

Petrolatum: A Useful Classic

Petrolatum, an occlusive moisturizer and skin protectant, finds wide applicability in cosmetic and OTC products and in drug research

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Petrolatum (also known as petroleum jelly or paraffin jelly) can be defined as a semisolid mixture of hydrocarbons, practically odorless and tasteless, obtained through the dewaxing of heavy mineral oils. Ever since its initial inclusion in the *U.S. Pharmacopoeia* in 1880, petrolatum's beneficial properties for skin care and treatment have been extensively reported.

Skin Care — Moisturization

The scientific literature is full of evidence that petrolatum is an effective moisturizer (Table 1-1). In a 1978 study to determine efficacy, Kligman describes a moisturizer as "a topically applied substance or product that overcomes the signs and symptoms of dry skin."²⁸ Petrolatum was found to be the best material for relieving ordinary xerosis in this study; no other substance matched it for both short-term and extended relief of dry skin. Kligman states that petro-

A Brief History

Petrolatum and its manufacture were patented in 1872 by Robert A. Chesebrough, who called the new material "Vaseline".^{52,63} While Chesebrough cited treating leather as its primary use, petrolatum also was recommended as a hair pomade and for treating chapped hands.⁶³ In 1875, the American Pharmaceutical Association found petrolatum "without a superior" for treating burns and scalds.^{31,52} The use of petrolatum in the pharmaceutical industry grew tremendously, mainly due to its ointment-like properties, similar to lard but without the associated problems of rancidity.⁵²

The skin-moisturizing properties of petrolatum coupled with its oxidative stability were noticed by cosmetic manufacturers who began using petrolatum in skin-care products.

tum is a good moisturizer due to its physical and pharmacological properties. Applying even small amounts produces a noticeable improvement in dry-skin symptoms.

Lazer and Lazer³⁰ indicate that Kligman's regression method for evaluating moisturizing efficacy²⁸ is probably the most popular test method available. In this article,³⁰ the authors verify that petrolatum moisturizes via occlusion of the stratum corneum (SC) and, for this reason, is used in many formulations.

A column by Fishman on treating dry skin cites petrolatum as a "classic" emollient that is highly efficient in relieving dry skin.¹² Like Lazer and Lazer, Fishman states that petrolatum is often found in oil phases of cosmetic emulsions. Petrolatum use in skin-care products, both alone and in emulsions, is common in earlier literature, primarily for its moisturizing properties.⁵⁵

Depuis des années, le petrolatum a été à la fois loué et critiqué: loué comme agent hydratante et critiqué pour l'impression grasse qu'il peut laisser. Cependant, grâce à son prix moins cher et ses bénéfices incomparables, l'utilisation de petrolatum comme matière première cosmétique a crû. Sa nature grasse peut être minimisée par la formulation créative du produit. Cet article examine la littérature récente concernant le petrolatum.

Über viele Jahre lang hat das Petrolatum sowohl Lob als auch Kritik erfahren. Es werde ausgelobt als feuchtigkeitfördernde Substanz und die Kritik richtete sich gegen das fettige Gefühl, das es erzeugt. Aufgrund seiner niedrigen Kosten und seiner allgemein günstigen Eigenschaften hat Petrolatum als kosmetischer Grundstoff an Bedeutung gewonnen. Das fettige Gefühl kann durch entsprechend kreatives Formulieren minimiert werden. In diesem Artikel wird die aktuelle Literatur zu Petrolatum besprochen.

Por años, Petrolatum a tenido ambos elogios y críticas-elogios como un humectante y se ha criticado por sentirse grasoso. Sin embargo, debido a el costo bajo y beneficios incomparables de Petrolatum, su uso como materia prima en cosmética ha crecido. Lo grasiado puede ser reducido por una formulación del producto. Este artículo revisa la literatura reciente en lo que concierne a Petrolatum.

