, >66% improvement; 1 = very good, 33% to 66% improvement; 2 = good, <33% improvement; and 3 = no change. The weighted mean will be calculated by dividing the sum of all individual patient indices by the total number of test subjects. The initial index in all cases will be 3.

Comedogencity Test

Thrice weekly, 0.2 to 0.5mL of the test material is delivered to the test site via syringe. The test sites, each measuring 4x4cm are covered with a piece of non-absorbing cotton cloth. The patches are closely secured to the skin by occlusive or semi-occlusive, hypoallergenic tape using an over-layer of adhesive taping if necessary. The procedure is repeated every other day until three applications per week is accomplished for a total of four weeks for occlusive and 6 weeks for semi-occlusive conditions. Patches are removed after 48 hour exposure and once weekly after 72 hour exposure. On removal all sites are cleaned and evaluated for any overt signs of irritation prior to re-patching. sum of all patients' degree of reaction .

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John Staton is founding Director of Dermatest Pty Ltd, Sydney, Australia and has been conducting SPF testing and skin efficacy and evaluation studies continuously since 1997.

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President's Report

by Matthew Martens

Hasn't time flown…. It is hard to believe that it has already been over three months since the ASCS Conference in Cairns in April. This will also be my first report as the new President of the ASCC. Building on the momentum of holding the first Asian Society of Cosmetic Scientists Conference in Australia earlier this year I have already seen a significant shift in our society to a more inclusive and dynamic representation of our industry. But this is only the beginning. Exciting times are ahead and the ASCC Council is working diligently to ensure that members from all parts of our industry get fantastic benefit for continuing to be a member of the ASCC. By continually challenging our own thoughts on how and what we do the society will continue to grow and evolve into an organisation that you can be proud to be part of.

It is an incredible honour to be entrusted with the role of President of the ASCC for the next two years. For a fresh faced university graduate with very limited knowledge of the Personal Care industry when I first commenced at Ross Cosmetics 12 years ago I would not have imagined the path that has transpired since. I have met and continue to meet many amazing people as a direct result of my involvement with the ASCC and this industry. The ASCC has given me much but I am very excited of what lies ahead and how we can evolve to meet the ever-changing needs of our industry in Australia and globally.

Any position within the ASCC is voluntary and as such requires a significant amount of time and energy to continue. I am extremely lucky that I have a great team behind me both within Council and the various other committees that continue to show the passion that allows us to organise various events of the highest calibre possible year after year. As Immediate Past President, Jenny Brown has left very big boots to fill. I can only hope that your guidance and mentorship can continue to help implement many of the fantastic ideas that have been discussed over the last few years. Robert McPherson has taken over the role of Vice-President with enthusiasm and a desire to continue to refresh and grow the society. Henry King will continue in his role of Treasurer. With Henry's wealth of experience in the industry he has been able to ensure the societies funds are utilised to the best benefit for our members. Registrar for the upcoming term will be Julia Hudson tasked with keeping all members and potential members adequately looked after. Parliamentarian will be Margaret Smith given that the future of the ASCC is an area close to her heart. Members who attended the AGM at the Conference this year would have seen Margaret's presentation looking at the Future Direction of the ASCC. Council is embarking on a in depth discussion surrounding membership and direction of the ASCC and the importance of how this links with our current Constitution needs. Iman Irhimeh will continue on as Education Officer and continue to implement ideas such as the recently ratified CPD program. The Education area will continue to remain an

important focus for the ASCC and how we engage our membership by providing learning opportunities for all our members. Trish Maharaj will take over as Secretary and ensure all communications are accurate and circulated to the relevant committees. I would like to welcome Belinda Carli on to Council as our newest member who along with Julian Jones will be responsible for publicity. This will be an extremely important role over the next few years as we look to improve the visibility of the society and provide increased resources to our membership through upgrading the website, E-newsletter, social media presence, etc. You will start to see some initial small changes come through in the next few months with many more exciting opportunities coming through shortly. Belinda comes with fresh enthusiasm and as a successful small business owner in the industry and understands how marketing your business is extremely important to get to the right audience. I would also like to take this opportunity to say thank you to Robert Angi who recently farewelled Council to concentrate on other areas. Robert's enthusiasm and commitment over the last few years is to be commended and he has been instrumental in getting the Queensland Chapter much more active again. It is also important to thank the continued hard work of Kate Paulett who continues to be an important asset to the success of the society and who without we would all be much further stretched in our responsibilities.

The incredible success of the 2015 ASCS Conference in Cairns can be put down to the fantastic work done by Huy Nguon and her team. To get an attendance of 350 delegates with over 100 international visitors including the IFSCC Praesidium is a great effort and reflects on the outstanding technical programme that was offered. Great feedback has been passed on to me from a large number of attendees and the organising committee can be proud of putting together a seamless event. I have to thank John Staton from Dermatest and Dr Silvia Pastor from Lubrizol for winning the Jack Jacobs and Lester Conrad Awards respectively. It was also at the Cairns conference that we saw the announcement for the 2016 ASCC Conference which will be held in Hobart from April 27-29, 2016. I know that Iman Irhimeh as Chairperson and the organising committee are hard at work planning how to "Get to the Point".

I recently attended the NZSCC Conference at the Chateau Tongariro from 28-311 July. Although the Conference is a much smaller event than our ASCC Conferences the New Zealand Society has continued to grow substantially in the last few years and has also had a significant increase in conference attendance during that time. In the last four years they have grown from about 26 attendees in 2012 to 81 this year which is a fantastic reflection of how Sigrid and her committee have worked over the last few years. The New Zealand industry is extremely important for us on this side of the Tasman and is truly unique. As a sister society we need to ensure that we both continue to work closer together as we tackle very similar issues moving forward and I welcome an increased interaction with our regional partners both in NZ and further afield throughout Asia.

Julian Jones one of our Council members, recently visited the CITE exhibition in Yokohama, Japan as a representative of the ASCC. At this exhibition the Japanese Society hosted all Zone 2 members for a meeting to discuss important events throughout the Asian region. As a direct result of our involvement with the ASCS through holding the conference we have been able to strengthen our ties with our neighbouring societies and have had significant input into the industry. Julian will continue to represent the ASCC by attending the IFSCC Conference in Zurich in September and we look forward to hearing a roundup of these discussions.

Our Chapter committees have been busy continuing on the energy from the conference by organising some fantastic lecture dinners with topics including Product Liability Insurance, Breakthrough Marketing Strategies, Emulsifier Free Emulsions and The Role of Vitamins in Skin Care, in addition to the Southern Chapter Suppliers Day. There already some great topics in the pipeline for events in the near future so keep an eye out for the ASCC Newsletters and the Website for more details.

As a closing thought in my first President's report I would like to thank you all for your contribution to the industry. We are all making a difference. Whether you hail from a formulation background, raw material supply, brand owner or even a spa owner and beauty therapist we all contribute in some small way to making people feel good about themselves. I think that this is a great thing and will see the Cosmetics, Toiletries and Personal Care industry thrive in coming years. The ASCC is an organisation which can bring people from all these sectors of our industry together to work, share and encourage each other. I look forward to being a part of the adventures that await and hope you will join in for the ride.

Matthew Martens

ASCC President

new test on UPLEVITY™ peptide: reshaping the face contour

Lipotec has performed a new test on its successful UPLEVITY™ peptide. This tetrapeptide counteracts the sagging and aging effects on the skin by increasing collagen and functional elastin synthesis. It further contributes to skin firmness by overexpressing genes involved in cellular cohesion due to focal adhesions (FAs) that are the interference between the actin cytoskeleton and extracellular matrix (ECM). The result is an improved quality of mature skin.

In the new *in vivo* study, a group of 40-60 year old women with saggy skin and loss of elasticity on the face applied cream with 2% UPLEVITY™ *peptide solution* twice a day for 56 days. At the end of the treatment, the following results were observed: improved skin firmness (25.2% decreased maximal deformation), enhanced general elasticity of the skin (16% increase in overall elasticity) as well as a visible lifting effect of the face contour with a decrease of 0.13 cm.

In addition, a self-assessment conducted by the participants regarding the efficacy of the product revealed that 95% of volunteers noticed a more toned skin after using the 2% UPLEVITY™ *peptide solution* and 90% believed that the treatment offered a firming effect.

UPLEVITY™ *peptide* demonstrated its firming and anti-sagging efficacy as the perfect ally in counteracting the force of gravity.

For more info contact
Lipotec Pty. Ltd, 28 River Street Silverwater, NSW 2128 Australia
Robert McPherson
Account Manager – Australia & New Zealand
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UPLEVITY™ *peptide solution* VISIBLY RESHAPES THE CONTOUR OF THE FACE

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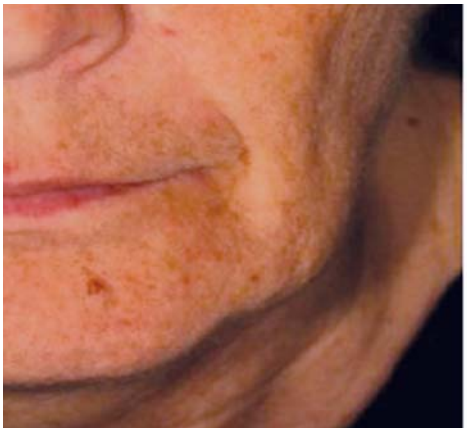

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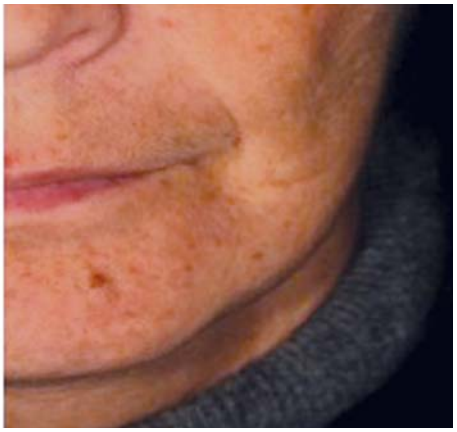


sunscreen highlights

by John Staton

Sunscreen – cosmetic or cherapeutic?

A current **Hot Topic** under discussion and negotiation between Australian industry associations and TGA is the regulatory status of sunscreens. It would appear that the main driver of this interest is the issue relating to costs involved for compliance with Australian requirements, which are above those of most parts of the World.

Region	Classification
Australia	Therapeutic
New Zealand	Cosmetic -> Therapeutic
European Union 28	Cosmetic
India	Cosmetic
China	Therapeutic
Japan	Cosmetic
Taiwan	Medicated Cosmetics
Korea	Functional Cosmetic
MERCOSUR 5	Cosmetic
USA	Therapeutic
Canada	Therapeutic
ASEAN 10 countries	Cosmetic
South Africa	Cosmetic
Mexico	Cosmetic
Chile	Cosmetic
Russia	Cosmetic

Previously, TGA applied a GMP Code, which was specific to sunscreens. This dates from a 1994 negotiation with industry associations, including ASCC, but TGA had indicated difficulty in auditing to a code, which was at variance with the PIC/S GMP code in use in many countries by mutual agreement. A new version of PIC/S[1] is soon to be implemented, moving this guide further still from the Sunscreen GMP Code.

The TGA and NICNAS recognized definition[2] of therapeutic includes two clauses which capture sun protection…

(a) preventing, diagnosing, curing or alleviating a disease, ailment, defect or injury

(b) influencing, inhibiting or modifying a physiological process

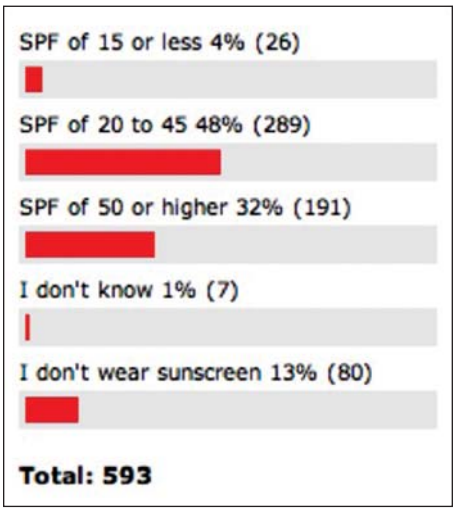
At present, SPF 15 skin care products are Secondary Sunscreens, but many marketers believe that this cut-off should be lifted to at least SPF 30. Countering this argument is the question of their use at this level as Primary, rather than Secondary sunscreens.

The issues for personal care product marketers is the TGA requirements for GMP and premarketing data, particularly stability, make it difficult and expensive to achieve a level of compliance which is above that in their country of origin and manufacture.

A TGA – Industry Working Group on GMP (TIWGG) has been set up and is currently discussing options.

What is the right SPF for a Sunscreen?

An on line survey of subscribers conducted by ConsumerReports.Org[3] in USA asked a simple question… "Which SPF sunscreen respondents typically use?" Last time I checked, the results looked like this…



The question of the "right" SPF is regularly asked by consumers. It is even more topical since the recent moves to higher SPF categories. At the U.K.Sun

Protection Conference in June this year, Dr. Marc Pissavini, R & D Director, Coty-Lancaster Monaco, addressed this very question and reminded us that the choice is not only a question of labelled SPF and amount applied, but also skin phototype, product spreadability, weather, latitude, altitude and general environmental location.

Prof. Brian Diffey[4] has pointed out that SPF 15 rated clothing is adequate to protect and an SPF 15 sunscreen should do the same if applied at 2 mg/sq cm. However, as this is not the case, an SPF 30 should, in the author's view, be recommended. This recommendation should avoid disgruntled consumers who end up with sunburn.

