Sunscreen Formulation and Testing

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Sunscreen, SPF testing, sunscreen actives, sunscreen active solvents, sunscreen water resistance testing, sunscreen emulsifiers

Abstract

The author reviews SPF testing methods and sunscreen components (actives, active solvents, water-resistance agents and emulsifiers) that assist the formulator in the art and science of sunscreen formulation.

Sunscreen formulation is both an art and a science. Sun screens appear to be simply an emulsion system with sunscreen actives included in the formulation. However, this is far from reality. Even a formulator experienced in the development of emulsion systems will experience a myriad of difficulties during sunscreen formulation. This review will be successful if the reader understands that sunscreen formulation is complex and is best left to the experienced artist.

Formulation greatly influences the efficacy of the sunscreen actives. Efficacy of a sunscreen is defined as its ability to protect the skin against ultraviolet-induced burning, or Sun Protection Factor. The SPF is influenced by the type of sunscreen active(s), by the emulsion's oil phase, by the emulsion water phase, by the emulsification process, and perhaps by other factors. Because sunscreen efficacy is defined by its SPF, the task of the formulator is to create a formulation with the highest SPF, at the lowest cost, and with highly favorable cosmetic properties.

This article reviews many of the tools available to the sunscreen formulator: sunscreen actives, formulation types, formulation characteristics and in vivo testing methodology.

Interaction Between Skin and UV Radiation

The skin: Skin is composed of two bands of defined tissue separated by a thin membrane. The dermis is the inner band. The epidermis, the outer band, is composed of four layers, stratum basale, stratum spinosum, stratum granulosum and stratum corneum.

The stratum corneum is the outer-most layer of the epidermis and is evident to the naked eye. It is about 20 cell layers thick, with no viable cells and no blood supply. The stratum corneum provides a protective barrier, called the acid mantle or horny layer, that keeps moisture inside the body and the environment outside. The stratum corneum provides some protection against UV radiation and can alter itself to provide additional protection.

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UV radiation: Ultraviolet radiation is composed of UVC (200-290 nm), UVB (290-320 nm) and UVA (320-400 nm).

Our atmosphere blocks UVC, so only UVB and UVA reach the surface of the earth. Generally, UVB penetrates only into the epidermis, while UVA penetrates all the way to the dermis. While both UVA and UVB cause skin changes, UVB is about 50 to 100 times more energetic than UVA at inducing these changes. UVB radiation is more energetic than UVA radiation at inducing erythema, melanogenesis, DNA damage and squamous cell carcinoma.

Interaction between UV and skin: UV radiation that impinges on the surface of the skin can be reflected back toward the environment, can be absorbed by substances on the surface of the stratum corneum or can continue deeper into the skin. The physics of ultraviolet radiation is reviewed elsewhere.[1] The stratum corneum thickens as it adapts to UV exposure, so it can absorb more UV.

Interaction between UV and sunscreen actives: Theoretically, sunscreen actives could perform their task of reducing or preventing UV-induced burning in one of three ways. One way (chemical) would be to absorb the UV radiation to prevent the radiation from damaging viable tissue. A second way (physical) would be to reflect the UV radiation. The third way (biological) would be to reduce inflammation either by blocking the biological inflammatory response or by enhancing biological repair. A few sunscreen actives may operate in more than one way.

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While a chemical or physical sunscreen active must stay on the stratum corneum to be effective, a biological sunscreen active would have to reach the viable tissues to be effective.

A chemical sunscreen active is believed to protect the viable tissues by absorbing the UV radiation and transforming it into less damaging radiation such as heat or light. Chemical sunscreen actives might also generate free radicals in response to UV radiation. Regardless of the mechanism, chemical sunscreen actives should absorb the UV radiation before it can reach the viable tissues. For this to occur, the sunscreen active must maintain a high concentration in the stratum corneum for several hours.

SPF Testing

SPF is not well understood by the public, or even within the sunscreen profession. SPF is a ratio of the ability of a person to burn with the sunscreen relative to his ability to burn without the sunscreen. Thus, if a person burns in 10 minutes without the sunscreen, but does not burn until 150 minutes with the sunscreen, then the SPF of the sunscreen is 150/10 = 15. Consequently, the better a sunscreen protects the user's skin against sunburn, the higher the SPF. The goal of the formulator is to develop the highest SPF possible using the least amount of sunscreen actives, because the sunscreen actives are expensive and may be irritating.

