



# Blood Work

A musician who became a scientist who became a businessman tries to turn **cow blood** into human blood into profits.

By Pamela Gwyn Kripke  
Portrait by Elizabeth Lavin


#### THE TAKEAWAY

- 1 Innovators are undeterred by failures.
- 2 Scientists and musicians have more in common than you'd think.
- 3 Coincidences create confidence.





**CATTLE CALLING:**  
HemoBio Tech's  
Arthur P. Bollani, Ph.D.,  
wants to save lives  
with the help  
of bovine blood.



he men who watch over this half-dozen head of Hereford cattle on a Texas Tech ranch have a keen interest in the heifers' health, but not for the usual reasons. The cows' milk is not destined for anyone's refrigerator, nor will their T-bones be found on any dinner plate. What's more, their hides are safe from the tannery. No, the men in lab coats who monitor this herd are after their blood.

Safe and sound at the university's Health Sciences Center, these chosen cows sit in the swirl of discovery, unaware of the contributions they have made to hematology. Specifically, these cows may be the source of the first viable blood substitute for human beings.

"Finding a red blood cell substitute has been a quest for 35 years. Everyone who has tried has failed," says Arthur P. Bollon, Ph.D. "But we persist because the potential is there to greatly impact global health."

Bollon, chairman and CEO of Dallas-based HemoBioTech, knows one of the quintessential ingredients of innovation: determination. Just because everyone else has failed doesn't mean no one can succeed. His company's core product, HemoTech, is an alternative to human red blood cells that is derived from the hemoglobin molecules of bovines.

A synthetic oxygen carrier has been a Holy Grail for hematologists. Such a substitute would eradicate the risk of disease transmission, most notably HIV and hepatitis. It would be compatible with all types and have a shelf life about four times longer than donated human blood. It would be hugely beneficial in cases of trauma—at home or on the battlefield—and transfusions during surgery.

"Trauma patients require a lot of blood quickly. The hope is that a substitute could be packaged in a form that could be infused at the scene just as a paramedic would start an IV, instead of waiting to get to a hospital," says Steven H. Kleinman, M.D., senior medical advisor, American Association of Blood Banks.

But formulations that have been attempted during previous decades to gain Federal Drug Administration approval have been stymied by toxicity in various forms.

Bollon, a molecular geneticist with doctoral and post-doctoral degrees from Rutgers and Yale respectively, is undeterred. "We know that ours is different on a molecular basis," he says. As he speaks he leans forward on the table in his North Dallas office; his eyes are riveted and his voice deliberate. "Based on our studies to date, others cause vasoconstriction. Ours causes vessels to dilate. There is a molecular reason, and we know why. Others cause inflammation. Ours does not. There is a molecular reason. And, we discovered, serendipitously, ours actually induces the production of red blood cells. Erythropoiesis!"

The original research was developed in the mid-1980s by Mario Feola, M.D. and Jan Simoni, Ph.D., DVM, professors of surgery at the Texas Tech University Health Science Center, who continue on at the company today. After years and years of tests, patents for HemoTech have been issued in twenty-one countries in Europe, Asia, and North America. Next, the product must show that it is not toxic at certain doses. Then, human clinical trials are expanded into the U.S., after which a new drug application is granted, if all goes well.

Bollon, who has raised \$10 million, will seek additional investment capital for the future trials, patents, and facility improvements.

"There were costs that the university could not possibly carry before the company was formed in 2001. HemoTech is the first of our products to be traded on NASDAQ," says Bernhard Mittermeyer, M.D., president, TTUHSC, former U.S. Army Surgeon General, and former CEO and commander of Walter Reed Medical Center. "We were fortunate to be able to recruit Arthur to raise the venture capital we needed to move forward and commercialize the product, which is not easy, especially when other researchers have tried and failed. When this is approved, it will represent a major clinical and technological revolution."

**B**OLLON, A SCIENTIST, ENTREPRENEUR, PAINTER, AND PIANIST, IS A revolutionary sort of guy. He is fervent about the potential impact of the research, the biochemistry itself, the "gestalt" of ideas, and unanticipated opportunities. Experiments happen in labs; epiphanies happen all over.

"Things happen all over the universe, and somehow, even subconsciously, you leave yourself open to them," he philosophizes. "Chance events are occurring around you, and it's that crossover of the parallel worlds that you need to seize."

His own life is a case in point. He grew up in an artistic household in the Bronx, the son of an Italian father and Czechoslovakian mother. One uncle was a painter, the other a pianist and composer, with an orchestra that performed on the radio.

"We'd go to my grandmother's house, and he always played. I'd stand and watch, mesmerized," says Bollon, 63, flitting his fingers across a stack of papers. At eight, Bollon began classical training. When he entered C.W. Post College, a division of Long Island University, in 1961 to study abstract expressionist painting, biology, and chemistry, he took gigs at local clubs, playing pop and jazz. As a doctoral candidate living in Manhattan, Bollon took a painting class for Columbia University medical students. At Yale, where he was a post-doctoral fellow researching gene regulation in yeast—"You know, a small eukaryote with a defined nucleus"—he was also a guest fellow at the school's Trumbull College, instructing undergraduates in abstract techniques and textures in painting.

"I gave a talk," he says, seemingly intrigued with his thinking, still, "in which I compared a painting of an old man, Rembrandt in nature, to a theory of gene regulation. The process of generating those two things came down to metaphysical issues: Are you really creating something? Or are you selecting something from some permutation that exists? Yes

to both," he says with a smile.

