



Nutrition and water: drinking eight glasses of water a day ensures proper skin hydration—myth or reality?

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Abstract How-to books, beauty journals, the Internet, and the media usually recommend drinking six to eight glasses of water each day for keeping the skin hydrated, helping it look healthier, and making it less prone to wrinkles. We have found no scientific proof for this recommendation; nor is there proof, we must admit, that drinking less water does absolutely no harm. The only certainty about this issue is that, at the end of the day, we still await scientific evidence to validate what we know instinctively to be true—namely, that it is all a myth.

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Introduction: the media

The sanctity of the sacred cow has been challenged! We will start with a few, among dozens of links, quoting the beneficial effect on your skin of drinking eight glasses of water before we put in our two cents' worth.

<http://whatscookingamerica.net/HealthBeauty/Water-TheFountainOfYouth.htm>

“Now that I have hopefully convinced you of the benefits of drinking water for your skin and health, how much should

you drink a day? The Mayo Clinic suggests using “8 × 8” as a guideline - 8 glasses (8 ounces each) = a minimum of 64 ounces of fluid (water) daily. You may need even more as exercising, hot weather, offices with exposure to central heating, air conditioning, and electrical equipment all cause your body to lose water.”

http://www.happyhealthylonglife.com/happy_healthy_long_life/2008/06/how-much-water-do-i-need-to-drink-what-the-experts-say.html

“Now all of a sudden the press is saying ‘Forget about forcing down those 8 glasses of 8!’ I decided to read the studies myself and separate the truth from the fiction. I also know how I feel when I drink my usual 64 ounces (8 glasses)

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of water (& other fluids) a day, and when I don't. For me, it's all about "evidence-based living"! Last weekend in Chicago, I didn't lug around my "stainless steel" water bottle, or down nearly enough liquid to fill my usual quota. And yes, my body noticed it. Won't do that again! Needless to say, my trips to the bathroom were not what they should have been. And as Dr. Goldfarb would say, 'There was definitely less turgor in my skin.' (I looked wrinkled.) As far as I'm concerned, water works! I look better, my digestion is better, I feel better & even think better. You can decide for yourself, but here's what I learned about water."

<http://www.smartskincare.com/nutrition/diet.html>

"A well-moisturized skin is somewhat less prone to developing of wrinkles. Drinking plenty of fluids throughout the day ensures proper hydration of the body and helps reduce skin dryness. Experts usually recommend drinking 6-8 glasses of water a day."

<http://www.mayoclinic.com/health/water/nu00283>

"The famous "8 × 8 rule" (around 1.9 liters) was indeed recommended by the Mayo Clinic, but nowhere do they claim that this behavior has anything to do with the skin! To the contrary. In the Mayo Clinic's "Skin Care Quiz: Best Practices for Healthy Skin", the answer to the first question "Drinking plenty of water makes your skin moist and supple" the answer is "False".

http://www.riversideonline.com/health_reference/Tools/QZ00078.cfm

"Though drinking water is essential to keeping your body hydrated, a generous water intake doesn't make your skin look moist and supple nor does it improve wrinkles or make your skin look younger. The amount of moisture in your skin is more likely determined by external factors, such as..."

<http://www.iloveindia.com/nutrition/water/index.html>

"Water forms a major part (2/3) of our body weight. Blood is 83% water, muscles are 75% water, brain is 74% water and bone is 22% water. Water is necessary for the very survival of human beings, as it ensures the smooth functioning of body systems. Skin cells, like any other cell in the body, are almost entirely made up of water. Without

water the organs in the body—and the skin is the biggest—will not function properly. Loss of hydration in the skin is expressed in a variety of ways, such as dryness, tightness, flakiness. Dry skin has less resilience and is more prone to wrinkling. Water is essential to maintain skin moisture and is the vehicle for delivering essential nutrients to the skin cells. Given that water is lost in large quantities every day, it stands to reason that it needs to be replaced somehow."

In summary, the argument for high water intake, as presented in the media, goes something like this: because our body is almost entirely made up of water and because water is essential for living tissues and humans cannot survive for more than a few days without ingesting water, we, therefore, need to drink large quantities of water, and the more the better. If this kind of logic were applied to gasoline and motor vehicles, the reasoning would be: because gasoline is essential for the car to function, we need to maintain large amounts of gasoline in our car's tank, and the more the better.

The alleged beneficial effect of extra fluid intake on general health

An excellent editorial recently published in the *Journal of the American Society of Nephrology* critically reviewed this issue.¹ The question asked was: "There are certainly well-recognized disease states, such as nephrolithiasis, for which increased fluid intake is therapeutic, but do average, healthy individuals living in temperate climate need to drink extra fluid—even when not thirsty—to maintain health?" The authors examined several claims of a benefit for extra water drinking, including it leads to more toxin excretion through the kidneys, it improves skin tone, and it reduces hunger and headache frequency. They came to the conclusion that:

There is no clear evidence of benefit from drinking increased amounts of water. Although we wish we could demolish all of the urban myths found on the Internet regarding the benefits of supplemental water ingestion, we concede there is also no clear evidence of lack of benefit. In fact, there is simply a lack of evidence in general.

We could not agree more. The conclusions of another review article² were similar:

Thus I have found no scientific proof that we must 'drink at least eight glasses of water a day', nor proof, it must be admitted, that drinking less does absolutely no harm. However, the published data available to date strongly suggest that, with the exception of some diseases and special circumstances, such as strenuous physical activity, long airplane flights, and climate, we probably are currently drinking enough and possibly even more than enough... osmotic regulation of vasopressin secretion and thirst is so sensitive, quick, and accurate that it is hard to imagine that evolutionary development left us with a chronic water deficit that has to be compensated by forcing fluid intake.