Requirements for higher SPF increase the difficulty for the formulator to generate a safe, efficacious and pleasant product. Generally, higher SPF values protect better because SPF is a measure of sunscreen's efficacy. As shown in Figure 1, a SPF 2 sunscreen will block 50% of the sunburn response.

The role of very high SPF values (SPF > 30) may be unclear to the consumer. An SPF 25 blocks 96% of the sunburn response, while an SPF 50 only blocks 2% more, or 98% of the total sunburn response. Very high SPF products are more expensive, may be more irritating to the consumer's skin and eyes and may offer little extra protection for the average consumer. Very sun-sensitive individuals may benefit from the extra protection, however, suggesting that a market niche exists.

In the recent Final Monograph on sunscreens, the US Food and Drug Administration (FDA) established the upper limit for SPF at 30+.[2] Any product offering a SPF greater than 30 can only exhibit 30+ on the label unless FDA approval is obtained.

SPF test: The SPF test approved by the FDA in its Final Monograph defines the only method to determine the SPF of a sunscreen.[2] The procedure is simply to determine the Minimal Erythema Dose (MED) on at least 20 but not more than 25 qualified subjects. The MED is that amount of ultraviolet radiation required to produce the first perceptible redness reaction with clearly defined borders at 22 to 24 hours after irradiation.

To determine the MED, a series of 5 exposures of increasing energy is administered to the subject's unprotected skin. Each exposure is 25% greater than the previous exposure. At 22 to 24 hours after exposure, a trained grader other than the person who conducted the irradiation or who applied the sunscreen evaluates the redness of each exposure site. The MED on unprotected skin, or MED_{US}, is used to calculate the radiation exposures for the sunscreen-protected site.

To determine the MED in the presence of the sunscreen, MED_{PS}, the first step is to apply the sunscreen to the subject's skin, usually the back. After a wait of at least 15 minutes for the sunscreen to dry, the treated area is exposed to seven geometrically increasing doses of radiation. The geometric progression is dependent on the predicted SPF of the sun-

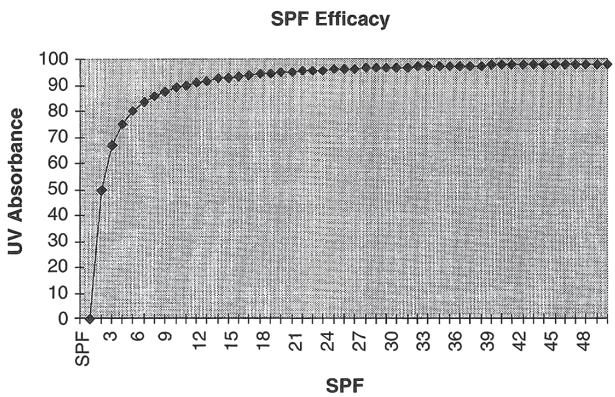

Figure 1. SPF efficacy versus UV absorbance

Table 1. Geometric progression of irradiation exposures

SPF	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
<8	0.64X	0.80X	0.90X	1.00X	1.10X	1.25X	1.56X
8 - 15	0.69X	0.83X	0.91X	1.00X	1.09X	1.20X	1.44X
>15	0.76X	0.87X	0.93X	1.00X	1.07X	1.15X	1.32X

Table 2. Product category designation of sunscreens

SPF	PCD
30+	high
12-30	moderate
2-12	minimal

screen, as shown in Table 1, where X is the product of the expected SPF and the subject's MED.

The MED_{PS} is the lowest dose of radiation that produces the first perceptible redness reaction with clearly defined borders of the exposure site at 22 to 24 hours after exposure. The SPF value is the ratio of the energy required to produce the MED_{PS} to that required to produce the MED_{US}. Based on its SPF, the sunscreen is placed in one of three product category designations, or PCD, as shown in Table 2. Any product with a SPF below 2 should not be labeled as a sunscreen drug product.[2]

Water-resistant or very-water-resistant test: To determine the water resistance of a sunscreen formulation, you must first subject the skin with the sunscreen test material to repeated exposures to fresh water. Fresh water in an indoor pool, whirlpool, or Jacuzzi[a] is maintained at 23° to 32°C for the test. The sunscreen is applied to the skin and allowed to dry.

The subject enters the water and engages in moderate activity for 20 minutes. The subject exits the water to rest for 20 minutes, being careful to avoid rubbing off the sunscreen. For a water-resistant claim, the 20 minutes in the fresh water while engaging in moderate activity is repeated once more, for a total of 40 minutes in the water. For a very water-resistant claim, the 20 minutes in the fresh water while engaging in moderate activity is repeated three more times, for a total of 80 minutes in the water. Each 20-minute segment in the water is followed by a 20-minute rest period out of the water.

