

# 화장품의 세계적인 개발동향과 21세기 아시아인을 위한 기능성 화장품

티. 조셉 린 박사

## Global Cosmetics Trends and Cosmeceuticals for 21st Century Asia

T. Joseph Lin, Ph.D.

TJL Associates, 628 Enchanted Way, Pacific Palisades, CA 90272, USA

### 요 약

2차대전 이후에 미국, 유럽, 일본의 사례와 냉전 종식 후의 동구권 국가의 사례 등을 볼 때, 전쟁과 가난에 의하여 화장품 소비는 억제되며, 평화와 번영의 시기에는 그 소비가 증대된다. 그 외에도 화장품시장의 성장은 아시아권 국가에서 볼 수 있는 것처럼 경제성장, 대중매체의 발달에 의해서, 혹은, 중국본토에서 볼 수 있는 경제체도의 변화 및 정치 흐름에 의한 것 일 수도 있다. 앞에서 본 전쟁, 경제, 정치흐름, 대중매체 등의 요소 이 외에도 생활방식, 종교, 윤리, 가치관 등도 화장품 시장의 성장에 영향을 줄 수 있다.

화장품은 사회의 산물이다. 사회와 그 구성원의 needs가 변하면 그에 따라 화장품도 내용물, 포장, 배송, marketing concepts, 소구사항 등도 변하게 된다. 많은 점에서 화장품은 우리사회의 거울이며, 사회변화를 반영한다.

1970년대 초반까지 미국에서의 화장품은 주로 백인 여성을 위하여 개발되었다. 그러나 60년대의 시민권운동이 후, 70, 80년대에는 미국의 흑인 여성을 위한

제품(색조화장)시장이 급성장하였으며, 안전성이 제대로 검토되지 않은 원료의 사용으로 부작용이 증가하였다. 이에 따라 FDA 규제에 의하여 70년대부터는 제품에 사용원료를 명기하게 되었다. 기존 원료의 안전성이 다시 검토되었으며 안전성이 확인되지 않은 많은 원료, 특히 기존에 사용되던 많은 색소의 사용이 제한되었다. 결과적으로 안전을 중시하는 “hypoallergenic” 화장품이 유행하였고, 원료의 사용에서도 기능성있는 복잡한 이름의 원료보다는 소비자에게 쉽게 인식되는 이름의 원료를 선택하게 되었다. 유럽에서도 신원료명기법이 제정되어 신제품 개발을 위한 개발자의 원료선택에 영향을 미치게 되었다. 그러나 원료의 명기에 따라 경쟁사의 제품복제가 매우 쉬워졌다.

환경오염도 마찬가지로 화장품 흐름에 영향을 미친다. 예를 들어 성층권의 오존층이 얇아지면서 suncare 제품의 소비가 늘었다. Hair spray제품에 있어서는 propellant로 사용되는 CFC가 오존층 파괴의 주범임이 밝혀지고 나서는 propellant를 다른 것으로 대체한 제품들이 많이 나왔으나 예전에 hair spray가 끌었던 만큼의 인기는 회복할 수 없었다. 이외에도 천연화장품원료의 증가, 비동물시험법의 개발, 포장의 간소화 등은 시대의 변화를 반영하는 것 들이다. 한편 70년대에 고조에 달했던 아무런 효과도 없는 화장품에 대한 비판에 대해서 80년대에는 효능 위주의 제품이 미국을 휩쓸었으며, FDA에 의하여 이에 제동이 걸렸다. 그러나 고기능성 화장품에 대한 소비자의 요구는 끊이질 않았다. 이때에 유명한 원료로는 AHA가 있으며 이를 사용한 화장품이 의약품이나 화장품이냐하는 논쟁이 있었다. 이와 같이 의약품과 화장품의 구분을 명확히 할 필요성이 제기되었으며, 기능성 화장품은 미국에서는 OTC(over-the-counter), 일본에서는 quasi-drug라고 구분하였다.