References

1 PS/INF 69/2014 (Rev. 1) PIC/S GMP Guide Chapter 1 Pharmaceutical Quality System

2 http://www.nicnas.gov.au/chemical-information/cosmetics/therapeutic-goods-and-uses

3 http://www.consumerreports.org

4 http://www.cosmeticsandtoiletries.com/regulatory/uvfilters/What-Should-the-Minimum-Recommended-SPF-Be-to-Avoid-Sunburn-199882841.html

John Staton, owner *Dermatest* and *TecConsult*

JOHN STATON has a background of over 40 years experience in the pharmaceutical and healthcare industries. John is a life member of the ASCC and serves in a number of industry representative roles with ASMI, ACCORD, TGA and Standards. He is the Australian representative to the ISO Committee on Sunscreen Testing-TC 217. (The committee for development of sunscreen standards). John is also in demand as a speaker on the International Conference Circuit.

MASK THAT

by Margaret Smith

Perhaps the most famous mask of all is the fabulous gold death mask of the ancient Egyptian Pharoh Tutankhamun. His visage is serene and at rest, and completely covers for all eternity the withered, dried up, mummified face slowly turning to dust, that is reality. I can see that we modern European types are so like the Ancient Egyptains, as we hold an ideal to the world, hoping no-one will actually notice our skin is baggy and blotchy, our teeth yellowing and broken. Makeup and all those lovely wrinkle removers and smoothers are now mainstays of the modern womans' (and some mens') morning ritual. (Change that to "mourning ritual" and bingo – Ancient Egyptian mask).

Face masks in our times are now hugely popular. There is every imaginable type of mask that claims to do all sorts of things to ones outer layers. They hydrate or tighten or build collagen, whiten or brighten, calm acne or scars.The modern gold leaf and colloidal gold mask claims to do all these and maybe even give one eternal life, however I think that so much preciousness going down the drain upsets me just a tad. I would want to leave it on forever, just like Tutankhamun, always shiny and beautiful.

Entire stores are currently dedicated to the face mask, especially in Asia.

It was once very embarrassing to be seen whilst induging in the art of masking, it is now fashionable. Especially with tha aptly named "facebook", you tube and so many young and old bloogeres showing all and sundry masks for the taking.

The easiest old fashioned masks were made from clay "to draw out all sorts of nasty oily and seeping things". Kaolin clay is has been the most common and is made up of the constituent kaolinite and has the notable composition of aluminium oxide (Al_2O_3) and silica (SiO_2). Coloured and white clays are by far the most popular masks.

After plain old clay comes ground up semiprecious stones. This photo of a turquoise face mask of an Aztec god is one of my favourites. Really, he looks more like Bart Simpson on a bad day than anything really scary. Turquoise is not much used in skin care, however the claimed mind clarifying benefits attributed to turquoise could only help us all. Precious and semi precious stones have long had alleged therapeutic properties. Our friend Tony Dweck in an article on just this subject summarises some of the elements and their claim to fame. Thanks Tony.

Therapeutic Gemstone Properties

This is a topic which may either be believed or treated with skepticism. However, the discovery of Scandinavian amber in a Neolithic grave near Stonehenge in Wiltshire shows that precious stones played a significant role in the culture of these early people and would travel vast distances as traded goods or offerings. Even today, a huge monetary importance is placed on these quality mineral forms and there is a revival in some individual groups with the importance of these stones in health and well-being. Stones should not have any chips or fractures, they should be left as found and not irradiated or dyed. They may be polished or rounded. The list is a fraction of the information widely available. ACD: Perhaps this could be put in a box?

Amazonite: improves self worth and confidence.

Amber: lift heaviness and depression.

Amethyst: spiritually uplifting, may improve communication and used for stomach problems.

Apatite: to improve communication when there has been a misunderstanding and used to fight virus infections.

Aquamarine: reminiscent of the sea, stands for love and mercy and recommend for those in grief.

Blue Aventurine: good for circulation and to clear congestion.

Green Aventurine: physical healing. It is often used with emerald and frosted quartz. Aventurine that is transparent is believed to be extremely powerful although the immature transparent aventurine may fade.

Cape Amethyst: for inner alignment.

Carnelian: to balance creativity and mental processes.

Citrine: upliftment and help to process energy in work.

Coral: for emotional foundation.

Diamond: is for the increase of personal clarity.

Emerald: for physical and emotional healing.

Green Fluorite: for hormone balance, such as PMS and menopause.

Purple Rainbow Fluorite: for change.

Jade: for relaxation and releasing tension.

Kunzite: for emotional support.

Lapis: to understand the mind and connecting the heart and mind.

Leopardskin Jasper: supposed to bring things that are needed.

Mahogany Obsidian: for decision making.

Malachite: bring harmony into life.

Moldavite: Grounding stone which puts one in their body.

Grey Moonstone: helps the power of other stones powers by cleansing blocks.

Orange Moonstone: similar to white moonstone but less powerful.

White Moonstone: helps effect and understanding of other stones by amplifying their effect. It balances yin/yang.

Moss Agate: to get in touch with nature and have plant knowledge.

Mother of Pearl: protection.

Black Obsidian: a grounding stone, used to gain insight into a problem.

Black Onyx: helps to change bad habits, is a grounding stone.

Mexican Onyx: aids better sleep.

Black Opal: to see inner soul and potential.

Opal: to see possibilities and discover a broader view.

Fresh Water Pearl: enable the acceptance of love.

Peridot: Brings the energies from the aura to the physical body.

Poppy Jasper: for positive outlook.

Frosted Quartz: for balance and soothing.

Rose Quartz: for emotional balance and soothing.

Rhodonite: emotional support.

Rhodocrosite: for change and used to give confidence during change.

Ruby: love; opens the heart, helps to overcome fear.

Sapphire: for mental clarity, clears unwanted mental clutter.

Sodalite: protects from external negative energy.

Sunstone: enhances contemplation, used to remember dreams.

Sugilite: absorbs impurities from the wearer's aura to uplift me and give greater energy.

Tanzanite: for changes, uplifts and opens the heart.

Green Tourmaline: promotes male balance and physical healing (not for females).

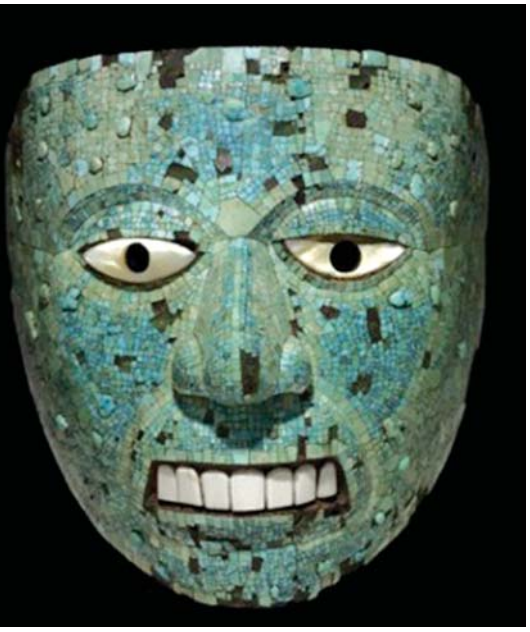
Pink Tourmaline: promotes female balance and protection.

Tree Agate: introspection, enables wider view of the world with greater clarity.

Unikite: balances physical/emotions.

Of the old fashioned but tried and true face masks we have the homemade mashed vegetable and fruit series, like cucumber , strawberry, citrus, avocado, papaya, banana, tomato, watermelon and on and on. All roughly based on the same fruit acid concept that exfoliates chemically and adds a bit of water at the same time. Not very easy to have as a product, is fresh fruit, so dried powder versions are available to just add water and mix. Although I did make a reconstituted tomato mask but the smell

MARG SMITH is the owner of Syndet Works – an Australian company established in 1984 to formulate and produce soap free skincare bars. Syndet has developed an enviable reputation for custom formulated and manufactured skincare that now extend well beyond the origins of the business.



of the tomato powder was so off putting, well I needed something to mask it! Boom tish.

Completely modern concepts include my favourite face mask concept, are made with PVP, so they dry and then you can peel them off...just like the good old days when we got burnt to a cinder on the beach and peeled one another's skin off our backs in the evening. Not something one ever sees nowadays for very good reasons! Other types of masks move away from just the face and treat the hands, the hair, the feet and boobs.

Marg Smith marg@syndet.com.au

Here again are some contributions to start you off with developing some different sorts of masks.

BASF Peel Off Mask (ref SC-FR-13-009-A023) CONTACT – INGREDIENTS PLUS

Phase	Ingredients	INCI	% by weight
A	Water	Aqua	53.04
	Euxyl K 320	Phenoxyethanol, Methylparaben, Ethylparaben, Propylene Glycol	1.00
	Luviset® One	Acrylates/Methacrylamide Copolymer	5.00
	D-Panthenol USP	Panthenol	1.00
B	Xanthan Gum	Xanthan Gum	0.30
	Palmera G995B	Glycerin	1.00
C	Selvol 205	Polyvinyl Alcohol	12.00
D	Eumulgin® SMO 20	Polysorbate 80	0.50
	Fragrance	Fragrance	0.20
E	Luviskol® K 90 Solution	PVP	5.00
F	Ethanol 96%	Alcohol	20.00
G	Reflecks™ Gilded Gold G232L	Calcium Sodium Borosilicate, Titanium Dioxide, Iron Oxides	0.20
	Reflecks™ Blazing Bronze G270L	Calcium Sodium Borosilicate, Iron Oxides	0.20
H	Sodium Hydroxide (25% solution)	Sodium Hydroxide	0.56

Manufacturing process

Add phase B, then phase C in phase A and heat at 85°C under stirring. Cool down at room temperature then add phases D, E, F and G. Finally, adjust the pH at 6.5 – 7.0 with phase H.

Face Mask Sheet CONTACT – AS HARRISON

SC-1046

Kerazyne™ conditions the skin in this facial mask leaving it radiant and glowing. The mask provides moisture and radiance for soft, supple skin. Spectrastat™ OEL is a broad spectrum preservation system optimal for wipes and mask sheets.

	Ingredients (INCI Name)	Trade Name	%w/w
A	Deionized Water		76.40
	Microcrystalline Cellulose	Avicell PC 611[2]	1.50
B	Glycerin		5.00
	Disodium EDTA		0.10
	Caprylhydroxamic Acid (and) Caprylyl Glycol (and) Propanediol (and) Ethylhexylglycerin	Spectrastat™ OEL[1**]	1.50
C	Butylene Glycol		5.00
	Algae Extract[3]		1.00
	Green Tea Extract[3]		1.00
	Polysorbate 80		0.50
	Sodium Hyaluronate, 1% Solution[4]		1.00
	Polyester-11	Kerazyne™[1*]	1.00
	Cetearyl Isononanoate (and) Ceteareth-20 (and) Cetearyl Alcohol (and) Glyceryl Stearate (and) Glycerin (and) Ceteareth-12 (and) Cetyl Palmitate	Emulgade CM[5]	5.00
D	Skin Care Fragrance	6104726[6]	1.00
		Total	100.00

Procedure:

1 Combine phase "A" ingredients and heat to 80°C. Mix until uniform.
2 Heat phase "B" ingredients to 80°C and add to main vessel with propeller mixing.
3 Begin cooling and add phase "C" ingredients at 60°C.
4 Cool to room temperature while mixing and add phase "D".
PHYSICAL PROPERTIES: pH @ 25°C = 6.77 Viscosity @ 25°C (Brookfield RVT; Spindle 2-C @ 10 rpm) = 1,500 cps

Sleeping Pack With SYN- TACKS CONTACT – BRENNTAG

Phase	Ingredient	INCI Name	% w/w	Supplier
A	Water Demineralised	Aqua	86.60	
	Hyaluronic Acid –BT	Sodium Hyaulronate	0.20	DSM / Brenntag
	EDTA	EDTA	0.10	BASF
	Aristoflex Velvet	Polyacrylate Crosspolymer-5	1.50	Clariant
B	Amphisol K	Potassium Cetyl Phosphate	0.30	DSM / Brenntag
	Lanol 99	Isononyl Isononanoate	3.00	Seppic / B&J
	Lexfeel 7	Neopentyl Glycol Diheptanoate	2.50	Inolex / AS Harrison
C	SeraSense SF CM5	Cyclopentasiloxane	0.50	KCC / Brenntag
	Syn-Tacks	Glycerin, Aqua, Palmitoyl Dipeptide-5 Diaminobutyloyl Hydroxythreonine, Palmitoyl Dipeptide-5 Diaminohydroxybutyrate	3.00	DSM / Brenntag
	Valvance Touch 150	Methyl Methacrylate Crosspolymer	1.00	DSM / Brenntag
	Fragrance	Parfum	0.30	

Procedure:

1 Disperse Hyaluronic Acid in water and let it swell. Add other ingredients of phase A and disperse well.
2 Add part B together and heat up to 70°C. Add to part A and homogenize.
3 Add part C while stirring and homogenize thoroughly again.

Technical Data

pH: 5.0-5.5
Viscosity (Brookfield RV4/10rpm): 28700 mPas

New Zealand Society of Cosmetic Chemists Annual Conference 2015

Chateau Tongariro Hotel, Mt Ruapehu. 29th – 31st July 2015

The Conference was held this year at the spectacular Chateau Tongariro Hotel, National Park (Mt Ruapehu) on the 29th – 31st July 2015 and had the largest attendance of any NZ conference, in recent times.

The search for synergy between Science and Nature was truly enjoyable – both in the stunning venue and in the collaboration of the fully packed program of technical and marketing presentations from speakers, who attended from around the Asia Pacific region.

