

# Liposhield<sup>®</sup> HEV Melanin

Protection from the Adverse Effects of High Energy Visible (HEV) Light



## THE CONCEPT:

Recent scientific evidence suggests that High Energy Visible (HEV) light, at the wavelengths that the eye perceives as blue to violet, is harmful to skin. HEV light has been shown to generate the same amount of reactive oxygen species (ROS) in the skin as those produced by UVA and UVB combined. The exact impact of this ROS burst to normal biochemical cycles that maintain healthy skin is not fully understood.

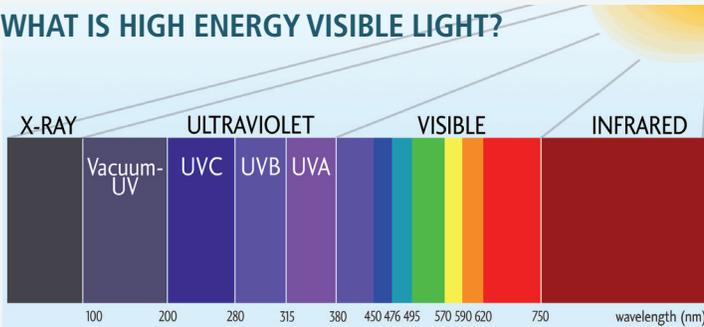
Vantage has conducted a study analyzing the changes in skin's gene expression when exposed to HEV light. This study's results indicate that HEV light may significantly affect the skin's inflammatory cascade and its progression to healing, its barrier recovery, cell cycles and melanogenesis. Our results may explain the variety of previously described effects of HEV light on skin and shed new light on the understanding of what is believed to be the harmful impact that leads to accelerated skin aging.

Our conclusion, based on this study and other research group's studies, is that in order to maintain skin's health; the skin must be shielded from these wavelengths. As a result, we have developed a novel compound that acts as an "umbrella" to shield the skin from HEV light, **Liposhield<sup>®</sup> HEV Melanin**.



ACTIVE INGREDIENTS

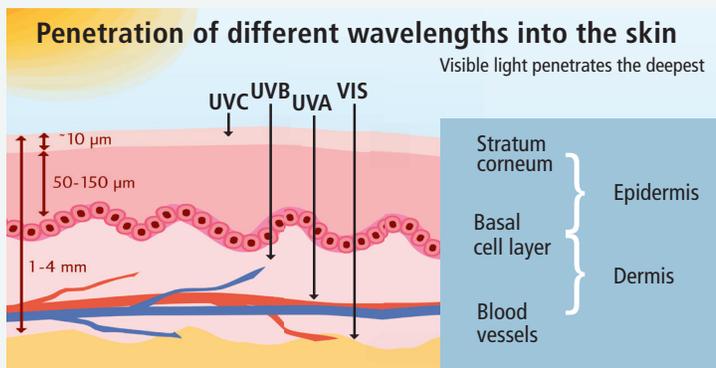
## WHAT IS HIGH ENERGY VISIBLE LIGHT?



## ADVERSE EFFECTS OF HEV LIGHT

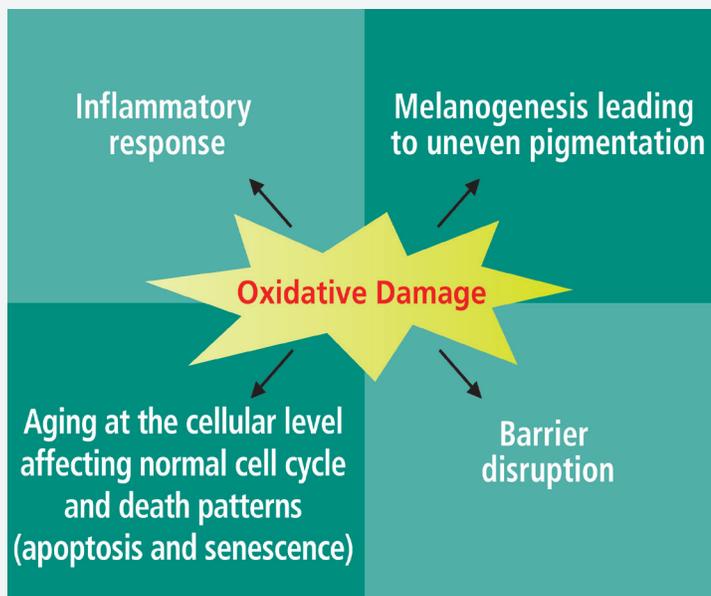
High energy visible (HEV) light is high frequency light in the blue/violet band, with wavelengths from 400 to 500 nm in the visible light spectrum. While the public is highly educated regarding the risks associated with excessive exposure to sunlight and especially ultraviolet light in the UVA and UVB wavelengths, findings in recent years indicate that we have yet to explore the full spectrum of adverse effects related to sun exposure. One of the more striking scientific discoveries is that skin damage caused by high energy visible light may be as harmful as the damage caused by UVA and UVB light combined.