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Table 1-1. Skin-care patents using petrolatum for emolliency or moisturization

Date	Patent	Company/Author(s)	Comments
Apr 18, 1995	US 5,407,678	Chesebrough-Pond's	Nongreasy cream, 30-95 wt% petrolatum
Feb 7, 1995	US 5,387,417	Dow Corning	Nongreasy emulsion said to have superior moisturizing and acceptable tactile properties; 5-50% petrolatum, a cyclic polydimethylsiloxane fluid and a crosslinked organopolysiloxane-polyoxyalkylene emulsifier in the continuous phase
Aug 18, 1994	WO 94 17,830	Procter & Gamble	Moisturizing lotion with 4-16% oil in an oil-in-water dispersion, petrolatum is a "highly preferred" oil phase ingredient; reduced greasiness and excellent feel
May 17, 1994	JP 06 135,817	Kao Corp	Petrolatum in the oil phase of this water- and oil-resistant moisturizer; claims to prevent loss of pigments and UV absorbers by perspiration and skin oils
Jul 11, 1991	JP 03 161,417	Kanebo KK	Water-in-oil hand cream incorporates a vitamin C derivative; has good skin affinity without excessive oiliness.
Jun 4, 1991	US 5,021,405	Dow Corning	Petrolatum cited in this patent (for amino-, amido- or carboxyfunctional polysiloxanes to enhance the durability of emollients) as an emollient and moisturizer. When tested against mink oil, lanolin oil and mineral oil without the added siloxane materials, petrolatum lasted longest after several soap washes.
Feb 13, 1990	US 4,900,550	EA Lowry	4-component (softener, cell-penetrating product, nourishing/protecting product and sealant/tightener) cosmetic regime "enhances the cell renewal cycle of skin without causing irritation." The softener has 75-80 wt% petrolatum and the nourishing/ protectant product also uses a small amount.
Sep 1, 1987	US 4,690,774	Chesebrough-Pond's	Moisturizer
Jun 12, 1984	US 4,454,118	ZM Johnson	Cosmetic compositions of lanolin, petrolatum, glycerin and "minor amounts of essential oils and other conditioners" for treating dry skin; said to be a completely natural product; one contained petrolatum at about 25%.
Jun 21, 1983	US 4,389,418	SC Johnson & Son	Moisturizing cream
Jan 11, 1983	US 4,368,187	MG Florn, AM Herrold, JO Martin, AA Mentlik and PP Warrick	Skin care regime (cleanser, toner, moisturizer and cream) designed to decrease skin sensitivity without causing irritation.
Feb 8, 1983	US 4,372,944	AM Herrold	The cream, patented separately
			Lip balms
Feb 21, 1995	JP 07 48,227	J Nakayama, T Ito and Y Kamya	Lip cream contains petrolatum at 40 wt%, "hydrophilic globular SiO ₂ " and a dimethylpolysiloxane
Nov 24, 1994	WO 94 26,234	Ibah, Inc.	Water-in-oil lip balms (preferably microemulsions) use 60-85 wt% petrolatum base and up to 5% water

In an article describing the effects of petrolatum, white oil, and white oil gels on a liquid-crystal model of the SC, Friberg and Ma report that petrolatum provides excellent occlusivity by coating the SC and preventing rapid water loss.¹³ Again, petrolatum's unsurpassed barrier to water vapor transmission is cited.

Rieger cites the moisturizing action of petrolatum by reducing transepidermal water loss (TEWL) in an article on skin care.⁴⁷ He states that the occlusivity (and hence moisturization) of petrolatum "is entirely consistent with accepted concepts of dermatologic practice, cosmetic formulation and OTC skin protection." Zoe Draelos, MD, states that petrolatum, often included in the traditional moisturizer, retards TEWL by occlusion.⁹

In a paper on allergic contact dermatitis, Fisher and coworkers report that white petrolatum is the best occlusive moisturizer.¹¹ White petrolatum also is mentioned as the ideal moisturizer for people with abnormal skin and specifically for those seeking a dermatologist's advice for dermatitis associated with cosmetic product exposure.

Idson, in 1992, published an extensive article on dry skin.²² He states that "petrolatum is the most efficient occludent and emollient for protecting dry skin and allowing it to hydrate again." He cited petrolatum as unique for its combination of occlusive action and being a pharmacologic agent. Oils containing unsaturated fatty acid moieties (such as

safflower, sesame, avocado and mink oils) were mentioned as contributing to skin flexibility, but as treatments for dry skin, they are significantly less occlusive than petrolatum.