As well as a full technical programme, the conference also involved team building activities which were a Quiz Night, a cosmetic ingredient Mystery Box Challenge and contribution to an artwork which incorporated some cosmetic ingredients. All activities fitted in wonderfully with our conference theme and our stunning location.
It was a fantastic opportunity for networking with friends in the cosmetic industry, meeting new and rekindling old friendships. There were even a few surprises with the stunning vocal and guitar duo of Linley Latu and Eve Storer-Blake who serenaded us as we enjoyed our Gala Dinner.

Overall, the Conference featured an abundance of invaluable information and networking opportunities and everyone enjoyed their time together. The NZSCC Committee is challenged, yet again, to plan an even better conference for next year!

Watch out 2016, our committee is up for the challenge!

Congratulations to Travis Badenhorst for The Lester Conrad Award.

His presentation was of his own research for his PhD which he has just completed at Auckland University. Travis presented his topic: Engineering Youth – a study on the delivery of the active – GHK-CU.

Our society was also very proud to award life memberships to the following people to recognise their overall contribution to our industry –

NZSCC President Sigrid Vorwerk with Travis Badenhorst winner of the Lester Conrad Award.

Is that Robert McPherson cuddling the snow man.

The delegates at the conference.

Delegates in one of the sessions

Right: Workshop

Bill Jennings, Terry Simmons and Bruce Barrack. Congratulations!

The NZSCC Committee would like to acknowledge all the wonderful sponsors involved for their support of this conference and we humbly thank you all for your attendance and support of the New Zealand Cosmetic Industry.

Below: Snowflake art activity

Peter Gibson and Carine Paporello

NZSCC Committee

Team building, Bianca McCarthy, Gregor Steinhorn, John Crouch, Huia Iti, Ian Foster, Katherine Samplonius, Tania Clarke and Mark Robotham

Assessing skin irritation potential of baby personal products using the Thor in vitro baby Reconstructed Human Epidermis (RHE) Model: the Baby VitroDerm

by Kevin Roden
Thor Specialties, Australia

Amélie Thélu & Sophie Catoire
Thor Personal Care, France

Abstract

Products specifically for babies are now a well-entrenched segment of the personal care market. When developing personal care products for use on babies the difference between baby skin and adult skin needs to be considered. Babies are generally more pampered and frequently smothered in more cleansing, moisturising, massaging and soothing personal care products than most adults. This excess exposure to personal care products combined with occluding clothing and skin differences makes baby skin more susceptible to problems.

Testing new formulations on babies in not a concept even to be considered so an alternate procedure is required. This paper will describe the differences between infant and adult skin and present a new epidermis model developed for use for in vitro toxicity testing of baby products. It will compare results of in vitro toxicology testing using this newly developed baby epidermis model and the currently available adult epidermis model.

Assessing skin irritation potential of baby personal care products using the Thor in vitro Baby Reconstructed Human Epidermis (RHE) Model: the Baby VitroDerm

Introduction

Personal care products specifically for babies have been around for over a century. Possibly the first supplier was Johnson & Johnson who released Baby powder in 1893 followed by Baby Cream in 1921, Baby Oil in 1938, Baby Lotion in 1942 and the benchmark for gentle shampoo, Johnson's Baby Shampoo in 1953.

"For more than a hundred years, new mothers have trusted JOHNSON'S® Baby products to provide the purest, gentlest and mildest care for their babies—from the first morning cuddle to the last bedtime kiss."

An increase in marketing efforts for this product type has resulted in a large

market segment being developed. This market has grown considerably and a typical baby personal care range is now composed of up to 15 different products as shown in Table 1.

Table 1. Typical Baby Personal Care Range

Bath	Toilet	Nappy Area	Skin Care	Sun Care
Foam bath	Cleansing milk	Nappy cream	Face and body cream	Sun protection cream/lotion
Shampoo	Cleansing water	Liniment	Face and body lotion	Sun protection stick
Hair and body cleansing gel	Wet wipes	Cold cream		
Soap/Syndet		Lip balm		

This increase in interest in baby products along with Internet sites specifically for "mums and bubs" carrying all sorts of warnings about the toxic effects of chemicals being put onto our baby's skin has led more and more requests for baby products that are very mild.

Recent knowledge from non-invasive in vivo techniques such as fluorescence spectroscopy, video microscopy and confocal laser scanning microscopy has indicated that adult and infant skin is different [1]. That is why, it is important to better understand the specific characteristics and properties of baby's skin to develop an epidermis model dedicated to test skin irritation potential of baby personal care products.

Infant, from the Latin word infans, meaning "unable to speak" or "speechless", is usually defined as the period of nursing which encompasses the first year after birth and is considered synonymous with baby. Infant is applied differently by different groups and although it appears to be generally taken as a child up to 2 years of age, some definitions include children up to 3 years of age [1-5]. Specific assessment for products intended for use on children under the age of three is required by the European regulation 1223/2009 (EU, 2009), so in effect all children under 3 years are grouped together.

Skin functions

The skin is the largest organ of the human body, a hugely complex organ that performs a number of tasks as set out in Table 2.

Table 2. Functions of Skin

Natural protective barrier
- physical injury - pathogenic microbes - chemical agents - UV radiation - extreme temperatures
Helps to prevent fluid and liquid loss
Sensory perception: temperature, pressure, heat, touch, pain
Temperature regulation of the body
Key role in metabolism, including vitamin D synthesis and biotransformation of some chemicals

Skin structure

The skin has 3 main layers, the dermis and epidermis and below these the hypodermis.

The epidermis is the outermost layer of the skin and is composed of 4 layers of specialised cells, almost entirely keratinocytes; from the inner to the outer layer: the stratum basale, the stratum spinosum, the stratum granulosum and the stratum corneum, The deepest layer, the stratum basale, consists of proliferating basal cells that move up through the different layers changing shape and composition as they undergo multiple stages of cell differentiation. During this process of differentiation the cells are far from the blood supply as the epidermis is avascular and they begin to flatten, die and accumulate keratin. The outermost layer, the stratum corneum consists of flat and anucleated cells, the corneocytes, which contain high levels of keratin. Corneocytes are attached together through corneodesmosomes and surrounded by a matrix of lipid to provide the barrier function of the skin.

Much of the barrier function of the skin and its water loss prevention capability is provided by the cornified cell envelope of cross-linked proteins and lipids, as well as by the lamellar sheets between the cells [6]. The ability of the skin to store water largely depends on the formation of the lipid barrier in the stratum corneum. The protein structure of the horn cells, including the presence of the amino acid arginine, also affects the ability of the skin to bind water. These substances, which occur naturally in the body and bind water in the stratum corneum, are called natural moisturising factors (NMF) [7]. It is essential to protect the skin moisturisation mechanisms to keep it healthy.

The epidermis is not only composed of keratinocytes, the basal layer also contains other cells types: the melanocytes that produce melanin, the pigment responsible for skin colour and the Merkel cells in large numbers in touch-sensitive sites such as fingertips and lips, which appear to be involved in light touch sensation. The stratum spinosum also contains Langherans cells, part of the immune system.

The dermis is below the epidermis and consists of connective tissue, collagen and elastin that provide the strength, elasticity and flexibility to the skin. The dermis is the layer harboring the blood and nerve supply for the skin to provide the nourishment and waste removal from its own cells as well as for the epidermis, and to provide the sense of touch and heat. It also contains other structures such as hair follicles, sebaceous glands and sweat glands.

The hypodermis is the deepest and the thickest compartment of the skin. It contains larger blood vessels and nerves than those found in the dermis. It mainly consists of adipocytes separated by loose connective tissue that act as an energy reserve, protect against temperatures changes by insulation and have a shock absorber function.

Physiological characteristics comparison of baby vs. adult skin

The development of the skin starts in utero during the first trimester. It is a gradual process and the level of maturity is a function of the gestational age. Newborns do not have a fully mature skin and lack mature sebaceous and sweat glands. Infant skin continues to undergo a maturation process and the age at which each function reaches maturity is not clearly defined and varies for each parameter and anatomical region [1].

As infant skin continues to develop during the first years of life it is morphologically and structurally different from adult skin. These differences of structure and composition may lead to functional differences as well and as a consequence, when it comes to skin care routines, infant skin should not be considered as resilient as adult skin. Infant skins unique properties should be carefully taken into consideration for the formulation of appropriate skin care products [8]. An overview of the major similarities and differences between

Table 3. Main differences between Infant and Adult skin and requirements [2, 10]

Skin parameter	Infant	Adult	Effect	Require
pH	6, 5 - 7	5 - 6	↗ potential infections	Neutral formulations
Water content of stratum corneum	higher (in older infants) drier at birth	lower	↗ skin hydration	Moisturising formulations
Natural moisturising factor (NMF) concentration	lower	higher	↗ dryness	
Transepidermal water loss (TEWL)	higher	lower	↗ water evaporation	
Surface lipids (sebum)	lower (7-10 month infant)	higher	↘ hydro-lipid film protection	Emollient, nourishing formulations
Stratum corneum	30 % thinner~7µm	thicker~10µm	↗ permeability	Mild, non-irritant formulations
Protective barrier	competent but weaker	competent		
Melanin density	lower	higher	↘ UV protection	Sun protection formulations

infant and adult skin are set out in Table 3 along with the effect of the differences and requirements for infant products to cater to the special needs of infant skin.

Infant skin has lower sebum content and thinner stratum corneum than adult skin so although infant stratum corneum is normaly more hydrated it loses moisture at higher rates than adults [9].

The thinner skin barrier in infants is an important aspect as it makes them vulnerable to skin diseases and the most common are set out in Table 4.

Infants have a surface area to volume ratio three times that of adults that could easily lead to increased dermal absorption as a proportion of body weight [10]. Furthermore, metabolic enzymes in the skin perform an essential role of transformation of some substances altering the potential toxicities of those substances. Lower expression of some metabolic enzymes in infant skin may result in higher internal exposure to certain substances than occurs in adults.

Skin irritation

Irritant contact dermatitis is the medical term for skin irritation. Irritant contact dermatitis is common in occupations that involve repeated hand washing or repeated exposure of the skin to water, food materials, and other irritants.

Skin irritation is a nonspecific inflammatory reaction with reversible injuries occurring after a chemical exposure and is characterized by erythema, mild edema and scaling. Irritant contact dermatitis is a complex, interlinked process involving perturbations in the skin barrier integrity, cellular changes, and release of various proinflammatory mediators [11].

The irritant action of a substance depends upon its ability to penetrate the outer layers of skin (stratum corneum) that act as a protective barrier. Organic solvents such as acetone can extract lipids from the stratum corneum, thereby leading to disruption of the epidermal barrier. Anionic surfactants like sodium lauryl sulphate (SLS) can damage protein structures exposing new water binding sites and causing hyperhydration of the stratum corneum and disorganisation of the lipid bilayers [11].

Once through the protective barrier, the irritant comes into contact with living cells resulting in tissue damage. The body's first response to tissue damage is a localised acute inflammatory reaction as nearby cells set up a defense to the invading chemical and speed up its removal.

The disruption of the skin barrier leads to cellular changes and production of proinflammatory cytokines, such as Interleukin 1-alpha (IL-1α), which represents an initial step in the inflammatory cascade [11]. Keratinocytes play an important role in the initiation and perpetuation of skin inflammatory reactions through the release of and responses to cytokines [12]. Cytokines are a diverse group of soluble proteins and peptides that act as humoral regulators and which modulate the functional activities of individual cells and tissues. The precise cytokines/chemokines activation cascade in Irritant contact dermatitis is still unclear, however, it is likely that the primary cytokines involved following irritant exposure are IL-1α and tumor necrosis factor-alpha (TNF-α). The synergistic effects of these two cytokines result in the further activation and release of secondary cytokines/chemokines including IL-6 and IL-8 [11]. Many other pro-inflammatory mediators and a variety of other chemokines that attract inflammatory cells may be involved in the inflammation process [13]. The response is proportional to

Table 4. Skin conditions of Infants [10]

Condition	Clinical Signs	Key Factors
Irritant Diaper Dermatitis 50% of babies develop nappy dermatitis	Red skin around the nappy area	Prolonged skin contact with urine and faeces
		Occlusion of skin by nappy use
		Skin wetness
		Friction
		Disrupting normal skin barrier integrity
Atopic Dermatitis or Eczema 20% of babies develop atopic dermatitis	Itchy, red rash that occurs in response to a trigger	Common with children who have a family history of asthma, allergies or atopic dermatitis. May occur on baby's face as a weepy rash. Over time it becomes thick, dry and scaly
Infant Sunburn	Red skin with blisters in severe cases.	The sun may expose baby's skin to the risk of damaging sunburn. Sunburn acquired in childhood correlates with increasing risk of malignant skin tumors
Skin problem after bath	Red rash and dryness	Bath temperature
		Liquid cleanser that compromise skin barrier integrity

Table 5. Common Skin Irritants, The Dirty Dozen plus some more [14. 15]

	Irritation/Allergy	Cause
Soap	Irritation	pH, lipid removal
	Allergy	Fragrance, dye
Household cleaners	Irritation	pH, lipid removal
	Allergy	Fragrance
Fabric dryer sheets	Allergy	Fragrance
Cloths	Irritation	Rough texture, friction
Heat	Irritation	Sweating
Latex	Allergy	
Fragrances	Allergy	
Facial creams	Irritation	Ascorbic acid, malic acid, lactic acid, alpha hydroxy acids
	Allergy	Fragrance, preservatives
Plants	Allergy	
Food	Allergy	
Nickel	Allergy	
Sunscreen	Allergy	para-aminobenzoic acid
Bug bites/stings	Allergy	
Razor burn	Irritation	Friction

the degree of irritation (dose-response), and the amounts of cytokines produced by keratinocytes in the skin in order to promote and control this early inflammatory response vary.

A wide range of chemicals can cause skin irritation if they are in contact with the unprotected skin in sufficient concentration or duration.