Cosmeceuticals는 cosmetics와 pharmaceuticals의 합성어이며, 90년대 미국에서 관심을 끌었고, 세계적인 관심사가 되었다. 과거에 식품업계에서 nutraceuticals라는 단어가 사용되었으나 FDA에 의하여 의약품으로 분류될 위험성으로 인하여 이 단어를 전면으로 사용하지 않았으며, 무기물과 비타민을 사용한 경우에는 nutra-cosmeceuticals라는 단어를 사용할 수도 있었으나 이 또한 FDA와의 문제가 생길 소지가 있어 사용이 자제되었다. 법적규제에도 불구하고, 소비자의 요구와 새로운 기술에 의하여 계속 개발되고 있으며, 수많은 아시아의

소비자의 욕구를 충족시키기 위한 새로운 종류의 cosmeceuticals가 21세기의 문턱에서 범람하고 있다.

아시아권의 화장품시장은 성장을 계속하고 있으며, cosmetics중에서도 미백 제품이 가장 중요한 종류이다. 백인여성은 갈색의 피부를 갖길 원하는 반면 일본, 중국, 한국의 여성들은 하얀 피부를 갖고자 한다. 단순히 안료를 사용하는 방법이 아닌 피부자체가 하얗게 되길 바라는 것이다. 미국에서는 OTC로 구분된 hydroquinone이 일본과 한국에서는 사용이 금지되고 있으며, 안전하고 새로운 미백원료의 개발을 위한 탐색이 계속되고 있다. 즉 미국과 유럽의 화장품 회사는 피부를 검게하기 위하여 melanogenesis를 활성화시키는 방법을 찾고 있으며, 이와 반대로 아시아권의 화장품회사는 melanin합성을 억제하기 위한 방법을 찾고있다. 각기다른 소비자의 취향을 만족시키기 위해서 21세기의 화장품 과학자는 상당히 바쁠 것임에 틀림이 없다.

## ABSTRACT

War and poverty depress the consumption of cosmetics, while peace and prosperity encourage their proliferation. With the end of World War II, the US, Europe and Japan witnessed rapid growth of their cosmetic industries. The ending of the Cold War has stimulated the growth of the industry in Eastern Europe. Improved economies, and mass communication are also responsible for the fast growth of the cosmetic industries in many Asian nations. The rapid development of the cosmetic industry in mainland China over the past decade proves that changing economies and political climates can deeply affect the health of our business.

In addition to war, economy, political climate and mass communication, factors such as lifestyle, religion, morality and value concepts, can also affect the growth of our industry. Cosmetics are the product of the society. As society and the needs of its people change, cosmetics also evolve with respect to their contents, packaging, distribution, marketing concepts, and emphasis. In many

ways, cosmetics mirror our society, reflecting social changes.

Until the early 70's, cosmetics in the US were primarily developed for white women. The civil rights movement of the 60's gave birth to ethnic cosmetics, and products designed for African-Americans became popular in the 70's and 80's. The consumerism of the 70's led the FDA to tighten cosmetic regulations, forcing manufacturers to disclose ingredients on their labels. The result was the spread of safety-oriented, "hypoallergenic" cosmetics and more selective use of ingredients. The new ingredient labeling law in Europe is also likely to affect the manner in which development chemists choose ingredients for new products.

Environmental pollution, too, can affect cosmetics trends. For example, the concern over ozone depletion in the stratosphere has promoted the consumption of suncare products. Similarly, the popularity of natural cosmetic ingredients, the search for non-animal testing methods, and ecology-conscious cosmetic packaging seen in recent years all reflect the profound influences of our changing world. In the 1980's, a class of efficacy-oriented skin-care products, which the New York Times dubbed "serious" cosmetics, emerged in the US.

"Cosmeceuticals" refer to hybrids of cosmetics and pharmaceuticals which have gained importance in the US in the 90's and are quickly spreading world-wide. In spite of regulatory problems, consumer demand and new technologies continue to encourage their development. New classes of cosmeceuticals are emerging to meet the demands of increasingly affluent Asian consumers as we enter the 21st century.

## 본 문

History tells us that periods of cultural growth and individual freedom have been marked by wide-spread use of fragrance and cosmetics, while their use was diminished during darker times (1). The end of the World War II

brought with it a rapid expansion of the cosmetic industry in the United States. Shortly thereafter, Europe and Japan also started to enjoy substantial growth of their cosmetic industries. The ending of the Cold War has opened the cosmetic markets in many former communist nations in Eastern Europe. In recent years, political stability, economic growth and improvement of the standard of living in many Asian nations have brought about significant increases in the consumption of cosmetics and personal-care products in Asia. Clearly, war, social instability and poverty depress the consumption of cosmetics, while peace, cultural development and prosperity encourage their proliferation.

