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Does Cosmetic Science Rate Highly as a Science?

Cosmetics are a category of consumer products marketed worldwide; their function is to color, cleanse, and beautify the body including skin, hair, and nails. The word "cosmetic" is derived from the Greek

Kosmetikos

meaning:
having the
power to
arrange and
skilled in
decoration.

In the United States alone, there are more than 1,400 domestic

cosmetic manufacturers, which in aggregate use more than 12,500 different cosmetic ingredients and make over 25,000 product formulations.⁶

On occasion, one may come across

extraordinary and sometimes, outlandish claims made for cosmetics.

A typical example would be an anti-aging cream, claiming to make someone look twenty years younger. It is very compelling to witness a person wearing a white coat, presumably a physician,

informing you about certain benefits of an anti-aging, anti-wrinkle, or a wonder cream

based on celebrity results. We

sometimes neglect to

realize that her picture/video could

be enhanced

and

modified utilizing modern photographic manipulation software such as Adobe Photoshop. Unscrupulous manipulation of visual images, used as evidence to substantiate claims, is NOT science at all. In this example, deceptive marketing is to



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blame. There are regulations and laws in place to monitor and prevent this type of false advertising. Done fairly, such photographs must be taken under reproducible lighting conditions in order to make comparative claims.

Whenever a product fails to deliver on its claims it creates doubts in consumers' minds. This is especially true in our industry, and when it happens the public becomes skeptical of all cosmetic claims. Therefore, it is worth pondering whether or not competition amongst rival scientists, marketing zeal, or profiteering ever corrupts our research. As scientists and cosmetic chemists, do we always have the courage of our convictions, education, and training to remain steadfast in our scientific rigor, reporting, and handling of our data? If you want repeat-sales, your product had better live up to its claims. Otherwise, failure in the marketplace is inevitable; and it negatively affects the industry as a whole in immeasurable ways.

Technically speaking, science is defined as an intellectual activity designed to discover information about the natural world in which humans live, and

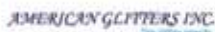
to discover the ways in which this information can be organized into meaningful patterns. Using this definition, does cosmetic science fall in the category of science? In fact, cosmetic science can be identified as: traditional science such as chemistry or physics; borderline science, e.g., the search of extraterrestrial intelligence; or pseudo-science, i.e. not science at all or the science



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of investigating unidentified flying objects.⁴ The popular science writer, Ben Goldacre, wrote an entire chapter, entitled “The Progenium XY Complex,” dedicated to cosmetic science where he described it as “bad science.”⁷ In the paragraphs that follow, reasons will be provided why cosmetic science is not highly rated as a science as well as suggestions to improve its image.

When a formulator develops a new personal care product, he/she attentively takes note of the product’s texture, dry-time, feel after application, stability, and many other required attributes. Whether or not this product delivers the advertised consumer benefits result, such as, moisturization, hydration, anti-aging, or anti-wrinkling properties is sometimes assumed rather than proven/substantiated by suitable methods. Clinical trials proving the efficacy of a cosmetic product are hardly ever published in peer-reviewed journals. In part, this could be due to commercial reasons as heavy competition among corporate entities may necessitate secrecy of results. However, it might just be because the results are not statistically significant. Without publication one conveniently avoids the scrutiny by other scientists of less than stellar results, which can be used against you and refute your company’s marketing campaign. Whatever the reason, it is considered by some to be a weakness in our science.

Cosmetic research is often conducted on in vitro models, rather than true-to-life in vivo testing. The human organism is operated by a delicate system of biochemical reactions that must be kept balanced. If something is applied to one side, it has to be compensated on the other side. In in vitro studies, it is impossible to see this effect. Often, the cosmetic

