

# Why Do Fingers and Toes Get Pruny in Water?

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## STORY AT-A-GLANCE

- › It takes several minutes to a half-hour, but if you leave your fingers and toes in water long enough, the tips will wrinkle up like prunes
- › The bottoms of your feet and the undersides of your hands, including the tips, are covered with “glabrous” skin, meaning hairless
- › When water seeps into glabrous skin, electrical charges are sent to your nerve endings, then the nerves tell your blood vessels it’s time to constrict, or tighten
- › Scientists believe there may be an evolutionary explanation for this seemingly inconsequential phenomenon: It may have helped our ancestors get a grip on things in rainy or otherwise wet conditions

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There are many uncertainties in life, with answers shrouded in mystery. Some of the world's most challenging perplexities will never be known, but others can sometimes be reasoned out analytically.

One of those enigmatic questions is – Why do our fingers and toes get pruny after sitting in water for a while? Luckily, while some of the most difficult-to-fathom disputes may, at first, seem out of our depths, the headwaters of science can often be tapped. In this case, we're in luck. At least there are a few theories.

## **The Dilemma – Too Much Time in the Tub**

You've probably been there – not much to do, plenty of time on your hands, achy bones and the splendid notion that a nice, relaxing bath might be the ticket.

After several minutes of bliss (about a half hour, they say), you happen to notice something that would be slightly alarming if it hadn't happened so many times before, starting when you were a kid with your snorkel gear and rubber ducks floating around with you – pruny fingers and equally pruny toes. Wrinkly digits.

Here's the scientific basis for this odd phenomenon. For whatever reason, the digits in question are more prone to wrinkling than other areas of your body. It's called "glabrous" skin, meaning hairless. It's thicker than the skin found on other parts of your body, which is good whenever you touch something that's too hot.

When water seeps into glabrous skin, electrical charges are sent to your nerve endings – more precisely, the sympathetic nervous system, says dermatologist Dr. Sarina Elmariah, in an interview for STAT.<sup>1</sup> In response, the nerves send a message to your blood vessels that it's time to constrict, or tighten.

When water starts to permeate into your skin, it's thought that the upper layers of your fingertips start to swell. Simultaneously, the nerves in your fingertips (or toe tips) start the constriction process, which scientifically is known as vasoconstriction – the narrowing of blood vessels.

"That creates a negative pressure that essentially pulls down the upper layers of the skin, leading to this wrinkling or 'undulating' pattern," explains STAT<sup>2</sup> reporter Megan Thielking.

## **Wrinkled Digits – Do They Serve Some Evolutionary Purpose?**

Great minds have pondered the question of whether the pruny finger and toes occurrence may have some sort of evolutionary rationale, if there can be such a thing.

"It's thought that the adaptation arose in primates and our ancestors to allow us to grip wet items," Elmariah suggests.<sup>3</sup> Sure enough, Scientific American concurs:

*"Laboratory tests confirmed a theory that wrinkly fingers improve our grip on wet or submerged objects, working to channel away the water like the rain treads in car tires.*

*People often assume that wrinkling is the result of water passing into the outer layer of the skin and making it swell up. But researchers have known since the 1930s that the effect does not occur when there is nerve damage in the fingers."*<sup>4</sup>

That interesting factoid indicates there may be an involuntary reaction within your body's autonomic, or unconscious, nervous system, the same system that regulates your heart rate and breathing.

## **Wrinkly Fingers May Be for a Better Grip, Like Tire Treads**

Scientists have actually looked long and hard at the crinkly conundrum of why this happens. Mark Changizi, an evolutionary neurobiologist and director of human cognition at 2AI Labs in Boise, Idaho, conducted experiments using marbles of different sizes, and volunteers who would try picking them up with both wet hands and dry hands.

The results,<sup>5</sup> published in *Biology Letters*, showed that the subjects were able to pick up the wet marbles faster when their fingers were wrinkled, but there was no advantage when they tried picking them up with dry, wrinkled fingers.

As Tom Smulders, co-author of the paper and another evolutionary biologist at Newcastle University, UK, conjectured:

*"We have shown that wrinkled fingers give a better grip in wet conditions – it could be working like treads on your car tires, which allow more of the tire to be in contact with the road and gives you a better grip."*<sup>6</sup>

Changizi agrees, and believes the test results corroborate behavioral evidence that the reason pruny fingers and toes appeared (appear) in wet conditions is to provide something like rain treads. Live Science quotes him as saying:

*"We worked out what the qualitative nature of the wrinkles should be like if they really are water drainage networks, and then showed that pruny fingers have that signature (... rather than infinitely many other sorts of wrinkle patterns that could potentially exist)."*<sup>7</sup>

It's probably only a matter of time until some enterprising manufacturing company produces footwear with traction-improving channels on the bottom, inspired by the mountain rivulet formation your fingers take on under the effects of moisture.

## **Scientific Pieces That May Fit Into the Puzzle**

Smulders wondered if wrinkly fingers may have been helpful for gathering food from streams or wet vegetation, and have the same effect in toes for them to lock a grip in better on a trail or mountainside in the rain.

The only drawback to this explanation is that, if there's an advantage for the body to spontaneously or over millennia develop wrinkly fingers in moist conditions, but there's no disadvantage with dry ones, one wonders why everyone's fingers aren't perpetually wrinkled.

If it happens on your fingers and toes, why not the other parts of the body? Regardless, Changizi's next venture is to find other animals besides the macaque, a primate hailing from South America and Asia, that produce a similar, wrinkly fingered state in wet conditions:

*"One would like to be able to predict which sorts of animals are expected to be pruny, and which are not, and, do wetter species have more pruniness?"*

*At the moment, though, we have almost no data on which animals do and do not have prunes. I did find that macaques get pruny, which suggests all Old World*

*monkeys probably do. But we need to have a lot more I asked more than dozen primate labs, and none had ever looked to see."*<sup>8</sup>

Keratin is a protein that makes up your **hair, nails and skin**, especially the outer layer, or epidermis. The grainy inside surface of your hands and feet is actually many layers of dead skin, explaining why it's so tough, compared to the skin on your chest, stomach or earlobes. According to How Stuff Works:

*"The epidermis contains the protein keratin, which strengthens your skin and helps keep it moist. Dead keratin cells make up the epidermis' own surface layer known as the stratum corneum, which is Latin for 'horned layer.'"*<sup>9</sup>

Everyday Mysteries, from the Library of Congress, notes:

*"These dead keratin cells in the stratum corneum absorb water easily and start to swell after extended periods in the water, but the living keratin cells deeper in the skin do not.*

*As the dead cell layer expands, it begins to take up more surface area, but it's still connected to the living cells beneath and doesn't have anywhere to go. As a result, the stratum corneum wrinkles to give the temporary new surface area someplace to go."*

## **Last Word on Prunified Extremities**

A few interesting points to note:

- The macaque, as an "Old World" primate, is a member of the Cercopithecoidea family, which means "tailed ape."<sup>10</sup> Unlike other apes, their tails are not prehensile (cannot be used for grasping).<sup>11</sup>
- Old World Monkeys are found in Asia and Africa, while New World monkeys are located primarily in Central and South America and South and East Asia, where there's mostly tropical forests or mountainous areas with heavy winter snows.<sup>12</sup>

So conceivably, if macaques and other Old World primates have tails that are unable to grip, meaning they have to rely on their fingers and toes to get around, it's quite interesting that they also have the wrinkled digits feature.

## Sources and References

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