

Science Behind Beauty

CTPA and SCS Media Event
12 May 2015 – Royal Society of Chemistry, London

The Cosmetic, Toiletry and Perfumery Association (CTPA) and the Society of Cosmetic Scientists (SCS) are co-hosting this event. CTPA is the voice of the cosmetics and personal care industry in the UK, representing manufacturers, brand owners, distributors, ingredient suppliers and service providers; from SMEs to multi-nationals. CTPA's primary goal is to promote good working practice to ensure that consumers are provided with the very best products. The SCS is a body whose membership is cosmetic scientists from every discipline including those who make products and those that provide expert opinion; two key aims of the Society are education and promoting science.

The CTPA/SCS-hosted event looks at the science behind long-lasting, effective products that are safe to use; with introductions from **Dr Chris Flower**, CTPA's Director-General and **Dr Emma Meredith**, Director of Science, CTPA & President, SCS and presentations from:

Steve Barton – Director, Skin Thinking Ltd & Vice President, SCS *'The skin, the ingredients, the products and their claims'*

Sam Farmer – Brand Owner, Sam Farmer *'Concept to final formula – selling sound science'*

Dr Barbara Hall – Director, SURECONSULT Ltd *'Chemicals, cosmetics and misconceptions'*

Panel Q&A

The speakers are all experts in their field and passionate about the industry and science. Steve brings a wealth of R&D experience and claims support; Sam has pioneered a unisex range for teenagers; and Barbara has spent many years safety assessing cosmetic products. All are great communicators, having presented on many occasions at scientific and industry events.

Speaker Summaries

Steve Barton, Director, Skin Thinking Ltd

The skin, the ingredients, the products and their claims

The cosmetics industry has a long and proud history of using science to ensure the safety and enhance the efficacy of cosmetics and personal care products. Advances in research into the physiological interactions of our products with skin, hair, teeth and nails have had many consequences.

Skin – We need skin to keep our precious internal organs protected from the threatening outside world. A key physiological process involves constantly sensing and responding to the environment to create a really effective barrier. Very few molecules actually penetrate this barrier and pharmacologists resort to sophisticated topical patches to overcome this for simple drug molecules like nicotine.

Ingredients – Understanding how ingredients interact with these physiological processes helps provide clues to beneficial effects and also helps to ensure safety of our ingredients. However we don't put individual ingredients on the skin – we make products.

Products – Cosmetic products are carefully formulated to ensure ingredients are delivered safely to the appropriate site on the skin or hair and designed to achieve a desired benefit. More importantly, products also need to be pleasurable to use – one of the most essential benefits required.

Claims – What is stated on a pack or an advertisement is not left to chance. Gathering all this knowledge to assemble a body of evidence for our products is a key part of product development. Most importantly performing tests on people helps ensure that our claim will be credible.

Sam Farmer, Brand Owner, Sam Farmer

Concept to final formula – selling sound science

R & D - the product development process, from concept to final formula, production and launch. How the industry creates checks and balances at every stage of the process to deliver a new product. This will draw on my personal experience of studying the SCS Diploma on Cosmetic Science and developing a new cosmetic product brand and range, working with formulators and manufacturers.

The innovation game - choosing appropriate ingredients for products using education, historical evidence and science.

The consequences of misinformation - the detrimental effect of misinformation in cosmetic science on the upcoming generation. This will be based on my frequent engagement with my customers and their parents – often concerned by things they have read and heard about ingredients and products.

Chemicals, Cosmetics and Misconceptions

Cosmetics are unique amongst consumer goods in that their use is daily, life-long, intimate and multiple: it is not unusual for an individual consumer to use up to twenty different products every day. To be truly successful, a cosmetic product must possess an almost impossible number of attributes: not only must it look, smell and feel good, but throughout its use-life it must withstand an assault of microorganisms while remaining stable even at extremes of temperature and use conditions.

However, the most important ingredient of a cosmetic product is its safety in use and in today's complex market of the myriad of cosmetic products, used by all sections of modern populations, cosmetics are still amongst the safest consumer goods (*Report on simplification of the "Cosmetics Directive", COM, 2008*).

