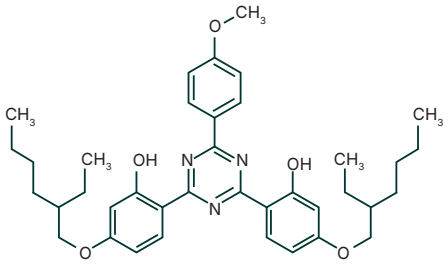
MEET THE FILTER:
BEMOTRIZINOL (BEMT)

Bemotrizinol (Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine), commonly known by trade names Tinasorb® S and Parsol® Shield, is a highly photostable, broad-spectrum ultraviolet (UV) filter widely used in sunscreen formulations outside the United States for more than two decades*. It provides substantial UVA and UVB coverage, enhances photostability of other UV filters, and demonstrates minimal systemic absorption.

This review summarizes its chemical properties, mechanism of action, preclinical toxicology, clinical pharmacokinetics, efficacy, safety profile, and public health implications.



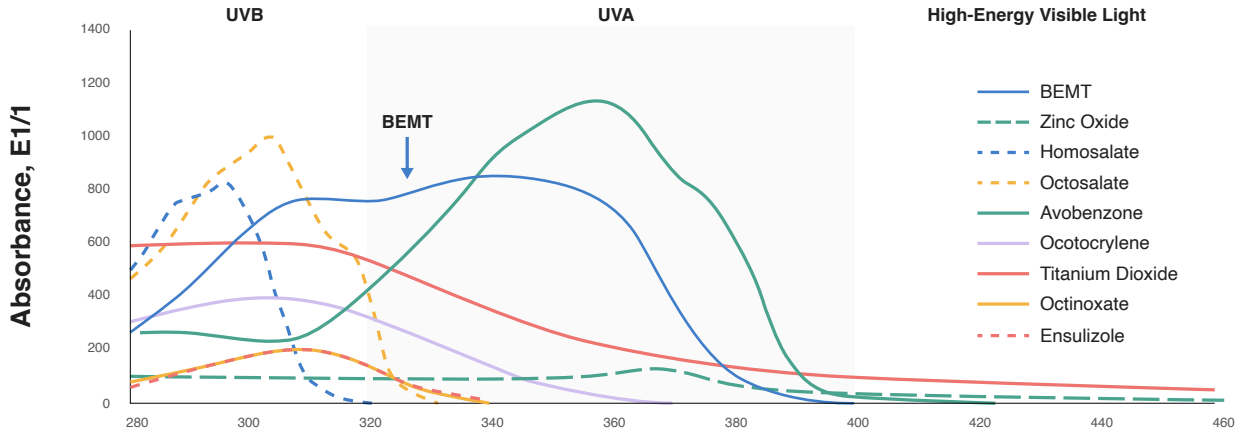
Bemotrizinol

Introduction

Ultraviolet radiation (UVR) exposure is a major environmental risk factor for nonmelanoma skin cancer, melanoma, and photoaging.[1] Broad-spectrum sunscreen use remains a central dermatologic prevention strategy. However, the number of FDA-approved sunscreen actives in the United States has historically lagged behind those available in Europe and other regions.[2]

Bemotrizinol (BEMT) is a triazine-based organic UV filter that provides strong absorption across both UVB (280–320 nm) and UVA (320–400 nm) wavelengths.[3] It has been incorporated into high-SPF formulations internationally.[2]

Sun Protection from Common UV Filters



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Chemical Properties and Mechanism of Action

Bemotrizinol is lipophilic with high molecular weight and strong photostability.[3] Its structure allows it to absorb UV photons and dissipate energy as heat without significant molecular degradation.[3]

Key photoprotective characteristics include:

Broad UV absorption across UVB and UVA	High photostability under prolonged irradiation	Stabilization of less photostable filters such as avobenzone

Preclinical formulation studies demonstrate that BEMT enhances SPF and UVA protection factor (UVA-PF) and improves overall formulation stability.[3,4]

Preclinical Toxicology and Dermal Safety

Dermal Absorption and Penetration

In vitro permeation testing (IVPT) submitted to regulatory authorities demonstrated minimal dermal penetration of bemotrizinol. Its lipophilicity and molecular size limit transdermal migration, reducing systemic bioavailability.[2]

Irritation and Sensitization

Nonclinical toxicology data submitted in support of regulatory review found: [5]

- Low dermal irritation potential
- Low sensitization potential in repeat insult patch testing
- No significant phototoxic or photoallergic responses

The European Scientific Committee on Consumer Safety (SCCS) previously concluded that bemotrizinol is safe at approved concentrations in cosmetic products.[5]

Genotoxicity and Endocrine Activity

In vitro and in vivo toxicology assessments did not demonstrate mutagenicity or genotoxicity.[2] Available receptor-binding data do not show clinically relevant estrogenic or androgenic activity, supporting a lack of endocrine-disrupting potential.[12]

Clinical Pharmacokinetics

A Maximum Usage Trial (MUsT) conducted under FDA guidance evaluated systemic exposure following topical application of a 6% bemotrizinol formulation under maximal-use conditions.[6]

Key findings:

- Plasma concentrations rarely exceeded the FDA threshold of concern (0.5 ng/mL).
- No evidence of systemic accumulation or steady-state buildup.
- Adverse events were mild to moderate and unrelated to systemic toxicity.

