

## LETTERS TO THE EDITOR

### Evaluation of Barrier Creams: An *In vitro* Technique on Human Skin

Sir,

May I be permitted to respond to the article by Treffel et al. (1) in your excellent publication. I read this article with considerable interest and agree with the conclusion that barrier creams should be used with caution, perhaps even more so than the authors suggests.

The evaluation technique describes how effective a cream might be *in a laboratory test*. However, it does not take into account actual working conditions. In my experience these play a major role in the probability that the cream will provide any protection.

Some of the factors that will influence the effectiveness of the cream are:

1. *Loss of skin cells due to abrasion*
2. *Effect of chemicals on the skin*

In the method described the chemical was in contact with the skin in a "static" condition, i.e. there was no significant movement between the chemical and the surface of the skin. In practice this will seldom be encountered. Almost certainly there will be some form of relative movement between chemical and skin, resulting in what might be described as a "washing" action.

This could have the effect of removing some – or all – of the cream together with skin cells. As far I am aware no method of evaluating this has yet been published.

3. *Pressure on the skin*

When one uses tools or handles components, pressure will be applied to the surface of the skin. If a substance is present on the skin, it is conceivable that this will be forced into the skin, thereby penetrating any protective layer formed by the cream.

4. *Usage*

The effectiveness of these creams will depend very largely upon the correct application by the user. This is an area where, in practice, many problems arise.

Taylor (2) demonstrated that when washing their hands most workers regularly miss certain areas. A similar, very basic study which I carried out some years ago suggested that when one applies a skin protection cream the same is true. Thus, even were the cream to be effective in itself, penetration could and will occur over those areas not coated by the cream. An analogy could be drawn with the provision of rubber gloves with holes cut in them!

It might prove beneficial for these creams, therefore, to be coloured so that the worker has a visible indication of the presence of the cream on the skin. Whether this would be cosmetically acceptable is another matter.

5. *Changes in substances in use*

Other factors will affect the performance of the cream. Krbek & Schäfer (3) showed how metalworking fluids split into separate oil and water phases when present in droplets on the skin. A second study (4) showed the effects that this had on the barrier cream with the oily phase "punching" holes in the layer of cream.

Most substances present in the workplace will be mixtures of different chemicals. It is not uncommon for significant changes to take place during their use. What effect will changes in relative humidity and in temperature have? Does increased sweating affect the performance of the cream?

In short, without wishing to disparage the work described in the article, can I suggest that the whole topic is far too complex to permit the "evaluation" of these creams in a laboratory? I believe the level of complexity is such that the construction of a scientific test to establish their performance under realistic conditions is likely to prove extremely difficult.

## REFERENCES

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## In Response to the Letter by Packham

We appreciate C. L. Packham's interest and valuable comments regarding our article. We agree that the simple technique presented does not take into account the hard conditions encountered during everyday work.

In designing this model, we had in mind a first step in the development of a future barrier cream, that is the prevention of the penetration of a foreign compound and the need for screening many different formulations. A rationale for the use of skin in vitro must take into account the interactions between the horny layer and the test product.

Most of the observations made are based on the consequences of movement during work:

- loss of skin cells due to abrasion
- contact of chemicals with moving skin
- pressure during handling
- changes in chemicals during use.

Testing of these factors is difficult to set up in the laboratory environment, although for example the influence of pressure has been shown to modify to a certain extent the penetration of a chemical into the skin (1). Clearly, a test under working conditions is required here.

Correct usage is a matter of education. The problem of cosmetic acceptance is crucial in our eyes. There is a need to screen many different formulations before going on with further tests. The results will be a compromise between cosmetic properties and specific protection against a given class of chemicals.

We agree that the level of complexity is extreme and consequently there are many possible approaches (2–4). The concept

of skin protection integrates not only barrier creams but also proper skin cleaning and skin care (5, 6). In a very near future, we will submit for publication in this journal the results of further experiments conducted in vivo, where we found dramatically decreased levels of protection compared to the in vitro results.

A lot of further work is needed and the ultimate proof of efficacy will be given only by suitable trials under different working conditions.

## REFERENCES

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