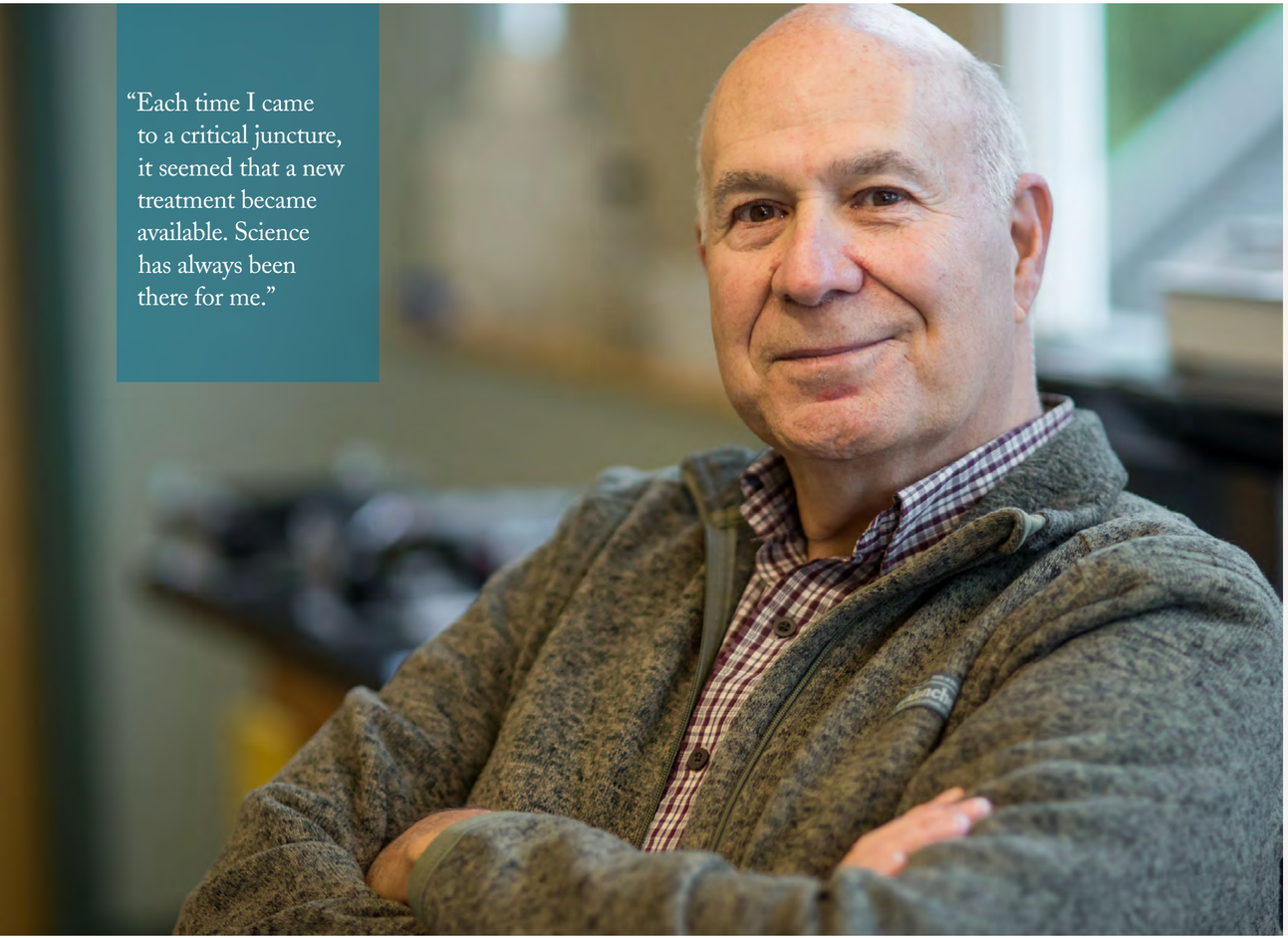


Alan Fidler

Benefiting from Scientific Breakthroughs

Alan Fidler has battled heart disease for 35 years (and counting). He has undergone seven major surgeries and any number of less significant procedures and treatments. It began in 1980. Alan was 36 and healthy, working long days to launch a high-powered career as an engineer and executive at Polaroid. He had a wife and three young boys.