These findings align with expectations based on its physicochemical profile and support minimal systemic exposure.[6]

Clinical Efficacy

In vivo SPF and broad-spectrum testing conducted according to FDA standards demonstrated that bemotrizinol:[2]

- Significantly increases SPF values
- Enhances critical wavelength (≥370 nm), indicating strong UVA coverage
- Improves photostability of multi-filter formulations

Regulatory review documents confirm that bemotrizinol contributes meaningfully to broad-spectrum efficacy at concentrations up to 6%.[2]

International clinical use over two decades further supports its real-world effectiveness in high-SPF sunscreen formulations.[3]

Post-Marketing Safety and Rare Adverse Events

Although bemotrizinol has demonstrated an excellent safety profile internationally, isolated cases of allergic contact dermatitis have been reported.[7] Importantly, no signal of systemic toxicity, carcinogenicity, or endocrine disruption has emerged from post-marketing surveillance in regions where BEMT has long been approved.

Regulatory Review

In December 2025, the FDA issued a proposed administrative order to amend OTC Monograph M020 to include bemotrizinol as a GRASE sunscreen active ingredient at concentrations up to 6%.[2]

The FDA's scientific review concluded that bemotrizinol:

Provides effective broad-spectrum protection	Demonstrates low systemic absorption	Has low irritation and sensitization potential

This represents the first proposed addition of a new sunscreen active ingredient to the U.S. monograph in more than two decades.[2]

Public Health Implications

Expanding access to photostable, broad-spectrum UV filters may improve formulation aesthetics, UVA protection, and consumer adherence. Given evidence that consistent sunscreen use is central to skin cancer prevention, availability of advanced UV filters may strengthen preventive dermatology strategies.[8]

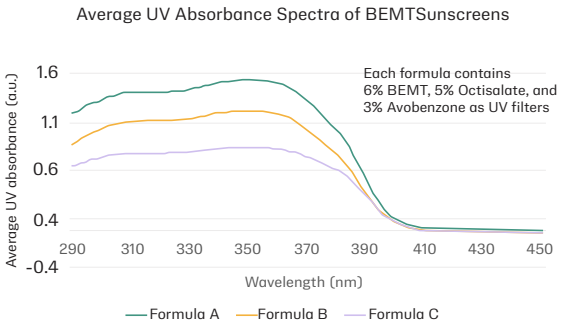
Formulation Matters

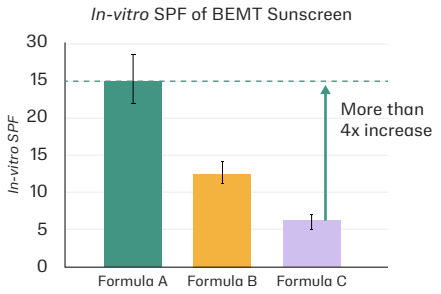
Sunscreen formulation is critical because it directly dictates SPF efficacy, photostability, and user experience, going far beyond just the active ingredients. A proper formulation ensures a uniform, stable film on the skin, prevents UV filter degradation, and balances protection with texture to encourage proper application.[9,10]

Formulating High Efficacy Sunscreens with BEMT

Purpose and Methods: This study evaluated the potential impact of excipients and formula design on the UV absorption efficacy of sunscreens with BEMT. Oil-in-water emulsions of comparable sensorial attributes and viscosities were formulated using 6% BEMT, avobenzone and octisalate. The efficacy of these formulas was evaluated using in-vitro UV spectroscopy.

Results:[11] These findings demonstrated the importance of non-active excipients in sunscreen formulations containing BEMT to achieve high levels of sun protection.





	Formula A (wt%)	Formula B (wt%)	Formula C (wt%)
UV Filter Solvent	10.00	10.00	10.00
Thickener	0.45	0.58	0.75
Emulsifier	2.30	2.10	1.90
Film Former	2.00	2.50	1.40
Oil Absorbant	3.00	2.00	1.20

- In-vitro SPF efficacy is greatly dependent on the choice of key structural ingredients in the formula with identical UV filter package and UV filter solubilizer.
- Both the chemical nature of the excipients as well as their concentration in the formula impact the SPF efficacy.

Conclusion

Bemotrizinol is a photostable, broad-spectrum UV filter with robust preclinical toxicology data, minimal systemic absorption in clinical trials, and decades of international safety experience. Regulatory review supports its safety and efficacy at concentrations up to 6%. Its inclusion as a UV filter in sunscreen formulations may enhance photoprotection options and support public health goals in skin cancer prevention. Carefully designed formulations will be essential to unlock the full UV protective potential of BEMT in sunscreens.

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