The general practitioner and sunscreen preparations

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Summary

In this article the dangers of exposure to the sun are discussed, how sunburn actually happens and to what kind of skin. It looks at the factors involved in recommending suitable sunscreen preparations and reviews in a practical way what is currently available in South Africa.

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KEYWORDS: Sunscreening Agents; Sunburn; Physicians, Family.

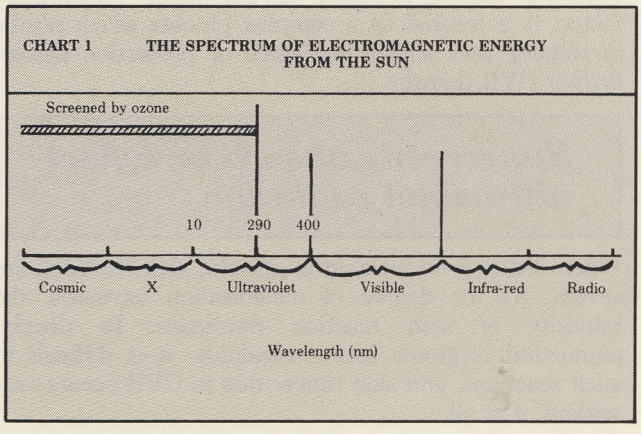
The general practitioner and sunscreens

INTRODUCTION

The dangers of exposure to the sun are an obvious concern of medical practitioners. Objective information on this important subject is, however, not always available. Hence, this paper attempts to consider the factors which are involved in recommending and/or prescribing suitable sunscreen preparations, from both the theoretical and practical stand-points. It also reviews sunscreen preparations and cosmetics currently available in South Africa.

ULTRAVIOLET RADIATION AND THE SKIN

CHART 1 illustrates the spectrum of electromagnetic energy from the sun over the range from the short cosmic rays to the long radio waves. Further detail on ultraviolet radiation, the causative agent of sunburn, is shown in CHART 2. Ultraviolet radiation (UVR) consists of 3 main components which are, in increasing wavelengths, UV-C, UV-B and UV-A[1,2].

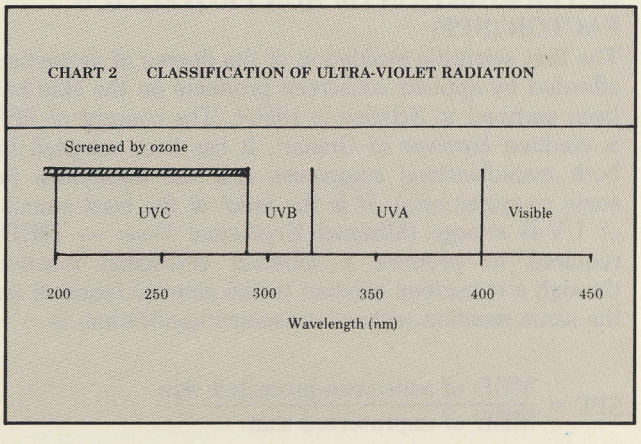


UV-C radiation (200-290 nm)

This radiation is the most destructive and theoretically will cause most damage. Fortunately, UV-C radiation is absorbed by the ozone layer in the upper atmosphere and hence becomes of little practical importance. UV-C rays do however reach the peaks of high mountains, but they do not penetrate to sea level. The sunlight which reaches ground level would therefore normally consist of UVR between 290 and 400 nm and visible radiation from 400-700 nm.

UV-B radiation (290-320 nm)

Sunburn in humans is normally caused by this narrow energy-rich band of radiation, which exerts intense physiopathological activity on the skin. UV-B causes sunburn and delayed skin pigmentation (delayed tanning).



UV-A radiation (320-400 nm)

This radiation enhances the erythema-inducing or burning effects of UV-B radiation, as well as being implicated in the long-term efforts of exposure such as ageing and loss of elasticity. UV-A manifests considerably less energy than UV-B, but unlike UV-B penetrates window-glass. UV-A produces immediate tanning, but this desired effect is more than counter-balanced by the deleterious effects just described above. To some extent these effects have been exaggerated, but there is no doubt that broad-spectrum UV protection is required to prevent premature skin ageing. Both UV-A and UV-B are erythemagenic and melanogenic, but the amount of UV-A energy required for this effect is about 800-1 000 times that of UV-B-radiation. It should be realised, however, that the amount of solar UV-A which reaches the earth's surface is about 10 times greater than that of UV-B. The long-term cumulative effects of UV-A radiation may therefore be as important as the effects from UV-B radiation[3].