Irritant contact dermatitis is often confused with allergic contact dermatitis, referred to as sensitisation, which is an entirely different condition involving the immune system reacting to allergens. Table 5 lists products commonly suggested as causes of skin irritation. Only three of the causes listed are solely due to irritation with three others being either due to either irritation or allergic reaction. The remainder are all due to allergic reactions. Although the most listed possible causes of dermatitis are due to allergies, this does not indicate that most cases of skin dermatitis are caused by allergic reactions.

In vivo testing for skin irritation

The Draize Test is an acute toxicity test devised in 1944 by Food and Drug Administration (FDA) toxicologists John H. Draize and Jacob M. Spines. Although the test was initially used for testing cosmetics it became the standard for testing any chemical for its effect on skin. The procedure involves applying a test substance to the skin of a restrained, conscious animal, and then leaving it for a set amount of time before rinsing it off and recording its effects using a visual scoring system of erythema and oedema. Tests were usually conducted on the shaved skin of albino rabbits and involved the addition of varying concentrations of the substance under test. Testing for skin irritation in animals potentially causes them pain and discomfort. Furthermore, the results are not always predictive for those found in humans [16].

A number of changes have been made to the animal test procedure over the years to reduce the number of animals involved and reduce the potential for pain to the animals while still achieving meaningful results [17]. However, there has long been a desire to develop alternative test methods for assessing skin irritation that do not involve the use of any animals, both for ethical and scientific reasons. The 7th Amendment of the European cosmetic directive establishes a prohibition to assess skin irritation on animals since 2004 for finished products and 2009 for ingredients. This amendment support the development of in vitro alternative methods to animal testing to assess different toxicological endpoints such as skin and eye irritation, skin and eye corrosion, skin phototoxicity, genotoxicity and several others.

Human volunteer skin testing can be ethically conducted on personal care product or ingredients as long as the hazard is already substantially understood [18]. Therefore, generally only mild substances would be tested for irritation in this way. It is easily understandable that this kind of skin testing is only performed on adults for ethical reasons.

In vitro testing for skin irritation

In vitro, literally 'in glass', toxicity testing involves the use of bacterial or mammalian cells to test for the toxicity of chemical substances or mixtures. The growing cells are exposed to the test substances for a given period and assessed for any effects on the cells. Cells types appropriate to the desired test can be used to give a more specific outcome.

Research has been ongoing for many years to develop non-animal tests to determine the toxicity of chemical substances. Any test for skin irritation must be able to differentiate between irritating and non irritating substances. As previously mentioned, in vivo test methods for skin irritation potential rely on visual scoring of skin reactions that are the result of complex cellular responses to irritants. For a new alternative method to animal testing to be validated, any sophisticated in vitro method needs to correlate in vivo clinical signs with in vitro biochemical measurements.

The European Centre for the Validation of Alternative Methods (ECVAM) and The Organisation for Economic Cooperation and Development (OECD) are responsible for determining the requirements for test models, approving them for use and encouraging their acceptance by regulatory bodies. Several reconstructed human epidermis (RHE) models for skin irritation potential assessment have been accepted, including the EpiSkin™ (SM) [18], the EpiDerm™ SIT (EPI-200) [19], the SkinEthic™ RHE and the LabCyte EPI-MODEL 24SIT models [20].

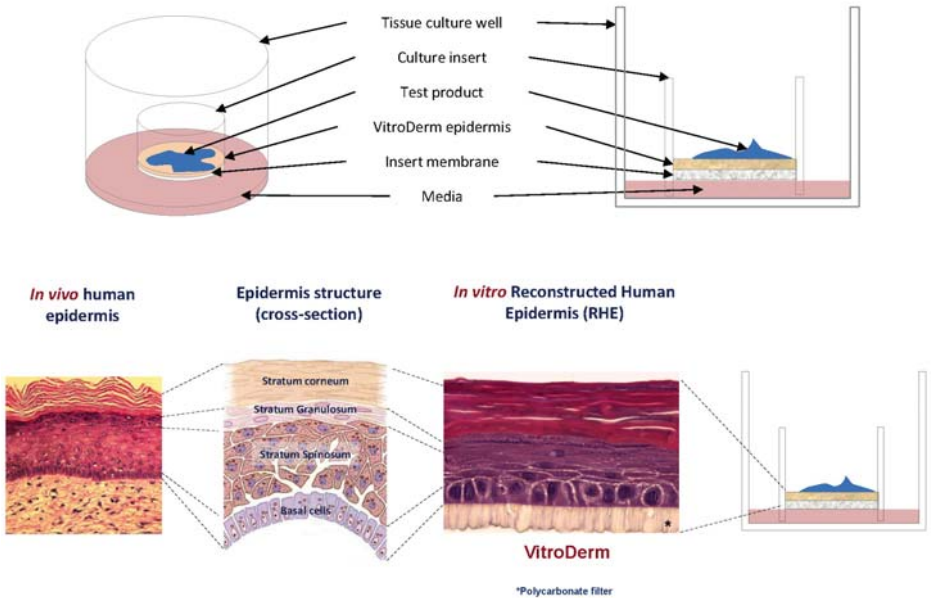
All the models consist of an in vitro reconstructed human epidermis from normal human keratinocytes cultured on a carrier membrane. These models are histologically similar to the in vivo human epidermis in cell organisation, the stratification of the epidermis and thickness of each stratum. As a consequence of the absence of visible clinical symptoms in vitro it was necessary to investigate biomarkers as indication that the potential for substances or products to cause irritation to intact skin [16].

The OECD test guideline 439, describes the principles of the test and the quality control criteria that must be respected [20]. The skin irritation potential assessment using theses epidermis models relies on the evaluation of skin cytotoxicity that is indicated by the death of exposed cells, as it is consistent with skin irritation. The test substance is applied onto the reconstructed human epidermis (RHE) surface for the required duration, depending on the RHE model. After the treatment, the substance is washed off from the RHE surface to stop the reaction and following a post- incubation period a colourimetic assay is performed. Skin cytotoxicity is measured using the enzymatic conversion of a yellow vital dye, the MTT 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide. Only viable cells are able to convert the yellow vital dye into a blue formazan salt. This blue formazan salt is extracted from the reconstructed human epidermis to be quantitatively measured by a spectrophotometer. The percentage of cell viability is determined by comparison with an untreated control reconstructed human epidermis. Irritant substances are identified by their ability to decrease cell viability to ≤ 50%.

Skin irritation testing using VitroDerm model

The ECVAM validated model and the OCDE test guideline are implemented to assess the skin irritation potential of raw material only. Thor's In Vitro Toxicology (IVT) Laboratory had developed an in-house reconstructed human epidermis, called VitroDerm, and had adapted the protocol to assess the irritant potential for finished products as requested by formulators [21]. The Diagram 1 shows the similarities between the VitroDerm structures when compared to in vivo human epidermis.

Diagram 1. VitroDerm model



This protocol tries to mimic the actual contact duration with the skin so different treatment periods and application quantities are used according to the product type: either leave-on or rinse-off products.

ECVAM validated models are only able to distinguish between irritant and non irritant based on the cytotoxicity of the test substance. A desire to also detect mild irritants was requested by formulators so further developments to the VitroDerm model were conducted to enable this. If the MTT cell viability test indicates >50% cell viability, indicating non irritant, the level of 4 main pro-inflammation markers genes expression may be determined by polymerase chain reaction (PCR): IL-1α, IL-6, IL-8 and TNFα. This technique is utilized to amplify a single copy or a few copies of a piece of DNA to determine whether exposure to the test substance has resulted in an increase in the expression of genes coding for specific cytokines. The endpoints for classification of the test specimens as irritant, mild irritant or non irritant are shown in Table 6.

If ≤50% cell viability is obtained the sample is considered as irritant and there

Diagram 2. Skin irritation testing procedure using VitroDerm model

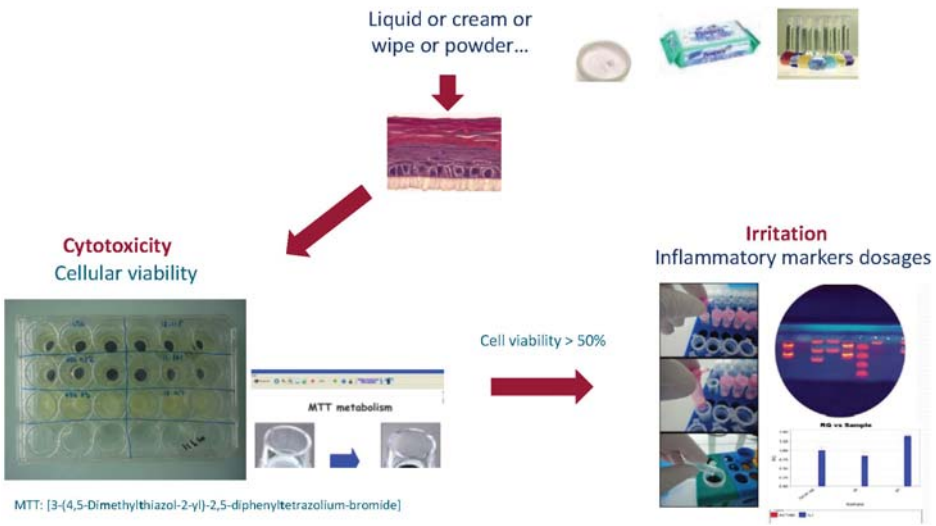


Table 6. Irritant Classification by the VitroDerm Model

Viability %	More than 2 inflammatory markers up regulated?	Classification
50%	NO	Non irritant (NI)
	YES	Mild irritant (MI)
≤ 50%	Not determined	Irritant (I)

is no need to measure the inflammatory markers. If there is >50% viability of the cells the test substance is considered non irritant. However, if more than two of the inflammatory markers show up regulation to a ratio of ≥5, that is a five fold increase when compared to an untreated RHE control, then the material is classified as a mild irritant.

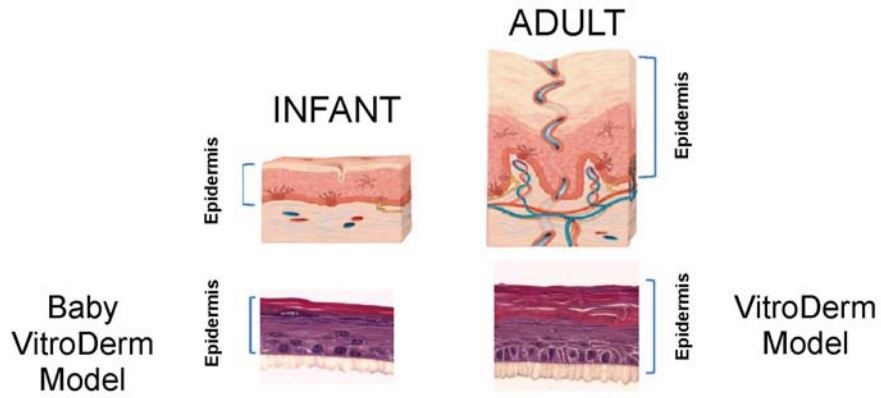
Skin irritation testing of baby range of personal care products

A number of in vitro methods to test skin irritation are currently available for testing for skin irritation but they may not provide accurate information on the effect of these products on infant skin. For ethical reasons, it is difficult to find in vivo information concerning infants that may be compared with the available in vitro results. The desire to use more mild ingredients in conjunction with a re-evaluation of the old notion that skin is fully matured at birth has led to the development of a baby human reconstructed epidermis model to assess infant skin irritancy.

The staff of the Thor IVT laboratories investigated the potential of producing a reconstructed human epidermis model that would be more representative of infant skin. Based on the review of the skin differences between infant and adult (Table 3), the decision was to focus on the essential morphological aspect, that is, the thinner stratum corneum. The result was the development of the Baby VitroDerm model that derived from the previous VitroDerm model. Histological cross section of Baby VitroDerm and VitroDerm (X400, hematoxylin/eosin staining) are shown in Diagram 3. There are obvious variations in the thickness of the stratum corneum (keratin layers).

The Baby VitroDerm has been tested to determine if any variation in results

Diagram 3. Comparison of Baby VitroDerm and VitroDerm models



	Baby	Adult	
	Baby VitroDerm	VitroDerm	
Non cornified epidermis	29,28 µm	26,8 µm	Δ = 9,3%
Keratin layers	10,33 µm	28,05 µm	Δ = 63,2%
Global thickness	39,61 µm	54,85 µm	Δ = 27,8%

would be obtained when compared against the use of Adult VitroDerm. The results from tests using 72 baby's products are shown in Table 7. The results show that for most products tested there is no difference in the irritant classification determined between the Adult VitroDerm and the Baby VitroDerm. However, for a number of products the Baby VitroDerm indicates the products would be classified as irritant while the adult model shows them as nonirritant. This indicates that the Baby VitroDerm model is more sensitive to skin irritation, the same as seen for infant skin in vivo.

Paired T-test analysis of the data is presented as Diagram 4 and shows that while there is a variation in the results obtained for the two models based on cell viability alone, when the results are divided between leave on and rinse off products the effect in the rinse off products is much greater. It is likely the surfactant content of these products is having a significant effect on the Baby VitroDerm due to the thinner keratinised layer.