Safety evaluation of cosmetics is carried out by a qualified safety assessor who needs to consider all safety-related aspects of the product, from toxicological profile of the ingredients to skin compatibility and acceptability of the finished product. It is also the safety assessor's responsibility and personal engagement to finally sign the Cosmetic Safety Report that permits product launch in the marketplace.

In my presentation I will explain typical stages of safety evaluation of a cosmetic ingredient by introducing the basic concepts of toxicology: definition of a poison and the difference between hazard and risk and I will point out the safety assessor's skills necessary to, for example, correctly evaluate study reports. I will also mention the cosmetics industry's flagship study on consumer exposure to cosmetic products in Europe.

Amazing Science, Applied Daily!

A whole team of scientists develop, manufacture and market each cosmetic product. From concept to final product the sequence will include basic biological research into specialist ingredients, formulation development and checking, efficacy testing, scaling up to manufacturing from laboratory development, packaging, further efficacy testing, safety assurance and regulatory compliance. Each and every step involves many different scientific disciplines. Indeed, there are few scientific disciplines that would not find a role somewhere in the complex symphony of activities that turns a concept into a new cosmetic product. These are just some of the steps involved and the questions being asked.



Responsible manufacturers invest their reputation in their brands, building trust with loyal customers and relying on customer satisfaction for success. Fundamentally, that trust is based on delivering products that are safe, effective and of high quality.

Robust Regulatory Framework

Cosmetic products manufactured in or imported onto the UK and European market are covered by **strict safety legislation** – the EU Cosmetics Regulation ((EC) No. 1223/2009). The main aim of the Cosmetics Regulation is consumer safety. The legislation also sets out a clear definition of a cosmetics product:

“A product intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odour.” [Article 2].

The manufacturer, supplier or importer of a cosmetic product is responsible for ensuring it is safe and legal, and each cosmetic product must be assessed for safety by an appropriately qualified safety assessor, as laid out in the Cosmetics Regulation, before being placed on the market. This safety assessment covers the finished product, all of the individual ingredients, the manufacturing process, the way the product is to be used, how often, where and by whom. This includes all cosmetic products for use at home and in the professional setting, such as in hair and beauty salons.

The law also controls what may or may not be put in a cosmetic. There are lists of substances that must not be present and lists of substances that may be used as ingredients subject to particular restrictions. In addition, certain classes of ingredients (colours, UV filters and preservatives) are part of positive lists, so only those individual ingredients pre-approved and listed in the Cosmetics Regulation are allowed for these purposes. As well as this, there are robust processes in place so that cosmetic ingredients and their safety are kept under constant review by the European Commission and EU countries, assisted by the Commission’s independent scientific expert committee (the Scientific Committee for Consumer Safety, SCCS).

There is a legal requirement for all of the ingredients added to a cosmetic product to be labelled on-pack, and the ingredients are listed in descending order of weight at the time they are added to the cosmetic product. This list is for people who have been professionally diagnosed with an allergy, so that they can avoid the ingredients to which they are allergic. To avoid having to know ingredient names in many different languages, many years ago the industry agreed on a common naming system called the International Nomenclature for Cosmetic Ingredients, or INCI. The same ingredient names are used in every European country and most countries worldwide.

As well as ensuring safety, the Cosmetics Regulation also requires that any claim made by a product must be substantiated. To make a claim for product efficacy requires a significant body of evidence. Companies will have made sure that test data are based on sufficient and statistically viable numbers. In addition to these legal requirements under the cosmetics legislation, claims made by cosmetic products in advertising are subject to other strict controls. In the UK this is overseen by the Advertising Standards Authority and by Clearcast, which pre-clears all television advertising in the UK.