Following the water immersion procedure, the sunscreen sites are allowed to air dry. Then the SPF of the sunscreen is determined in a manner identical to that described above under SPF test. The SPF of the sunscreen determined after 40 total minutes of water exposure is the SPF placed on the label of a water-resistant sunscreen. The SPF of the sunscreen determined after 80 total minutes of water exposure is the SPF placed on the label of a very water-resistant sunscreen.

[a] *Jacuzzi is a registered trademark of Jacuzzi Inc., Walnut Creek, CA.*

One controversy in water-resistant sunscreens is whether water resistant is the same as sweat resistant. In essence, the debate is whether water coming from outside the skin acts identically to water coming from inside the skin in disrupting sunscreen efficacy. In the 1993 Tentative Final Monograph,[3] the FDA ruled that because the water-resistant test was more stringent than the sweat-resistant test, any product that passed the water-resistant or very-water-resistant test could also make the claim of sweat resistant.

Recommended approach for testing: The target for the novice sunscreen formulator is to develop a sunscreen that will meet the customer's SPF requirements. General principles to meet those requirements will be discussed later. After a few years of formulating sunscreens to meet SPF values, the experienced sunscreen formulator can then begin to formulate sunscreens with improved cosmetic properties. The experienced formulator remembers that SPF formulations must meet the requirements of the tests first and meet consumer requirements second.

Methods exist for clinical testing labs to obtain high SPF values and stay within the FDA testing guidelines. For example, COLIPA has greater defined values for the emission spectrum of solar simulators than the FDA's Final Monograph. When testing a sunscreen for the US market, the solar simulator must only emit between 290 nm and 400 nm with a spectrum similar to sunlight at sea level from the sun at a zenith angle of 10°. A solar simulator can have an increased amount of UVB that then generates a higher SPF relative to the COLIPA-certified solar simulator. Using solar simulators with higher amounts of UVB relative to UVA will increase the SPF of sunscreen products containing UVB sunscreen actives.

UVA protection testing: Currently, there is no FDA-accepted method to test for UVA protection. Developing an accepted method is difficult because of the inability to easily detect any acute changes in skin resulting from non-erythemal UVA radiation (340-400 nm). Sunburn satisfies the requirements for UVB radiation and for erythemal UVA radiation. However, for non-erythemal UVA radiation, no easy method exists to detect changes. It seems that we may be attempting to provide protection from UV radiation that causes only minimal changes in skin biochemistry.

Sunscreen Actives

The FDA has published a Final Monograph which details the sunscreen actives that can be used in OTC sunscreens in the US.[2] This Final Monograph incorporates the two additional actives that were added after the Tentative Final Monograph was published.[4,5] A list of these sunscreen actives appears in Table 3 with additional pertinent information. Many suppliers of these sunscreen actives can be found in different source books, such as the *International Cosmetic Ingredient Dictionary and Handbook*.[6] To obtain additional information, you need only ask one or more of the suppliers.

The Final Monograph includes only maximum concentrations of sunscreen actives when used alone and in combination with other sunscreen actives. The sunscreen active concentrations allowed by the Final Monograph are shown in Table 3.

Sunscreens are safe and effective for the prevention of sunburn as determined by the SPF test. Ultraviolet radiation triggers many biological events, including acute, delayed and chronic skin effects in addition to sunburn. Animal and human studies indicated that sunscreens prevent these biological events. The risk of allergic contact dermatitis or of photoallergic contact dermatitis due to sunscreen actives is low.[7] Gasparro, Mitchnick and Nash published a thorough review on sunscreen safety in 1998.[8]

To formulate a high SPF sunscreen, one must first block much of the UVB, so in selecting sunscreen actives, you must first choose a UVB blocking active. For many years, Padimate O was the UVB sunscreen active of choice because it was very effective, inexpensive and relatively easy to formulate. Recently, octyl methoxycinnamate has become more popular with experienced formulators owing to concern about increased photosensitization with Padimate O relative to octyl methoxycinnamate and to increased stinging with Padimate O. Although the former concern appears to be unfounded,[7] the public now looks for sunscreens that are "PABA free."