Protecting the moisture barrier: Tranner and Berube relate petrolatum's skin protection properties along with its moisturizing benefits.⁵⁶ They ascribe petrolatum's moisturizing characteristics to the slowed water loss when petrolatum is applied to skin, referencing several other papers that support this explanation.

Ghadially and coworkers report that, when skin is damaged by removing the barrier lipids with acetone, petrolatum actually accelerates rather than impedes the healing process.¹⁹ Petrolatum penetrates the uppermost SC layers; these results suggest that it helps repair damaged tissue in addition to moisturizing. The results obtained from occlusion with vapor-impermeable membranes are clearly different from those obtained when petrolatum is used.

Frömder and Lippold report an in vitro study of TEWL using lipophilic excipients.¹⁴ In this study, white petrolatum reduces TEWL after application significantly more effectively than the other lipids tested.

Measuring moisturizing effects: Recent work on the skin's moisture content continues to verify petrolatum's efficacy in skin-care products. This work includes both anhydrous products and the more aesthetically pleasing emulsion formulas. For example, using the method developed by

Safety

Noncomedogenic: Despite many misconceptions to the contrary, petrolatum is noncomedogenic. This has recently been reported by Lanzet²⁹ and Fulton,¹⁵ both of whom used the rabbit ear assay in making their determinations. The safety of petrolatum was further demonstrated when Fulton, a dermatologist, recommended petrolatum as a moisturizer for acne sufferers. The physical characteristics of petrolatum often lead people to believe that it (or a cosmetic product containing petrolatum) is comedogenic or acneogenic; however, attendees of a symposium on comedogenicity concluded that "neither the consumer nor the physician can assess whether the formulation will be acneogenic by simple inspection of the product or by examining the list of ingredients. Furthermore, the product's physical characteristics, such as oiliness or viscosity, are not in themselves predictors of an acneogenic response."¹

Nonirritant: The irritancy of selected cosmetic ingredients on the skin of several animals has been studied by Motoyoshi and coworkers and compared to the irritancy on human skin.⁴⁰ These authors determined that the intact skin of miniature swine is very similar to human skin histologically. They also cited a paper³ that stated that the permeability characteristics of miniature swine skin are very close to that of human skin. Thus, Motoyoshi et al concluded that miniature swine skin should be considered as a suitable substrate for evaluating cosmetics and cosmetic ingredients for dermal irritation. Their

article⁴⁰ reported that petrolatum is nonirritating on both miniature swine skin and human skin.

Ireson and coworkers compare the dermatitic properties of the lubricant waxes, including petrolatum, used in the cutting industry.²³ The authors evaluate the effects of the waxes, which are reconstituted after each use, on mouse skin both prior to use and after the waxes were reconstituted several times. Five stages of progressive use were performed; at each stage, petrolatum produces no significant dermatological lesions. In contrast, several commercial lubricant waxes produce squamous lesions (even before the wax is used in cutting), leading to inflamed ulcerous lesions with progressive use of the lubricant.

Nonallergenic: Petrolatum's nonallergenicity has been made evident by its frequent use as a carrier in skin-patch tests. In an article on allergens, petrolatum was specifically recommended to physicians as a carrier when testing for sensitivity to mercury.⁸

The effects of skin contactants during early infancy and their relationship to the eventual development of atopic dermatitis has been reported.³⁷ This study showed that no association exists between the use of certain skin-care products and the development of dermatitis. The authors indicate that petrolatum can safely be used for skin care, even for individuals susceptible to atopic dermatitis. In an article on pediatric rashes, petrolatum was cited as a carrier for 6% sulfur precipitate, used in the management of scabies.⁶

Obata and Tagami for quickly evaluating topical moisturizer effectiveness by determining high-frequency conductance of an in vitro skin model,⁴¹ petrolatum's occlusivity provides long-lasting skin hydration. At 18°C and 27% relative humidity, a hydrophilic ointment and a 10% urea cream each immediately increased hydration, which then slowly decreased. Under identical conditions, petrolatum did not induce a large initial increase in hydration but gave a slow increase up to 60 minutes. At 60 and 120 minutes, the petrolatum provides more hydration, as determined by conductance, than either of the other two test materials.

