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BASICS

## Finally, the Spleen Gets Some Respect

By [NATALIE ANGIER](#)

As a confirmed crab apple who has often been compared to the splenetic Lucy Van Pelt character from Peanuts, I am gratified to learn that should my real spleen ever decide to vent in earnest, the outburst may just help save my life.

Scientists have discovered that the spleen, long consigned to the B-list of abdominal organs and known as much for its metaphoric as its physiological value, plays a more important role in the body's defense system than anyone suspected.

Reporting in the [current issue of the journal Science](#), researchers from [Massachusetts General Hospital](#) and Harvard Medical School describe studies showing that the spleen is a reservoir for huge numbers of immune cells called monocytes, and that in the event of a serious trauma to the body like a [heart attack](#), gashing wound or microbial invasion, the spleen will disgorge those monocyte multitudes into the bloodstream to tackle the crisis.

"The parallel in military terms is a standing army," said Matthias Nahrendorf, an author of the report. "You don't want to have to recruit an entire fighting force from the ground up every time you need it."

That researchers are only now discovering a major feature of a rather large organ they have been studying for at least 2,000 years demonstrates yet again that there is nothing so foreign as the place we call home.

"Often, if you come across something in the body that seems like a big deal, you think, 'Why didn't anybody check this before?'" Dr. Nahrendorf said. "But the more you learn, the more you realize that we're just scratching on the surface of life. We don't know the whole story about anything."

Dr. Nahrendorf, with Filip K. Swirski, Mikael J. Pittet and a dozen other colleagues, performed the initial studies using mice, but the scientists suspect the results will apply to humans as well.

Ulrich H. von Andrian, an immunologist at Harvard Medical School who was not involved with the research, agreed that the findings were a surprise. "If one had to guess the source of these cells, one would have thought it likely that they were mobilized from the bone marrow rather than from the spleen," he said. "The discovery adds another layer of complexity not previously

associated with that organ.”

The latest work also sounds a cautionary note against underestimating a body part or dismissing it as vestigial, expendable or past its prime. In an accompanying essay, Ting Jia and Eric G. Pamer of [Memorial Sloan-Kettering Cancer Center](#) admit that “the spleen lacks the gravitas of neighboring organs” like the liver or the stomach “because we can survive without it.”

Spleens can rupture during contact sports, say, or in a motorcycle accident, at which point surgeons have no choice.

“It’s such a vascularized organ, and the risk of big-time hemorrhaging is so great, that if the spleen ruptures, it’s a surgical emergency,” said James N. George, a hematologist with the [University of Oklahoma](#) Health Sciences Center. “You have to remove it.”

The new findings in no way counter the necessity of excising a ruptured spleen, the researchers said, but they do suggest that the loss of the organ is more than a mere “inconvenience,” as it has often been depicted, and could help explain previous reports showing an enhanced risk of early death among people who have undergone splenectomies.

In one study that appeared in *The Lancet* in 1977, for example, researchers compared a group of 740 American veterans of World War II who had had their spleens removed as a result of battle injuries with a similar size sample of veterans who had suffered other war injuries but had kept their spleens. The splenectomized men, the researchers found, were twice as likely to die of cardiovascular disease as were the veterans in the control group. All of which means that despleening should be diligently guarded against, particularly among our little sports warriors, perhaps through the wearing of appropriate protective gear.

Researchers cite other cases in which organs were presumed to be so dispensable that they could be removed “prophylactically” — often with unfortunate outcomes. In recent years, for example, many older women undergoing [hysterectomies](#) have been advised to have their healthy ovaries removed at the same time, the rationale being: if you are past your childbearing years, why hang on to reproductive organs that might turn cancerous and kill you? Yet follow-up surveys have shown that women who underwent elective ovariectomy had a heightened risk of dying during a given study period, were more susceptible to heart disease and lung [cancer](#) and were twice as likely to develop [Parkinson’s disease](#) compared with women who had kept their ovaries.

“Evolution has an edge on us,” Dr. Nahrendorf said. “I would be very careful about saying, ‘You don’t need this organ, get rid of it.’ ”

Another reason to esteem the spleen — a purplish, fist-size, five-ounce organ in the upper left quadrant of the abdominal cavity, just behind the stomach and under the diaphragm — is its illustrious medical and poetic history. Galen considered the spleen to be a source of one of the four bodily humors, specifically the black bile associated with irritable, melancholic cranks. In his poem, “Spleen,” Charles Baudelaire describes a young narrator so weary and despondent,

unresponsive even to beautiful women and jesting men, that it is as if the “green waters of Lethe” fills his veins.

More recently, researchers determined that the spleen is like an elaborate wetlands, a Mississippi bayou for filtering and freshening the blood. In other organs, blood flows through an interconnected mesh of increasingly narrow arteries, veins and capillaries. The spleen, by contrast, has a so-called noncapillary circulatory system: as the blood flows in, it is dumped into puddle-like sinusoids, and to get back out it must squeeze between cells. That dumping and squeezing help filter out blood-borne parasites, aging blood cells too brittle for compression and the little oxidized pellets, the BB's, with which red blood cells are often pocked. The spleen has often been called a graveyard for red blood cells, but it is more of a recycling center, for the iron and other components are plucked out of the cells and used to stock new [hemoglobin](#) cages.

Filtration, cannibalization, and now — serious monocyte cultivation. In the new study, the researchers began by looking at monocytes, the largest of the body's white blood cells. “It was recognized that these cells are the major repair workers after a heart attack,” Dr. Nahrendorf said. “They remove dead muscle cells, they start rebuilding stable [scar](#) tissue, they stimulate the generation of new blood vessels.”

The cells make haste to cut and paste. “Within 24 hours after a myocardial infarction,” Dr. Nahrendorf said, “there are millions of monocytes” congregating around the broken heart. All of which would seem sensible, desirable, an excellent display of emergency preparedness, except that Dr. Nahrendorf and his principal colleagues were puzzled by one big unknown: Where did the rapid response team come from? The numbers circulating in the blood were simply too low. The researchers searched one organ after another, until they checked the spleen and found the monocytic mother lode. “The numbers there were huge, 10 times higher than what was in the bloodstream,” Dr. Nahrendorf said.

By the researchers' reckoning, monocytes, like all blood cells, are born in the bone marrow and at some point migrate to the spleen, lured by cues yet to be identified. They sit and wait, a sessile bunch, but when aroused by such chemical signatures of damage as angiotensin, the cells surge forth without hesitation, a reaction the researchers hope someday to understand well enough to recapitulate at will. Hail to the chief, hail to the queen and hail to the monocytes residing in my spleen.

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