## WHAT DAMAGE CAN BE CAUSED BY HEV LIGHT?



© PROF. JOHAN MOAN, PROFESSOR FOR BIOPHYSICS FROM THE UNIVERSITY OF OSLO MEDICAL HOSPITAL

## HYPOTHESIZED PATHWAYS BASED ON AFFECTED GENES



## GENE EXPRESSION STUDY RESULTS NEW

Like UVA, HEV light may be another silent, long-term aging wavelength region. It does not generate the immediate erythema or sunburn reactions triggered by UVB but it may induce accelerated photo-aging. While the effect of UVB radiation is associated with direct damage to the DNA, the cellular damage caused by HEV radiation is similar to UVA damage, i.e. it is indirect and is associated with the generation of free radicals as well as the induction of oxidative stress. HEV is most likely absorbed by endogenous non-DNA chromophores in skin; a process that leads to the generation of photo-sensitizing mediators. In their photo-excited state these intermediates exert photo-damage by directly reacting with substrate molecules, including DNA bases or molecular oxygen, leading to ROS formation. Through our microarray gene expression study it was discovered that HEV light initially affected 90 different genes. After thorough statistical filtering of the genes that were not relevant to the skin, about 40 different genes were then identified, which can point towards a path of potential skin damage.

We have deduced that exposure to HEV light induces inflammation due to the immense number of free radicals generated and prevents the progression of inflammation to a healing state. This occurs primarily at the stage where immune system cells need to reach the damaged tissue. It is this attenuation of the healing process that keeps more cells in a state of cell senescence, thus leading to overall skin aging.

In addition to the attenuation of the healing process leading to weak skin barrier functioning, it has also been found that exposure to HEV light affected the expression of several genes that point towards uneven pigmentation.

Through this recent microarray study, it was found that a number of genes involved in the production of melanin were being up-regulated and/or down-regulated. We hypothesize that this creates "mixed messages" to melanocytes in the skin. The "confused melanocytes" may then substitute amino acids that can result in premature termination of melanin synthesis causing uneven skin pigmentation.

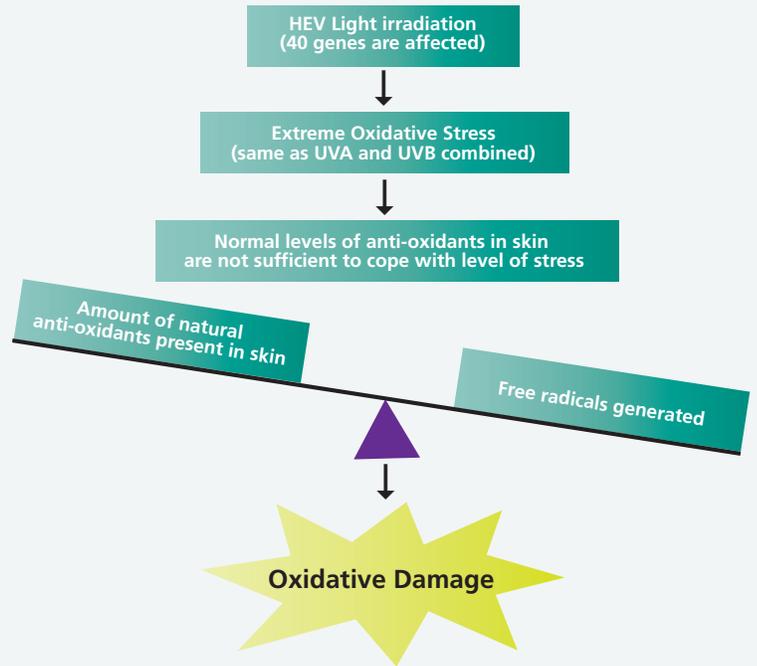
When the gene expression study was conducted using 0.5 % **Liposhield® HEV Melanin**, there were no changes to any of the genes. Thus **Liposhield® HEV Melanin** prevented the damage caused by the exposure to HEV light.

## HOW DOES SKIN COPE WITH HEV LIGHT?

Melanin, a widely occurring pigment within the animal and plant kingdom, has been long considered photo-protective. It absorbs light at all wavelengths of the electromagnetic solar emission spectrum. Melanin occurs naturally in the human body where it is released from melanocytes into the skin as a first line of defense against exposure to certain damaging light waves.

Melanin's photophysical properties and its biological activity make it an excellent photoprotectant. While natural melanin produced in human skin results from complete melanogenesis, which generates a high molecular weight polymer and protects from the broad spectrum of sunlight, its absorbance is relatively low in the HEV region and may be insufficient to effectively shield the skin from HEV light when used topically. In order to further protect the skin from HEV light effects, a special derivative of melanin was prepared, **Liposhield® HEV Melanin**. This product, a fractionated melanin compound, is the first cosmetic ingredient designed to protect the skin from damaging high energy visible light.