In a study of clinical and instrumental evaluation of skin dryness,⁴⁵ emulsion formulations containing petrolatum were compared with emulsions containing urea and unspecified hydroxy acids (AHAs). Over four weeks of application on human panelists, an emulsion containing 10% urea was determined (by visual assessment of dryness) to be equal in efficacy to an emulsion containing 15% petrolatum. Similarly, the 15% petrolatum product reduced skin dryness as much as an emulsion with 6% AHAs.

Rietschel published a method to evaluate skin moisturizers in vivo in 1978.⁴⁶ His method does not give a direct measurement of in vivo water content. Instead, the skin's "hydration status" is obtained indirectly, through TEWL measurements. Thirty minutes after application of a water-containing cosmetic product, Rietschel found all water from the product on the skin surface had evaporated. Thus, he concludes that any detection of increased transpired water

vapor (compared to a control) at that time could be assigned to increased SC hydration and may not necessarily reflect a damaged horny layer. He also shows that petrolatum moisturized the skin via occlusion and determines that dry skin may be treated either by occlusion or by moisture enhancement.

In 1977, Wepierre published the results of a study on the hydrating effects of various cosmetic preparations by measuring cutaneous impedance in hairless rats.⁶¹ Petrolatum, tested along with other preparations, reduces cutaneous impedance over time. This indicates hydration of the skin, obviously due to occlusivity. However, before the impedance drop, an impedance increase is seen. Applying petrolatum to the skin causes an increase in cutaneous impedance with duration and intensity proportional to the amount of petrolatum used. The increased impedance likely corresponds to electrical resistance, which is inversely proportional to petrolatum's permeability to water. Thus, this initial impedance increase for petrolatum results from its occlusivity.

Tsutsumi and coworkers published an article regarding the occlusivity of oil films (including petrolatum) on human skin in 1979.⁵⁷ They studied occlusivity, as determined by TEWL, in relation to the physical form and emulsion droplet size of the oils, among other parameters. The authors show that, as expected, petrolatum provides greater occlusivity than either solid or liquid paraffin, regardless of the amount of product applied to the skin. Also, not surprisingly, oil-in-water emulsions with smaller emulsion droplets have greater occlusivity than emulsions with larger droplets.

Medical Uses

Petrolatum is a primary ingredient in over-the-counter (OTC) topical pharmaceutical products, especially creams and ointments. It is commonly used in hospitals for a variety of health-related applications. It was recently cited as a shield against excessive moisture and toxins for incontinent patients with reduced mobility.³⁸ Table 3-1 lists a range of recent patents using petrolatum in medical applications.

Lazar and Lazar³⁰ have stated that petrolatum is a preferred skin lubricant and moisturizer for bedridden patients. In an article on diabetic neuropathy, special care of the feet was cited, since the nerves to the feet are the longest in the body and are most often affected by neuropathy.³⁵ The diabetic foot perspires less than normal, which leads to dry skin. Thus, it was recommended that petrolatum be applied to the feet before putting on socks and shoes.

Petrolatum can be used at up to 90 wt% as an oil-based carrier in moisturizer and eczema-treatment compositions.⁶⁶

Wound care: New medical materials for skin burn dressings are often studied to try to develop products that shorten healing time, improve the quality of healing, lower the pain intensity and reduce the need for dressing changes. Petrolatum is frequently the standard gauze dressing by which other materials are measured.^{10,16,20} A recent patent issued for a medicinal salve useful for topical treatment of burns, wounds, lesions and other skin conditions claims petrolatum as the preferred, "pharmaceutically acceptable" ointment base.⁶⁵ It has been stated that petrolatum-impregnated dressings are especially appealing to burn-care professionals.³⁹ In addition, petrolatum ointment has been used as an occlusive dressing in the treatment of meshed skin grafts.^{49,50}

Another study on petrolatum and wound care was reported in 1993.⁴⁴ A comparison was made between standard gauze dressing and sterile petrolatum ointment as wound dressings in major head and neck cancer surgery. The authors conclude that using the petrolatum dressing does not increase risk of infection compared to using the standard gauze dressing.