During the Great Cultural Revolution in China, manufacturing and use of decorative cosmetics and fashion goods were banned by the central government. I visited China mainland in 1979, about the time Deng Xiaoping initiated his bold experiments with an open-door policy and market-oriented economy. During my first visit, I saw very few cosmetics in the stores and virtually no fashion on the streets. Even on the main streets of Shanghai, most people were attired in black, blue and gray; anyone wearing bright colored dress had to be a foreigner. With the success of economic reform, the economy and living standard grew rapidly. Paralleling the economic growth since that initial visit has been a rapid expansion of the Chinese cosmetic industry, attracting many multi-national manufacturers to this communist nation, and competition for market shares has intensified dramatically (2,3). It is evident that changing economies and political climates can deeply affect the health of the cosmetics, toiletries and fragrance business.

In addition to war, cultural development, economy, political climate and mass communication, many other factors such as lifestyle, religion, moral code and personal value concept can all affect the growth of our industry. Cosmetics are the products of our society. As society and the needs of its people change, cosmetics also evolve with respect to their contents, packaging, distribution,

marketing concepts, and emphasis. In many ways, cosmetics mirror our society, constantly reflecting social changes. Thus, understanding the history of social changes can help us to understand the trends of our industry.

For example, until the early 1970's, cosmetics in the United States were primarily developed for white American women. Few makeups were available with shades specifically prepared for non-white women. The civil rights movement of the 60's changed the cosmetic industry in America and gave birth to ethnic cosmetics. Products designed for African-Americans started to become popular in the 70's. Initially, these products were marketed only by relatively small manufacturers owned by African-Americans. Realizing the opening of a new market, large cosmetic manufacturers, including Avon and Revlon started to promote makeup and hair care products designed for African-American consumers, and the market grew even larger in the 80's.

Similarly, the emergence of consumerism in America in the late 1960's and 1970's also had a great impact on the cosmetic industry. Many books critical of the cosmetic industry were published, including Toni Stabile's "Cosmetic: Trick or Treat?" (4). Many critics of the industry accused cosmetic companies of seducing consumers into buying totally useless, and even dangerous, products. These strong attacks put the industry on the defensive. The industry's need to prove the safety and social benefits of cosmetics prompted increased testing on raw materials and research on functions and effects of personal care products. The attacks by consumerists on the industry also led the U.S. Food and Drug Administration (FDA) to tighten cosmetics regulations and ban many cosmetic colors and ingredients where safety data were lacking.

The attack on the industry and publicity over the purported hazards of using cosmetics, heightened the American consumers' concerns over the safety of these products. This trend also resulted in the popularization of safety-oriented skin-care products. Clinique and Almay are two examples of

successful brands of "hypoallergenic" cosmetics which dominated the U.S. skin-care market in the 1970's.

In July 1977, a group of 12 Japanese women filed a class action suit against five major cosmetic manufacturers, alleging that the cosmetics they used caused a permanent, uneven darkening of skin which was called, *kokuhisho* (black skin disease) (5). This condition appeared to resemble melanosis reported by Riehl in 1917. This was shocking news for the cosmetic industry in Japan, and the resulting publicity raised a deep concern for the safety of cosmetic products. Following the class action suit, many books highly critical of cosmetic manufacturers, bearing sensational titles such as "Devil's Cosmetics," appeared in Japan (6,7). This course of events was a wake up call for Japanese cosmetic manufacturers and resulted in tightening of their quality control and safety testing procedures. It also caused the Ministry of Health and Welfare (MHW) to become even more cautious in approving new ingredients for cosmetic use.

In the United States, the FDA's ingredient labeling law promulgated in the 1970's had a great impact on the cosmetic industry. The FDA and the industry needed to agree on the language to be used for ingredient labeling. The American trade association, Cosmetic Toiletry and Fragrance Association (CTFA) had to expend considerable manpower and resources to compile an extensive list of the ingredients used in cosmetic products. The new law also forced manufacturers to disclose on their product labels a complete ingredients list, in plain view of consumers as well as competitors.

The ingredient labeling law was designed to protect consumers by allowing them to choose products based on the disclosed ingredients, and at same time, to promote the truthfulness of marketing claims. However, the law has produced some unintended effects on marketing and competition. First of all, the revealing of ingredients on packages has certainly made it easier for competitors to copy formulations. It has also made it easier for raw material

suppliers to sell ingredients to competing companies. It is doubtful that many consumers can understand the complex chemical names listed on the product labels. Even when they are able to, it is very unlikely that they can ascertain their functions or their degree of safety, just by reading the list.