Bollon's right brain is still as active as ever. On weekend mornings, he noodles on the full electronic keyboard in his house. He creates computer-generated visuals and sets them to 12-tone compositions. "I think that Picasso tried to merge art and music before," he says.

The creative process, for Bollon, is essential for his science.

"The order of music appeals to scientists," he says. "But the improvisation I discovered playing in those clubs opened up a whole new world. It permits you to work without the security of order. As an entrepreneur, you need some [order], but you need to recognize when to shift from it. Louis Pasteur said, 'Chance favors a prepared mind.' That concept is a driving force for me."

Bollon came to the University of Texas Southwestern Medical Center in 1972 to join the faculty in the Department of Biochemistry. In 1979, he started a new department of molecular genetics and genetic engineering at the Wadley Cancer Center. By 1987, he formed his first company, Wadley Biosciences LDL Inc., a joint venture between Wadley Cancer Center and Phillips Petroleum, which had a fermentation system in use to grow animal feed. The notion was, the same process could be applied to develop biomedical products. Ultimately, Phillips decided to focus on the oil industry, honoring the partnership but leaving Bollon with a company, initial seed money, and a big quandary: "A scientist now in the business world. What to do next?"

Easy answer. He started to look for funds. Uncharacteristically, Bollon answered a cold call from a broker at an investment banking firm in New York and wound up investing approximately \$10,000 in an eye laser technology company. "Then, I told him about my limited partnership with Phillips and how I was looking for money," says Bollon, loving the karmic positioning of it all. "He raised \$5 million for me in several months."

With those funds, Bollon founded Cytoclonal Pharmaceuticals Inc., which was focused on turning discoveries made in university laboratories into commercial successes. He raised \$65 million, took the firm public in 1995, and closed a licensing deal with Bristol-Myers Squibb.

"A doctor up in Montana found a fungus from the yew tree that made Taxol, the drug for ovarian and breast cancer," Bollon says. "Twelve companies were competing for the technology. I went up to Bozeman, got my broker on the phone, the same one from the cold call years earlier. Bruce was a black belt. I was a third degree black belt in Okinawan karate. Roger, in Montana, was a wrestling champion from Long Island, where I went to college. It was family. The money was wired. And Bristol-Myers sublicensed the fungal system to make the drug."

Bollon built Cytoclonal into a \$330 million company while Bristol-Myers was involved, before Taxol development ended and the drug became generic. At a conference in Houston, he heard a presentation about HemoBioTech. In 2003, he accepted the chairmanship, reorganized, went back to Bruce, and raised \$4.5 million in 2004. He converted warrants in 2005 and reaped another \$5.5 million. Now, the testing continues. If the product is approved, it can take four to five years to get to market.

He is confident that it will. "You see," he says, his voice getting softer, "the hemoglobin alone is too small. So, you polymerize several of them with adenosine, then you treat it with glutathione, and the end result is it has the pharmacological properties it has."

"You can't do this business without science," says Bollon, who was last at the lab bench in 2000. "Now, the world is my laboratory."



**"As an entrepreneur, you need some [order], but you need to recognize when to shift from it. Louis Pasteur said, 'Chance favors a prepared mind.' That concept is a driving force for me."**

—ARTHUR BOLLON

**T**HE BENEFITS OF HEMOTECH EXTEND beyond trauma and surgery and vary from country to country. In third-world nations, 25 percent of the donated blood supply is contaminated by disease. In the Americas, about two percent of what is collected is not used, according to Dr. Jose Ramiro Cruz, regional advisor for laboratory and blood service, Pan-American Health Organization.

"It depends on how donors are recruited and screened," he says.

Here in the United States, 14 million units of blood are collected each year. "A synthetic product wouldn't affect the day-to-day function of the blood banks," Kleinman says, "but it would help in times of shortage."

Also, delivering oxygen to the tissues of the body via a synthetic source would be helpful for heart attack and stroke victims. "This has a small molecular weight, smaller than human red blood cells, so it goes through vessels that otherwise might require a higher blood pressure," explains Ronald R. Blanck, scientific advisor, former president of the University of North Texas Health Science Center, former U.S. Army Surgeon General, and current chairman of the board of Martin Blanck and Associates, a federal health care consulting firm in Washington, D.C.

Three or four other competitors are trying to develop similar products, Blanck says. "It feels like a race to the finish. We've got to go through some regulatory steps, but Dr. Bollon has terrific vision and is very careful about putting together all the pieces."

For Phase Two of the clinical trials, the herd of six cows will get about 20 more barnmates, each screened for disease before reporting for service. "We know all about these cows, three generations back," Bollon says. "The biochemical advantages of bovine hemoglobin, as a carrier of O<sub>2</sub>, are great. Human hemoglobin binds O<sub>2</sub> too tightly to use as a blood substitute. Bovine hemoglobin binds it just right."

Even if HemoTech hits a snag, Bollon will stay focused and upbeat. He knows another key lesson in the path to innovation: No failure goes to waste.

"I am confident," Bollon says. "I always look for what could be good in all events. Even if it is negative, what is the positive piece of this that may have value? I ask myself. In karate the Kata is a series of moves with a beginning, middle, and end. After you've learned them, you perfect them for the rest of your life. What I love the most is how all that I do gives me a feeling outside of the globe, looking at the Earth and its population from the outside, but also being an enthusiastic participant." **D**