Diagram 4. Paired t test data 72 baby personal care products

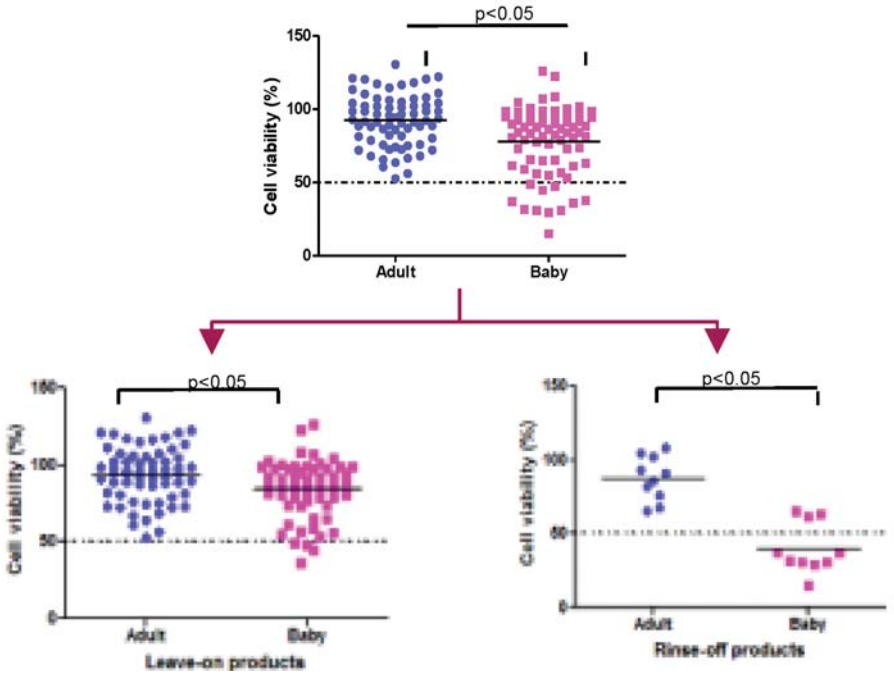


Table 7. Cell viability results from irritation tests on 72 baby personal care products

Personal care product	Code	% Cell viability					
		Adult VitroDerm			Baby VitroDerm		
		Mean	SD	Score	Mean	SD	Score
Cleansing Milk	BC J.03	86,4	12,56	●	77,8	4,81	●
	BC J.05	102,1	9,87	●	80,4	5,74	●
	BC J.06	78,7	11,32	●	48,7	4,27	●
	BC J.07	104,8	4,54	●	98,1	2,34	●
	BC J.09	98,6	6,74	●	90,6	5,66	●
	BC J.10	72,0	8,37	●	98,8	3,95	●
	BC J.11	88,1	15,05	●	78,9	6,59	●
	BC J.12	87,0	6,89	●	86,3	10,51	●
Shower gel	BC E.03	65,6	4,12	●	15,1	7,18	●
	BC E.04	75,8	7,28	●	36,9	3,07	●
	BC E.09	81,7	8,87	●	31,5	5,76	●
	BC E.17	67,9	8,32	●	30,8	7,55	●
Nappy cream	BC D.04	92,2	3,72	●	88,4	9,92	●
	BC D.06	118,0	1,94	●	65,7	9,60	●
	BC D.08	107,2	2,96	●	92,4	8,26	●
	BC D.10	93,6	8,87	●	96,5	16,64	●
	BC D.12	96,4	2,56	●	122,4	6,80	●
Cleansing water	BC A.05	72,5	2,64	●	54,8	5,47	●
	BC A.07	56,0	9,53	●	36,1	4,16	●
	BC A.09	63,6	3,13	●	44,7	9,74	●
	BC A.11	68,1	5,16	●	53,1	6,45	●
	BC A.13	71,9	6,92	●	55,9	12,25	●
	BC A.15	81,3	6,46	●	82,3	6,15	●
	BC A.16	52,6	4,81	●	47,4	1,53	●
Foam bath	BC M.06	85,9	8,53	●	65,0	6,37	●
	BC M.07	91,2	13,02	●	29,4	3,43	●
	BC M.09	104,1	6,14	●	63,1	7,51	●
	BC M.10	107,9	5,67	●	61,4	15,99	●
	BC M.11	101,8	14,64	●	31,0	4,17	●
	BC M.15	92,8	9,64	●	37,7	1,84	●
	BC M.17	101,0	2,95	●	87,5	7,77	●
Liniment	BC K.05	102,0	4,84	●	97,4	8,97	●
	BC K.07	98,4	8,59	●	91,0	8,06	●
	BC K.08	98,5	11,00	●	97,4	7,96	●
	BC K.10	96,3	6,81	●	100,4	10,36	●
	BC K.13	116,6	6,85	●	108,3	2,08	●
Cold Cream	SKC D.05	102,2	1,43	●	98,4	6,56	●
	SKC D.06	117,2	7,68	●	78,7	11,67	●
	SKC D.09	113,3	6,95	●	86,6	8,63	●
	SKC D.10	110,3	9,58	●	125,9	3,70	●
	SKC D.13	110,9	9,72	●	87,6	5,15	●
Emulsion wipes	BC L.03	94,7	9,80	●	91,7	4,11	●
	BC L.05	91,1	8,74	●	81,3	5,47	●
	BC L.07	104,2	8,55	●	91,5	4,89	●
	BC L.09	122,0	3,29	●	84,1	9,38	●
	BC L.11	120,5	10,02	●	83,4	7,81	●
	BC L.14	114,6	3,10	●	83,9	6,54	●
Protective stick	SC A.02	91,4	12,70	●	73,6	10,14	●
	SC A.04	88,4	6,92	●	76,3	7,47	●
	SC A.06	95,5	4,73	●	96,4	3,25	●
	SC A.09	89,2	9,76	●	101,8	2,93	●
	SC A.11	94,3	12,22	●	90,0	16,44	●
Body milk	BC H.06	60,5	10,25	●	56,5	11,10	●
	BC H.08	90,6	3,37	●	84,1	6,20	●
	BC H.12	75,6	7,07	●	64,9	7,44	●
	BC H.14	86,9	9,81	●	73,2	2,84	●
Sun cream W/O	SC B.04	107,1	4,79	●	104,7	4,13	●
	SC B.06	106,1	3,58	●	98,3	4,55	●
	SC B.08	94,5	8,78	●	80,6	12,30	●
	SC B.11	93,3	6,31	●	94,5	2,16	●
	SC B.13	100,8	5,86	●	100,1	5,51	●
Hydrastick	SKC B.04	66,6	9,16	●	61,0	5,67	●
	SKC B.08	74,0	8,77	●	72,9	6,50	●
Body cream	BC C.05	72,5	3,03	●	81,4	2,37	●
	BC C.07	80,2	6,12	●	98,9	7,49	●
	BC C.10	89,3	8,56	●	94,9	7,35	●
	BC C.12	82,1	6,56	●	79,8	4,11	●
	BC C.14	82,2	6,52	●	89,7	6,33	●
	BC C.15	75,1	9,24	●	87,7	5,38	●
Sun cream	SC C.04	121,0	7,68	●	58,9	12,85	●
	SC C.07	120,3	5,01	●	96,9	5,03	●
	SC C.08	130,4	7,01	●	106,9	8,11	●

SD: Standard deviation ● cell viability > 50% ● cell viability ≤ 50%

The results presented in Table 7 indicate that the Baby VitroDerm model is more sensitive than the adult model when looking only at cell viability as an indication of irritancy for infant skin.

Further tests were conducted using leave on and rinse off products. The results are presented in Table 8.

All products were classified as non irritant by the adult model while the use of the Baby model classified a wet wipe sample as irritant due to cell viability. Three other products were classified as mild irritant based on up regulation of inflammatory marker gene

Table 8. Skin irritation results obtained comparing Adult and Baby VitroDerm models
I: Irritant; MI: Mild Irritant; NI: Non Irritant

Exposure conditions			Baby products	ADULT model							BABY model							Patch test
				% cell viability	Inflammatory markers					Classification	% cell viability	Inflammatory markers					Classification	Classification
				Mean	SD	IL-1	IL-6	IL-8	TNFα		Mean	SD	IL-1	IL-6	IL-8	TNFα		
Leave on	*100%*	*20H*	Ointment	102,9	7,65	2,8	2,6	4,9	0,8	NI	97,6	9,78	6,9	2,2	9,7	3,1	NI	*NT*
			Cream	106,7	2,89	3,3	1,6	6,4	1,4	NI	88,4	4,02	40,3	6,4	23,2	14,3	MI	*NT*
			Wet wipe1	93,9	2,49	2,2	3,9	5,0	0,9	NI	95,4	6,90	4,6	2,1	4,2	2,8	NI	*NT*
			Wet wipe2	50,8	11,12	6,3	0,3	7,6	0,7	NI	32,2	8,37	11,2	4,2	66,4	5,3	I	*NT*
Rinse off	*2%*	*4H*	Shampoo1	85,1	12,66	0,9	0,2	0,5	1,2	NI	82,5	5,41	2,5	22,7	18,1	4,5	NI	NI (2%)
			Liquid Soap	84,9	5,29	1,0	0,5	1,0	1,9	NI	90,3	7,56	2,6	24,5	13,7	2,8	NI	NI (2%)
			Shampoo2	97,6	5,62	1,3	0,4	1,1	2,9	NI	92,2	9,19	2,5	18,2	18,7	1,6	NI	NI (2%)
			Shampoo3	95,4	3,59	1,0	0,2	0,4	2,0	NI	96,0	7,95	1,5	8,9	6,0	1,9	NI	NI (2%)
Rinse off	*2%*	*15H*	Shampoo1	84,4	3,96	2,3	1,1	2,8	0,9	NI	86,6	2,94	5,6	1,0	9,4	1,7	NI	NI (2%)
			Liquid Soap	95,2	5,24	3,1	0,5	2,1	1,0	NI	84,8	11,87	9,9	3,4	17,3	2,1	NI	NI (2%)
			Shampoo2	84,7	4,45	3,4	1,6	3,6	0,9	NI	75,0	8,16	19,3	7,2	15,2	4,4	MI	NI (2%)

expression. In vivo human patch tests conducted for some of the samples using adult volunteers showed no irritation indicating the Baby VitroDerm model has greater sensitivity and is more appropriate for use when testing products for use on infant skin.

In order to mimic the actual baby conditions in the nappy area, the VitroDerm model can be used in conjunction with the use of artificial urine [23] in an occlusive environment. The urine induces a shift of pH, may increase the permeability of the skin, may directly irritate the skin or interact with personal care products applied to the nappy area to form new irritants.

Conclusion

Infant skin is not the same as an adult skin resulting in a different skin barrier that continues to develop during the first years of life. In consequence, babies may facilitate the development of pathological condition such as dermatitis and irritant contact dermatitis. Respecting the unique properties of infant skin, risk assessment of personal care products for babies should be considered as a separate issue – data should not simply be extrapolated from human adult testing.

A new tool has been developed to assess the skin irritation potential of products intended for use on infants, the Baby VitroDerm reconstructed human epidermis.

Improvement in the prediction of irritation with this new model allows a better risk assessment during the development of baby products and can be used as a tool to select the most appropriate ingredients during formulation.

Moreover, as this new model is more prone to cell cytotoxicity as well as inflammatory markers up regulation, this model could be investigated for its use as a surrogate of sensitive skin.

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formulator's forum

Part 4 –

Formulations used in hair products

by Ric Williams

This column has been prompted by a blog started on a Linked-in site "The in-cosmetics Group" titled "Why is there always conflict between R&D and Marketing Departments? by Belinda Pilmore (IPCS)"

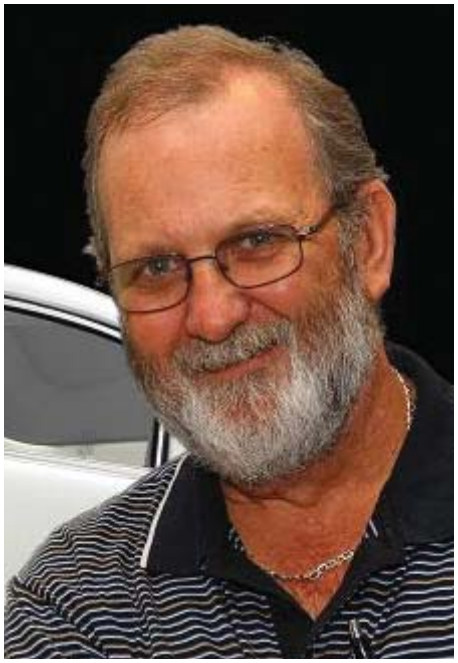
Hair bleaching and colouring

From above, the major proportion of cells in the hair cortex is the macrofibril (0.05-0.20 um). The macromatrix is probably similar in constitution to the endocuticle in that it is composed of cell remnants. Some cortical cells have close packed microfibrils and very little macromatrix, ie, paracortical cells. Other cortical cells have less microfibrils and more continuous matrix, ie. Orthocortical cells. The orthocortex is more accessible to staining and more susceptible to chemical attack than paracortex.

A microscopic examination of the Negroid hair shows the cortex pigment granules are dark, coarse and have a tendency to be clumped together. In mongoloid hair pigment granules may be dark or darker, but are more evenly distributed. Caucasoid hair usually exhibits finer, more even pigmentation with light coloured granules.

To bleach hair one must destroy the colour coming from the cortex pigment granules (ie the Melanin). The standard for this is Hydrogen Peroxide (H2O2), usually at 3.0% in a stabilised water base. No other additives are used in such a treatment as Hydrogen Peroxide is a powerful oxidising agent and would destroy most additives considered. The colour produced is a white appearance (devoid of any colour). One of the undesirable side effects of peroxide bleaching is the cleavage of disulfide bonds, which weakens the hair causing breakage. In a normal bleaching process approximately 15-20% of disulfide links in hair are broken. Hence continual bleaching can cause irreparable damage, split ends plus loss of gloss and condition. Post-bleaching conditioning treatments are highly recommended.