Consequently, development chemists are often encouraged by their companies to incorporate more "natural" ingredients with which consumers are familiar, and to avoid ingredients with long chemical names. One result is a marked increase in the use of a wide variety of natural or botanical-based ingredients in cosmetics marketed in the U.S. Unfortunately, instead of selecting ingredients strictly based on function and safety, chemists are now often forced to choose ingredients based how they sound to, or are perceived by, the consumers. The new ingredient labeling law in Europe may also produce similar effects, and alter the manner in which development chemists choose ingredients for new products.

Environmental pollution, too, can have a serious impact on cosmetics trends. For example, the discovery in 1974 of possible ozone depletion in the stratosphere caused by man-made chlorofluorocarbons (CFC) caused a panic among the manufacturers of aerosol personal-care products. Even after the use of CFC's was banned by the FDA in 1978, and was replaced by ozone-safe hydrocarbon propellants, aerosol products never regained their earlier popularity. Many consumers mistakenly associated all aerosol products with pollution, and many switched to nonaerosol products. California's recent regulation of the use of volatile organic compound (VOC) in personal-care products is again forcing many cosmetic manufacturers to reformulate their aerosol, as well as nonaerosol, products (8).

On the other hand, the concern for skin cancer and skin aging due to the depletion of ozone in stratosphere has reminded consumers all over the world of the dangers of excessive sun exposure. The rapid growth of the world-wide suncare products market is another example of the effect of



environmental pollution on our industry. Similarly, the popularity of natural cosmetic ingredients, the search for non-animal testing methods, and ecology-conscious cosmetic packaging seen in recent years all reflect the profound influences of our changing world. Thus it is important to understand the direction of this change in order to design products for tomorrow's consumers.

In "The Third Wave," Alvin Toffler, the author of "Future Shock," described evolution of civilization from agriculture-based societies to industrial-based societies to the present information/computer-based societies (9). Among his many predictions, the futurist stated his belief that consumer products would become more diversified. Instead of producing a small variety of nearly identical products in large quantities through mass production, manufacturers in the Third Wave world will be forced to make large variety of products in smaller quantities to fulfill the needs of modern customers with diversified needs.

The U.S. presently has the largest cosmetic market in the world, As such, the trends in U.S. cosmetics affect international trends. As the cosmetic business becomes more global, the products will become more diversified, and the trends become ever more complex. Until recent years, large multinational cosmetic companies in the U.S. and Europe would simply take products developed for their domestic markets and attempt to sell them all over the world without modification. Today, many manufacturers reformulate and/or repackage their products to target local tastes or market requirements. Many U.S. and European multinational cosmetic companies now design products specially for their Asian customers, and some even have R & D and manufacturing facilities in Asia.

In 1979, Jane Ogle, a beauty editor for the New York Times, stated that we were entering the age of "serious" cosmetics (10). She opined that "people are no longer satisfied with a product that simply makes them look good; they

want it to do them some good as well," and suggested that the cosmetics for 1980's would be more drug-like and efficacy oriented. As examples, she pointed to the introduction of Charles of the Ritz's "Prescribed Skin Care Collection" and a new line of skin-care products called, "Dermage," being developed by a group of dermatologists known as "Cosmedics."

From the late 1970's to the early 1980's, many similarly positioned skin-care and make-up products appeared in the U.S. market. Some of these products included Estee Lauder's successful "Prescriptive" line and Elizabeth Arden's "Visible Difference." Initially, the marketers of these "serious cosmetics" made relatively mild claims, mostly pertaining to moisturizing effect or controlling of oily skin. The efficacy claims gradually escalated to include cell renewal, removing facial lines and anti-aging. These promises were regarded as drug claims by FDA and in 1987, the agency sent strongly-worded warning letters to many major cosmetic manufacturers (11). Fearful of FDA action, cosmetic manufacturers in the U.S. began to refrain from making strong drug claims but the consumer demand for drug-like cosmetics never ceased.