Titanium dioxide and zinc oxide are two new important sunscreen actives for the formulator. Each of these metal oxides displays absorbing properties throughout much of the UVB and UVA spectrum. These actives can impart high SPF values at relatively low concentrations, provide for broad-spectrum protection, and are relatively inexpensive. The difficulty in formulating with titanium dioxide or zinc oxide is creating a product with acceptable consumer qualities. Recent research by Kobo Products and by Sunsmart has advanced the formulation possibilities of these two sunscreen actives.

Sunscreen Active Solvents

Once the formulator has decided which sunscreen active(s) to use in the formulation, the next step is to choose a solvent or solvents to solubilize those sunscreen actives. The solvents allow the sunscreen actives to emulsify and may have additional effects on the orientation of the sunscreen actives after the actives are applied to the skin. Some of these solvents, such as butyloctyl salicylate,[b] may actually stabilize some sunscreen actives against photodegradation.[9-11] Rassat and colleagues published a list of solvents for the newest sunscreen active, avobenzone.[12]

For the inexperienced sunscreen formulator, benzoate esters are perhaps the best starting point. Formulations using C12-15 alkyl benzoates are shown in Formulas 2 and 8. A common solvent for the sunscreen active avobenzone is butyloctyl salicylate. Some selected sunscreen solvents are shown in Table 4.

The more experienced formulator can examine the use of unique co-solvent systems such as the combinations of the

[b] *Butyloctyl salicylate is marketed as HallBrite BHB, which is a trademark owned by The C.P. Hall Company, Chicago, IL.*

Table 3. FDA-accepted sunscreen actives

INCI Name	Max. Conc.	Protection Range	Trade Name(s)	Selected Supplier(s)
PABA	15%	UVB	PABA	Rona
Avobenzone	3%	UVA	Parsol 1789	Roche
Cinoxate	3%		None	None
Dioxybenzone	3%	UVA	Benzophenone-8	American Cyanamid
Homosalate	15%	UVB	HMS	Rona
Menthyl anthranilate	5%	UVA	Neo Heliopan MA	Haarmann & Reimer
Octocrylene	10%	UVB/UVA	Excalol 597	ISP Van Dyke
Octyl methoxycinnamate	7.50%	UVB	Parsol MCX	Roche
			Escalol 557	ISP Van Dyk
Octyl salicylate	5%	UVB	Escalol 587	ISP Van Dyk
Oxybenzone	6%	UVA	Neo Heliopan BB	Haarmann & Reimer
Padimate O	8%	UVB	Escalol 507	ISP Van Dyk
Phenylbenzimidazole sulfonic acid	4%	UVB	Eusolex 232	Rona
			Parsol HS	Roche
Sulisobenzone	10%		UMS 40	BASF
Titanium dioxide	25%	UVB/UVA		Kobo
Trolamine salicylate	12%	UVB	None	None
Zinc oxide	25%	UVB/UVA		Kobo
				Sunsmart

alkyl benzoates with isopropanol. Suppliers are now making new sunscreen solvent blends available, such as hexyldecyl benzoate with butyloctyl benzoate and C12-15 alkyl benzoate, stearyl ether benzoate and dipropylene glycol dibenzoate. The subject of sunscreen solvents is a very active area of research within the R&D programs of raw material suppliers as well as of sunscreen formulators. Much useful information on the issue of solvency should be available from experienced sun-care formulators during the next several years.

Inorganic Sunscreen Active Dispersions

Inorganic sunscreen actives, titanium dioxide and zinc oxide, present formulation difficulties unlike those of organic sunscreen actives. Inorganic sunscreen actives must have a small particle size to avoid the "whitening" effect, a particle size large enough to absorb UV radiation,[13] and proper wetting and dispersion to avoid agglomeration. The optimum particle size for titanium dioxide seems to be about 15-20 nm, while that for zinc oxide appears to be slightly larger, 15-35 nm. These sizes are best for avoiding the "whitening effect" while maintaining strong UVB and UVA absorption.

Proper wetting and dispersion of the inorganic sunscreen will prevent agglomeration and precipitation in the formula. Some advances have been made by treating or coating the particles to improve dispersion and stability. For example, Schlossman patented the treatment of titanium dioxide with isopropyl titanium triisostearate.[14] This treated material has greater dispersability and minimizes aggregation.