The white colour from peroxide bleaching may not be acceptable hence



by Ric Williams B.Sc.; Dip.Env.St.
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This column is intended not only as an education tool for non-technical people or beginners in our industry, but as a forum for those wishing to enlighten all about recent technology advances and new ideas. I hope experienced scientists will also contribute to this ideal and if you wish to do so please email me at: ric@cosmepeutics.net.au

there are many organic colorants that have been developed to provide (with combinations of these colours) any shade possible. These are usually provided in a simple shampoo, hair conditioner or cream base, possibly with mild conditioning additives only. The base is a vehicle only for the dispersing of colour through the hair.

Note; If the hair has not been bleached with peroxide prior to colour treatment then only a modification of the current colour is achieved. That is, highlights in dark hair or a reasonable change in light hair are possible, but you cannot create a blonde out of black hair, unless you bleach first.

Temporary Hair Dyes

These are colouring products which give a colour to the hair, which washes out on the first shampooing. These products use colourants of high molecular weight that are deposited on the surface of the hair, without penetration.

Semi-Permanent Hair Dyes

This is a very common type of hair dye, with a permanence between that of temporay hair dyes and permanent hair dyes. Typically, hair coloured using semi-permanent colourants will tolerate between 3 and 6 shampooings, before significant colour fading takes place. The greater degree of permanence takes place because the dye penetrates into the hair, by the process of diffusion, due to its small molecular size.

Permanent Hair Dyes

Permanent hair dyes provide colour to the hair which resists shampooing, mechanical wear and tear (brushing, combing, etc.) and light. Permanent hair colorants are based almost exclusively on oxidation dyes. These are small

molecules that diffuse into the hair, where they are coupled to formlarge highly coloured molecules, which cannot diffuse back out of the hair shaft.

Despite which dye you use as hair grows the original colour returns. Scientists are still looking a genetic modification of hair growth so that a new hair colour is totally permanent.

Major hair fixatives

It must be noted that hair fixatives do not clean hair of dirt or grease or condition hair but that there main objective is to keep the hair in a style that the consumer has set. Apart from standard Hair Fixatives other products such as Hair Boosters, Shapers and Moulding Muds are just modifications of the standard type for marketing purposes.

The major ingredient in a hair fixative is the **long chain polymeric organic molecules** that form films around the hair shaft giving effects such as;

Strength (increasing the strength of the outer cuticle layer resisting bending – this is the basis of most hair fixatives where the hair holds is position, usually styled to be away from the scalp giving the impression of more hair);

Protection (forming a protective layer that damaging environmental conditions do not penetrate);

Repair (where the polymers can "glue" slit ends together or cover a damaged section of hair cuticle).

Moisturisation (by creating a water impermeable barrier water loss is reduced);

Colour (by providing a continuous film on hair additives such as colour and sparkles can be attached with some loggevity).

Usually all other ingredients are designed to carry or make more cosmetically acceptable the hair fixative, hence a hair fixative (except in the case of an aerosol) is relatively simple.

Hair Gels

Typical formula is:

Purified water	91.05	Carrier
Carbomer	1.00	Thickener & Polymer
Triethanolamine	0.25	ph Adjustment
PVP/VA Copolymer	5.00	Hold Polymer
Conditioning agent	0.50	Conditioning
Solubiliser	2.00	Solubilise fragrance
Fragrance	0.20	Fragrance

Hair Spray

Typical formula is:

Ethanol/Water	91.05	Carrier
PVP/VA Copolymer	6.50	Hold Polymer
2-Amino-2-Methyl-1-Propanol	1.25	ph Adjustment
Conditioning agent	0.50	Conditioning
Wetting agent	0.50	Plasticiser for polymer
Fragrance	0.20	Fragrance

Major hair treatments

Hair Rinse

Mild / leave-in hair conditioning. A typical formulation is similar to hair conditioners but with reduced viscosity, hence reduced emollients, emulsifiers and gel, to reduce the amount deposited on the hair.

Hair Tonics

Hair tonics are usually Ethanol (or volatile solvent) based solutions that have minimal emolliency. The active (to be deposited on the hair or scalp) can be Antidandruff, Antiseptic, Anti-Seborrhea, Hair Loss Reduction, Hair density increase (new peptides), Hair Colourants (incl. new peptides that restore the natural colour of hair) and Hair Stimulants.

Hot Oil Treatment

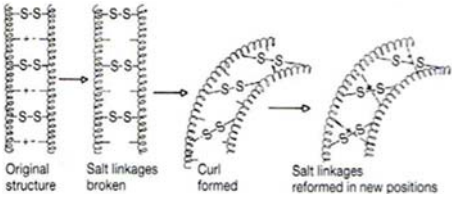
The purpose is to provide a concentrated conditioning treatment in a unique form. The product has to be warmed before use, not only to melt the myristyl alcohol, but to increase substantivity to hair. Proteins may be added for a specific protein treatment effect.

A typical formulation is:

Paraffin Liquid	91.40	Carrier
PEG-15 Cocopolyamine	2.50	Conditioning Treatment
Lanolin Oil	2.00	Hair Plasticiser
Myristyl Alcohol	2.00	Solidifying agent
Preservative	1.00	Preservative

Semi permanent and permanent waves

Semi permanent waves are when milder forms of treatment are used and only the salt linkages (weaker binding forces in hair strands) are reformed eg.



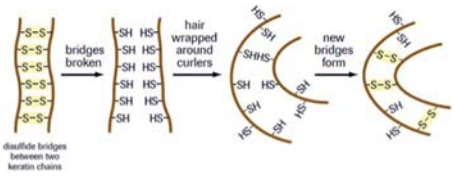
Permanent waving is where the Cysteine bonds (the stronger bonds in hair strands) are chemically broken, the hair reshaped and the bonds allowed to reform (after neutralisation). eg.

The actual chemistry of perms is where a solution containing ammonium thioglycolate contains free ammonia, which has a high pH and swells hair, rendering it permeable. The thioglycolic acid in the perm solution reduces the disulfide cystine bonds in the cortex of the hair. In a sense, the thioglycolate removes crosslinks. After washing, the hair is treated with a mild solution of hydrogen peroxide, which oxidizes the cysteines back to cystine. These new chemical bonds impart the structural rigidity necessary for a successful perm. However, not as many disulfide bonds are reformed as there were before the permanent. As a result, the hair is weaker than before the permanent was applied and repeated applications over the same spot may eventually cause strand breakage.

The sequence involves three steps:

1 Setting the hair into the desired shape (curl or straight),
2 Softening and/or swelling of hair with an alkaline chemical agent (usually Ammonium Thioglycollate),
3 Neutralisation of the softening agent with a mild oxidising solutrion or by air oxidation.

Air oxidation is a much slower process and is the process used in the "no-neutraliser" permanent waves.



From an old ICI Catalogue or "Harry's Cosmeticology" a typical formulation of a Permanent Wave Treatment is:

Water	**q.s.**
Emollient/Thickener	20.0%
Emulsifier	10.0%
Ammonium Thioglycolate	10.0%
Ammonium Hydroxide	to pH 9.3-9.5

The neutralizer can use (stabilized) dilute Hydrogen Peroxide (1-3%), Sodium Bromate (5-12%) in a base with emollients and surfactants for aesthetics.

Hair Straightening Gel

The action of this product is to add a silicone complex that negates to hydrogen bonding between hair fibrils thereby relaxing the hold effect in hair bonding.

A typical formulation is:

	%	
Polyacrylamide & Isoparaffin & Laureth-7	3.00	Thickener
Cyclomethicone & Dimethicone Copolyol	5.00	Emulsifier
Propylene Glycol	10.00	Solvent
Purified Water	21.65	Carrier
Glycerol	20.00	Solvent
Ethanol	10.00	Solvent
Preservative	0.10	Preservative
Dimethicone	10.00	Silicone Hair Relaxant
Cyclomethicone	10.00	Silicone Hair Relaxant Solvent
Dimethiconol	10.00	Silicone Hair Relaxant & Coemulsifier
Conditioning agent	0.25	Conditioning

Apart from standard products above others such as Reconstructors, Hair Masks, etc. are just modifications of the standard type for marketing purposes.

Depilatories

Depilatories are based principally on the Calcium, Potassium or Sodium Salts of Thioglycolic Acid. By its ability to cleave the Disulfide linkages between the polypeptide chains of Keratin, the major hair protein, Thioglycolic acid causes the hair fibre to rapidly degenerate.

Depilatories containing Thioglycolic acid are commonly used in alkaline media, pH approximately 12 – below pH 12 depilation is slow and above pH 12.5 the risk of skin damage is too great. Excess alkalinity is provided by the addition of Potassium, Sodium or Calcium Hydroxide.

Alternatively, Thioglycerol may be used as a depilatory agent. Again excess alkalinity is provided by the addition of Potassium, Sodium or Calcium Hydroxide.

The presence of catalytic trace metal ions and the high degree of chemical reactivity of the depilatory formulation can lead to offensive odours and undesirable colour formation in the finished product. Inclusion of a sequestrant (such as EDTA), which forms a complex with trace metal ions in the formulation, reduces the tendancy for oxidation of thiol and reduces or eliminates any colour change or odour formation.

Depilatory Creams

The active components must be formulated into a suitable inert base. The level of emulsifiers and emollients in these bases must be chosen carefully because;

1. the product should not penetrate skin but remain on the surface and be able

to be removed easily.

2. too much used may inhibit depilation, and
3. too little used and the product may be too aggressive to skin.

Creams should be applied to clean, dry skin and left for 4 – 6 minutes (no longer than 10 minutes), before removing with a spatula.

A typical formulation would be:

Water Phase		
Purified water	79.75%	Carrier
Disodium EDTA	0.05%	Humectant
Glycerine	2.00%	Humectant
Oil Phase		
"Mineral" Oil (eg Paraffin Oil)	2.00%	Emollient Oil
Petrolatum (Petroleum Jelly)	1.00%	Emollient Skin Softener
Lanolin	1.00%	Emollient Skin Softener
Cetyl & Stearyl Alcohol	5.00%	Thickener
Steareth-21	2.00%	Emulsifier
Other Ingredients		
Potassium Thioglycolate	5.00%	Depilatory
Calcium Hydroxide	0.50%	Alkali
Potassium Hydroxide	0.80%	Alkali to pH 12.5
Preservative	1.00%	Preservative

Post treatment of skin (after depilatories) should be a soft soothing cream containing Chamomile or Calendule extracts, Allantoin or hydrolysed proteins to reduce irritation, and be moderately acidic with a pH of 4.50 – 6.00 to neutralise any residual alkaline from the treatment.

Depilatory Waxes

Hair removal by this means is not a chemical destruction of hair but a mechanical removal where the wax is melted, applied to the skin by a spatula and allowed to cool and harden. When this happens the product traps the hair shafts in its resin / wax matrix, the emollients and humectants (with the heating action of the melted wax barrier) causing the skin to become soft and more ready to release the hair medula, and when the wax is removed the hair shaft is pulled from the skin. This technique gives better hair removal than Depilatories as it removes all the hair strand rather than chemically degrade only the part of the hair which is above the skin, but is more painful when removed and much messier.

Some products use Benzyl Alcohol as a preservative as this also has a slight anesthetic effect on skin making it less painful. Other anesthetic agents may be used.

A typical formulation is:

Natural Wood Resins, Rosin or synthetic Rosin	45 – 55%	Hair removal
Beeswax, Paraffin Wax or other high melting point wax	30 – 50%	Carrier
Petrolatum, Lanolin or Cocoabutter	5 – 10%	Melting point modifier, emollient
Benzyl Alcohol	1.00%	Preservative, anesthetic
Allantoin	0.25%	Skin Soothing
Oil Soluble Pigment	0.20%	Colour
Essential oils	0.10%	Fragrance

Thank you.

The next issue I will discuss "Antiperspirants, Deodorants, Deo-Colognes and then onto Perfumes".

Topically applied Keratins for Hair and Skin Care

Part one: Investigating the use of Oxidized Keratin in the repair of hair

by Gill Worth[1], Robert Kelly, Gail Krsinic[1], Sonya Scott[2], and Alisa Roddick-Lanzilotta[2]

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Abstract

Keraplast Technologies manufactures a mix of Keratin proteins extracted from New Zealand sheep wool using proprietary technologies. The extraction processes maintain the structural integrity and functionality of the keratin proteins and their composite peptides.

Three general classes of keratins are produced, denoted by the INCI labels of Keratin, Hydrolyzed Keratin and Oxidized Keratin. Each class has a different functional activity for both skin and hair and provides benefits for both applications when topically applied.

The presentation will briefly review previous research of the biological activity of these Keratins when topically applied. It will also present recent and unpublished research. For skin research this includes in vivo and in vitro analysis of activation of keratinocytes, collagen formation, and antioxidant activity which aid in skin health

and wound healing. Volunteer trials with finished product formulations use a range of analytical measures such as erythema, hydration, elasticity, TEWL, and tensor effect as measured using silicon profilometry, to present the beneficial effects of keratin within cosmeceutical products. Beneficial effects of the keratins for hair are analysed using Instron measurement of tensile strength, SEM of fibres and panel assessment of sensorial properties, and are compared with results from competitor technologies.

Introduction

Proprietary processes are used in the commercial extraction of keratin from virgin New Zealand sheep wool to produce three types of keratin protein fractions. These extracts are described by the general INCI names of Keratin, Hydrolyzed Keratin and Oxidized keratin, but have unique properties that differentiate them from other ingredients with the same INCI names, that are generated via other processes.

The Keratins are a group of α-keratin intermediate filament proteins (IFPs) which have been extracted via a process of oxidative sulphitolysis (Kelly et al., 2001) that converts the cystine crosslinks between the keratin molecules to sulphonated cysteine (see equation one below)groups. These proteins have a size range of 15-85Da and are capable of film forming.

