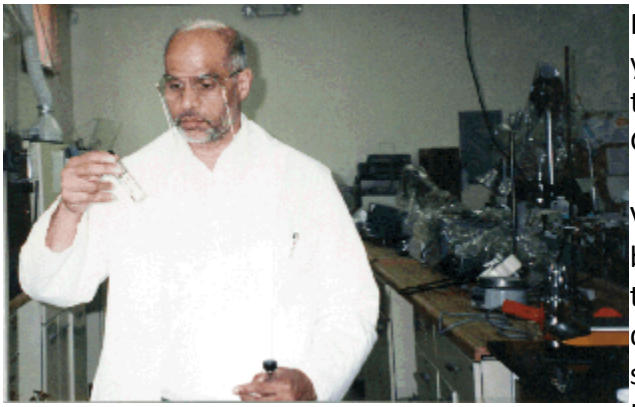
Taking the Heat
by Mukul Pandya

Gordhan Patel toils in an industry dominated by giants



Pharmaceutical companies had struggled for years with a vexing problem: finding a reliable test for spoilt vaccines. That was before Gordhan Patel came along.

Vaccines, like other perishable medicines, go bad if they are left out in the heat or stored for too long at room temperature. To prevent such degradation, drug companies usually set up a so-called cold chain, a system that ensures that products are kept cool as they are shipped around the country. But when vaccines are sent to developing countries, which lack the expensive infrastructure that a cold chain demands, the system breaks down. People in the past had no way of knowing whether a batch of vaccines had degraded on its way across continents to a distant hospital. After all, one can't break open a vaccine vial and smell it, the way one does a carton of milk, to see if it is still good.

Enter Patel, who runs J.P. Laboratories in Middlesex, N.J., a three-person research and development company. In a simple but ingenious solution, J.P. Laboratories developed a small sticker that changes color in response to heat or time lapse. The stickers are attached to the vaccine batches, and if the vials are exposed to more heat -- or thermal abuse, as Patel call it -- than they should be, the stickers' color changes from blue to red. During the past two years, Rexam, a large British manufacturer of packing, print and coated products, has been producing and marketing the stickers -- known in the industry as time-temperature indicators -- to large numbers of pharmaceutical companies as well as others, such as perishable food makers. Rexam thought highly enough of this technology to use a time-temperature indicator on the cover of its 1994 annual report.

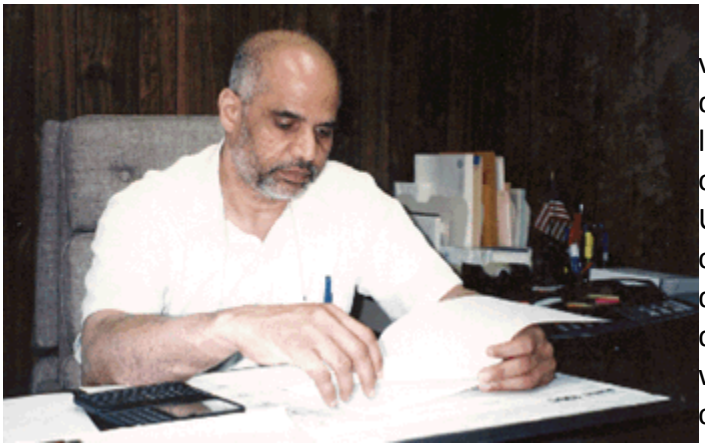
That was no small triumph for Patel, a scientist with some 35 patents to his name, who founded J.P. Laboratories in 1983 after being fired from his job as a researcher at Allied -- now AlliedSignal -- a large conglomerate based in Morristown, N.J. During the past 15 years J.P. Laboratories has received 15 research grants totaling nearly $3 million in funding from federal agencies. Most of these have been from Small Business Innovation Research, a federal program

that supports research projects of businesses with less than 500 employees. During the late 1980s, J.P. Laboratories received more SBIR funding than any other company in the country. Says Patel: "Had the SBIR program not been there, I would not have survived."

Patel, a meticulous, unpretentious and jovial man, often wonders about his gumption in entering and slogging on in an industry dominated by giants. "It was stupidity on my part to start a business in which big companies invest millions of dollars," he says with a chuckle.

J.P. Laboratories' research, however, has been anything but stupid. J.P. Laboratories -- which Patel named after his children Jessica and Paresh -- conducts research in four areas: time-temperature indicators; etching and plating of plastics; instant X-Ray films; and artificial blood. Besides the licensing arrangement with Rexam, Patel has struck deals with companies like Connecticut's Enthon -- and is now looking for more partners who can help the company move into manufacturing.

Finding the right partner will be a tough task, however. Patel is much less of a businessman than a scientist, most at home in the library of his converted-warehouse headquarters. "My library is the heart of my business," he says. Finding a business partner who can identify with and support that sentiment will be a major challenge.



Patel grew up in Gujarat in the small village of Manund in Mehsana district. After finishing high school in the local village school, he studied chemistry and physics at Sardar Patel University in Vidyanagar, where he completed his bachelor's and master's degrees as well as his Ph.D. Patel's doctorate, which he received in 1970, was based on research into the crystallization of polymers. "The day after my oral exam I went to England as a post-doctoral fellow at the University of Bristol," he says. "I wanted to continue working on the crystallization of polymers. The person who discovered polymer crystals, Andrew Keller, was at that university, and he offered me the position of a research associate." That research background was to later play a crucial part in developing projects for J.P. Laboratories.

