Living OUTSIDE the Bubble

A young boy battles immunodeficiency disorder to lead a normal, healthy life

BY **KAREN DOSS BOWMAN**

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Dannen and his grandmother Lisa

For 4-year-old Dannen Sisler of Luray, a family trip to Ocean City, Md., this past summer was filled with milestones: eating dinner in a restaurant, walking along the beach and splashing around in the hotel's pool. These seem like ordinary pleasures for most, but for Dannen–who has battled a deficient immune system–these activities offer hope for a normal life.

"For his whole life, I've just wanted to take Dannen to the beach, but he couldn't even put his toes in the sand or get in the water because the risk of infection was too great," says his paternal grandmother Lisa Sisler. "Now that he's cured, we can let him be a normal kid. He's had the best time doing so many things he couldn't do before."

Dannen was nearly seven months old in March 2016 when he suddenly became lethargic and struggled to breathe. His parents, Chad Sisler and Danica Strate, took him to the pediatrician, who found that Dannen's blood oxygen level was at just 57 percent. Dannen was put on oxygen and sent to UVA Children's via helicopter.

The UVA medical team determined that Dannen had pneumocystis pneumonia (PCP), which is found mostly in people with weakened immune systems. After extensive testing, Dannen was diagnosed with a type of primary immune deficiency (PI) called X-linked hyper IgM (HIGM) syndrome.

PI disorders, a group of more than 350 immune system disorders varying in severity, affect the body's ability to produce infection-fighting proteins called immunoglobulins, or antibodies. Patients are vulnerable to recurrent—and potentially debilitating or life-threatening—illnesses. Caused by hereditary or genetic defects, they often are not suspected or diagnosed until late childhood, or even adulthood.

A Lifestyle Change **for the Entire Family**

Dannen was hospitalized at UVA for three weeks, where his treatment included intravenous immunoglobulin (IVIG) infusions to boost his body's infection-fighting ability. For more than a year, his parents and grandmothers gave Dannen injections of Hizentra SciG immune globulin every two weeks, as the UVA pediatric immunology team oversaw his care.

During this time, Dannen was rarely taken out in public, and he wasn't around anyone except close family members. His caregivers even boiled his drinking and bath water to protect him from potential parasites.

"Talk about a lifestyle change—we were so concerned about him picking up infections," Sisler says. "Whenever any of us were with him, we were very careful about washing our hands, and we kept our homes sterilized and cleaned all the time."

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Bone Marrow Transplant **Offers Promising Outcome**

When Dannen was 2 years old, UVA pediatric immunologist Monica Lawrence, M.D., referred him to Children's National Medical Center (CNMC) in Washington, D.C., for a bone marrow transplant—a procedure not currently offered at UVA for patients with immunodeficiencies. This procedure involves the infusion of healthy stem cells (the blood-producing cells) into the body after the destruction of unhealthy ones via chemotherapy. The new cells make healthy blood cells and regenerate the immune system.

"Dannen was a good candidate for transplant because he was diagnosed early and maintained on infection precautions, antibiotics and IVIG to keep him as healthy as possible going into transplant," says Dr. Lawrence. "He also had a good donor match (an unrelated donor) identified."

Dannen's transplant procedure took place in November 2017, and he remained at CNMC and later at the nearby Ronald McDonald House until late April 2018. Dannen is now considered cured, though he occasionally needs IVIG infusions for low antibody levels.

This summer, Dannen received his childhood vaccines, and in the fall, he started preschool—a triumph his family couldn't have imagined two years ago.

"As scary as this experience has been for us, I can't say enough about the doctors, nurses and caregivers at UVA—they really treated us like family," Sisler says. "Dannen has received phenomenal care. We were protective of Dannen for so long, but now he seems like a typical 4-year-old boy. We feel so blessed."■

SIGNS OF PRIMARY IMMUNODEFICIENCY DISORDER

Primary immunodeficiency disorders (PI) can affect almost every organ in the body, causing recurrent infections and other complications that can lead to excessive missed days at school or work, as well as a poor quality of life. Potential warning signs of PI include:

- **Frequent ear, sinus or respiratory infections**
- **Prolonged or difficult-to-treat infections**
- **Infections with atypical organisms that usually are harmless**
- **Invasive infections involving internal organs, bones, bloodstream or the central nervous system**
- **Recurrent fungal infections**
- **Family history of PI**
- **Chronic diarrhea with weight loss**
- **Failure to thrive in childhood**

SUPERB CARE FOR PRIMARY IMMUNODEFICIENCIES

UVA recently was designated a Jeffrey Modell Diagnostic and Research Center for Primary Immunodeficiencies (PI) by the Jeffrey Modell Foundation, established by Fred and Vicki Modell after the loss of their 15-year-old son from PI complications. Our dedicated pediatric clinic for PI patients offers access to a network of specialists in areas such as rheumatology, gastroenterology, dermatology and pulmonology. The clinic's dedicated nurse coordinator helps patients' families navigate appointments, lab testing and at-home treatments. There currently are only 350 such centers worldwide. Learn more at ***uvahealth.com/pidd***

Newborn Screenings Save Lives

All newborns in Virginia are screened for severe combined immunodeficiency (SCID), the most serious primary immunodeficiency disorder—also known as the "bubble boy disease." It can be fatal if not diagnosed and treated early.

The blood spot test obtained by a needle prick on the baby's heel during the first 24 to 72 hours of life, looks for T-cell receptor excision circles (TRECs). These markers signal the immune system's production of T cells, which are critical for fighting infections.

SCID is just one form of PI, so having a normal newborn screen does not rule out other immune system disorders. Families can opt out of the screening if desired.

"Early diagnosis allows for appropriate treatment, which can be curative in many cases and lead to excellent outcomes if started early," says UVA pediatric immunologist Monica Lawrence, M.D. "Without treatment, children with SCID die in infancy or early childhood.