Out of the blue, he had a heart attack. “It wasn’t a terribly bad one—it was what they call a warning heart attack,” he recalls. “They did all the appropriate testing and risk analyses. I didn’t fit the profile—no high cholesterol or blood pressure, no family history of heart disease, nothing. I chalked it up to bad luck, started exercising more, went on the appropriate medications, and got on with my life.”

Neither he nor his doctors expected anything more to happen.

But three years later, they were all proved wrong. Alan suffered a massive heart attack. “I shouldn’t have lived through that one. I was closer to dead than alive.”

Emergency surgery revealed such extensive damage that the heart muscle could no longer beat symmetrically. Surgeons removed a significant portion of his heart and performed a quadruple bypass—an incredibly complex and dangerous surgery—and hoped for the best.

“I knew it was about as serious as it could get,” says Alan. “I remember saying goodbye to my wife and children.”

He kept the details of his struggle to himself, knowing that revealing his condition would sabotage his chances for professional success. “I was not going to let this thing define me.” He continued climbing Polaroid’s corporate ladder and raising his family.

But it wasn’t easy. It took a toll on Alan. Because the pumping ability of his heart was greatly reduced, he had to limit and monitor his activities. He watched his diet and took a lot of medications. He always wore a shirt in the pool to cover the frightening scar on his chest, and long pants to cover the scars on his legs where they took veins to use for his bypass surgery.

Perhaps even worse was the toll on his wife, who lost any semblance of security about the future, knowing that she had “a time bomb sleeping next to her each night.”

The following decades brought five more life-threatening surgeries for bypass repairs, electronic defibrillator implantation and subsequent repairs, surgical ablation, and defibrillator replacement. Alan is thankful that each procedure extended his life—but he’s all too aware that they are just Band-aids—not cures—for his heart disease.

“Heart damage is irrevocable—it can’t be fixed. For someone like me, there is nothing more that can be done,” says Alan.

But what if there were a way to stimulate the human heart to regrow or repair the damage caused by a heart attack?

The Yin lab: going way beyond the band-aid

Voot Yin, research scientist and assistant professor of regenerative biology at the MDI Biological Laboratory, and his colleagues are certain it's possible—because that ability has already been achieved in a variety of animals, over millions of years of evolution.

The zebrafish, for example, is a champion of regeneration. Cut off part of its tail, brain, spinal cord, pancreas—and yes, even its heart—and it will completely regenerate bone, nerves, muscle cells, and blood vessels, fully restoring both form and function.

Voot Yin, research scientist and assistant professor of regenerative biology, gives a simple explanation of a heart attack: "The arteries that provide oxygen to the heart muscle become clogged and the muscle, deprived of oxygen, begins to die. The major problem is that the human heart doesn't create new heart muscle to replace the damaged area." And in the U.S. alone—someone dies from a heart-disease related event every single minute.

"Why come up with the next great solution from scratch when the next great solution is already here?" asks Voot. He and his colleagues decided to study how zebrafish regenerate tissue, looking for ways to activate this process in humans. Since humans share 70 percent of their genes with zebrafish—including those the fish use for regeneration—it promised to be an expedient line of inquiry.

In 2012, when Voot and his colleagues identified a naturally occurring chemical that stimulates the genetic machinery of zebrafish to regenerate tissues two or three times faster, his team began exploring whether the substance might encourage regeneration in humans.

Subsequent research and testing have shown that this substance—potentially the basis for a new therapeutic drug—is stunningly effective at kickstarting the regrowth process—not only in zebrafish, but also in mammals who (like humans) don't naturally have the ability to regenerate damaged tissue. When this drug was administered for only four weeks to mice who suffered heart damage—just like the damage humans sustain from a heart attack—these animals showed a 200 percent improvement in heart function and a 50 percent reduction in scar tissue. The implications for human heart health are profound.

