

The finding of Interstitium, the Largest Organ We Never Knew We Had, shows a better picture of the network in our body

A study published in *Scientific Reports* very recently suggests that a previously unknown organ has been found in the human body. This new organ is the largest by volume among all 80 organs.

The new organ is a thin layer of dense connective tissue throughout the body, sandwiched just under our skin and within the middle layer of every visceral organ. The organ also made up all the fascia, or the thin mesh of tissue separating every muscle and all the tissue around every vein and artery, from largest to smallest. What initially seemed to be a solid, dense, connective tissue layer was actually a complex network of fluid-filled cavities that are strong and flexible, yet so tiny and undiscerning that they escaped the attention of the brightest scientific minds for generations.

In fact, the author Neil Theise expanded, this “interstitium” could explain many of modern medicine’s mysteries, often dismissed by the establishment as either silly or explainable by other phenomena. Take acupuncture, Theise said—that energetic healing jolt may be traced to the interstitium.

Or perhaps the interstitium acted as a “shock absorber,” something that protected other organs and muscles in daily function. Also, the space is in direct communication with the lymphatic system as the origin of lymph fluid—which means the interstitium’s system of fluid-filled backroads could explain the metastasis of cancer cells and their quick spread beyond the limits of the organ in which the cancer started.

One day nearly four years ago, David Carr-Locke and Petros Benias, endoscopists—specialists that insert an endoscope directly into an organ to examine it—approached Theise. Theise was a liver pathologist at Mount Sinai Beth Israel Hospital’s Digestive Disease Division at the time. Endoscopists like Carr-Locke and Benias collect samples from organs and pathologists like Theise analyze them. Endoscopists tend to look at surface-level tissue, while pathologists look deeper, at the entirety of an organ.

That fateful day, Carr-Locke and Benias approached Theise with an unusual image. A new endoscope they were using allowed microscopic viewing of living tissues, not just the dead tissues removed at surgery or biopsy and transformed into a microscope slide. Carr-Locke and Benias gathered the sample from living tissue just before taking a biopsy. They used a green dye called fluorescein, which spreads through the body when infused into a vein and allows an endoscopist to clearly see differences in microscopic, closely set structures to a depth of less than a tenth of a millimeter, or the thickness of seven sheets of paper.

Carr-Locke and Benias were viewing the large duct that drains bile from the liver to the gut and saw what seemed to be a “reticular pattern”: dark bands that separate what Theise called “oddly shaped bright spaces.”

Theise, Carr-Locke, and Benias weren’t sure what to call this space with its collagen bundles and fluid. The fluid itself appeared rich in proteins typical of lymphatics and serum, but the space was neither lymphatic nor vascular (meaning that it contained neither veins nor arteries), so what could it be?

It dawned on them that what they'd stumbled upon was actually talked about in medical textbooks, but that they were the first to actually define it.

It is the interstitium, a space vaguely described in textbooks as where "extracellular fluid" is found, the fluid that isn't contained within cells. What doctors had defined as "dense connective tissue" wasn't dense connective tissue at all. In fact, they were all fluid-filled structures that only appeared to be densely compacted when tissues were made into slides, the fluid draining away, the collagen lattice collapsing onto itself.

They had a theory—that the space was the interstitium—and a way to prove it.

So far they had only recognized this in the bile duct. But Theise began to recognize through his daily lot of diagnostic slides from surgical resections and biopsies of all sorts of tissues and tumors that the dense connective tissue layers of other parts of the body also had the same appearance as this layer in the bile duct. He noticed it in stomach and intestine and esophageal specimens, then he saw it in fascia around muscles and in fat. And then he noticed it around veins and arteries. Then skin.

It seemed to be everywhere, and Theise realized the potential enormity of what they'd discovered, calculating that it was largest organ of the body by volume—larger even than that of skin due to its wrapping around every organ, including the skin. At about 20 percent of all the fluid of the body, and about 10 liters, it was gigantic despite the fact that it could only be seen by peering through a microscope: The cardiovascular system (heart, veins, arteries, and capillaries) weighed in at about a third of that volume, the cerebrospinal fluid 20 times smaller.

how could an organ have escaped noticed until 2018?

"We always thought those cracks were, 'Oh, we tore the tissue a little,'" Theise said as he flipped through slides that consistently showed the wavy, almost dancing, spaces that were in each slide. "But no, those tiny 'cracks' are the remnants of the interstitial spaces. For 200 years, we said these cracks were just tear artifacts."

Theise went further. With organs that contracted constantly, like the gastrointestinal tract or heart, why was it that they were so flexible, so capable of handling the daily stress of continuing to contract predictably, automatically, and regularly without wearing out? "It's a shock absorber," Theise realized. These cells formed a protective, elastic sort of wall around each organ, allowing them to do their perform pressurized functions that would otherwise break them down over time. Instead, they're going on and on, thanks to the interstitium.

"There's something new here," Theise said. "No one's ever seen it before, but it's been there the whole time."

<https://www.thedailybeast.com/meet-the-interstitium-the-largest-organ-we-never-knew-we-had?from=groupmessage&isappinstalled=0>