The pathological effects of sunlight are summarised in TABLE 1.

TABLE 1

PATHOLOGICAL EFFECTS OF SUNLIGHT

Spectral band (nm)	Effect
280-315 (UV-B)	Sunburn and delayed tanning Skin ageing and cancer
315-400 (UV-A)	Immediate and delayed tanning Sunburn with large doses
400-780 (visible)	Innocuous in normal individuals Harmful with certain chemicals and in porphyria
780-1000 (infrared)	May possibly augment UVR-induced carcinogenesis

Source: See reference (4)

These are all extremely serious effects. That which has received most attention is the induction of skin cancer. Experimentally, it has been shown that UVR-induced cancer is a cumulative process. Reducing the amount of UVR reaching the basal layer, eg by the use of sunscreens, will retard that process. Complete prevention of tumours is possible in experimental mice treated with an appropriate sunscreen[5]. DNA appears to be the major molecular target for UVR lethality and mutagenesis in bacterial and mammalian cells in culture[6,7,8]. While a definite cause and effect relationship for carcinogenesis is not certain, UV-B induced DNA damage is thought to be an important component of UV-B skin carcinogenesis.

The major change observed in exposed skin of lightly-pigmented people is accelerated ageing. The skin looses its natural elasticity, there is marked epidermal atrophy, and increased levels of mucopolysaccharides are found in the dermis. Focal benign abnormalities of keratinisation develop into small, crusty solar keratoses. These may be succeeded by basal and squamous cell carcinomas. Evidence for the role of solar UVR in skin carcinogenesis in humans is epidemiological but it is convincing.

Twenty-four hours after exposure, cellular degeneration is evident in the dermis.

The majority of skin cancers, where no other direct carcinogenic influence is known, are found in the sun-exposed skin of lightly-pigmented people. Skin cancer is rare in Negroids. There is an approximate correlation between the incidence of skin cancer and the degree of exposure to the sun in similar populations living in areas of similar latitudes. Tumours develop in areas of the skin most directly exposed to sunlight. The epidemiological evidence is supported by data from numerous studies with experimental animals. The carcinogenic action of UVR appears to be derived both from the mutagenic effects and the hyperplasia-inducing action, ie thickening of the stratum corneum. The UVR wavelength region involved is basically similar to that for UV-erythema, ie wavelengths below 320 nm (See CHART 2).

An average unprotected, untanned, white-skinned person requires approximately 20 minutes to absorb a so-called minimal erythemal dose (MED) of sunlight in a temperate climate and approximately 10 minutes in a subtropical climate. By contrast, the MED for heavily-pigmented Negroids is approximately 13 times as high[9].

Skin type thus plays an important role (see TABLE 2). The 6 types are listed in decreasing order of response to sunlight. Types I and II require greatest protection and Types V and VI least. This point does not mean that black-skinned people require no protection from the sun, as they will respond, but in lower measure than lighter-toned skins.

TABLE 2

SKIN TYPES AND THEIR RESPONSE TO SUNLIGHT

TYPE	CHARACTERISTICS
I	Always burns easily: never tans
II	Burns easily: tans minimally
III	Burns moderately: tans gradually
IV	Burns minimally: always tans well
V	Rarely burns: tans profusely (insensitive)
VI	Never burns: deeply pigmented (insensitive)

Source: See reference (10)

With the appearance of erythema, intracellular oedema in the epidermis and minimal leucocyte migration in the dermis may both be observed. Twenty-four hours after exposure cellular degeneration is evident in the dermis. The number of damaged cells increases with exposure and basal layer cells may be involved. Complete epidermal necrosis is seen in blistering reactions and dermal connective tissue damage may occur. Epidermal regeneration occurs by 72 hours. The sunburned epidermis is significantly thicker than normal after 6 days[11].

In lightly-pigmented skin the major contribution to the attenuation of the effects of UVR is from the horny layer of the epidermis, ie stratum corneum. Melanin, a complex, indole polymer, is the main contributory factor. It is formed by a complex process which results in tanning and affords a degree of protection against further UVR damage.

Sunscreens absorb or reflect ultraviolet radiation.

