

# Medical minds meet to develop novel treatment for one patient's immune system defect

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A young woman who had been hospitalized for three months straight due to debilitating, recurrent infections with no apparent underlying cause was finally able to go home thanks to a Massachusetts General Hospital (MGH) team who put their heads together, discovered a root of the problem, and developed a novel treatment strategy just for her.

Eight months after she had received an autologous bone marrow transplant at age 20, the patient developed a central line-associated [bloodstream infection](#), which was followed by a string of bacterial and fungal infections of a type typically seen in patients with compromised immune systems.

"She had a hospitalist who was very caring and wanted to see her do well but had reached a limit in [clinical care](#) and management. Nothing was working for her," says investigator Michael K. Mansour, MD, Ph.D., of the Division of Infectious Diseases and Department of Medicine at MGH, and assistant professor of Medicine at Harvard Medical School.

Mansour and the other members of the multidisciplinary team that finally cracked the case describe their novel investigative and therapeutic approaches in an article published online in *The Journal of Allergy and Clinical Immunology: In Practice*.

In addition to Ryan Thompson, MD, and Priscilla Parris, NP, from the

complex care hospitalist service, the team collaborating on the young woman's care included Mark Pasternack, MD, of the Pediatric Infectious Disease Unit, and Joceyln Farmer, MD, Ph.D., and Rebecca Saff, MD, Ph.D., of the Allergy and Clinical Immunology Unit.

After standard immune testing failed to demonstrate an explanation for these repeated infections, "they reached out to me, because my research is focused on one specific immune cell: the neutrophil. It's the most common immune cell in our blood," Mansour says. "They asked me if we could run some experiments on her neutrophils to try to understand whether they were defective, and, in collaboration with Daniel Irimia, MD, Ph.D., and Alex Hopke, Ph.D., from the MGH BioMEMS Resource Center, that in fact was what this team found."

After obtaining permission from the patient and the institutional review board (IRB), Natalie Alexander, a research technician in the Mansour Laboratory, isolated neutrophils from the patient's blood and discovered that her cells, which when healthy are key to healing wounds and fighting infections, were working poorly compared to those of similar neutrophils from a healthy person.

The investigators then treated the isolated neutrophils with [growth factors](#) and FDA-approved cytokines to see whether they could stimulate neutrophils to mount a stronger defense against fungal and bacterial invaders. They found that the treatment restored neutrophil function, improving control of pathogens in a dish.

Finally, after receiving the patient's consent and the IRB's approval, the team began treating the patient with twice-weekly injections of a type of growth factor called granulocyte-colony stimulating factor (G-CSF). G-CSF is typically given to patients with neutrophil deficiency from immune disorders, as well as patients whose neutrophils have been depleted from chemotherapy.

"She was able to go home for the first time in months, spend time with her family and see her dogs. It was a really special moment," Mansour says.

The patient has remained on G-CSF therapy without [serious side effects](#), and although she still gets bloodstream infections, the overall frequency and severity of those infections have lessened since she was started on the growth factor. The cause of her underlying neutrophil deficiency is still under investigation.

Mansour says that the case illustrates how clinicians and researchers working in different medical specialties can pool their intellectual resources and experience to tackle highly challenging medical cases and improve the lives of others, one patient at a time.

"It embodies the entire spirit of the hospital: we all came together, we put her safety and her current condition at the forefront, we applied cutting-edge research and found something—it's a rare moment when we can do that and have it result in a wonderful outcome," he says.

**More information:** Natalie J. Alexander et al, Neutrophil functional profiling and cytokine augmentation for patients with multiple recurrent infections: A case study, *The Journal of Allergy and Clinical Immunology: In Practice* (2020). [DOI: 10.1016/j.jaip.2020.08.024](https://doi.org/10.1016/j.jaip.2020.08.024)

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