Sports medicine: Petrolatum finds its primary use in

sports medicine as a lubricant. In *Health & Fitness Magazine*, Dr. Jeffrey Ross, a Houston podiatrist and marathoner, suggests runners treat previous foot blisters or skin cracks with petrolatum to avoid problems.⁴² M.L. Ramsey lists petrolatum as a preventive product to protect skin areas most prone to friction and blisters.⁴⁶

For open-water swimming, chafing can sometimes be a problem, especially in cold water. Petrolatum is recommended as a preventive.⁶²

Drug delivery: Petrolatum is often used in transdermal drug delivery and other skin penetration studies, for instance, as a standard vehicle for occlusive skin-patch applications.¹⁸

A recent study on the in vitro dermatokinetics of ibuprofen investigates dermal absorption as a more effective administration route for the drug, which has "low solubility in acidic media (the gastric environment) and inadequate pharmacokinetics when administered orally."⁴³ Petrolatum is one of the oleagenous systems evaluated in the various topical reservoir systems prepared. At one of the dosing levels, the petrolatum system gives a very high ibuprofen delivery rate.

Bronaugh and Stewart use petrolatum as a vehicle for determining percutaneous absorption of hydrophobic compounds both in vivo and in vitro.⁵ This study reveals that significant differences in the amount of compound absorbed may occur between the in vivo and in vitro tests, regardless of the vehicle used.

Petrolatum as an ointment vehicle for studying drug penetration also has been reported by Lippold and Hackemüller.³² This article shows the influence of certain skin moisturizers on drug penetration in vivo.

Volden and coworkers studied the efficacy of a psoriasis treatment in 1992.⁶⁰ Dithranol in petrolatum shows faster clinical improvement than Micanol, a new dithranol formulation being evaluated. Similarly, using thrombin in a petrolatum-based ointment, Sawada and coworkers found that this material speeds hemostasis of split thickness donor wounds, especially on the scalp.⁵¹ Bleeding of the wounds is cut in half using the petrolatum ointment when compared to a thrombin solution.

Table 3-1. Patents including petrolatum in medical-related uses

Date	Patent	Company/Author(s)	Comments
Nov 22, 1989	JP 01 290,616	Shiseido	In a skin cream using amine oxides as skin-penetration aids
Mar 26, 1991	US 5,002,974	NM Geria	Long-lasting, aesthetically pleasing anesthetic/skin moisturizer
May 28, 1991	US 5,019,604	GM Lemole	Water-repellent protective gels for use on hands under surgical gloves
Apr 18, 1995	US 5,407,670	WK Shinault	Ointment for treating epidermal trauma, such as burns, wounds, rashes and ulcers
Sep 22, 1992	US 5,149,538	Warner-Lambert	As the anhydrous medium for dispersing an opioid in a misuse-resistant transdermal opioid patch
Apr 15, 1986	US 4,582,865	Biomatrix	Cross-linked gels of hyaluronic acid, particularly a cross-linked hydrophilic gel filled with water-insoluble hydrocarbons, such as petrolatum; claimed to give all the benefits of using petrolatum without its associated greasiness
Jan 9, 1992	WO 92 00077	Medicis	High-molecular-weight fractions of petrolatum mixed with volatile silicones and an amphiphilic compound to give an ointment base that spreads easily yet is resistant to mechanical removal

An interesting result was found when neat petrolatum was applied to the skin and later rubbed. A film of petrolatum was applied by a simple spreading technique. After 30 minutes, the occlusivity was determined to be 89%. After 90 minutes, the occlusivity had dropped to 58%. However, the occlusivity of petrolatum could be returned to 84% of the original value at that time simply by rubbing. The occlusivity decrease suggests that the petrolatum film had become discontinuous, but continuity (and occlusivity) could be restored by rubbing, without the need to apply more product.

Loden compared the occluding properties of petrolatum to two oil-in-water creams, one containing 27% lipids and the other 66% lipids.³⁴ The materials were applied to the skin and removed after 40 minutes. The authors used an evaporimeter to determine TEWL. The water loss was reduced by 50% when treated with petrolatum, whereas the two creams reduced water loss by only 16%. Loden also has used petrolatum in studies of moisturization as measured by skin capacitance.³⁵

Skin Protection

Liu and coworkers studied the effect of barrier creams on the electrical conductivity of excised hairless mouse skin during exposure to detergents such as sodium lauryl sulfate (SLS).³³ Exposure of human skin to SLS lowers electrical resistance and produces signs of skin damage, such as erythema. In addition, this loss in the SC's electrical resistance precedes erythema, so a reduction in barrier function occurs before the dermal tissue is involved.