Where little or no melanin is present, skin reactions are severe. As the degree of melanisation increases, the intensity of skin reaction decreases. In deeply-pigmented Negroids and Australoids, it is difficult to elicit reactions, and skin cancer due to UVR occurs only seldom, if at all.

Sunscreens provide an obvious method of minimising the effects of sun-exposure. They contain ingredients which absorb or reflect ultraviolet radiation. Preparations of the absorbent type are usually very efficient at filtering out UV-B but relatively inefficient at filtering out UV-A, except for some newer products. Reflectant-type sunscreens, which generally incorporate substances such as titanium dioxide and zinc oxide, are moderately effective at protecting against UV-A as well as UV-B, but are usually visible on the skin, thus tending to be cosmetically unacceptable for everyday use[4]. The relative efficiency of sunscreen agents and products which contain them, is determined by reference to a SUN PROTECTION FACTOR (SPF).

DETERMINATION OF SUN PROTECTION FACTOR (SPF)

The first scientific evaluation of the degree of protection afforded by applied sunscreen products on the skin has been ascribed to Schulze in 1956[12]. The concept of SPF is credited however to Greiter[3]. It has been adopted by both manufacturing companies and the authorities (in some countries only). It is the ratio[3] of the least amount of UV-B energy (Minimal Erythemal Dose — MED) required to produce a minimal erythemal reaction through a sunscreen product to the amount required for the same reaction without sunscreen application, ie

$$\text{SPF} = \frac{\text{MED of sunscreen-protected skin}}{\text{MED of unprotected skin}}$$

The FDA requires that a standard sunscreen must be used in any test. This preparation is an emulsion with a given formula which contains 8% of homomenthyl salicylate[12]. It has an SPF value of 4,24 ± 1,4.

TABLE 3

SUNSCREEN PRODUCT CATEGORIES

CATEGORY OF PROTECTION	SPF	SPF RANGE
Minimum	2	2 to under 4
Moderate	4	4 to under 6
Extra	6	6 to under 8
Maximal	8	8 to under 15
Ultra	15	15 and up

Source: See reference (10)

Currently, human volunteers with skin Types I and II are used as test subjects[3]. TABLE 3 tabulates sunscreen product categories classified on an SPF range from 1 to 15, which is the maximum necessary for practical purposes. TABLE 4 lists the recommended SPF for the 6 types of skin.

TABLE 4

SKIN TYPES AND RECOMMENDED SUN PROTECTION FACTOR (SPF)

SKIN TYPE	RECOMMENDED SUN PROTECTION FACTOR*
I	10 or more
II	10 or more
III	8 to 10
IV	6 to 8
V	4
VI	none indicated

* Based on outdoor field studies
Source: See reference (3)

Unfortunately, among the major limitations of the SPF system are that it is a measure only of UV-B effects. Furthermore, it is a biological assay, so that variations of up to 25% may regularly occur. Additionally, it has been 'forced up' to levels beyond the original maximum of 15, predominantly for marketing purposes to an uninformed public.

More recently, a method for determining the Light Protection Factor (LPF) of agents against UV-A radiation has been introduced. This measure is the ratio of the Minimum Phototoxic Dose (MPD) for protected skin to the MPD for unprotected skin.

CHEMICAL SUNSCREEN AGENTS

The absorbent sunscreens generally fall into one of the following chemical groups:

(i) **PABA and its derivatives** (eg Octyl dimenthyl PABA, ie Padimate - 0). These para-aminobenzoic acid-based compounds are commonly used in sunscreens. They penetrate the outer horny layer of the skin (stratum corneum) within 30 minutes to two hours, apparently affording long-lasting, fairly effective protection against UV-B, though not against UV-A. Because they penetrate the skin, they appear to be relatively waterproof[13].

Be aware of drugs which cause photo-sensitisation.

(ii) **Salicylates** (eg Homomenthyl salicylates). These compounds are weak UVR absorbers. They are derived from benzoic acid by the addition of an hydroxyl group in the ortho position. They are usually used in combination with other agents. High concentrations are necessary (10-15 per cent homomenthyl salicylate).

(iii) **Cinnamates** (eg Ethylexyl para-methoxy cinnamate, ie Parsol MCX). Cinnamates do not bind to the horny layer of the skin, and thus are easily washed off by swimming or perspiration; their efficacy is dependent on the adhesiveness of the vehicle[14].

