

Methylene blue, a common antioxidant, could reverse signs of aging in human skin

Zheng-Mei Xiong

Mike O'Donovan

Linlin Sun

Ji Young Choi

Margaret Ren

Kan Cao

Video Abstract

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Abstract

Antioxidants – considered by many the superheroes of the dietary world – are reported to do everything from improving heart health to helping fight cancer. They're also a common anti-aging ingredient in skin care lines. University of Maryland researchers have narrowed down one antioxidant that seems to significantly outperform others in the anti-aging arena: methylene blue – a chemical used in research laboratories across the world. In a recent study published in Scientific Reports, the team showed that applying the molecule to a reconstructed skin model can slow or even reverse several well-known signs of aging, opening the door to new, more effective cosmetic treatments. The team compared the performance of methylene blue against three other popular antioxidants on skin cells collected from healthy young donors, elderly people, and individuals with progeria – a genetic condition that causes accelerated aging. They also created an artificial, three-dimensional model of skin tissue to evaluate the compound's performance in a more natural environment. Methylene blue outperformed the competition in every test. Cells treated with the compound for 4 weeks showed lower levels of damaging molecules known as reactive oxygen species than cells treated with the other antioxidants. They also showed a reduced rate of cell death. These changes seemed to result from alterations in gene expression following methylene blue treatment. Treated cells showed lower levels of proteins associated with cellular deterioration and increased expression of Nrf2, an essential regulator of cellular antioxidant defenses. In the three-dimensional skin model, the results were even more striking. The compound increased both skin thickness and skin hydration – two essential characteristics of young skin. At the molecular level, these changes were accompanied by increased levels of extracellular matrix proteins like elastin and collagen, the fibers that make up the skin's underlying support network. The researchers also used the model to test the safety of methylene blue and found that the chemical causes little to no irritation of skin cells, even at high concentrations. Altogether, these results show that methylene blue possesses a wide range of beneficial effects for skin cells and suggest that the molecule holds great potential as an anti-aging treatment.