The loss of electrical resistance can be delayed by the application of barrier creams before exposure to SLS. This lowers erythema scores as well. The authors found that petrolatum and a commercial cream containing petrolatum were the most effective at preventing a loss of electrical resistance and in resisting removal (being washed off) by SLS. In contrast, barrier creams based on hydrophilic ingredients containing little or no hydrocarbon substances were less effective. Thus, even in an emulsified form (which is more aesthetically pleasing), petrolatum is shown to have excellent barrier properties and provides protection to the skin.


Another study that shows the protective characteristics of petrolatum has been reported.³⁴ Certain skin-protecting silicone creams were tested for their permeability to industrial sealants. The silicone creams were sealant-resistant for 4-5 minutes, whereas petrolatum exhibited protective properties for 5

hours. Thus, the authors conclude, petrolatum is an effective protective agent for industrial conditions.

Laser-Doppler blood flowmetry and erythema index have been used to quantify patch test reactions of irritants (sodium lauryl sulfate and benzalkonium chloride).¹⁷ In this study, petrolatum changes neither blood flow nor erythema, attesting to its nonirritancy.

In 1990, a method was reported for evaluating topical protectants against chemical penetration by FT-IR spectroscopy.⁴ This work arose from the U.S. Army's need for protectants that decrease the effects of cutaneous exposure to chemical warfare agents. Petrolatum was shown to have a breakthrough time over 4 times longer than polysaturated fat when tested with ethyl disulfide, a mustard gas simulant.





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Hair-Care Patents with Petrolatum

Petrolatum finds a variety of uses in hair care. It is frequently used to minimize scalp irritation in relaxers. It can help keep hair shiny and under control; indeed, a number of patents for conditioning products incorporate it. Some recent hair-setting preparations use petrolatum to add gloss as well as antistatic and combability properties.

Date	Patent	Company/Author(s)	Comments
Relaxers			
Jul 23, 1985	US 4,530,830	Revlon	Quat. ammonium hydroxides; cosmetic base with emollient (petrolatum) at 2-30%
Apr 19, 1994	US 5,304,370	Revlon	Lye-based "emulsion within an emulsion" gives minimal scalp irritation
Dec 15, 1992	US 5,171,565	M Akhtar, F Newell	Alkaline hair relaxer
Feb 2, 1995	WO 95 03,031	DR Cowsar, TR Adair	Alkaline hair relaxer
Conditioning hairdressings			
Nov 25, 1991	JP 03 264,516	T Tada, N Myamoto	Moisturizer/conditioner emulsion to protect hair from heat (hair dryers)
Jan 13, 1976	US 3,932,611	CM McCarthur	Anhydrous pomade (87% white petrolatum) retards moisture loss during pressing, drying, and combing; lessens appearance of dandruff
Nov 5, 1985	US 4,551,330	J Wagman, B Sajie	Oil-in-water (o/w) "rinse-on" inverts to w/o when rubbed on (w/o emulsion benefits, no greasy feel); moisturizes/conditions/protects skin/hair; 5 to 25% petrolatum
Mar 12, 1991	US 4,999,187	DM Vernon	Anhydrous antidandruff hair and scalp treatment, at least 60wt% petrolatum along with sulfur, 1,2,3-propanetriol and an oil (also claims hair regrowth).
Nov 25, 1991	JP 03 264,515	M Fujikawa, N Suzuki	Hair conditioners containing petrolatum (0.5-5 wt%) and silicones
Coloring/decoring			
Jul 22, 1992	JP 04 202,120	Shiseido	This "decoring composition" mixes an oxidative (hydrogen peroxide) and a reducing part, the latter with petrolatum (for example, 20%)
Jul 31, 1991	JP 03 176,416	K Mizumaki	Hair-dye emulsion
Setting/waving			
Jan 27, 1995	JP 07 25,733	M Hasegawa, E Yoda, M Yogoshi, T Koresawa	Hair-setting preparation; antistatic, adds gloss and combability
May 13, 1992	JP 04 139,112	Croda Japan	Low-odor depilatories and permanent-waves use Ca thioglycolate, petrolatum

Sun Care

Petrolatum is a key ingredient in sun-care products, from sunblocks to after-sun moisturizers, and is often used in anhydrous sunscreen preparations. In fact, red petrolatum is approved in the U.S. as a physical sunscreen at 30-100%.³⁶ However, petrolatum appears in sun-care products primarily for its moisturizing properties rather than as a principal sunscreen ingredient (Table 1-2).