Equation one: Extraction of individual keratin proteins (IFP)

$$K\text{-}[S\text{-}S]_x\text{-}K + [O] \rightarrow 2K\text{-}[SSO_3^-]_x + 2OH^-$$

where K represents the keratin protein

The peptides are a hydrolysed form of the IFP's with sizes of less than 10 kDa. Through the process, these peptides retain the functionality of the sulphonate protected cysteine moiety. The production of these keratins (Aitken & Ellis, 2009) is generally described in equation two.

Equation two: Formation of sulphonated keratin peptides

$$KSSO_3^- \xrightarrow{\text{enzyme}} \text{peptides} + \text{peptides-S-}SO_3^-$$

Both peptides and IFP's are capable of undergoing cysteine cross-linking chemistry through the reductive removal of the sulphonate moiety protecting the thiol.

The third type of keratin extract, denoted by the INCI description of Oxidized Keratin, are extracted via an acid oxidation process (Van Dyke,

Blanchard, Timmons, Siller- Jackson, & Smith, 1999), as portrayed in equation three.

Equation three: Formation of oxidized keratins

$$\text{Keratin} \xrightarrow[\text{Acid conditions}]{[O]} \text{Keratin-}SO_3H$$

Conditions in this process are such that the cysteines are converted to cysteic acid (K-SO_3H) and the typical molecular weight is around 15 kDa. While these keratins have lost the crosslinking capability of the cysteine amino acids, they have other activities as will be described below.

The Benefits of Keratins to Hair and Skin

Peptides and proteins are increasingly being used in personal care products as their benefits are discovered. Wool proteins are mild, natural, biodegradable and produced by sustainable processes. They have multiple functionalities that afford them potential benefit for both hair and skin.

Research into the use of the sulphonated peptides and keratin proteins shows that they have a number of benefits for hair. Applied to bleached hair, both IFPs and peptides increase the ability of bleached hair to take up water but lower the rate at which water is added or removed from the hair (Barba, Marti M. et al., 2010), helping to avoid rapid changes in water content and the associated hair management issues. The sulphonated IFP's have proved to help with reducing hair breakage and making hair softer. They also provide conditioning and benefits for relaxed hair and for UV protection of colour (Roddick-Lanzilotta A., Kelly R., Scott S., & Chahal S., 2007). Applying a combination of keratins and peptides improves the mechanical properties of bleached and permed hair (Barba, Scott S. et al., 2010).

Research has shown the peptides to be beneficial for the hydration and elasticity of skin (Barba et al., 2008) and also for the care of fingernails (Barba et al., 2007).

Oxidized Keratin has been shown to be beneficial for skin, particularly in the healing of chronic wounds (Pechter et al., 2012; Than, Smith, Hammond et al., 2012). In-vitro and in-vivo studies have shown that the oxidized keratins accelerate the epithelisation of wounds through encouraging the proliferation of keratinocytes and promoting the formation of collagen IV and VII (Tang, Sierra, Kelly, Kirsner, & Li, 2012). These collagens are instrumental in the formation and adhesion of the dermal-epidermal junction (Abreu-Velez & Howard, 2012). In several parts of the world, Oxidized Keratins have become the treatment of choice for sufferers of Epidermolysis Bullosa (EB) (Than, Smith, Cassidy et al., 2012). This genetic disease results in poor development of the dermal-epidermal junction with the result that the individual continually suffers from blistering and extensive wounds. Treatment with Oxidized Keratin can result in a marked improvement of the resilience of the skin and reduction in the extent and frequency of these wounds. The demise of the dermal- epidermal junction in EB patients is replicated at a much slower rate, in the general population as it ages. From this we can expect that Oxidized Keratins would be very beneficial as part of an anti-aging skin care treatment.

In this paper we focus on the use of Oxidized Keratin in hair and describe recent research into the use of Oxidized keratins in repair applications for hair.

Experimental

All experiments were conducted on human hair collected from volunteers. Hair was prepared into tresses (2g) and the cut ends tied together with cotton thread and then glued. Loose fibres were removed by combing the tresses before treating them as described below.

Tensile Testing

Using a standard method based on ISO 5079:1995(E), tensile data was obtained for single hair fibres. All hair strands were soaked in distilled water for 30 minutes prior to tensile testing, allowing each hair fibre to have similar internal water content. All fibres were loaded in the same direction. A variable load was applied at a constant extension rate of 20mm/min using an Instron 4204 apparatus until fibre rupture. The fibre elongation and rupture force were measured. Accumulated energy levels at 20% of the initial gauge length (20mm), and at rupture, were also recorded. A total of 50 fibres were broken from each tress. Jaw breaks were discounted.

In the first series of experiments, tresses from two hair samples were put through treatment protocols to effect hair damage representative of repeated combinations of salon and home hair treatments over a period of time:

Protocol A: A set of hair tresses (Hair I) prepared from short dark Caucasian hair, were bleached, as per the manufacturer's instructions, using a professional 12% bleaching product containing persulfate and peroxide. After bleaching, the hair was coloured using an oxidative dark red permanent hair dye based on 4-amino-2-hydroxytoluene, with peroxide base developer. After dyeing, the hair was rinsed and blow dried.

Protocol B: A second set of tresses prepared from long fine wavy hair were permed using a home kit based on ammonium thioglycolate and using a peroxide neutraliser. The perming solution was left on the hair for 45 minutes. After the perm, the hair was rinsed then blow dried and a leave-in conditioner (containing glyoxyl and quarternium salts) applied. The perming process was repeated twice more. After perming, the hair was then bleached using a professional 6% bleaching product containing persulfate and peroxide. The bleach process was repeated after washing and drying the hair.

Once the hair had been processed using either protocol A or B, a single tress from each treatment protocol was then submitted to one of five hair repair treatments.

Four were commercial treatments available in salons internationally. A fifth treatment entailed a simple

aqueous formulation of oxidized keratin and hydroxyethyl cellulose. The four treatments were selected to contain a range of humectants, emollients and actives and to represent four different brands.

Commercial Repair Treatment A contained a mixture of ingredients including fruit extracts, Vitamin E, Hyaluronic Acid, Hydrolysed hair proteins, silicones, essential oils, quaternary ammonium salts, glycolipids and humectants.

Commercial Repair Treatment B was described as containing Protein complex extract, Guar gum, Cyclomethicone, Dimethicone, Arnica, (Arnica Montana), Colouring and fragrance.

Commercial Repair Treatment C included ingredients such as silicones, quaternary ammonium salts hydrolysed plant proteins, vitamin B5, hair conditioning agents and humectants.

Commercial Repair Treatment D included a serum containing oils and a mixture of the sulphonated keratin and peptides and oxidized keratin, together with an intensive treatment conditioner.

Once treated with a repair treatment, a portion of each of the hair tresses was tested for hair strength. The two sets of hair tresses were provided by Keraplast to AgResearch for testing under a double-blind experiment.

With a third set of hair tresses a further comparison trial was undertaken. The hair used in these tests was of Caucasian origin, of medium coarseness and had a slight wave. It had clearly undergone previous processing with strands of bleached and red hair evident. Half of the tresses were used as provided, and the remainder was further processed with 6% bleach before applying the repair treatments. In this trial the Oxidized Keratin was compared with two variants of a fifth professional hair repair brand. The commercial treatments were each based on a two-pot system, in which two formulations were combined immediately prior to treatment.

Commercial Repair Treatment E included quaternary and tri-ammonium conditioning agents, alcohol conditioning agent, silicones and surfactants.

Commercial Repair Treatment F included humectants, plant based emollients, tri-amonium conditioning agents, silicones and surfactants.

After treatment the tresses were sent for tensile testing.

Durability of Oxidized Hair Treatment

A set of tresses, prepared from unprocessed teenage girl's hair of Caucasian abstraction (Hair IV), was used to assess the durability of the oxidized keratin treatments. As per the comparisons with other treatments the selected hair was twice treated using 6% bleach followed by three cycles of perming.

The untreated and processed hair tresses were treated with Oxidized Keratin formulation as per the previously described process. Tresses were then put through a number of hair-washing cycles. Each hair wash cycle included hand washing and conditioning the hair. After each wash the hair was blow dried. The individual hair tresses were subjected to 0, 10, 20 or 30 wash cycles, and samples then submitted for tensile testing.

Scanning Electron Microscopy of Hair Fibres

Fibres from untreated hair, and hair treated with the oxidized keratin, were examined using a Jeol JSM 7000F Scanning Electron Microscope operating at 10kV. The hair samples were mounted onto separate metal stubs with conductive carbon tape.

These were sputter coated from a gold/palladium source to impart conductivity to the samples.

Sensorial Testing of Hair Treated with Oxidized Keratin

A range of six hair processing treatments were used to treat equivalent pairs of hair tresses. One of each processed pair was then treated with Oxidized Keratin. The resulting matched pairs of hair tresses were provided in a blind experiment to a group of hair experts to choose their preference for these. In this experiment, the Oxidized Keratin Hair Rescue treatment incorporated a conditioning treatment before blow-drying. The six hair processes were of a range of types and had been previously processed to a greater or lesser degree:

1 Dark Blonde hair: coloured twice, using a high lift colour, requiring a 12% peroxide bleach. Each treatment timed an hour. Applied Oxidized Keratin treatment after 24 hours.
2 Gray hair: coloured twice with permanent colour requiring a 6% bleach. Colour level 4. Each process time for 1 hour. Applied Oxidized Keratin treatment after 24 hours.
3 Dark blond hair: bleached using a 12% bleach. Applied Oxidized Keratin treatment immediately after and then a repeat application after 24 hours.
4 Virgin brown hair: flat ironed at high temperature (420oC) ~ 50 times. Applied Oxidized Keratin treatment immediately after and then a repeat application after 24 hours.
5 Gray hair: coloured twice with permanent colour requiring 6% bleach. Each process time for 1 hour. Colour level 7. Applied Oxidized Keratin treatment after 24 hours.
6 Dark blonde hair: permed twice with an exothermic permanent wave for 30 minutes each. Applied Oxidized Keratin treatment after 72 hours.

The tresses were pinned as randomised pairs onto boards and the panel were asked to assess each pair on the basis of several parameters relating to hair appearance and feel. For each parameter the panel were asked to determine which of the two tresses they had a preference for, or if they could not determine a difference between the two tresses.

Results and Discussion

Tensile Strength

Hair samples from the heads of four volunteers were used in measuring tensile strength of Oxidized Keratin treated hair, compared with hair repair treatments

from five brands, and the durability of the Oxidized Keratin treatments.

The results for the tensile strength measurements of the Oxidized Keratin Gel compared with Commercial Repair Treatments A –D are given in Table I and Table II. In brackets is given the Student T-Test level of significance. These are presented as p values for the result when compared with the processed hair. P-Values: P<0.10 equates to 90% level of significance, P<0.05 is 95%, P<0.01 is 99% and P<0.001 is 99.9% significant.

In the first comparative experiment, the hair processing (protocol A) reduced the strength of the hair by almost 36%; significant at the 99.9% level. For the subsequent repair treatments there was a trend towards an increase in hair strength. These increases are significant when comparing average peak force measurements against that of the processed hair, but significant only for treatments B, D and oxidized keratin when comparing total energy to break.

Hair process Protocol B did not have an immediate negative impact on hair strength (Table II). However Hair Repair Treatments A-C all reduced the tensile strength of the hair. Only Repair Treatment D and the Oxidized Keratin gel, both of which contained Oxidized Keratin, did not weaken the hair. Of all treatments in this batch, only the Oxidized Keratin Gel significantly improved hair strength. The increase in hair strength was 15% for total energy required to break.

With the third hair sample (Hair III), when the unprocessed hair was used without further processing (Table III), all the treatments appeared to have a detrimentaleffect on hair strength. However the difference between the control and the Oxidized Keratin was significant only for the peak force (at 95% level), while the differences between the control and both treatments E and F, were significant across all three parameters, measured at either the 99% or the 99.9% level. The tensile strength for the Oxidized Keratin Gel is significantly better than Repair Treatment E for Peak force and Total work (at ≥99% significance) while it performed better than Repair Treatment F for work at 25% extension.

For the second set, where Hair III had been bleached prior to the repair treatments, (Table III) the Oxidized Keratin Gel gave the best results of the group across all parameters. The results for the Oxidized Keratin Gel were significantly better than the bleached hair control, for Total work (at 99% level) only, but were significantly better than for both Treatments E and F across all three parameters.

Table I: Tensile testing results for four commercial hair treatments and Oxidized Keratin on permed and bleached hair I

Details	Peak force (gF)	Energy at 20% extension (mJ)	Total energy (mJ)
Control hair I	49.99	1.04	2.34
Permed x 3/Bleached 2x6% hair I	32.1 (P<0.001 compared with control)	0.61(P<0.001)	1.85 (P,0.01)
Repair Treatment A	38.32 (P<0.01 compared with the processed hair))	0.69 (P<0.01)	1.92 (insignificant increase)
Repair Treatment B	43.12 (p<0.05)	0.68 (P<0.05)	2.12 (P<0.10)
Repair Treatment C	35.57 (P<0.10)	0.65 (insignificant increase)	1.98 (insignificant increase)
Oxidized Keratin Gel	38.36 (P<0.01)	0.67 (p<0.05)	2.11 (P<0.10)
Repair Treatment D	38.26 P<0.01)	0.62 (insignificant difference)	2.19 (P<0.05)

Table II: Tensile testing results for four commercial hair treatments and Oxidized Keratin on bleached and coloured hair II

Details	Peak force (gF)[a]	Energy at 20% extension (mJ)[a]	Total energy (mJ)[a]
Control original hair II	77.66	1.58	3.74
Bleached12%/Colorx2 hair II	76.86 insignificant difference to original hair)	1.31 (P<0.001)	4.75 (P<0.01)
Repair Treatment A	66.14 (P<0.05)	1.18 (P<0.10)	3.72 (P<0.01)
Repair Treatment B	64.18 (P<0.001)	1.18 (P<0.05)	3.57 (P<0.001)
Repair Treatment C	67.48 (P<0.05)	1.25 (insignificant difference)	3.72 (p<0.01)
Oxidized Keratin Gel	89.93 (P<0.01)	1.49 (P<0.01)	5.44 (p<0.05)
Repair Treatment D	75.37 (insignificant difference)	1.32 (insignificant difference)	4.42 (insignificant difference)

a P values and insignificant differences are reported, in brackets, and are between the original hair and the processed hair and between each treatment and the processed hair.