"Cosmeceutical," a term reportedly first coined by Prof. Albert Kligman of the University of Pennsylvania about 14 years ago, refers to hybrids of cosmetics and pharmaceuticals that he saw on the horizon of the American cosmetic market (12). The appearance of minoxidil hair growth preparations and tretinoin wrinkle creams in recent years has stimulated research by cosmetic and pharmaceutical companies to develop similar products to satisfy consumers who demand quick and clear results. The explosive popularity of alpha hydroxy acid (AHA) based skin treatment products in America has revived the debate over whether such "cosmeceuticals" should be regulated as cosmetics or drugs.

Cosmeceuticals are a very hot topic in the U.S. today as they are regarded as representing a new trend in cosmetics which will continue into the 21st

Century. However, most American cosmetic manufacturers are afraid to use this word to describe their products for fear that their cosmetics will be classified as a drug by the FDA. In the U.S., there is a clear distinction between cosmetics and drugs for regulatory purposes. Cosmetics are defined by the Food Drug and Cosmetic Act as articles topically applied for beautification, and cannot affect the structure or function of the skin. Cosmetics that can affect the structure or function of the skin, such as sunscreens, and antidandruff shampoos, are regulated as over-the-counter (OTC) drugs in the U.S. From a legal point of view, cosmeceuticals are likely to fall in the drug category.

As cosmeceuticals start spreading worldwide, they will undoubtedly cause regulatory definition problems in many nations. In Japan, many efficacy oriented cosmetics may be classified as *iyakubugaihin*, or "quasi-drugs," which are regulated more strictly by the MHW than cosmetics but less strictly than are drugs. Cosmeceuticals may be classified in this category. However, Japanese quasi-drugs are quite different from OTC cosmetic drugs in the U.S., as they also include hairdyes and permanent waves which are clearly not cosmeceuticals.

It appears to me that the same driving force which is causing cosmetics to become more like drugs is also responsible for driving some food products in the U.S. to become more like drugs, causing potentially troublesome regulatory problems. "Nutraceuticals" are the food industry's equivalent of cosmeceuticals. They refer to a variety of processed foods which are designed to offer medical benefits. They go a step further than conventional vitamin-enriched cereals and fat-free cookies to offer specific medical benefits. Campbell Soup Co.'s "Intelligent Quisine" is an example of a complete meal plan aimed at people with high blood pressure, high cholesterol or diabetes. For the same reason cosmetic companies have not embraced the cosmeceutical label, food companies are avoiding the use of the term, nutraceuticals for fear

of having their products classified as drugs by the FDA (13)

It is interesting to note that in recent years, major U.S. cosmetics manufacturers, including Avon, Mary Kay and Revlon, have marketed vitamins and mineral supplements to promote beautiful hair or skin. I have not yet heard of anyone describing a new class of foods or food supplements, providing both cosmetic and medical benefits, as "nutra-cosmeceuticals." Conceivably, the usage of this term has been suppressed by the manufacturers to avoid potential trouble with the FDA!

In Asia, the concept of nutra-cosmeceuticals is actually nothing new. Many Asian cosmetic companies have long marketed vitamins for the promotion of beautiful hair or skin. A well-known Japanese pearl accessories manufacturer has marketed pure powdered pearl designed to be taken internally for enhancing the beauty of the skin. In the future, however, consumers and government regulators are likely to demand proof of the efficacy of such nutra-cosmeceuticals, and controlled clinical tests will be required to substantiate the claims.

As the markets for cosmetics continue to grow in Asia, and more pharmaceutical companies become involved in marketing cosmetics, it is clear that many different cosmeceuticals will be developed for Asian consumers. One important class of Asian cosmeceuticals which is receiving much attention is whitening cosmetics.

Many Asian women, including Japanese, Korean and Chinese, desire to have whiter skin complexion. Interestingly, this is the opposite of the ideal of many white Americans and Europeans who love to bake in the sun to tan their skin. Whitening of the skin can be achieved by applying light colored makeups, but many Asian consumers are demanding cosmetics that will truly lighten the color of the skin without the use of pigments. The use of sunscreens to prevent darkening from sun exposure is boosting sales of suncare products in Asia. However, many Asian consumers are not satisfied

with merely preventing suntan, and are seeking preparations that promise to make their skin color even lighter.

There was a time when skin bleaching preparations containing ammoniated mercury were very popular in Asia. Fear of mercury poisoning and government regulations have removed these products from most markets. Although approved as OTC drugs in the U.S., preparations containing hydroquinone are not allowed in Japan. Many Japanese and Korean cosmetic manufacturers are actively searching for new ingredients that will be safe and effective for skin whitening.

