

Sunscreen: a brief walk through history

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ABSTRACT

The sunscreens we see today were paved by our ancestors' sun protection methods, followed by scientific discovery in the more recent era and the trials and errors of the sunscreen formulations that followed. This history highlights sun protection methods used over the centuries and the varying degrees of agreeable sensorial properties or comforts in these methods.

KEYWORDS Dermatology; history; SPF; sun protection; sunscreen; tanning beds; ultraviolet radiation; UVA; UVB

Devoid of sun protection products only a century ago, pharmacy shelves are now lined with an assortment of sunscreens with a variety of active ingredients and vehicle formulations, aimed to please everyone from the outdoorsman to the beauty conscious shopper. Standing between these aisles, you too may have wondered how our sun protection methods have evolved to where they are today. The timeline below tells a brief story of one of dermatology's most important and beloved players: sunscreen.

300,000-200,000 BC: Ancestors of the *homo sapiens* were likely dark-skinned people in Africa with natural melanin that protected them from the sun.¹

70,000-60,000 BC: The early *homo sapiens* first begin their slow migration to cooler, northern climates with lower levels of solar radiation; over time, they slowly begin to lose the natural pigmentation that provided them with sun protection.¹

3100-300 BC: The ancient Egyptians use methods of sun protection for cosmetic reasons; lighter skin is more desirable culturally. The Egyptians use ingredients such as rice bran, jasmine, and lupine to block the tanning effects of the sun on the skin. (It has only recently been discovered that rice bran absorbs ultraviolet [UV] light, jasmine helps repair DNA, and lupine lightens skin.)²

800-500 BC: The ancient Greeks use olive oil to protect their skin from the sun and for care after sun exposure.² (Modern testing of olive oil confirms it has an SPF rating of about 8.)³

700: From this century onwards, female beauty in Japan is associated with a white face, or *o-shiroi*, achieved with lead or mercury-based powders.⁴

1600s: Fair skin continues to hold importance in the status of the upper class. Women in Europe wear uncomfortable visards—face coverings made of velvet—to protect their skin from the sun⁵ and use skin whitening cosmetics containing lead.⁴

1798: Robert Willan, the father of modern dermatology, describes a skin condition called *eczema solare*, or skin sensitivity to light.⁶

1801: Johan Wilhem Ritter of Germany first discovers UV radiation.⁶

1820: English physician Sir Everard Home first proposes that skin pigmentation has protective effects against the sun⁷ and that a component of sunlight other than heat affects the skin.⁶ In observational experiments, he notes that sun exposure on the bare hand causes a “scorched” pigmentation, whereas covering the hand with a black cloth does not, despite the hand under the black cloth registering as 4° to 10° warmer. To demonstrate the effect of skin pigmentation, he exposes the back of an African man's hand to the same sun without eliciting any “scorched” effect.⁶

1878: Otto Veiel of Austria describes tannins as a form of sun protection. However, the darkening effect of tannins on the skin prevents them from being commercialized as a sunscreen.⁷

1889: Erik Johan Widmark of Stockholm publishes a landmark study that experimentally proves UV radiation can cause skin erythema and burns.⁶

1891: Dr. Hammer of Stuttgart, Germany, is the first to specifically recommend the use of chemical sunscreens to prevent UV radiation from causing *erythema solare* of the

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skin; he uses quinine prepared in an ointment as the first human sunscreen.⁶

1896: Dr. Paul Unna, a German physician, first describes an association between sun exposure and skin cancer: he explains precursor skin cancer changes, such as hyperkeratosis, on sun-exposed skin.^{8,9} He terms these changes *seemanshautcarzinom*, or sailor's skin carcinoma.⁸

1910: Dr. Unna develops a sunscreen from chestnut extract, sold under the names "Zeozon" and "Ultrazeozon";⁶ however, the thick formula is not well liked.¹⁰

1920s: Coco Chanel popularizes the idea of tanning after photographs of her are taken following a Mediterranean cruise. Her friend, Prince Jean-Louis de Faucigny-Lucigne, says: "I think she may have invented sunbathing."¹¹ Tanned skin becomes a sign of a healthy, leisurely, and privileged way of life. It is the new precedent of beauty in Western culture.¹² (This ideal, however, is not carried over to postcolonial countries in Africa and Asia, where lighter skin is still associated with increased privilege and better social standing.)¹³