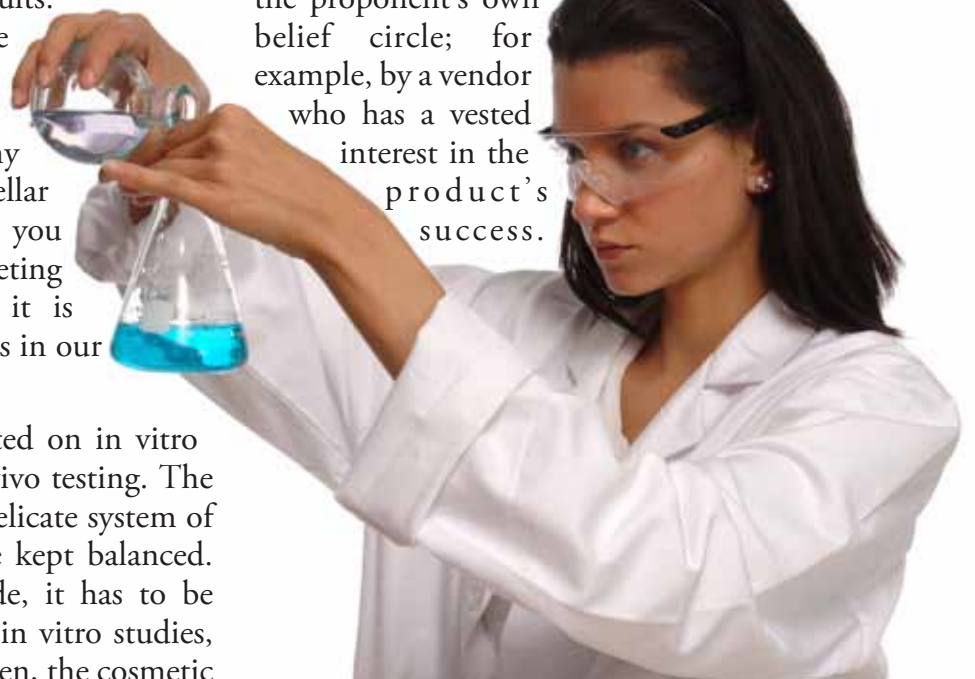
scientist offers an explanation using sophisticated biochemical proofs—based on in vitro tests—where the up- or down-regulation of various proteins is investigated without providing in vivo efficacy of the product. Technically, biopsies need to be taken from the face, however, such practices are not ethically acceptable. For this reason, in vitro studies are carried out. However, one has to avoid extraordinary claims

based on in vitro experiments. For instance, an in vitro experiment may yield results that demonstrate 75% improvement relative to the corresponding placebo. While the test may be accurate in regard to the in vitro model, it may not accurately represent the improvement that will be observed in vivo. Thus the lack of real life data on the human species, with its wide range of biodiversity between individuals, is cited as another deficiency in our

research. The claims made about a particular product are often not verified by other sources. Perhaps these claims are verified by a source within the proponent’s own belief circle; for example, by a vendor who has a vested interest in the product’s success.

“The recent multi-part article written by Johann Wiechers in the past few issues of Cosmetics and Toiletries has readers deliberating on whether or not cosmetic science is rife with “bad” science, as suggested by some scientific authors.¹⁻⁵ Regardless of your position on the subject— and I hope it is favorable—the question, “Why isn’t the research that cosmetic chemists conduct more widely regarded as a respectable body of science amongst scientific peers from other fields?” is worth consideration. Here then follows one of our member’s musings on the subject. It is not always flattering to our industry. So keep the Maalox handy—happy reading!”

- Joseph Albanese, Contributing Editor, Cosmeticscope





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The lack of verification leads to the same question whether the claims can be trusted or not. According to Johann W. Wiechers, cosmetic scientists often work in such a manner that always leads to a desired outcome.¹⁻⁵ Such behavior may arise from managerial pressures, and as a result, a researcher may conduct their work in a way that does not investigate all aspects of a certain phenomenon or does not report all of the data. There should be more transparency of the research work, which could be accomplished by publication of the studies in peer-reviewed journals. The reluctance to publish in an open forum, both good and bad results, is perceived by many as a failure to



provide full disclosure and gives the appearance that we are hiding something.

Very often manufacturers are selling the end result produced by a product, not the mechanism of action. Ingredient suppliers, on the other hand, sell the mechanism of action usually as part of a marketing concept. One may, therefore, assume that raw ingredient suppliers have more to gain by divulging as much data as possible to their customers (finished goods companies) while finished goods houses have less to gain, and possibly more to lose by releasing such information. It is not important to consumers how something works. Only that it does.

