The History of Sunscreen
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THE EARLY DAYS
Late 19th century: photosensitivity diseases were described
1911: Paul Unna used Hammer’s acidified quinine sulfate, turned to ascorcin derivatives, searching for sunscreen materials
1922: Eder & Freund suggested use of 2-naphthol-6,8-disulfonated sodium, 2-4% in an ointment base (Antilux)
1929: Meyer & Amster prefer 10% tannin in alcohol, which they presumed changed the colloid chemical structure of skin components
1926: Stephen Rothman observed that local injection of procaine prevented erythema & pigmentation from UVR, probably because it absorbed at about 300 nm
1928: Behelag et al investigated relationship between selective UVR absorption and chemical constitution
1934: Raabe examined protective effect from various ointments
1936: Benzophenone derivatives absorb from 260-313 nm, with maximum at 278.5 nm
1933: PABA & derivatives absorb from 290 to 320 nm, with absorption maxima at 304 nm
1934: Vitamin D synthesis
1922-1936: Expanded proposal by Austrian scientist, Franz Greiter
1938: Introduction of two important advances in sunscreen materials and testing
1942: Rothman & Rubin described 10-15% PABA in an ointment base, the most popular sunscreen in the US for many years
1942: Army Air Force approached the AMA requesting advice about the most effective protective substance for the prophylaxis of sunburn
1940: Henschke studied transmission through a 0.01-mm thick layer of a very large number of sunscreen materials
1940: Knox et al investigated relationship between selective UVR absorption and chemical constitution
1949: Leopold Freund investigated a variety of existing sunscreens using a photographic method to test UVR absorption capabilities
1950: Giese et al reported on the sunscreen absorption spectra of 90 compounds
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1957: Ippen extensively reviewed light-induced injury by cosmetics & sunscreen materials
1960: Expanded proposal by Austrian scientist, Franz Greiter
1962: Knox et al investigated relationship between selective UVR absorption and chemical constitution
MODERN DEVELOPMENT
THE MODERN DEVELOPMENT OF SUNSCREENS
1936: Eugene Schueller prepared a sunscreen with benzil salicylate as UVR absorber in an oily vehicle
1939: Bachem & Fantus made spectroscopic studies of individual compounds and followed them with limited human studies – wool fat, yellow/white petrolatum, diachylon ointment, titanium dioxide, ascoratin & methyl salicylate
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1946: Luckiesch et al were asked to investigate protective effects of 12 combination materials
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1966: Koltermann & Fieger introduced a water-cooled xenon high-pressure arc for skin testing
1963: Schulze first calculated the relative effectiveness for erythema of solar radiation
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1964: Increasing evidence that UVA, especially 315-340 nm, can cause chronic skin damage in healthy people
1984: Not yet feasible to produce a UVA protective factor similar to SPF
1991: Tariq et al: sunscreen has a higher water content than body's own water content
2001: Not yet feasible to produce a UVA protective factor similar to SPF

THE FUTURE OF SUNSCREEN
List of chemicals useful for sunscreen formulation is now extensive
• The FDA, COUPA, and the European community have published approved chemicals and inorganic filters
Goal: development of a pill
Astaxanthin – found in red ocean plants and animals, i.e. salmon
Antioxidant, reduces pain & swelling associated with sunburn
• Effective protection against free radicals

SPF (SUN PROTECTION FACTOR)
1956: Concept was originally introduced by Schuze
• By first determining the minimal erythema dose (MED) for human skin, and then exposing the same person to multiples of the MED, a reproducible index for effectiveness could be determined
1984: Expanded proposal by Austrian scientist, Franz Greiter
• Useful method for studying water resistance of sunscreens
• Quantitative measure of effectiveness of a sunscreen formulation
• Usefulness, relevance, & methods recently severely criticized - especially actual applied thickness

SPF = – minimal erythema dose in sunscreen-protected skin

SIDE EFFECTS & CONTROVERSIES
• Contact reactions
• Photostability
• Safety
• Vitamin D synthesis
• Systemic absorption
• Hormonal activity
• Mutagenicity
• Risk for the environment

ANCIENT PROTECTION
Ancient Egypt
Pale skin was an ideal among women
• Recently translated papry and tomb walls reveal the ingredients of potions used to ward off a tan and heal damaged skin
Some ingredients rediscovered by modern scientists:
• Rice bran extract: gamma oryzanol
• Jasmine – heals DNA at the cellular level
Lipin extract – skin lightener
Forms of physical protection:
• 1st century BC: Celus recommended covering the head and rubbing the skin with oil
• Tibetans used a combination of tars and herbs as sunscreen
• Guyana Indians: a variety of plant extracts used to decorate the skin also served as sunscreen

PHOTOPROTECTION
Sun exposure: main cause of photocarcinogenesis, photaging and photosensitivity
UV radiation: main etiological agent of most types of skin cancer
• Sunscreens are among the best photoprotective measures

WHAT IS SUNSCREEN?
A lotion/spray/gel or other topical agent that absorbs or reflects some of the sun’s ultraviolet (UV) radiation on skin exposed to light
• Helps to protect against sunburns
Sunblock: typically an opaque sunscreen effective at blocking both UVA & UVB rays
• Uses a heavy carrier oil to resist being washed off
Ideal requirements for a topical sunscreen:
1. protection against UVB radiation
2. protection against long-wavelength UVA radiation
3. reactive oxygen species scavenging capability
4. inclusion of enzymes or active reagents that activate the cellular DNA repair systems
5. stability and safety of the filters

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