Optimizing Hydrogels in Cosmetics: Creating Effective Self-Assembled Nanostructures Coupled with an Antioxidant-Rich and High SPF Pollution-fighting Soybean Oil Cream

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Free radical damage to skin caused by particulate matter and ultraviolet (UV) radiation takes over nine million lives per year. Current creams can be remedial barriers; however, particles, (microns in diameter), and UV radiation may still contact the skin. Hence, we conducted an experiment utilizing a peptide amphiphile that self-assembles into hydrogel-nanostructures. If hydrogels are incorporated in a natural cream, consisting of oils and antioxidants, then the skin will be protected from free radical damage. The peptide sequences K2(SLXL)3K2 (where X represents Tryptophan, Asparagine or Cysteine) were assembled in an amphiphilic solution, and tested for optimum conditions (pH, temperature, concentration). The cream was then tested in novel engineered designs against particulate matter and ultraviolet radiation. Coupled with optimized hydrogels, the cream was further tested to determine if the presence of nanostructures yields an increase in Sun Protection Factor (SPF) and antioxidant levels. Additionally, Soybean, Coconut, and Rosemary oils were incorporated and tested for SPF and antioxidant values. Statistically, our findings concluded that through 174 trials, we are 95 percent confident that our natural emulsion with the assembled peptide K2(SLXL)3K2 at a pH of 8.0, a temperature of 24°C, and a concentration of 10 mg/mL blocked three times the pollution as the control commercial cream. Furthermore, the addition of nanostructures integrated with soybean oil increased SPF levels significantly, and antioxidant levels by 20%. Future directions include testing the cream in vivo, and creating an application to inform people of natural solutions against free radical damage.

Awards Won:
Fourth Award of $500