Table III: Tensile Measurements for Hair Sample III, Unprocessed with Oxidized Keratin Gel and Repair Treatments E & F

Sample	Peak Force (gF)	Work at 25% extension (mJ)	Total energy (mJ)
Hair III as received	119.09	0.69	2.11
Oxidized Keratin Gel Treatment	106.35 (P<0.05)	0.66 Insignificant difference	1.86 insignificant difference
Treatment E	90.97 (P<0.001)	0.63 (P<0.01)	1.21 (P<0.001)
Treatment F	97.51 (P<0.001)	0.59 (P<0.001)	1.65 (P<0.01)

Table IV: Tensile Measurements for Bleached Hair Sample III, Oxidized Keratin Gel and Repair Treatments E & F

Sample	Peak Force (gF)	Work at 25% extension (mJ)	Total energy (mJ)
Hair III as received	119.09	0.69	2.11
Hair III Bleached	102.55 (P<0.01)	0.65 (P< 0.05)	1.49 P<0.01)
Oxidized Keratin Gel Treatment	112.20 Insignificant change compared with bleached hair	0.68 Insignificant change	1.96 (P<0.01)
Treatment E	94.65 insignificant change	0.58 (P<0.05)	1.58 insignificant difference
Treatment F	91.26 (P<0.05)	0.58 (P<0.05)	1.42 insignificant difference

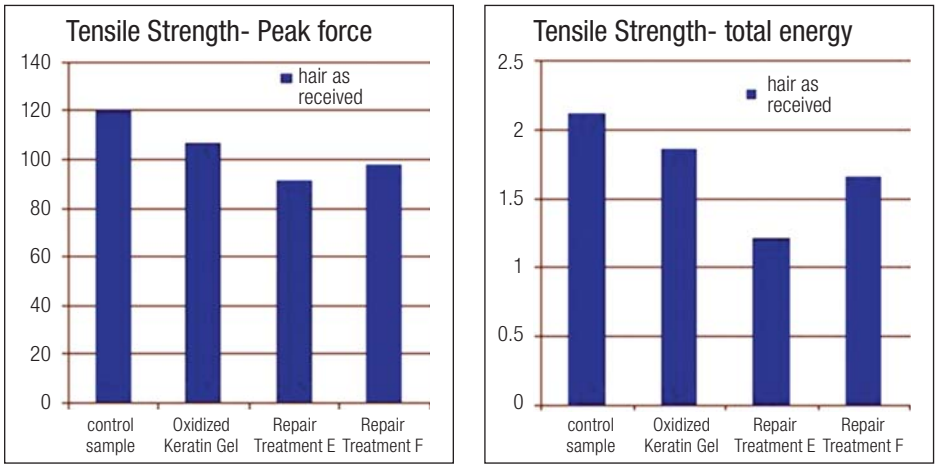

Figure 1: Hair III, as received, with repair treatments

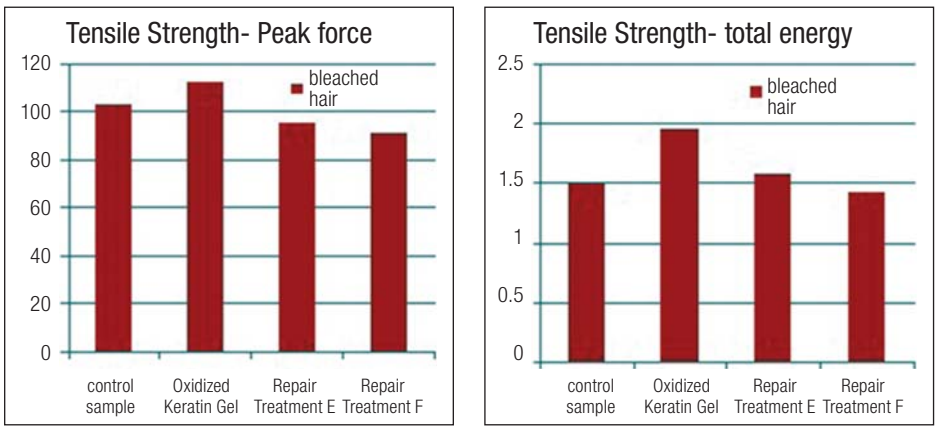

Figure 2: Hair III, bleached, with repair treatments

Durability Testing of Oxidized Keratin Treatments using Hair Sample IV

Treating the hair (sample IV) with Oxidized Keratin gave rise to a 13% increase in hair strength when considering peak force. This increase is significant at the 99% level. The impact of the Oxidized Keratin declined over the 10, 20 and 30 washes. After 30 washes the influence of the Oxidized Keratin was no longer evident. The hair appears to have deteriorated beyond the original point; however some reduction in hair strength could be expected due to the repeated washing and blow drying process.

The process of bleaching and then perming the hair had a hugely detrimental impact with a reduction in hair strength of more than 50%. Applying Oxidized Keratin to the damaged hair led to a 26% increase in hair strength. At 10 washes the strength appeared to increase even further though this trend is not statistically significant. The impact of Oxidized Keratin reduced over subsequent washes, and at 30 washes the hair strength had declined to a value equivalent to that of the initial processed hair.

Table V: Durability of Oxidized Keratin Treatment on Unprocessed Hair IV

Sample	Peak force (gF)	Energy at 20% of extension (mJ)	Total energy (mJ)
Unprocessed hair IV	106.88	1.27	7.59
hair IV + HR	120.65	1.48	8.05
hair IV + HR + 10 Washes	110.42	1.38	7.56
hair IV + HR + 20 Washes	112.42	1.38	8.14
hair IV + HR + 30 Washes	97.07	1.19	6.94

Table VI: Durability of Oxidized Treatment on Hair IV Permed and Bleached

Sample	Peak force (gF)	Energy at 20% of extension (mJ)	Total energy (mJ)
Unprocessed hair IV	106.88	1.27	7.59
Hair IV Bleached 6% 2 x & Perm 3x	48.92	0.41	2.54
Bleached 6% 2 x & Perm 3x + HR	61.87	0.57	4.09
Bleached 6% 2 x & Perm 3x + HR + 10 Washes	68.26	0.54	4.25
Bleached 6% 2 x & Perm 3x + HR + 20 Washes	60.32	0.55	4.40
Bleached 6% 2 x & Perm 3x + HR + 30 Washes	57.49	0.43	3.76

Visual and Sensorial Testing

A panel of hair stylists were asked to compare seven pairs of tresses where one of the tresses had been treated with Oxidized Keratin. The hair was a range of types and the pairs of tresses were unlabelled and randomly arranged. All of the hair tresses had been processed through bleaching, perming and/or dyeing. The results are tabulated in Table VII (on next page). For parameters that included both visual and sensorial factors the results were strongly in favour of the hair treated with oxidized keratin. There was a significant improvement in hair damage indicators such as frizz, ends damage and shininess.

Overall, the results show that for hair wet strength, the Oxidized Keratin gel performed at least as well as, and in many instances better than, the five brands of commercial hair repair systems that were trialled. The durability of the treatment was shown to last between 20 and 30 washes.

Combining Oxidized Keratin Gel into a treatment that also included conditioning agents and emollients afforded an overall improvement in sensorial and visual properties when compared with untreated hair, for hair that had previously undergone a variety of hair processing regimes.

In attempting to explain the process by which the Oxidized Keratin increases hair strength and reduced apparent damage, we can consider some of the

Table VII: Expert Panel Assessment of Oxidized Keratin Gel Treatment System versus non-rescued samples. Preference between sample pairs

Hair parameter	% hair with NO Oxidized Keratin	% hair with Oxidized Keratin	% Could not determine between two treatments
Better Condition	0	98.5	1.5
Stronger Ends	0	100	0
Shinier	1.5	97	1.5
Nourished	0	100	0
Softer	0	100	0
Silkier	1.5	98.5	0
Drier Ends	100	0	0
Most Damaged	98.5	0	1.5
Most Frizz	100	0	0

previous research with sulphonated keratins. Attaching a fluorescent dye to the sulphonated groups of the IFPs and peptides has identified the ability of the smaller molecules to penetrate to the centre of the hair fibre and the ability of the larger molecules to form a durable coating on the surface of the fibre (Figure 3). As part of this study, SEM photos were taken of the Oxidized Keratin treatment and compared with the original untreated fibre. The results, shown in Figure 4, clearly show their presence on the surface of the fibre, obscuring the cuticle cell structure. As the size of the oxidized keratins is intermediate to that of the IFP and peptides, it is likely that some of the molecules are also able to penetrate the fibre.

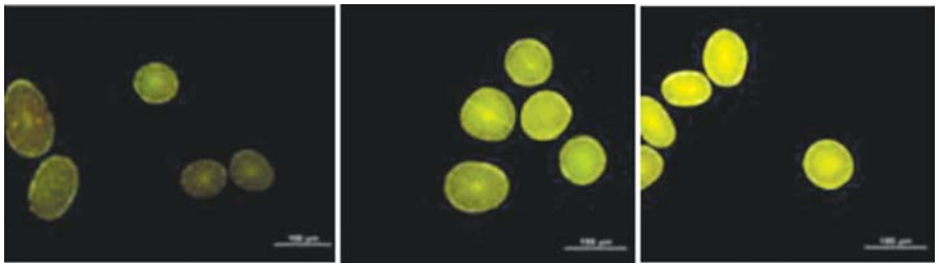

Figure 3: a) Relaxed hair fibres b) With fluorescent labelled sulphonated IFP c) With Fluorescent labelled peptides (Scott et al., 2009)

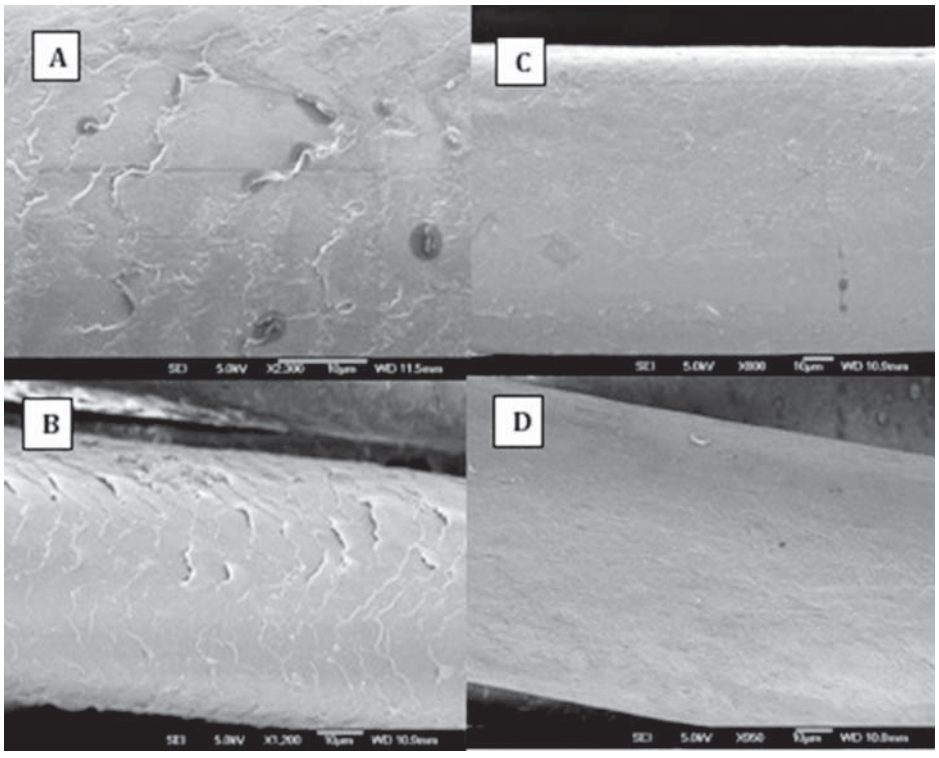

Figure 4: A, B: Hair fibres before and C, D: After oxidized keratin treatment

The homology between wool keratins and hair keratin is very high. This attribute will facilitate the formation of salt bridges between the amino acids within the oxidized keratins and those in the hair fibre. Both the ability to surround and impregnate the fibre and the anticipated degree of attraction between the oxidized keratins and the hair keratin molecules can explain the ability of the keratins to improve hair tensile strength and the durability of the treatments.

Conclusions

A simple treatment of Oxidized Keratin compares favourably with several commercial hair repair treatments in terms of improving the tensile strength of the hair. Durability testing indicates that treatment maintains some effect out to 20-30 washes. When the Oxidized Keratin has been combined with conditioning ingredients there is a very clear improvement of both the sensorial and visual properties of the hair.

The ability of Oxidized Keratin to improve hair strength is attributable to an ability of the keratins to both impregnate and coat the hair fibre, together with the high degree of homology that wool keratins have with hair keratins.

Combining the positive results for hair of Oxidized Keratin described in this paper, with the previously published beneficial effects of Oxidized Keratin should make it an attractive ingredient for inclusion in hair treatments for the benefit of both hair and scalp.

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