In a 1992 study on the effects of hydrophobic emollients and UVB-induced skin damage, Kligman and Kligman report that petrolatum provides significant protection in UVB-irradiated mouse skin.³⁷ The most impressive finding was a 95% reduction in tumor yield when petrolatum was applied prior to irradiation. The Kligmans conclude that the petrolatum protects against dermal damage and reduces the number of sunburn cells. When petrolatum is applied *after* irradiation, the incidence of tumors falls 21%, thus suggesting that petrolatum is not acting differently as a classic sunscreen. Emolliency is mentioned as a possible protective mechanism.

Red petrolatum: Red petrolatum typically is not used as a sunscreen because of its physical characteristics and its poor absorbance.²⁵ One recent consumer publication does

mention that red petrolatum, as a sunscreen, works best in an oil-based formula.⁵³ The use of red petrolatum as a sunscreen was more common years ago. For example, a 1970 patent assigned to Colgate-Palmolive discloses stable, non-toxic sunscreen compositions based on the fluorescent concentrates of "naturally pigmented petrolatum" (typically red or dark green petrolatum).⁵⁴

Moisturizing sunscreens: In an article on combination sunscreen products, Vaughan and Dulak state that moisturizers containing sunscreen increased from 1% of the marketed brands to 12% from 1987 to 1992.⁵⁹ They also report that, of the occlusive moisturizers, the most effective ones "are made of materials like petrolatum," which is very nonpolar. These authors also cite an article²¹ in which the sunscreen Padimate O was found to increase the occlusiveness of petrolatum, whereas a commercial sunscreen containing octocrylene in a petrolatum base showed some porosity compared with pure petrolatum.

Examples of skin-protecting, UV-blocking lip balm products are also given in the Vaughan and Dulak article.⁵⁹ These examples contain petrolatum at 10 and 48%, and each product has an estimated SPF of 4. While petrolatum is one

Table 1-2. Sunscreen patents including petrolatum

Dec 14, 1994	EP 628,303	GH Dahms	Emulsion with a metal oxide dispersed in oil
Sep 27, 1994	JP 06 271,442	Shiseido	UV absorbers and/or scattering agents to prevent skin discoloration and roughness
Jan 27, 1995	JP 07 26,247	Shiseido	Diphenyl derivatives as UV absorbents
Mar 12, 1991	US 4,999,186	Procter & Gamble	Low-penetration, longer-lasting, less irritating sunscreen agents — a UVA-absorbing chromophore covalently bonded to a UVB-chromophore so that the electron systems of the two chromophores are not directly coupled; oil-phase materials may comprise up to about 20% by weight

of the most common barrier ingredients; however, for it to be approved for an OTC skin protectant claim, it must be present at a minimum concentration of 30%.

Mineral sun filters: Dahms has mentioned the use of petrolatum in formulas containing physical sun blocks.⁷ One formula listed for an oil-in-water sunscreen using micronized titanium dioxide dispersed in water included petrolatum as part of the oil phase. The oils are incorporated in a liquid-crystalline gel matrix, which is fairly independent of the polarity of the oil phase. Formulas of this type are highly suitable for suntan creams and lotions. Dahms states, since they exhibit excellent stability toward heat and cold. The micronized state of the titanium dioxide is maintained in such emulsion systems, so the products are very transparent when applied to the skin.