(iv) **Benzophenones** Benzophenones (eg mexenone, oxybenzone) mainly absorb in the UV-B range although absorption does extend into the UV-A range[15]. At higher concentrations they also protect against UV-C[16].

(v) **Anthranilates** These compounds are ortho-amino-benzoic acid derivatives. They are weak UV-B filters and absorb mainly short wave UV-A with maximal absorption at 340 nm[17]. They are nearly always combined with UV-B absorbers to give broad spectrum protection[18].

(vi) **Camphor derivatives** These chemicals protect mainly against UV-B. Eusolex 6300 may be used in concentrations of 1-5 per cent in combination with benzophenones and other agents[19].

(vii) **Others** Other substances used as sunscreen agents include 2-phenyl-benzimidazole-5-sulphonic acid, 2-phenyl-5-methyl benzoxazol, sodium 3,4 dimethoxy-phenyl glyoxylate, digalloyl trioleate and dibenzalazine, all of which are generally effective UV-B screens.

Sunscreens should be re-applied after every hour or after swimming.

Compounds in all of these groups are recognised in Martindale[20], which lists 30 substances, by the FDA with 24[21], and by the EEC with 42[22]. Clearly, there is considerable overlap in these lists. The wavelengths absorbed by compounds in the respective groups are tabulated in TABLE 5.

TABLE 5

CHEMICAL GROUPS OF SUNSCREEN AGENTS AND WAVELENGTHS ABSORBED

CHEMICAL GROUP	WAVELENGTHS ABSORBED (nm)
Para-aminobenzoic acid (PABA) and derivatives	290-320
Salicylates	290-330
Cinnamates	290-320
Benzophenones	290-360 (variable)
Anthranilates	322-350
Camphor derivatives	290-320
Others	variable

Source: See references (13) (14) (15) (17) (18) (19)

SUNSCREEN PREPARATIONS

There are numerous sunscreen preparations on the South African market. Due to inadequate labelling requirements and varying claims of efficacy, we surveyed the products and endeavoured to obtain details of active ingredients. The results are tabulated in TABLE 6, which can be used as a reference chart. Where gaps occur in active ingredients and/or their concentrations, the manufacturer did not provide the required information.

COSMETIC HOUSES AND SUNSCREENS

Most major cosmetic houses now manufacture sunscreen preparations. Details of those available on the South African market appear in TABLE 7. Only products which contain known effective compounds should be selected or recommended. Vague references to "natural ingredients", which have so far not been proven to be of benefit, should be viewed with suspicion.

TABLE 8

SOME DRUGS WHICH MAY CAUSE PHOTOSENSITISATION

Chlordiazepoxide
Chlorpromazine (Largactil®)
Griseofulvin (Grisovin®)
Nalidixic acid (Wintomylon®)
Oral contraceptives
Phenothiazines
Sulphonylureas
Tetracyclines
Thiazide diuretics

Source: See reference (23)

DRUGS AND SUNLIGHT

The prescriber should be aware of drugs which cause photosensitisation. Some of them appear in TABLE 8. Whenever they are prescribed special precautions should be exercised, particularly in light-skinned persons.

DISCUSSION

TABLES 6 and 7 show a confusing array of products. To choose and recommend a suitable preparation, the patient's skin type is assessed on the basis of TABLE 2. This type is then related to the recommended SPF in TABLE 4. An actual preparation may then be chosen from TABLE 6 or TABLE 7. *(please see next page)*

Fair-skinned people (Type I) should obviously use high factor products (SPF about 10-15) for high protection in subtropical areas. SPF 6 products will allow a light tan with moderate exposure in this skin type.

If the sunscreen is to be used when swimming, a more water-resistant cream base should be used. A PABA-containing preparation probably gives the most lasting protection as it penetrates the stratum corneum and is not easily washed off. The sunscreen should be reapplied every hour or so if sweating, and again after swimming, in order to give adequate protection.