## EFFECT OF HEV LIGHT

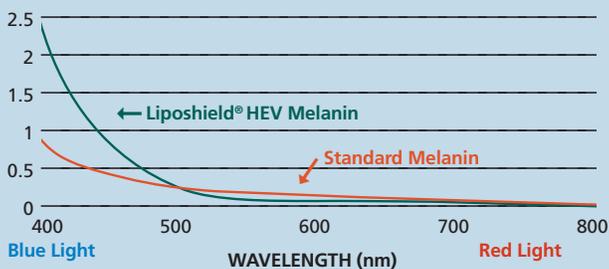


## WHAT IS LIPOSHIELD® HEV MELANIN?

**Liposhield® HEV Melanin** is a fractionated melanin compound, designed to be used topically as an additional environmental defense against High Energy Visible light (HEV). It is designed to shield the skin from high energy blue/violet visible light. This novel, patent-pending ingredient may help to prevent premature aging and hyperpigmentation. **Liposhield® HEV Melanin** is tailored specifically to absorb light in the range of 400-500 nm wavelengths. **Liposhield® HEV Melanin** was designed to have a molecular weight that is estimated to be 5,000 to 10,000 Daltons and will not penetrate healthy, intact skin.

### HEV MELANIN COMPARED TO STANDARD MELANIN

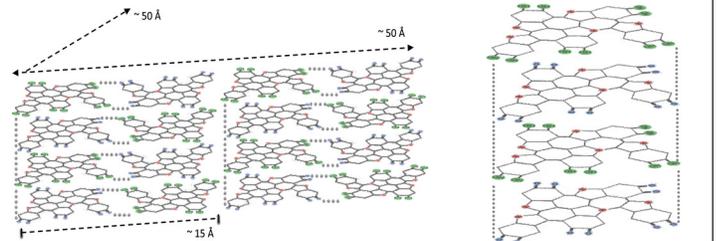
Protects skin from damaging blue light while allowing absorption of beneficial red light



### CHEMICAL STRUCTURE OF STANDARD MELANIN AND FRACTIONATED MELANIN

Aggregation model of melanin molecules:  
Conglomerated molecule (unfractionated)

Stacked model of melanin molecules:  
Protomolecule (fractionated)



# LIPOSHIELD® HEV MELANIN

Protection from the Adverse Effects of High Energy Visible (HEV) Light

## KEY BENEFITS

- Protects skin from harmful effects of HEV light
- Prevents oxidative stress
- Prevents the generation of an impaired barrier
- Prevents skin aging that is generated though accelerated cell senescence
- Possibly prevents hyperpigmentation

## IDEAL FOR USE

- Daily wear moisturizing creams and lotions
- Anti-aging treatment products
- Sunscreen products
- Foundation make ups



**Product:** Liposhield® HEV Melanin

**EINECS #:** 232-473-6

**INCI Name:** Melanin

**CAS #:** 8049-97-6

Preservative System: Pentylene Glycol and Ethylhexylglycerin

## HOW IS LIPOSHIELD HEV® MELANIN USED?

**Liposhield® HEV Melanin** is soluble in water. For use in aqueous applications the pH should be adjusted and held between 5.5-6.9. At higher pH levels the melanin will darken. It should be added to emulsions after emulsification at 45°C with medium propeller mixing. **Liposhield® HEV Melanin** will impart a yellowing effect to oil-in-water (o/w) emulsions, which can be mitigated with the addition of dyes, resulting in pale pastel formulations. Incorporation into water-in-oil (w/o) or water-in-silicone (w/Si) emulsions may partially mask the yellowing effect. The ingredient is UV stable when exposed to light in formulations.

**Liposhield® HEV Melanin** is not suitable for gel formulations, as colorless formulations can not be obtained. It is also not compatible with cationic ingredients, resulting in the formation of a precipitate. It is heat sensitive and therefore should not be heated above 50°C. Incorporation into formulations at temperatures below 45°C is recommended.

**Recommended use level: 0.2 – 0.5%**

## LIPOSHIELD® HEV MELANIN TYPICAL PROPERTIES

Appearance @25° C	Dark brown liquid
Odor	Characteristic
Solid Content	9-12%
Recommended Use Level	0.2-0.5%
Solubility	Soluble in water

## REFERENCES

1. Zastrow L., Groth N., Klein F., Kockott D., Lademann J., Ferrero L. Detection and identification of free radicals generated by UV and visible light in Ex Vivo human skin. IFSCC Magazine 11(3) (2008) 297-315.
2. Besaratinia A., Kim S.I., Pfeifer G.P. Rapid repair of UVA induced oxidized purines and persistence of UVB induced dipyrimide lesions determine the mutagenicity of sun light in mouse cells. The FASEB Journal 22(2008) 2379-2392.
3. Denda M. and Fuziwara S. Visible radiation affects epidermal permeability barrier recovery: selective effects of red and blue light. J. Invest. Dermatol. 128 (2008) 1335-1336.
4. Lee J.H., Roh M.R., Lee K.H. Effects of infrared radiation on skin photo-aging and pigmentation. Yonsei Medical Journal 47(4) (2006) 485-490.

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## ACTIVE INGREDIENTS