1928: Dr. G. M. Findlay publishes a paper with the first experimental proof of the association between UV radiation and skin cancer in an animal study (mice).⁹

1935: Eugene Schueler, founder of today's L'Oréal, develops the first tanning oil with UV radiation-filtering properties; the active ingredient is benzyl salicylate.⁶ Named Ambre Solaire, it claims "tanning five times faster without burning" and can still be bought today.¹⁴

1938: Swiss chemist Franz Greiter gets sunburned while climbing Mt. Piz Buin¹⁰—an event that will inspire him to create the first modern sunscreen a decade later.

1942: Stephen Rothman and Jack Rubin first describe para-aminobenzoic acid, active ingredients that will become the most popular in sunscreens in the US for many years.^{6,15}

1942: The Army Air Force approaches the American Medical Association Council of Pharmacy and Chemistry for a "top secret experiment" to study the most effective protective substances to prevent sunburn of men stranded in the desert or on life rafts. They find that dark red veterinary petroleum is the ingredient that possesses all of their desired qualities: waterproof, inexpensive, and free of toxicity.⁶

1944: Pharmacist Benjamin Green, who served as an airman during World War II and used red veterinary petroleum, develops a more pleasing, consumer-friendly version of the product by adding cocoa butter and coconut oil, a combination that eventually becomes the Coppertone suntan lotion.^{10,16}

1946: Swiss chemist Franz Greiter develops and commercializes the first modern sunscreen, known as "Gletscher Crème," or Glacier Cream.^{1,10} He names his brand Piz Buin in honor of the mountain he climbed.¹⁶ The brand still exists today with more effective variations of Glacier Cream.¹⁰

1962: Greiter is credited with inventing the sun protection factor (SPF) rating¹⁶; the original Gletscher Crème has an SPF rating of 2.¹

1967: Formulators begin to develop water-resistant sunscreens.¹

1978: The US Food and Drug Administration (FDA) begins to regulate the booming sunscreen market.² UV tanning beds also start to appear in the US.⁴

1980s: Australia, followed by other countries, accepts the definition of SPF as "the ratio of UV energy needed to produce a minimal erythema dose on protected to unprotected skin." SPF becomes the standard in testing sunscreen formulations. Sunscreen with PABA and its derivatives is also abandoned during this time period due to recognition of its sensitizing potential and nitrosamine content.¹

1990s: Most sunscreen products in the market have SPFs ranging from 15 to 30; avobenzone (with octyl triazone added to increase photostability) is the most common ingredient for UVA protection, whereas octyl methoxycinnamate is the most common ingredient for UVB protection.¹

2007: The International Agency for Research on Cancer publishes a landmark study confirming the association between tanning beds and melanoma.¹⁷

2008: Danovaro and colleagues publish the first study describing the potential role of sunscreen ingredients causing coral bleaching in areas with high levels of human recreational use.¹⁸

2018: Following Downs and colleagues' paper raising concern for potential harm of two sunscreen ingredients—oxybenzone and octinoxate—on coral bleaching and underwater ecosystems,¹⁹ Hawaii becomes the first state to pass a bill banning the sale of sunscreens containing oxybenzone and octinoxate, active ingredients found in most major sunscreen brands.²⁰

2019: Matta and colleagues' study in *JAMA* details the application of four commonly available sunscreens on healthy volunteers that resulted in plasma concentrations above the exceeded level established by the FDA for waiving nonclinical toxicology studies for sunscreen. The active ingredients included in the study are avobenzone, oxybenzone, octocrylene, and ecamsule. This study has served as a catapult for the need for further studies to determine the significance of these findings.²¹

Reading the past gives us a glimpse of the future. In more recent years, the chronicle of sunscreen is built on the foundation of sun protection education within our communities. As an increasing number of people are learning about the importance of sun protection, more thought is also being given to the long-term impact sunscreen ingredients have on the environment and our health. The next chapter of sunscreen, soon to be written, will continue to move forward in the pursuit of the ideal sunscreen: one that not only protects against UVA and UVB radiation, but is also a formulation that allows for the best user compliance.

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