The greater the exposure to sunlight, the greater the incidence of skin cancer. All major categories of skin cancer appear to be related directly to the accumulation of sunburning UVR in susceptible individuals. In sunny areas, eg Texas, the risk for skin cancer is greater than for all other forms of cancer combined[24]. The risk from exposure to the sun in tropical and subtropical latitudes in winter is almost as great as that in summer, particularly in the summer rainfall areas. There is also an increased risk due to high altitude, which is based on a 4% increase in solar radiation for every 300 metre altitude rise. If a person uses a product with an SPF of only 2 no matter what exposure he receives, he will effectively reduce that exposure by half, and would reduce the risk of developing skin cancer to that of a person living in a geographical area with only half the radiation. If, overall, we can reduce the total accumulation of solar irradiation throughout a lifetime, we should be able to reduce skin cancer for the entire population.

It is therefore recommended that normal people should avoid sunburn by appropriate use of a sunscreen, gradually reducing the frequency of application of the preparation as natural tanning and thickening of the skin occur. New and highly effective sunscreens are continually being developed. Current research may well lead to non-allergic and non-irritant agents.

TABLE 6: SUNSCREEN PREPARATIONS

Product	Manufacturer	Active ingredient	Concentration	SPF	UV Wavelength filtered (nm)	Possible adverse effects
Ambre Solaire	Elebell (Pty) Ltd	Ethylhexyl paramethoxy cinnamate	2%)	SPF 3	UVB 280-320	X
		3,4 Methyl benzylidene camphor	2%) Swim & sun		UVB 290-320	FDA considers this neither safe nor effective. See rerefence (20)
		Ethylhexyl paramethoxy cinnamate	4%)	SPF 6	UVB 280-320	X
		3,4 Methyl benzylidene camphor	2,5%) Swim & sun		UVB 290-320	See reference (20)
		Ethylhexyl paramethoxy cinnamate	6%)		UVB 280-320	X
		3,4 Methyl benzylidene camphor	3,5%) Swim & sun	SPF 9	UVB 290-320	See reference (20)
		Benzyl salicylate	5% Oil	SPF 2		Photosensitivity & stinging may occur
		(-)	Lotion	SPF 3		See reference (20)
		(-)	Lotion	SPF 5		
		(-)	Cream	SPF 4		
		(-)	Cream	SPF 6		
Block-out	Sea & Ski Corporation	Padimate (-)		(-)	UVB 290-320	Widespread photosensitivity & contact dermatitis
Coppertone	Scholl Plough SA Ltd	Homomenthyl salicylate in Noskote		SPF 8	UVB 290-320	+
		and products up to		SPF 6		
		Benzophenone 3: in water-resistant products of		SPF 6-15	UVB 280-320	X
		Padimate 0: in products		SPF 5-15	UVB 290-315	Some photosensitivity → dermatitis
Everysun	Richardson-Vicks	Ethylhexyl paramethoxy cinnamate	2% Aqua sport	SPF 2	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	3% Aqua sport	SPF 3	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	6% Aqua sport	SPF 5	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	2% Milk	SPF 2	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	7,5% Milk	SPF 5	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	7,5% Cream	SPF 7	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	2% Oil	SPF 2	UVB 280-320	X
		Padimate 0	3,5%)		UVB 290-315	[X]
		Butyl methoxy benzoyl methane	2,5%) UV Blocker	SPF 6	UVA 325-380	?
		Ethylhexyl paramethoxy cinnamate	3,5%)		UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	5% lip balm		UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	5% lip stick		UVB 280-320	X
Lutsine	Hoechst	Ethylhexyl paramethoxy cinnamate	5% cream	SPF 3	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	9% cream	SPF 7	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	3% lotion	SPF 2	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	5% lotion	SPF 8	UVB 280-320	X
Nivea	Smith & Nephew	Ethylhexyl paramethoxy cinnamate	2%) Creams	SPF 2	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	&	SPF 4	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	↓ Lotions	SPF 5	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	6%)	SPF 6	UVB 280-320	X
Pabina	SCS Pharmalab (Noristan)	Para aminobenzoic Acid	5%	(-)	UVB 290-320	Photosensitivity → dermatitis (its use in cosmetics is prohibited in some countries)
Solarcare (Nulon)	Reckitt Toiletries	Ethylhexyl paramethoxy cinnamate	0,9%	(-)	UVB 280-320	X
Spectraban	Stiefel Labs UK	Padimate	2,5% Lotion	(-)	UVB 290-320	Widespread photosensitivity and contact dermatitis
Sundown	Johnson & Johnson	Padimate 0	5,3%)		UVB 290-315	[X]
		Benzophenone 3	1,75%)	SPF 6	UVB 280-320	X
		Padimate 0	(-)	SPF 8 and	UVB 290-315	[X]
		Benzophenone 3	(-)	15	UVB 280-320	X
		Octylsalicylate	(-)		UVB 280-320	?
Ultra Vera	Cheeseborough-Ponds	Ethylhexyl paramethoxy cinnamate	(-)		UVB 280-320	X
		Benzophenone 3	(-)	SPF 10	UVB 280-320	X
		Titanium Dioxide	(-)	and 20	UVA & UVB reflector	X
Uvistat	Boehringer Ingelheim	Mexenone	4% cream	(-)	UVB & some UVA 250-350	+ Stated to be non-irritant. See reference (20)
Uvistat-L	Boehringer Ingelheim	Mexenone	4%	(-)	UVB & some UVA 250-350	Stated to be non-irritant. See reference (20)
Uvitan	Boehringer Ingelheim	Para aminobenzoic acid	1,65%	(-)	UVB 290-320	Photosensitivity → dermatitis (its use in cosmetics is prohibited in some countries)

