

Glycerin is safe, effective in psoriasis model

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Dr. Wendy Bollag and first author Dr. Vivek Choudhary, MCG physiologist and molecular biologist. Credit: Michael Holahan, Augusta University

Patients with psoriasis have reported that glycerin, an inexpensive, harmless, slightly sweet liquid high on the list of ingredients in many skin lotions, is effective at combatting their psoriasis and now scientists have objective evidence to support their reports.

They found that whether applied topically or ingested in drinking water, [glycerin](#), or glycerol, helps calm the classic scaly, red, raised and itchy patches in their [psoriasis](#) model, Dr. Wendy Bollag, cell physiologist and [skin](#) researcher at the Medical College of Georgia and Charlie Norwood VA Medical Center and her colleagues report in the *International Journal of Molecular Sciences*.

The studies also provide more evidence of the different ways glycerin enables the healthy maturation of [skin cells](#) through four stages that result in a smooth, protective skin layer. Psoriasis is an immune-mediated problem that typically surfaces in young adults in which skin [cells](#) instead multiply rapidly, piling up into inflamed patches.

"We have experimental data now to show what these patients with psoriasis are reporting," says Bollag, who nearly 20 years ago first reported in *The Journal of Investigative Dermatology* that glycerin, a natural alcohol and water attractor known to help the skin look better, also safely helped it function better by helping skin cells mature properly.

Bollag's early report led to many anecdotal reports from individuals and their reports ultimately led to the newly published study.

Topically, glycerin is known to have a soothing, emollient effect. But another key part of its magic, which Dr. Bollag has helped delineate, is its conversion to the lipid, or fat, phosphatidylglycerol, which ultimately regulates the function of keratinocytes, our major skin cell type, and suppresses inflammation in the skin.

Glycerin gets into the skin through avenues like aquaporin-3, a channel expressed in skin cells, and the MCG scientists have shown that once inside, aquaporin 3 funnels glycerin to phospholipase-D-2, an enzyme that converts fats in the external cell membrane into cell signals,

ultimately converting glycerin to phosphatidylglycerol.

In 2018, Bollag and team reported that topical application of phosphatidylglycerol reduced inflammation and the characteristic raised skin patches in a mouse model of psoriasis. This time they decided to look at the impact of its widely available precursor glycerin.

For the new studies, they used imiquimod, which is known to produce psoriasis-like plaques on humans using it for problems like genital warts and some skin cancers, to produce an animal model. The mice either drank the sweet natural alcohol or the scientists applied it topically. Either way, glycerin helped reduce development of the characteristic skin lesions, the scientists report, a finding which helps underline that glycerin works in more than one way to improve the skin condition.

Externally, glycerin showed its action as an emollient because even in mice missing phospholipase-D-2, it was beneficial. Additionally, topically it appears to compete with hydrogen peroxide for space inside the aquaporin 3 channel. Hydrogen peroxide is commonly known as a mild antiseptic but we produce it as well and at low levels it's a cell signaling molecule. But at high levels, hydrogen peroxide produces destructive oxidative stress, which can actually cause psoriasis.

The scientists found that topical glycerin reduced the levels of hydrogen peroxide entering skin cells. When they added glycerin and hydrogen peroxide at the same time directly to skin cells, they found that glycerin protected against the oxidative stress from hydrogen peroxide.

"Glycerol is basically outcompeting the [hydrogen peroxide](#) in getting in there and preventing it from being able to enter and increase oxidative stress," Bollag says. Oil and water don't mix, so yet another way glycerin may be helpful is by supporting the skin's major role as a water permeability barrier so that, as an extreme, when we sit in a bathtub the

bath water doesn't pass through our skin so we blow up like a balloon, she says.

On the other hand, when glycerin was ingested by the mice missing the phospholipase- D-2, which converts fats or lipids in a cell's membrane to signals, it simply did not work, Bollag says, which confirmed their earlier findings that internally anyway, glycerin pairs with the enzyme to produce the signal essential to skin cell maturation.

Some of their other most recent work is detailing more about how phosphatidylglycerol decreases inflammation.

Bollag would like next steps to also include clinical trials with dermatologists and patients and is working to find a formulation scientist who can make what she thinks will be the optimal combination: glycerin and phosphatidylglycerol in the same topical cream.

The addition of phosphatidylglycerol itself, rather than just the glycerin that makes it, is essentially a backup since there is some evidence that in psoriasis the essential conversion of glycerin to phosphatidylglycerol is not optimal. Bollag's lab and others have shown reduced levels of aquaporin 3 in psoriasis, which likely means less phosphatidylglycerol, so making more glycerin available may help, albeit not as efficiently, raise the availability of this lipid essential to normal skin cell proliferation.

Moving quickly into [clinical trials](#) should be comparatively easy since, as with glycerin, there already is experience with the use of phosphatidylglycerol in humans. For example, it's a component of some high-end cosmetics, Bollag says.

She suspects that this sort of two-punch combination, could help keep early signs of psoriasis at bay and, with more advanced disease, use existing psoriasis treatments to get the skin condition under control then

start applying glycerin to help keep it that way.

Bollag and her colleagues reported in 2018 in the *Journal of Investigative Dermatology* that in a mouse model of psoriasis, phosphatidylglycerol reduced inflammation and the characteristic raised skin lesions of psoriasis.

While its exact cause is unclear, psoriasis is an immune-mediated condition and patients have higher levels of inflammation, as well as too many skin cells being produced then maturing abnormally. The heightened inflammation also puts them at increased risk for problems like heart disease.

Biologics used to treat psoriasis work different ways to stem this overactive immune response but in addition to their high cost, can put the patient at risk for problems like serious infections and cancer. The only side effect she has seen in about 20 years of working with glycerin and the clinical and cosmetic use already out there, is it can leave the skin feeling slightly sticky.

Our bodies can make glycerol from the carbohydrates, proteins and fats that we eat or already have in our body.

More information: Vivek Choudhary et al, Glycerol Improves Skin Lesion Development in the Imiquimod Mouse Model of Psoriasis: Experimental Confirmation of Anecdotal Reports from Patients with Psoriasis, *International Journal of Molecular Sciences* (2021). [DOI: 10.3390/ijms22168749](https://doi.org/10.3390/ijms22168749)

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