Table 4. Selected solvents for organic sunscreen actives

- Alkyl salicylate
  - Butyloctyl salicylate
  - C12-15 Alkyl benzoate
  - C12-15 Triethoxy alkyl benzoate
  - Cocoglycerides
  - Dipropylene glycol benzoate
  - Isocetyl salicylate
  - Isodecyl isononanoate
  - Isodecyl salicylate
  - Isononyl isononanoate
  - Isostearyl benzoate
  - Isotridecyl isononanoate
  - Isotridecyl isononanoate
  - Methyl gluceth-20 benzoate
  - Octyldodecyl benzoate
  - Poloxamer 105 benzoate
  - Poloxamer 182 dibenzoate
  - PPG-15 stearyl ether benzoate
  - Tridecyl salicylate

Table 5. Selected agents imparting water resistance

Film formers
- PVP hexadecene copolymer
- PVP eicosene copolymer
- Tricontanyl PVP
- Acrylates/C10-30 alkyl acrylate crosspolymer
- Acrylates/t-octylpropenamide copolymer

Hydrophobic barrier formers
- Cetyl dimethicone
- Maleated soybean oil

Agents Imparting Water Resistance

Agents imparting water resistance are materials that protect the sunscreen active from being removed easily with water. This is an important characteristic for sunscreens that will be used at the beach or swimming pools, or during times of high physical activity. Under these conditions, the sunscreen should be able to avoid any loss of efficacy from the aqueous environment. Sweating or swimming will cause a loss of activity from a sunscreen product without water resistance. With these agents, the sunscreen actives are not lost to an aqueous environment.

The first waterproof sunscreen was developed by Johnson & Johnson in 1977. Coppertone quickly followed with a water-resistant product using a polyanhydride resin, PA-18, as the agent imparting water resistance. PA-18 has several characteristics that make it ideal for imparting water resistance in sunscreens. First, it imparts water resistance to the sunscreen; it's effective. Second, it is very inexpensive. Third, it is safe topically as evidenced by years of successful use. Unfortunately, PA-18 is under patent until 2002.[15]

Several other agents can be used to impart water resistance to sunscreen formulations. These are generally based on film forming characteristics or on hydrophobic barrier characteristics. A listing of selected water-resistant agents appears in Table 5.

One important note for the formulator using a film former is to use the lowest possible concentration of emulsifier. The emulsification system dries on the skin with the waterproofing agents. If too much emulsifier exists, then the addition of water can cause the waterproofing agent to re-emulsify and wash off. This would allow the sunscreen active to wash off as well.

Sunscreen actives cause irritation to the eyes. When a waterproof sunscreen enters the eye, the waterproofing agents adhere to the mucus membrane of the eye. This holds the sunscreen actives in place, causing severe and prolonged irritation. Therefore, this author suggests that waterproof sunscreen products never be tested for eye irritation. Alternatively,

the product without the waterproofing agents in the formula might be tested in an eye-stinging assay.

Emulsifiers for Sunscreen Products

The choice of an emulsifier for a sunscreen product is dependent on many variables including the influence of emollients on sunscreen performance (spreadability, water resistance and penetration), your existing internal technology and knowledge base and manufacturing capabilities. The choice of emulsifier affects the absorption spectrum of the sunscreen actives, penetration of the sunscreen actives, the spreading of the actives and the adherence of the actives to the skin.

A relationship appears to exist between the thickness of the film, the spreadability of the product and the efficacy of a sunscreen. This should not be surprising because sunscreen actives are, for the most part, planar molecules; orientation is important. If the sunscreen active is positioned properly on the skin, then its ability to absorb UV radiation is maximized. A thicker layer of sunscreen may result in better orientation.

The spreadability and surface tension are important and have been important for sunscreen formulators. Usually, creams have a higher SPF than corresponding lotions. However, with research, lotions can match creams for SPF values. Any sunscreen emulsification system should not be able to oxidize on the skin. Dahms suggests that PEG emulsification systems can undergo auto-oxidation, resulting in an incompatibility between the sunscreen product and the skin.[16]

If spreadability is too great, then the sunscreen product will spread over the skin into the eyes of the user. Sport type sunscreen products are designed to hold the sunscreen actives in place so they do not spread. These formulations are designed for customers with an active lifestyle. The first product of this class was marketed by Coppertone under the name Coppertone Sport. Since its creation, several similar "sport" type formulations have been developed.