(-) Information not supplied by manufacturer.
[X] Rare cases of photosensitivity occur
X No adverse effects listed in references
\+ One report of contact dermatitis
? No reference found, so wavelength range and possible adverse effects indeterminable.

TABLE 7: SUNSCREEN PRODUCTS FROM COSMETIC HOUSES

Product	Manufacturer	Active ingredient	Concentration	SPF	UV Wavelength filtered (nm)	Possible advers effects
Biotherm	Biotherm	Benzophenone 2	(-) Antiwrinkle cream	SPF 2, 4	UVB & some UVA	?
		(-)	(-)	6	280-330	?
		(-)	(-) Total Sun Screen	SPF 15		
		(-)	(-) Sun tanning milk	SPF 2, 4 & 6		
		(-)	(-) Stick for eyes and lips	SPF 8		
Charles of the ritz Total Sun-block	Charles of the Ritz	Padimate 0	7%)		UVB 290-315	[X]
		Benzophenone 3	2,5%)	SPF 22	UVB 280-320	X
		Benzophenone 8	0,5%)		UVA & UVB 300-380	+
Clarins	Clarins	(-)	(-)			
		"3% vegetable extract including aloe, buckthorn and cascara"	(oil (cream (cream	SPF 3, 5 SPF 6 SPF 9	?	?
Clinique	Clinique	Padimate 0	1,5%)		UVB 290-315	[X]
		Benzophenone 4	0,5%) cream	SPF 4	?	X
		Padimate 0	5%)		UVB 290-315	[X]
		Benzophenone 4	2%) cream	SPF 8	?	X
		Padimate 0	7%)		UVB 290-315	[X]
		Benzophenone 3	2%) oilfree lotion	SPF 10	UVB 280-320	X
		Padimate 0	5%)		UVB 290-315	[X]
		Phenylbenzimidazole	) sunblock cream	SPF 19	?	X
		5-sulphonic Acid	5%)			
		Padimate 0	5%)		UVB 290-315	[X]
		Benzophenone 3	2,1% Lip block	SPF 11	UVB 280-320	X
		Titanium Dioxide — continuous coverage make-up		SPF 23	Reflects UVA & UVB	X
Ellen Betrix	HM Betrix & Co Frankfurt. Distributed in SA by Jothenil	3,4 Methyl Benzylidene Camphor	(-) Waterproof jelly	SPF 2	UVB 290-320	FDA considers this
		3,4 Methyl Benzylidene Camphor	(-) stick	SPF 6	UVB 290-320	neither safe nor effective -
		Ethylhexyl paramethoxy cinnamate	(-) Waterproof milk	SPF 3	UVB 280-320	X
		Padimate 0 (-)	Waterproof milk	SPF 6	UVB 290-315	[X]
		3,4 Methylbenzylidene Camphor	(-) Waterproof cream	SPF 6	UVB 290-320	FDA considers thi neither safe nor effec tive
		Ethylhexyl paramethoxy cinnamate	(-)		UVB 280-320	X
		Padimate 0	(-) Waterproof cream	SPF 8	UVB 290-315	[X]
		Ethylhexyl paramethoxy cinnamate	(-)		UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	(-) Multisun Quick Milk (selftan)	SPF 2	UVB 280-320	X
		Ethylhexyl paramethoxy cinnamate	(-) Multisun Quick Bronze (selftan)	SPF 2	UVB 280-320	X
Estee Lauder	Estee Lauder	Para aminobenzoic acid derivatives (varying)	(-) oil	SPF 2	UVB 290-320	?
		Para aminobenzoic acid derivatives (varying)	(-) gel	SPF 4	UVB 290-320	?
		Para aminobenzoic acid derivatives (varying)	(-) cream	SPF 4	UVB 290-320	?
		Para aminobenzoic acid derivatives (varying)	(-) lotion	SPF 8	UVB 290-320	?
		Para aminobenzoic acid derivatives (varying)	(-) cream	SPF 10	UVB 290-320	?
		Para aminobenzoic acid derivatives (varying)	(-) cream	SPF 15	UVB 290-320	?
		Para aminobenzoic acid derivatives (varying)	(-) sun-blocker	SPF 23		
		Titanium dioxide			UVA & UVB reflector	
Helena Rubenstein	Helena Rubenstein	Padimate 0	2,2%)		UVB 290-315	[X]
		Cinoxate	2,2%) Golden Beauty Lotion	SPF 6	UVB 290-320	+
		Padimate 0	4,0% Golden Beauty Lotion	SPF 4	UVB 290-315	[X]
		Padimate 0	10%)		UVB 290-315	X
		Cinoxate	10%) Golden Beauty Sunblock stick	SPF 10	UVB 290-320	+
		Padimate 0	2,2%)		UVB 290-315	[X]
		Cinoxate	2,2%) Golden Beauty Face Cream	SPF 6	UVB 290-320	+
		Padimate 0	3,3%)		UVB 290-315	[X]
		Cinoxate	3,3%) Golden Beauty Gel	SPF 10	UVB 290-320	+
		Padimate 0	3,0% Lip repair cream	(-)	UVB 290-315	[X]
		(The following Rubinstein cosmetics contain 1,5% Padimate 0: Skin Dew Moisturing Emulsion, Fresh Cover Moisturising Lotion, Skin Life oil regulating Moisturiser, Skin Life Emulsion, Skin Life Light Weight Emulsion, Existence Emulsion and Tan in a Minute)				