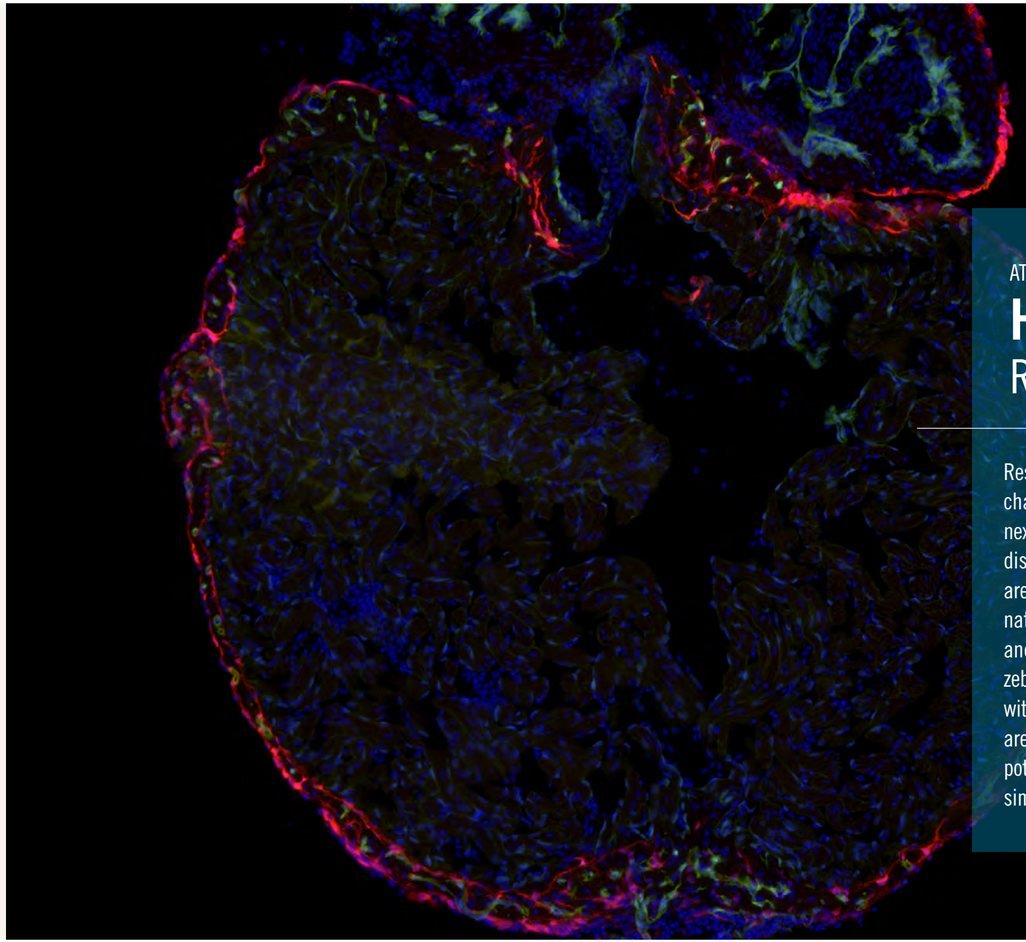
Particularly for someone like Alan. Voot believes that if drugs that stimulate heart regeneration were available at the time of his first heart attack, "Alan's life may have been completely different. He may never have experienced reduced heart function and his quality of life could have been improved."

Changing the future

For now, the testing of this drug will continue. Studies on adult pigs will follow the current mouse studies. And if those are successful, the researchers will move into human drug trials. If the drug works in humans, Voot believes that—with adequate funding for this research—it could be available for heart attack patients within ten years.

Alan is alive today because of the great leaps in medical science over the last 40 years. "Each time I came to a critical juncture, it seemed that a new treatment became available," he says. "Science has always been there for me."

But the next great innovation may be right around the corner, thanks to Voot's team and their zebrafish. "Alan's a great example of a person who has benefited by advances in scientific research and technological innovation," says Voot. "We're trying to push both of these frontiers so that we can help the future Alan Fidlers of the world.



AT THE BENCH >

HEART REGENERATION

Research scientist Voot Yin is championing what could be the next great solution for heart disease. Here, brightly colored areas depict the formation of naturally regenerating heart cells and blood vessels in a damaged zebrafish heart. Based on results with this model, Yin and his team are now exploring the ability of a potential new drug to stimulate similar repair in mammals.