Conclusion

Decades before the many applications and advantages of petrolatum described in this article were reported, the benefits of petrolatum were known. Kligman and Kligman have stated that "a considerable clinical experience over many years has established petrolatum as a work-horse moisturizer in a variety of settings, for instance after chemical peels and dermabrasions, superficial burns, skin grafts, atopic dry skin and other xerotic rashes."²⁷ Elsewhere, Albert Kligman reports on the protective properties of petrolatum. He states that petrolatum's "uses to protect the skin against physical and chemical traumas are many, including the treatment of cuts, abrasions and burns. It is also a moisturizer par excellence."²⁶

Petrolatum (along with mineral oil) was considered "the ideal oil phase for a hand cream or lotion" in a 1977 *Cosmetics & Toiletries* article titled "New Trends in Formulating with Mineral Oil and Petrolatum."² While the trends in the article are no longer new, the above quotation still holds true. The author also states that "a number of recently developed applications illustrate the great versatility of these hydrocarbons. They have been used in such diverse applications as shave creams, aftershave lotions, body lotions, cleansers, bath products, shampoos, antiperspirants and moisturizers." Even today, numerous patents that reflect the diversity of petrolatum's use in skin-care products are constantly being issued (Table 1-3, pg. XX).

As scientists continue to develop new products, the next 100 years likely will find petrolatum continually used in the personal-care industry, as well as in many other markets and applications. The low cost and efficacy of this unique natural product (which has never been duplicated synthetically) are features that attract formulators to petrolatum time and time again. It is, indeed, an incomparable material.

Acknowledgment

Dedicated to Professor Roy A. Olofson on the occasion of his 60th birthday.

For More Information

Petrolatum circle No. 152

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Functional raw materials



SPECIALITIES FROM IKEDA

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DERIVATIVES

- * silk coated inorganic pigment
- * water soluble silk peptide
- * alcohol soluble silk peptide
- * quarternary ammonium silk peptide

INORGANIC COMPOUND SPECIALITIES

- * spherical silica & titanium dioxide
- * titanium dioxide coated mica, sericite & talc
- * lysine treated sericite
- * spherical silica coated mica
- * micronized titanium dioxide
- * micronized zinc oxide
- * titanium dioxide sol

SYNTHETIC ESTER SPECIALITIES

- * replacement of lanolin
- * replacement of castor oil
- * replacement of squalane
- * silicone solubilizer
- * excellent water holding capacity



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Table 1-3 Other patents using petrolatum

Date	Patent	Company/Author(s)	Comments
Apr 5, 1994	JP 06 92,858	Pola Kasei Kogyo	Skin lightening In emulsions with glycosides as melanin-formation inhibitors
Feb 21, 1995	JP 07 48,240	T Koresawa	In the oil phase of a cosmetic using hydrogenated <i>Limnanthes alba</i> oil
Oct 12, 1993	US 5,252,331	AW Curtis and L Freeman	Shaving Shaving cream for soothing the skin and minimizing ingrown hairs contains significant amounts of petrolatum, presumably as a lubricant, emollient and protectant
Jun 22, 1994	EP 603,080	L'Oréal	Skin cleansing 2-phase cosmetic/dermatological composition with a 47% petrolatum oil phase, for removing makeup or as a skin-care or sunscreen lotion
Dec 25, 1990	US 4,980,084	M Vishnupad, JE Ramirez and TM Deppert	Water-rinsable emulsions (typically 50% petrolatum) using surfactants to provide rinseability
Dec 3, 1985	US 4,556,554	LC Calvo	Enzymes break down sebum's fatty components and improve the skin's appearance; sample compositions include anhydrous ointments with 20% and 46.8% petrolatum.
Nov 1, 1994	US 5,360,824	DE Barker	Anhydrous skin-cleansing and wrinkle-reducing cream with water-soluble granules dispersed in the oil base; examples include 40% and 64% petrolatum, but patent does not limit the amount to be used
Jul 23, 1992	WO 92 11,838	L'Oréal	In a cosmetic slimming composition with growth factor
Jan 7, 1988	JP 63 02,916	Kanebo	Makeup Anhydrous emulsion contains perfluoro compounds and 3% petrolatum
	JP 63 44,510	Kobayashi Kose	Pressed powder with silica-treated TiO ₂ for improved application properties uses 3% petrolatum
	JP 03,181,410	Kobayashi Kose	Foundation contains pressure-disintegratable spheres in oil base of 2% petrolatum with silicone and mineral oils
	JP 04 74,109	Kanebo	Soft-textured face powders that leave a uniform film; good water and sebum absorbers and have high skin affinity use 1% petrolatum

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