continued . . .

TABLE 7: SUNSCREEN PRODUCTS FROM COSMETIC HOUSES (cont)

Product	Manufacturer	Active ingredient	Concentration	SPF	UV Wavelength filtered (nm)	Possible adverse effects
Payot	Laboratories Payot	Parsol MCX	(-) Gel	SPF 3	UVB 280-320	X
		Parsol MCX	(-) Antiwrinkle Liquid	SPF 3	UVB 280-320	X
		(-)	(-) Intense Br	SPF 3		
		(-)	(-) Liquid	SPF 4		
		(-)	(-) Cream	SPF 6		
		(-)	(-) Water Resistant Liquid	SPF 9		
Reeva	Reeva Forman Ltd	Cinoxate	(-) Lotion	SPF 4	UVB 290-320	+
		Cinoxate	(-) Lotion	SPF 10	UVB 290-320	+
Roc	Roc International	A cinnamic ester	(-) Lotion	SPF 3	?	?
		A cinnamic ester	Oil	SPF 3		?
		A cinnamic ester	Cream	SPF 4		?
		A cinnamic ester	Cream	SPF 6		?
		A cinnamic ester	Cream	SPF 8		?
		A cinnamic ester)			?	?
		Zinc Oxide)	Total Block	SPF 10	Reflects UVA & UVB + some visible	
		A cinnamic ester)				?
		Titanium dioxide)	Facial Block	SPF 10	?	X
		(-)	Sunblock Stick	SPF 10		?
		A cinnamic ester	Lip Screen	SPF 5	?	?
Ultima II	Revlon	(-)	(-) Gel	SPF 2	?	?
		(-)	(-) Emulsion	SPF 4	?	?
		(-)	(-) Antiwrinkle cream	SPF 6	?	?
			(-) Emulsion	SPF 8	?	?
		(-)	(-) Sunblock	SPF 15	?	?

(-) Information not supplied by manufacturer
[X] Rare cases of photosensitivity occur
X No adverse effects listed in references
\+ One report of contact dermatitis
? No reference found, so wavelength range and possible adverse effects indeterminable

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