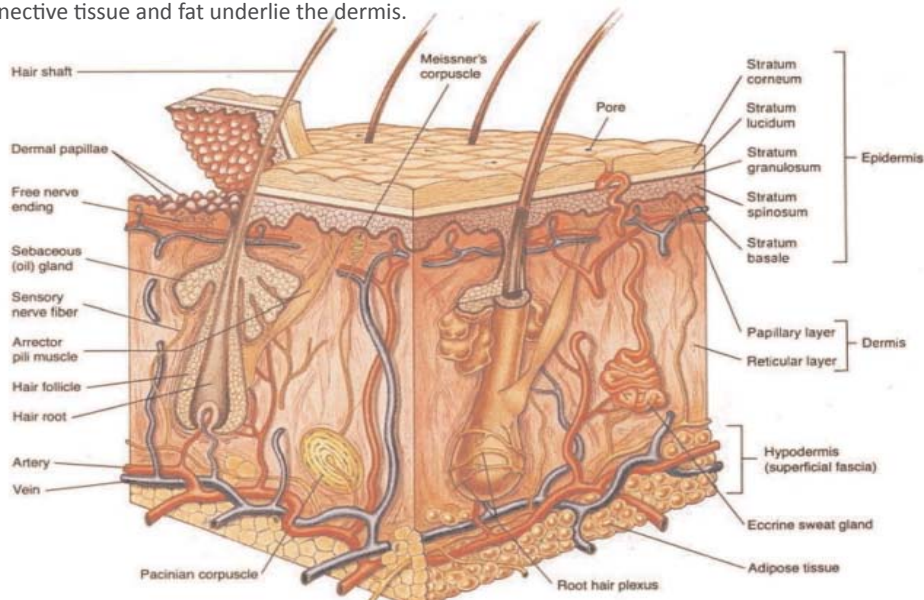
The Skin – a Barrier Not a Sieve!

Aims

The skin covers our entire body, and through it we project our image to other people. It reflects our age and state of our health. Skin is the organism’s first defence barrier, and as such it is subject to constant aggressions that can succeed in upsetting its structural balance. Healthy skin is determined by the structure and proper function of its components. To maintain healthy skin, and slow the rate at which it ages, the structures and functions of the skin must be supplemented and protected. In order to know how to supplement and protect the skin, it is important to know more about the skin’s basic anatomy and composition.

1. SKIN STRUCTURE & FUNCTION

Skin is the outermost tissue of the body and the largest organ in terms of both weight and surface area. As seen below, skin has a very complex structure that consists of many components. Skin comprises the dermis, a layer 3mm to 5mm thick, and the epidermis, which varies in thickness from about 0.06mm on the eyelids to 0.8mm on the palms and soles. The dermis contains blood vessels, hair follicles and sweat glands, whereas the epidermis is composed of four layers of densely packed keratinocytes (skin cells) in various stages of development. Loose connective tissue and fat underlie the dermis.



Skin performs a wide variety of functions resulting from reactions inside these components. The major function of skin is to act as a barrier to the exterior environment. It protects the body from friction and impact wounds with its flexibility and toughness. Harmful chemicals, bacteria, viruses and ultraviolet (UV) light are also prevented from entering the body by the skin. It also prevents water loss and regulates body temperature by blood flow and evaporation of sweat. These functionalities are critical to our well being. Furthermore, skin has a large amount of nerve fibres and nerve endings that enable it to act as a sensory organ. When the skin is exposed to sunlight, it can produce vitamin D, which is essential for the growth and maintenance of our bones.

Therefore skin is complex and multifunctional, containing many specialised cells that are adapted to different functions (Table 1).

| Structure | Functions |
|--------------------------------|---|
| Stratum Corneum or Horny Layer | Barrier protection against unregulated loss of salt and water and entry of particles (e.g. chemicals, microbes) |
| Keratinocytes | Adhesion, cytokine production, keratin production, production of vitamin D |
| Basal cell layer | Reduplication and repair |
| Langerhans cells | Immunological defence |
| Melanocytes | Protection against ultraviolet radiation |
| Basement membrane | Adhesion of epidermis to underlying zone supporting dermis |
| Dermis and subcutaneous fat | Strength with suppleness, shock absorption, insulation |
| Blood vessels | Delivery of nutrients and removal of waste; temperature regulation |
| Eccrine sweat glands | Temperature regulation |
| Apocrine sweat glands | Production of pheromones |
| Sebaceous glands | Waterproofing and moisturising |
| Fibroblast cells | Synthesis of collagen, elastin, collagenase, fibronectin |
| Phagocytic cells | Engulf and destroy bacteria |
| Lymphocytes | Immunological defence |
| Mast cells | Immunological defence, production of histamine |

Table 1 How different components of the skin contribute to overall function

1.1 The Epidermis

The epidermis is the outermost layer of the skin. It is the first barrier between you and the outside world. The composition and thickness of the epidermis vary depending on the location on the body. This outer surface of the skin contains several layers — the basal cell layer, the spinous cell layer, the granular cell layer and the stratum corneum .

