"The challenge faced by the personal care industry in developing alternatives to animal testing"

An interview with Carl Westmoreland by Evita Vandenbossche

Short Bio

Carl Westmoreland is the director of science and technology at Unilever's Safety Environmental Assurance Centre with an ambition to drive the development of safety assessment to no longer depend upon "traditional" animal toxicology studies. Carl first started working in this area as head of the *in vitro* models group at GlaxoSmithKline which aimed to use *in vitro* toxicology techniques during the drug development process. Since working at Unilever Carl has been involved in alternatives to animal testing in a broader way, considering not only *in vitro* methods but also contributions by chemistry, exposure science, mathematics, informatics and modelling. Outside of Unilever Carl is also the chairperson of the NC3Rs studentship panel.

Main Text

The following are some of Carl's insights on *the challenge faced by the personal care industry in developing alternatives to animal testing*.

There are many drivers to assure consumer safety of ingredients in personal care products without the use of animals, including both societal and regulatory (e.g. the EU Cosmetics Regulation, Indian Drugs & Cosmetics Act etc.) aspects, which poses the challenge of: how can we complete a safety assessment without the use of such data? First steps to the solution have already been addressed by the development of OECD Test Guidelines based on methods such as EpiSkin and EpiDerm assays, which replace the traditional *in vivo* OECD Test Guideline for skin irritation and other local toxicity endpoints.

A bigger challenge still remains in the assessment of systemic toxicity, including reproductive, developmental and carcinogenic toxicity. This is a very active field of research and new approaches are emerging on how non-animal approaches will be used to characterise hazard for risk assessments. Traditional toxicology studies have determined the critical doses by generating parameters such as NO(A)ELS and LO(A)ELS and then combined with anticipated exposure to determine risk. It is clear that non-animal studies won't characterise the hazard of a material by generating exactly the same parameters.

The way this is currently being approached is by developing *in vitro* methods that use human cells and *in silico* models that are based on biochemical pathways which are known to be relevant to man (often referred to as 'toxicity pathways' or 'adverse outcome pathways'). The use of these new, pathways-based approaches are poised to inform human safety risk assessments just as well as traditional studies. This same concept is also being applied for use in ecotoxicology assessments by using cells and models based on the species of interest.

Currently, if a new cosmetic ingredient is novel the challenge of systemic toxicity remains large and uncertain. However, if the material has some data available, be that from history of use, read-across or historical animal studies, it may be possible to address the remaining data gaps using some of these novel pathways-based approaches. A particular challenge for many of these new approaches is

understanding the dose response information obtained *in vitro*/*in silico* and the relevance of these doses to the *in vivo* situation in humans

The use of alternatives to animal testing is not purely for the risk assessment of cosmetic ingredients, the potential use of these methodologies is much broader as human biology is quite indifferent as to whether a chemical is a “cosmetic”, “drug”, “food” or “pesticide”.

Novel approaches can at times be met with some cynicism, partly due to the familiarity and comfort with our traditional approaches. There is also some reluctance to venture into the use of assays which are not currently accepted by the regulators. However, thanks to the advancement in mechanistic safety science, regulators across the globe are increasingly involved with the development and evolution of pathway-based risk assessments.

Clearly there is a lot of room for collaboration, so it’s no surprise that there are several organisations which are trying to facilitate this, such as EPAA, NC3Rs, HTPC, Cosmetics Europe as well as EU-funded research (e.g. SEURAT-1 and EUToxRisk) and a significant research programme in the US (ToxCast, Tox21). Something unique to this area of research is the cross-industry (and cross-sector) collaboration, due to the common interest that any new approaches for assuring safety are based on sound science.

The future of toxicological risk assessment is likely to increasingly leverage multi-disciplinary teams, including experts in chemistry, mathematics, informatics and mechanistic biology as well as experts in toxicology.

EPAA	European Partnership for Alternative Approaches to Animal Testing
SEURAT-1	Safety Evaluation Ultimately Replacing Animal Testing
NC3Rs	National Centre for the Replacement, Refinement & Reduction of Animals in Research
HTPC	Human Toxicology Project Consortium
NO(A)EL	No Observed (Adverse) Effect Level
LO(A)EL	Lowest Observed (Adverse) Effect level
OECD	Organisation for Economic Cooperation and Development