The alleged beneficial effect of drinking 8 × 8 glasses of water on the skin

We are aware of only one study,³ relating to the effect of long-term water intake (2.25 liters daily of mineral water or tap water) on skin physiology. After 4 weeks of drinking water in excess, the measurements in mineral water group revealed a significant decrease in skin density and increased skin thickness, which was significant only in the participants who routinely drank comparably little before the start of the study. Skin density increased significantly, and skin thickness decreased significantly in the tap water group. Finger circumference decreased noticeably in the mineral water group and increased in tap water group. Objective skin surface morphology did not change in any group. As the authors admitted, "...not all of the objectively measured changes can be explained straightforwardly, as the exact mechanisms necessitate further research in this area."

This report leaves more questions than answers, particularly concerning the differences and contradictory results between measurements of the group who drank mineral water compared with the group who drank tap water. The clinical relevance of the results is unclear; however, the study is important by being the first to demonstrate that the consumption of more than 2 liters of water per day can have a measurable influence on skin physiology in healthy volunteers.

A noteworthy finding was that objective assessment of the skin surface profile did not reveal any significant changes in either group. "This is interesting," the authors noted, "as it is generally claimed that drinking lots of water might reduce visible signs of cutaneous ageing such as wrinkles and lines. We could not confirm any objective improvement of wrinkles or skin surface roughness after increasing the daily water uptake to more than 2 liters over weeks."

In our opinion, the lack of association between excessive fluid intake and skin surface profile (eg, wrinkles, skin surface roughness) as demonstrated in this study³ provides the main take-home message of the current presentation as well. The lack of any convincing evidence for a benefit of the 8 × 8 rule in other fields also applies to dermatology, including skin wrinkling and surface roughness in otherwise healthy people.

We are taught in medical school how to evaluate dehydration by assessing skin turgor. The skin should be pinched and lifted to create a fold over the sternum, the abdomen, or the arm. In cases of decreased skin turgor, the skin fold will "hold" or "tent" for up to 30 seconds, whereas in normal conditions, it returns immediately to its original state.⁴⁻⁶ Does the fact that severe dehydration can decrease skin turgor indicate that excessive fluid intake in otherwise healthy individuals over a long period of time will do the opposite, namely increase turgor? Obviously not.

Although the main water reservoir of the skin is the dermis, it is the stratum corneum water content that is crucial

in maintaining many of the skin's biophysical properties, such as elasticity and surface roughness. The connective tissue of the skin is crucial for water storage in the body. A man who weighs about 70 kg has a skin tissue volume of about 7 liters. The extracellular matrix comprises two-thirds of this volume and consists of about 50% fluid; thus, one-third of the tissue layer consists of interchangeable water. Proteoglycans, a major component of the extracellular matrix, can bind one-third of the total interstitial amount of fluid.⁷

The Starling equation

The interstitial fluid volume and the net flux through the capillary wall is regulated by the forces of the Starling equation, which postulates that the movement of fluid depends on six variables:

1. capillary hydrostatic pressure,
2. interstitial hydrostatic pressure,
3. capillary oncotic pressure,
4. interstitial oncotic pressure,
5. filtration coefficient of the capillary wall, and
6. reflection coefficient, a "correction factor" that also describes the permeability of the capillary wall.

The main value of this equation lies in its didactic, logical explanation of the forces involved in fluid movement from one compartment to another — in our case, from blood vessels to the interstitial spaces of the skin — especially, when pathologic processes grossly alter one or more of the variables. The equation is not meant for clinical use, because it is almost impossible to measure all six variables together in actual patients.

According to the Starling equation, increasing capillary hydrostatic pressure and decreasing colloid osmotic pressure or increased permeability of the capillary wall leads to increasing fluid shift from the intravascular space to the interstitial tissue. There is enough evidence to show that excessive and rapid fluid intake or infusion may lead to increasing interstitial volume and edema. In a recent study using a canine model,⁸ dermal echogenicity decreased (dermal water content is negatively correlated with dermal echogenicity due to interstitial edema which leads to a decrease in the strong echogenicity of collagen bundles) and skin thickness increased significantly after hydration by intravenous administration of an isotonic crystalloid solution (30 mL/kg/h for 30 minutes). In another study of 20 healthy men, dermal thickness increased significantly 30 minutes after infusion of 10 mL/kg of Ringer's solution, given over 15 minutes,⁷ whereas rapid removal of fluids and water from the body during dialysis had an opposite effect. Removal of fluid after hemodialysis was associated with a significant decrease in skin thickness,

skin elasticity, stratum corneum water content, and skin distensibility.⁹

Does the fact that changes in plasma colloid osmotic pressure after excessive and abrupt fluid intake (a change that may also be detected by hematocrit and electrolyte changes, as well as changes in the variables of the Starling equation) may influence water content of the skin indicate that excessive fluid intake throughout the day and over long periods of time do the same? Of course not! There is no scientific proof that drinking habits may intervene or cause a change in the Starling equation, and, thus, that it has any influence on the water content of the skin.

Conclusions

As so often appears at the end of a scientific contribution, we, too, have no choice but to recommend further research to provide some definitive evidence about whether drinking excessive amounts of water or drinking 8 × 8 glasses a day has any beneficial effect on the skin of healthy individuals in normal conditions. The only certainty about this issue is that at the end of the day, we still await scientific evidence to validate what we know instinctively to be true—namely, that it is all a myth.

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