Cyanobacteria—the future of sunscreen?

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Credit: Cyanobacteria

Sunscreens and moisturizers derived from biological sources such as cyanobacteria could represent a safer alternative to current, synthetically produced cosmetics, research published in the *European Journal of Phycology* suggests.

Using organic matter to develop sunscreens could lessen the risk of adverse side effects, such as contact sensitivity and estrogen mimicking, and help prevent potentially harmful chemicals from entering the environment, lead author Peyman Derikvand of the University of Isfahan, Iran, and colleagues from Swansea and London, say.

The use of biological compounds has many potential advantages for the cosmetics industry, one of which is the organism's ability to self-renew and reproduce, ensuring that supplies are sustainable. This is especially true for photosynthetic organisms that require only light energy, carbon dioxide and basic nutrients.

One group of such organisms, cyanobacteria, could have great potential as a source of cosmetic products for sunscreens and moisturizers because some of its species live in extremely arid habitats and thus produce compounds that give them the ability to cope with both high UV radiation and extreme desiccation.

These compounds include mycosporine-like amino acids (MAAs) and scytonemin, which provide strong screening protection from longwave and shortwave UV radiation respectively. Such natural photoprotectants could be good candidates as alternatives to synthetic UV filters.

In addition, extracellular polymeric substances (EPS) derived from cyanobacteria appear to be much more effective at retaining moisture than EPS from conventional moisture preserving materials, such as urea, glycerin and propylene glycol, currently used in cosmetics.

Cyanobacteria have higher photosynthetic and growth rates than more complex plants, simple nutritional requirements, and the ability to grow under closed cultivation systems that do not compete with agriculture. However, economic and sustainable production of these bio-compounds at the large scales required by the cosmetic industry is a key challenge.

"As we move into an era where we are turning to nature to replace synthetic chemicals, industry is being driven to look to natural product alternatives. Cyanobacteria, tiny photosynthetic microbes, offer new potential. One suite of compounds are synthesised to protect against damaging ultraviolet and intense sunlight. These compounds, as discussed in this review, offer many advantages over current synthetically derived sunscreens," said author Carole Llewellyn, Associate Professor in Applied Aquatic Bioscience.

"On-going research into the intensive cultivation of photosynthetic microorganisms in photobioreactors is bringing new understanding in terms of design, operation and scale-up, and will steadily improve both the economics and feasibility of industrial production of cyanobacteria," said Llewellyn.

Technical improvements coupled to market demand should see the increasing application of cyanobacterial metabolites in the cosmetics sector, the authors conclude.

More information: Peyman Derikvand et al. Cyanobacterial metabolites as a source of sunscreens and moisturizers: a comparison with current synthetic compounds, *European Journal of Phycology* (2016). DOI: 10.1080/09670262.2016.1214882

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