



Using chemistry to reduce animal testing

Key words

cosmetics
testing
industry
analysis

Fifty years ago it was considered quite acceptable to use animals in scientific studies for new medicines, new cosmetics and general scientific research. However, times have changed and many people now feel that this is ethically unacceptable and so have turned to science for solutions.

Two years ago it became illegal to conduct any animal testing for cosmetics across the whole of the EU (although it is still a legal requirement for new medicines from the pharmaceutical industry). So, if they are not allowed to use animals to check our products are safe, how can they do it? This is where recent scientific developments have played a role, by designing alternative methods to decide if a new chemical is safe enough to be used in items such as make-up, deodorants and household cleaning products.



A laboratory rat: testing cosmetics on animals is now no longer acceptable and chemists are helping to find alternatives.

Devising new products

There are several ways a company can manage to create a new product and be sure it is safe without using animals. The simplest of these is sticking to ingredients that have been around for a long time where we know they are alright to use. In these cases the company must somehow 're-design' the formulation to make it seem new and exciting even if the ingredients are all the same.

However, if a company wants to be really unique they need to add new ingredients, perhaps to help the product last longer, such as with a hair dye, or have a novel effect, such as a new anti-wrinkle cream. In these cases the company must still prove the chemicals are safe without actually testing them on animals. In a bid to create suitable alternatives, scientists have been working hard to develop an array of alternative methods using biology, chemistry and, more recently, computers, which provide data that they can analyse to decide if a chemical is safe or not.



Chemists have created a reaction database to help predict how other chemicals will react.

Chemistry has played a major role in this explosion of ideas and methods, both directly by helping scientists understand how new ingredients react with chemicals in the body and, indirectly, by creating a 'reaction database' that computer simulations can use to analyse new reactions. Now it is possible to watch chemicals react using modern techniques such as spectroscopy, chromatography and calorimetry. Scientists can then understand how things react and, more importantly, why they react. Once they know this information then they can design chemicals that are unreactive in the body which makes them safe to use.



Make-up has to be safe to use and can no longer be tested on animals

Through the skin

In some cases it is more important to know if the new chemicals even get into our systems in the first place so if you use make-up on your skin you need to be sure it doesn't sink through your skin layers and end up in your blood stream. This is known as transdermal permeation and for household products must be avoided at all costs. Obviously in some products permeation is necessary, such as pharmaceutical products including pain relief creams and nicotine patches, but for everyday items including shower gels and shampoos permeation is undesirable.



Chemicals from shampoo and other cosmetics should not be absorbed into the body.

Scientists traditionally applied these products to animal skin and took blood samples to see if the compound had made its way into their system but in recent years it has become acceptable to apply a new chemical to a skin mimic and see how much gets through and how fast.

Computer tests

When a chemist discovers a new compound then they will firstly spend time working out its structure, figuring out which elements it is made of and how they are bonded within the compound. Then if they slightly change the structure they can re-evaluate the compound and see if it reacts differently. This is known as a structure-activity relationship and is the basis for most computer simulation programs. Breaking up a large molecule into its smaller parts and then identifying which parts of the molecule produce which effects allows scientists to predict the behaviour of any molecule you can imagine making.

The replacement of animal testing is a slow process for industry, and although some alternatives have already been introduced for cosmetics there is still a long way to go in the pharmaceutical industry. Chemistry will certainly play a major role in the future of developing alternative methods as understanding the reactions that occur is essential for understanding their safety.

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You can read more about Laura Waters life as a research scientist in the article on pages 20-21 of this issue of CATALYST.