Sometimes product claims indicate that the ingredients are derived from natural sources, implying greater efficacy and safety than corresponding synthetic ingredients. Most of us like the idea of natural sources and green movements, however, the human body is unable to distinguish the origin of a synthetically equivalent molecule (unless, of course, we are dealing with stereo specificity). For example, the body will not distinguish whether or not glycerin originates from natural or synthetic sources. The human body will react with every glycerin molecule in same way. This process is independent of the source of glycerin.⁴ We must be wary of any abuse in regard to "all natural" claims, which could violate our moral responsibilities if consumers are improperly informed. Deliberately

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creating a chemophobia in order to take advantage of vulnerable consumers would compromise our moral obligation to the public.

There are different methods for conducting cosmetic claims in different countries. In Europe and Asia, wherever possible, skin bioengineering tools are utilized for claim substantiation, while in the United States, questionnaires can be used to make cosmetic claims.⁴ Questionnaires are meant to provide direction, but sometimes it can be misleading. While answering a questionnaire related to antiwrinkle products, you may be led to believe that this product has done a superb job. Of course, the questionnaires are constructed in such a way that they lead to positive results. For this reason, measuring the skin biophysical properties via bioengineering equipment is preferred.⁴ Most individuals will accept results obtained by instrumental measurements as opposed to the more subjective approach of asking a volunteer whether she felt better after using this product. If a study uses questionnaires, it has to be designed in such a way that same question should be asked in different ways. When both methods are used each will compliment the other.

As already noted, cosmetic science is often considered

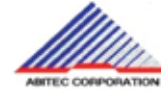
commercial science.¹⁻⁵ The reason for this is that academic science is conducted to find out how things work and to test or deny a hypothesis, whereas commercial science is conducted to find the reasons for selling the product, mostly to discover how good is my product compared to a benchmark or compared to a competitor's product.⁵ Thus, cosmetic science is often considered as comparative science instead of explanatory science. It does not ask: How does my product work? Of course, there is nothing wrong with this approach—it just is not representative of the higher ideals of science.

There are many career opportunities for formulators of cosmetic products. In contrast, there are far fewer positions available for a cosmetic scientist who conducts research to demonstrate whether or not a formula provides the efficacy stated in the claims. Part of this may be financial or competitive—industries often wish to sell their product as quickly as possible without investing too much money on research and development. Many cosmetic companies do not even have a research facility. There are numerous examples in the literature about the consequences of using products that have not been adequately tested. In order to improve



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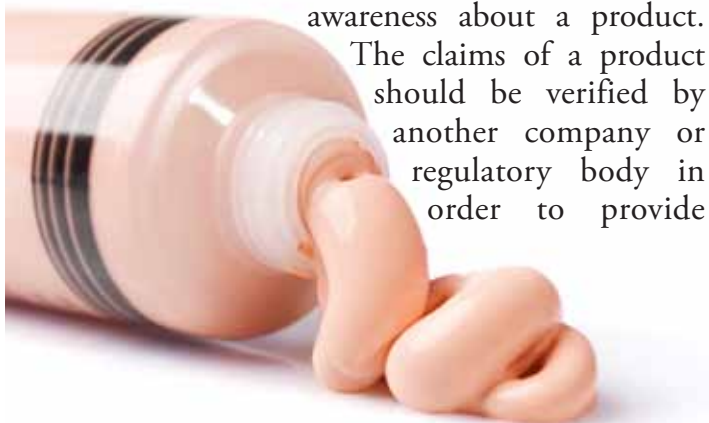
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the overall image of cosmetic science, research and development must be taken seriously. And many cosmetic companies do.

Nowadays, consumers are well educated and the cosmetic scientist is more and more challenged to offer a complete depiction of a cosmetic product: How does the product meet the efficacy standards put forth by the claims? More research should be conducted in vivo utilizing bioengineering equipment in order to offer a complete mechanism of action of the product. Research work must be published in peer-reviewed journals to create more awareness about a product.



The claims of a product should be verified by another company or regulatory body in order to provide

confirmation.

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About the Author...

Santosh Yadav, Ph.D.

Santosh finished her Ph.D. in Chemical Engineering from University of Cincinnati last year. She studied the biomechanical properties of human skin with respect to hydration and water retention. Before coming to the United States, she completed her Master's degree in Biochemical Engineering from the Indian Institute of Technology (IIT) in Delhi, India. Throughout her graduate studies she received several fellowships for her research and awards for presentations. She is currently working as a post-doctoral researcher in the Skin Care department at International Specialty Products located in Wayne, NJ. Santosh's latest work involves studying the effect of polymers on formulations and their benefits to skin.

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