At present, the main active ingredients allowed for use in whitening cosmetics in Japan are all enzyme inhibitors, including ascorbic acid and their derivatives, kojic acid and arbutin (14). All claim to be effective in reducing melanin production in melanocytes by inhibiting the action of tyrosinase on tyrosine to prevent the biochemical conversion to dopa (3,4-dihydroxyphenylalanin) and dopaquinone, which are the precursors of melanin. *In vitro* tests indicate that they are effective inhibitors, but their *in vivo* effectiveness is still not satisfactory. One problem is the lack of an effective means for delivering the inhibitors to melanocytes where melanin is synthesized. Other means of affecting melanogenesis are under active investigation. Controlling of cytokines including endothelins to interrupt signals for melanin production is being studied(15).

Research designed to lead to understanding the complex process of pigmentation of human skin and finding means to control the process is quite active on a worldwide scale. The dangers of UV exposure and desire to get a suntanned look without damaging the skin has led American and European suncare products manufacturers to develop products allowing quicker and safer tanning. Better understanding of the pigmentation mechanism will also facilitate finding better means of treating pigmentation-related diseases such as vitiligo.

It is interesting to note that whereas the U.S. and European manufacturers are working hard to find better means of enhancing melanogenesis in order to develop effective self-tanning products and suntan accelerators, Asian companies are, on the other hand, working diligently to control precisely the same mechanism to reduce melanin synthesis and to please their customers (16). Indeed, beauty is in the eyes of the beholder. The cosmetic scientists of the 21st Century, in the East and West, are certain to be kept very busy, finding ways to please the many "beholders" in the world, each having different "eyes."

## References

1. Letitia L. Sage, Cosmetics-past, present, future in *The Chemistry and Manufacture of Cosmetics, 2nd ed.*, M.G. DeNavarre, ed. Continental Press, Orlando, Florida, (1975), 1-6
2. T. J. Lin, Visit to Shanghai, Part1, Part 2, Notes from the Orient, *Cosmetics & Toiletries*, **94** 19-20 (Nov. 1979), **95** 14-15, (Jan. 1980)
3. T. J. Lin, China Revisited, Part 1, Part 2, Notes from the Orient, *Cosmetics & Toiletries*, **97** 21-23, (Mar. 1982), **97** 13-16,(May 1982)
4. Toni Stabile, *Cosmetics: Trick or Treat?* Hawthorn Books Publishers, New York, 1966
5. T. J. Lin, Cosmetic Class action litigation in Japan, Notes from the Orient, *Cosmetics and Toiletries*, **92** 14-16 (Nov. 1977)
6. Japanese Consumers' Association, *Dangerous Cosmetics*, San Ichi Shobou K.K., Tokyo, 1979
7. Takaharu Ozawa, *Devil's Cosmetics*, Kakinoha Kai, Tokyo, 1978
8. T. J. Lin, Challenges of 55% Hair Sprays, International Review, *Fragrance Journal*, 2 -3, (June, 1996)
9. Alvin Toffler, *The Third Wave*, W. Morrow and Co., New York, 1980

10. Jane Ogle, Entering the age of serious cosmetics, *New York Times*, September 23, 1979
11. T. J. Lin, Antiage cosmetics in the U.S., FDA vs. cosmetic industry, International Review, *Fragrance Journal*, 12-13 (Jan. 1989)
12. A. M. Kligman, Why cosmeceuticals?, A Dermatologic View, *Cosmetics & Toiletries*, **108**, 37-38 (August, 1993)
13. Judann Pollack, Nutraceuticals take healthy food to new level, *Advertising Age*, 1, 54 (Dec. 2, 1996)
14. Kazuhisa Maeda, Minoru Fukuda *In vitro* effectiveness of several whitening cosmetic components in human melanocytes, *J. Soc. Cosmet. Chem.*, 42, 361-368 (Nov./Dec. 1991)
15. G. Imokawa, Y. Yada and M. Miyagishi, Endothelins secreted from human keratinocytes are intrinsic mitogens from human melanocytes, *J. Biol. Chem.* **267** 24675-24680, (1992)
16. Alban Muller, Two Tyrosine-based suntan activators, *Cosmetics & Toiletries*, **107** 125-132, (October, 1992)