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Ingredients Present In Personal Care Products That Need Scrutiny

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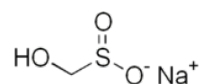
Opinion

The title addresses an issue which I feel is pressing and I give three examples of areas which need positive action.

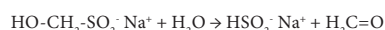
Formaldehyde in hair cosmetics

Formaldehyde is a Class 1 carcinogen; the maximum amount permitted in a cosmetic product as a preservative is 2000ppm. It comes as a surprise that many products sold worldwide to remove artificial colour from human head hair are based on

Sodium Hydroxymethane Sulphinate



This compound is a commonly used reductant in the textile industry, being used for the vat dyeing and discharge printing of cotton. It is commonly known as Rongalit [BASF]. It functions by forming the potent sulphinate reductant in the following manner:



The hair colour removal products available on the high street include, ColorB4, Louise Galvin Colour Remover, Rusk and JoBaz, all advertise that they contain sodium hydroxymethanesulphinate (INCI name sodium oxymethylene sulfoxylate, CAS No 149-44-0), which is permitted for use as a reducing agent in the EU cosmetic directive. The previous chemical equation indicates that formaldehyde has to be released in a proportion of 25% of the original weight used. A quick calculation reveals that a typical application of 200ml of the product to a human head would release 12,500ppm formaldehyde – bearing in mind that the maximum level of formaldehyde, a Class 1 carcinogen, permitted in a cosmetic product as a preservative is 2000ppm then something is clearly wrong with this system. The quantity of formaldehyde gas that is emitted from the product when applied to the hair is above the 2ppm workplace exposure limit - particularly applicable when product is used in salons by hairdressers. Our own Dräger-Tube tests on a small quantity of the ColorB4 product indicate measurements above 3ppm (in the vicinity of the hair), which as one may appreciate is present when the entire packet of product is normally used. It is worth nothing that the majority of the formaldehyde will form and remain as solution on the head.

The Brazilian Keratin Treatment is a hair straightening process that claims to use keratin-based proteins to naturally smooth and straighten dry frizzy hair. The treatment can be used on frizzy, damaged, unhealthy, dull and mistreated hair to give a shiny, voluminous straight finish. This treatment is applicable to previously bleached, hi-lighted, dyed, permed, or straightened hair and lasts up to 4 months. However, analysis of the Brazilian Keratin Treatment solution have indicated the presence of unacceptable levels of formaldehyde, levels in excess of 10% having been obtained; these formaldehyde levels being much greater than the 0.2% level currently allowed for use in cosmetic formulations. Formaldehyde is a carcinogen and can be easily absorbed by the body through inhalation, ingestion or skin absorption, which has resulted in this product being removed from the market in certain areas. A Californian court in Los Angeles, March 2012, found against Brazilian Blowout (Van Tibolli Beauty Corp.) which had been marketed as formaldehyde-free; the settlement was \$4.5 million.

Hair coloration with so-called oxidative colours

The majority of hair coloration processes are based on oxidation of aromatic amines and phenols on the head using ammonia/peroxide as an activator to bring about complex chemical reactions to actually synthesise the coloured species *in-situ*.

The exact nature of the oxidation reactions has not been fully clarified as the chemistry is complex and the dark pigments finally produced are probably a mixture of substances. A typical example of colour development from a starting mix of complex organic chemicals is shown in the diagram below.

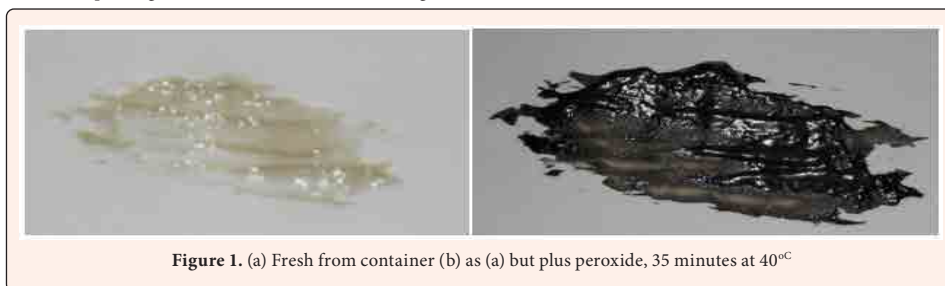


Figure 1. (a) Fresh from container (b) as (a) but plus peroxide, 35 minutes at 40°C



Figure 1, Oxidative hair dye – Majirel No 3 (ex. L’Oreal): (a) just after mixing with developer (i.e. hydrogen peroxide) and (b) mixture left 30 minutes at 40°C

The industry seems to look away from the body of evidence that this method is hazardous to human health. There is a large database covering the carcinogenic and allergenic properties of the aromatic amines. Dr Ian White who is an active independent member of the SCCP/ COLIPA (European Cosmetic, Toiletry and Perfumery Association) has stated that up to 17% of Hair dressers have some form of contact dermatitis associated with oxidative hair dyeing and up to 9% of clients [1].

Unfortunately these allergic reaction can be very severe, leading to hospitalization and even death (UK examples of extreme anaphylactic shock: Ms Tabatha McCourt, aged 17, died 20 minutes after colouring her hair in October 2011; Mrs Julie McCabe, aged 38, in November 2011 died in hospital after using a shop-bought hair dye Preference). There are alternative safer methods to colour hair; for example one can use water-soluble, well-characterised acid dyes; such dyes were originally developed to dye wool which has identical chemical make-up to human hair. The Elumen system offered by Goldwell is actually based on an acid dye/propylene carbonate formulation. The health hazards with such a method of coloration are negligible - in fact no patch test to ascertain allergic reaction is necessary. In addition by following this path the salon ensures the client’s hair stays in excellent condition which is quite opposite to the situation which prevails when using oxidative dyes – in this latter case the alkaline peroxide treatment conditions required to generate colour damages the hair severely – dryness, lack of shine and hair-thinning are just some of the disadvantages experienced by the client (note these outcomes will apply to some 90% of the hair coloration customers worldwide).

Sodium lauroyl sulfate and sodium laureth sulfate in shampoos and toothpastes

There is much anecdotal and some scientific evidence that these common surfactants present in the majority of shampoo and toothpaste products cause irritancy which can manifest itself as dandruff, psoriasis, eczema or mouth ulcers.

A typical skin irritation outcome is shown below in Figure 2:



Figure 2: Typical skin irritation attributed to SLS and SLES use

It is likely that, in addition to readily passing through the skin barrier, the laureth sulfates, and other alkyl sulfates, are chemically reactive to skin and keratin proteins – possibly even DNA – the sulfate group is well-known to organic chemists as being capable of reaction with nucleophilic sites such as amines, thiols and hydroxyls, thus permanently modifying them. These nucleophilic sites are present in enzymes and in DNA. Any chemical modification of these essential body-function materials will result in a strong immune response; such a response may result in dandruff or even severe eczema.

References

1. McFadden JP, White IR, et al. (2007), *Cosmetic Dermatology: Products and Procedures*. In: Zoe Diana Draeos (Eds), 2nd (edn.), Wiley Blackwell, US, *Brit Med J* 334: 220.