Patel worked in Bristol with Keller, whom he describes as a "great person" for three years. Simultaneously, like many Indians of his generation, he applied for a green card to come to the United States. Patel moved to Waco, Texas, in 1973 to join Baylor University. Soon, though, he landed his first corporate job at Allied.

"That was the only company I've every worked for before I started my business," Patel says. "I worked in corporate R&D. That's where I laid the foundation of developing products." Patel had

a good supervisor who gave him a lot of freedom, but the atmosphere at Allied was intensely competitive. "There were 200 Ph.Ds down there," he recalls. Patel is not bitter about his experience at Allied, however, and warmly remembers the nine years he spent at Allied. One of his favorite responsibilities was to travel around the world, delivering lectures about his research. What more could a scientist in love with his work want? Over the years, Patel's research was published in some 65 papers and a book.

In the early 1980s, in response to a tough economic climate, Allied went through what is nowadays politely called downsizing. Patel was one of several people to be laid off, and he decided to start his own company. Like every small businessperson, he had trouble raising capital. Venture capitalists, he realized, were either not interested in the kind of research he wanted to do, or wanted more control over his operations than he was willing to surrender. Eventually he reached into his own savings, which began to rapidly vanish.

And then, serendipity smiled. President Carter had proposed launching a federal program that would support research by small businesses, and after making its way through the Washington labyrinth, President Reagan signed the proposal into law at around the same time when Patel went into business. "It must be a sheer coincidence," says Patel. "Small Business Innovation Research is a great program, in which the government shoulders the risk for small business."

Under the program, companies that have fewer than 500 employees -- that includes 95% of the companies in the country -- submit proposals for projects to develop innovative technology. If the government approves the project, the company get $75,000 to demonstrate the project's feasibility. If the company succeeds in that first phase, the government provides upto $750,000 in further funding. Any technological development that results from the project remains the company's intellectual property.

"The technology remains yours, and you can license it or do whatever you want with it," Patel says. "If you fail, no problem -- it's gone. You have to submit a progress report about what you did. In R&D, 99% of the time you are going to fail. That's the kind of high risk that only the government can take. R&D is the business of big business. I could not have done what I did had SBIR not been there."

And J.P. Laboratories did a lot. The company's first SBIR project was for the U.S. Army, which wanted him to develop a color-changing indicator that would detect the presence of mustard agents and nerve agents used in chemical warfare. "These are chemical agents that can put you out for life if you breathe them once," Patel says. "You either die in minutes, or you develop blisters, or your nerves get affected."

While electronic gadgets exist that can detect the presence of these chemicals, their downside is that the equipment is both heavy and expensive, and cannot easily be lugged around on a fast-moving war front.

"The Army wanted a sticker that would change color if these war chemicals were present, so soldiers could carry them all the time and everyone could have one," Patel says. "As soon as the sticker changed color, the soldiers could immediately put on their masks and take precautions." Patel got a $50,000 grant to demonstrate feasibility of the concept and then another $500,000 to develop the stickers. "That was my first product development for my company," he says.

Ironically, the project bombed -- metaphorically. While J.P. Laboratories developed compounds that did change color in the presence of war chemicals, the problem was that they were non-selective. "They were giving false alarms," Patel says. "The compounds would change colors in the presence of war chemicals, but they would also change colors if you put them behind your car's exhaust pipe."

Patel was deeply disappointed, though he now jokes that maybe the stickers might make a good indicator for pollutants on the New Jersey Turnpike. Having realized that it would be difficult to finish the project, Patel pulled the plug on it. "The government had given us a half-million dollars," he says. "We spent $150,000 or $200,000 and when we realized the project would not go forward we gave back the rest of the money."

Other J.P. Laboratories projects -- also funded by SBIR grants -- have been successful. The time-temperature indicator whose technology Patel has licensed to Rexam has been a clear home run. Another success has been a project that developed a substance that can be used to metallize plastics. Plastics resist water, and so they have to be etched before they can be plated with metal. Chromic acid, the chemical traditionally used for etching plastics, is expensive and also highly toxic.

"We proposed to the Environmental Protection Agency that we would find a non-toxic substitute for chromic acid," Patel says. J.P. Laboratories got SBIR funds, developed a non-toxic system, and got four patents for the technology, which has now been licensed to a company in Connecticut." The technology has extensive uses in the automotive industry, which extensively uses metal-plated plastics to build cars. Patel says he has tried to market the technology to "the Big Three auto giants Chrysler, GM and Ford but they are so big that they don't want to deal with little companies."

J.P. Laboratories has also developed technology that takes X-Rays that don't need a dark room to be developed. Another device, which Patel calls a dosimeter, measures how much radiation someone has been exposed to; soldiers, for example, could use it to provide immediate treatment.

Patel's major challenge over the coming years will be to find compatible business partners who can turn his innovations into marketable products. That will ensure that if the successful SBIR program becomes a victim of the federal budget deficit, J.P. Laboratories and other innovative small businesses don't go down with it.

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