Because the majority of raw material costs for a sunscreen are for the sunscreen actives, the formulator must develop

Formula 1. Sunscreen Lotion (SPF 30) (ISP Van Dyk)

A	Water *(aqua)*	50.40% wt
	Xanthan gum	1.00
B	Glyceryl stearate (and) laureth-23	6.00
	PEG-20 stearate	3.00
	Cetyl lactate	3.00
	C12-15 alkyl lactate	1.00
	Myristyl myristate	4.00
	Octyl methoxycinnamate	7.50
	Benzophenone-3	3.00
	Octyl salicylate	3.00
	Propylene glycol	6.00
C	Titanium dioxide, ultra fine	5.00
	Isocetyl stearoyl stearate	3.00
	Maleated soybean oil	3.00
D	Preservative	1.00
E	Fragrance *(parfum)*	0.10
		100.00

Procedure: Mix C with a roller mill. Disperse A with high speed mixing. Heat to 75°C. Heat B to 80°C and add C. Add BC to A. Mix with homogenizer for 15 minutes. Mix while cooling to 40°C with a sweep blade. Add D and then E. Mix while cooling to 25°C.

Formula 2. Sunscreen Lotion with Avobenzone (SPF 26) (C.P. Hall Company)

A	Octyl methoxycinnamate	7.50% wt
	Oxybenzone	3.50
	Avobenzone	3.00
	Octyl salicylate	5.00
	Butyloctyl salicylate	5.00
	Hexyldecyl benzoate and butyloctyl benzoate	5.00
B	Tocopheryl acetate	0.20
	Sorbitan oleate	0.40
	PVP/eicosene copolymer	0.75
	Dimethicone copolyol	0.20
	Silica	0.40
	Acrylates/C10-30 alkyl acrylates crosspolymer	0.30
C	Water *(aqua)*	qs
	Disodium EDTA	0.10
	Carbomer	0.20
D	Butylene glycol	2.00
	Preservative	qs
	Panthenol and propylene glycol	0.50
	Hydroxypropyl methylcellulose	0.20
E	Triethanolamine	0.50
		100.00

Procedure: Mix A until dissolved. Add B to A and heat to 50-55°C. Mix C. Add D to C and heat to 50-55°C. With vortex stirring, add AB to CD and stir for 30 min. Cool while stirring. Adjust viscosity with disodium EDTA.

products with high SPF values and low concentrations of sunscreen actives. Recently, several companies have developed materials referred to as SPF boosters or enhancers. These raw materials attempt to increase the SPF of a formulation without increasing sunscreen actives. These SPF boosters or enhancers should be evaluated carefully because they are not universally effective. They may enhance the SPF of one particular type of formulation, but not of another.

Sunscreen products are available in many different types of formulations to appeal to a wide variety of customers. Formulas 1 through 5 illustrate various types of creams, lotions, gels, sprays and sticks, but these are not inclusive. The talented formulator will branch from accepted formulation types to create a unique product.

Formula 3. Waterproof Sunscreen Formula (SPF 14) (Kobo Products)

A	Cetyl dimethicone	3.00% wt
	Cyclomethicone	7.50
	Isononyl isononanoate	6.00
	Methyl glucose sesquistearate	0.50
	Dioctyl malate	2.00
	Polyglyceryl-4 isostearate (and) cetyl dimethicone copolyol (and) hexyl laurate	5.00
B	Micronized zinc oxide (and) isononyl isononanoate (and) hexaglyceryl polyricinolate (and) isopropyl titanium triisostearate	21.33
C	Water *(aqua)*	51.07
	Sodium chloride	0.50
	C10 polycarbamyl polyglycol ester	2.50
	Preservative	0.60
		100.00

Procedure: Heat A to 75°C and cool to 65°C with propeller. At 65°C, add B to A under homogenizer. With propeller mixing, add premixed C to AB. Cool to 30°C.

Formula 4. SPF 15 Lip Balm (Protameen Chemicals)

A	Isostearyl linoleate	10.00% wt
	Caprylic/capric triglyceride	60.20
	Octyl methoxycinnamate	7.00
	Benzophenone-3	3.00
	Propylparaben	0.10
	C30-40 alkyl methicone	4.00
	Ozokerite wax, white	5.00
	Petrolatum	10.00
B	Fragrance *(parfum)*	0.70
		100.00

Procedure: Heat A to 80°C, mixing until uniform. Cool to 65°C. Add B. Pour into suitable container.

Formula 5. Sunscreen Spray

A	C12-15 alkyl benzoate	10.00% wt
	Octyl methoxycinnamate	7.50
	Octyl salicylate	4.00
B	Isododecane	73.50
	Isohexadecane	5.00
C	Fragrance (parfum)	qs
		100.00

Procedure: Mix A. Add B and continue mixing. Add C.

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