The deepest layer of the epidermis is the basal cell layer. Here, cells are continually dividing (mitosis) to produce new skin cells. These cells move towards the skin surface, pushed upward by the dividing cells below them. Cells above the basal cell layer become more irregular in shape and form the spinous layer. Above this, cells move into the granular layer. As they mature, keratinocytes flatten out and move upward. Eventually, at the end of their life cycle, they reach the uppermost layer of the epidermis called the stratum corneum (SC). Dead cells from SC continuously slough off (desquamation) and are replaced by new ones coming from below. This is balanced by the dividing cells in the basal cell layer to produce a state of constant renewal. The skin completely renews itself about every 28 days.

In the very outer layers of the SC, the barrier has a slightly acidic pH (4.5 to 6.5).

1.3 The Dermis

The dermis is the deep layer, forming the main bulk of the skin. The dermis is the layer responsible for the skin's structural integrity, elasticity and resilience. The key types of cells in the dermis are fibroblasts, which synthesise collagen and elastin and other structural molecules. Both collagen and elastin are critically important skin proteins: collagen is responsible for the structural support and elastin for the resilience of the skin. Elastin and collagen are the keys to healthy skin and a youthful appearance. But the presence of these skin proteins is not enough, the dermis also has to have appropriate fillers, these fillers give the skin its mechanical cushioning and retain moisture. The main skin matrix fillers are glycans (a type of glucose based polymers that include glycosaminoglycans and proteoglycans). The most well known example of glycosaminoglycans is hyaluronic acid (otherwise known as hyaluronan, hyaluronate or HA). Hyaluronic acid is known to play a vital role in the hydration of tissues since it carries with it a large volume of water.

Extract from Module 1 of the Distance Learning Course in Cosmetic Science (www.cosmeticlearning.com). 'Skin Biology', prepared by Paul Mouser. Reproduced with kind permission of the SCS.

To find out more about cosmetic products and their ingredients visit the CTPA's consumer website:



The CTPA's consumer website www.thefactsabout.co.uk aims to provide factual advice, best tips (for example applying sunscreen and using hair colorants) and information on the science behind the products we use and enjoy daily. There are also sections on the legislation, ingredient labelling and a comprehensive section on allergy including an easy-to-follow allergy infographic and factsheet. There is also commentary from external sources such as the Royal Society of Chemistry and Sense About Science and dedicated sections on body confidence and baby care with a useful parents' guide to cosmetics.

SCS Diploma

The SCS Diploma Course is an industry-recognised qualification in the essentials of Cosmetic Science. The course is in a modular format with units written and assessed by experts in the industry. For some units, specially designed practical activity kits are available to enable students to undertake important practical work at home.

Topics studied include: foundations in chemistry, physiology, biochemistry and microbiology; key functional roles of development, production, packaging and marketing; stability testing, microbial preservation, quality assurance, legislation, safety assessment, performance evaluation and market research; specific product categories such as hair, skin and oral care, colour cosmetics, aerosols and perfumes.

Find out more at: www.cosmeticlearning.com

To find out more about cosmetic products and cosmetic science take a look at these websites:

- www.ctpa.org.uk
- www.scs.org.uk
- www.ctpa.org.uk/regulation
- www.ctpa.org.uk/educationresources (<http://www.ctpa.org.uk/content.aspx?pageid=298>)
- www.scs.org.uk/careers (<http://www.scs.org.uk/content.aspx?pageid=460>)
- www.cosmeticlearning.com
- www.thefactsabout.co.uk



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