

Platform for growth

Guelph biotech startup aims to use tobacco to make money and save lives

By Elisabeth Johns

Mere minutes after hearing Chris Hall outline his plan for a new biotech startup, Mark Goldberg knew the possibilities were limitless. The only issue was narrowing down what they were going to tackle first.

Goldberg, Hall and colleague Don Stewart head up PlantForm Corp., a Guelph-based company that is using genetically modified tobacco plants as a platform to create inexpensive versions of name brand therapeutic drugs. The name is a play on the words plant and platform. Hall, a professor in the University of Guelph's environmental biology department, explains that PlantForm's technology, developed at the university, provides a platform that gives the company almost unending options to springboard from.

PlantForm's first project targets cancer. It is creating an antibody drug that it describes as a "biosimilar version" of Herceptin, an expensive drug used to treat certain women who have breast cancer. Herceptin, with a worldwide market of several billion dollars a year, was developed by San Francisco-based biotech giant Genentech. The patent on the drug expires in 2014, which is precisely when PlantForm hopes to get its lower-cost generic version onto the market.

Since Herceptin was approved in 1998, it has been used to treat almost 420,000 women who have a specific type of breast cancer, called HER-2, which is a genetic abnormality that tells the body to reproduce cancer cells. This particular protein makes breast cancer more difficult to treat. "It's a growing disease problem," says Goldberg. "There are more and more women coming down with breast cancer every year."

Herceptin is expensive to produce and purify to a point that it's safe for the public. Treatment costs about \$50,000 a year per patient. Ontario started fully covering the cost in 2005.

Goldberg notes that Genentech must use huge bioreactors to make the vaccine,



Chris Hall, PlantForm's chief scientific officer, uses tobacco to create therapeutic drugs because it grows so quickly.

Photography | E. Brian Clark

an expensive time-consuming process. That's where Hall's research comes into play; it changes how vaccines and antibodies like Herceptin are going to be developed.

Hall, holder of the Canada Research

Chair in Recombinant Antibody Technology, has been working on this particular technology for 10 years. He has been working on developing antibodies for more than two decades.

Hall initially trained as a plant scientist. »

» But what he really wanted to do was create therapeutic drugs that not only are cheap to produce, but also inexpensive for people to obtain.

He turned to tobacco, perhaps the most understood plant on the planet, given that the tobacco industry has shelled out so much money over the years to study the plant. There are a number of reasons why he chose tobacco. For one thing, it grows quickly. Also, there aren't other native plants in this area that share the same genetic make-up as tobacco, so researchers don't have to worry that antibodies they grow in the tobacco will show up in other plants.

Antibodies, which help the body combat infection, are taken from animals and usually are grown in cell cultures maintained in incubators, known as bioreactors. Hall, PlantForm's chief scientific officer, says growing antibodies in tobacco plants is much more efficient. Larger quantities of antibodies can be produced in tobacco plants than in a bioreactor. A bioreactor also is more expensive and difficult to maintain.

Hall uses low-nicotine tobacco plants, grown in a greenhouse at the University of Guelph. Antibodies are introduced into the cells of the tobacco plants; two weeks later, the leaves are harvested and put into what is basically a huge blender to produce a slurry. Working in a lab, Hall and his team of 12 graduate students and two other researchers purify the slurry in a process that separates the antibodies from the tobacco plant. "This is really a platform we're talking about — we could do this with just about any (type of) antibody," he says. "You only have to make minor changes to get a whole new antibody. That is the power of this."

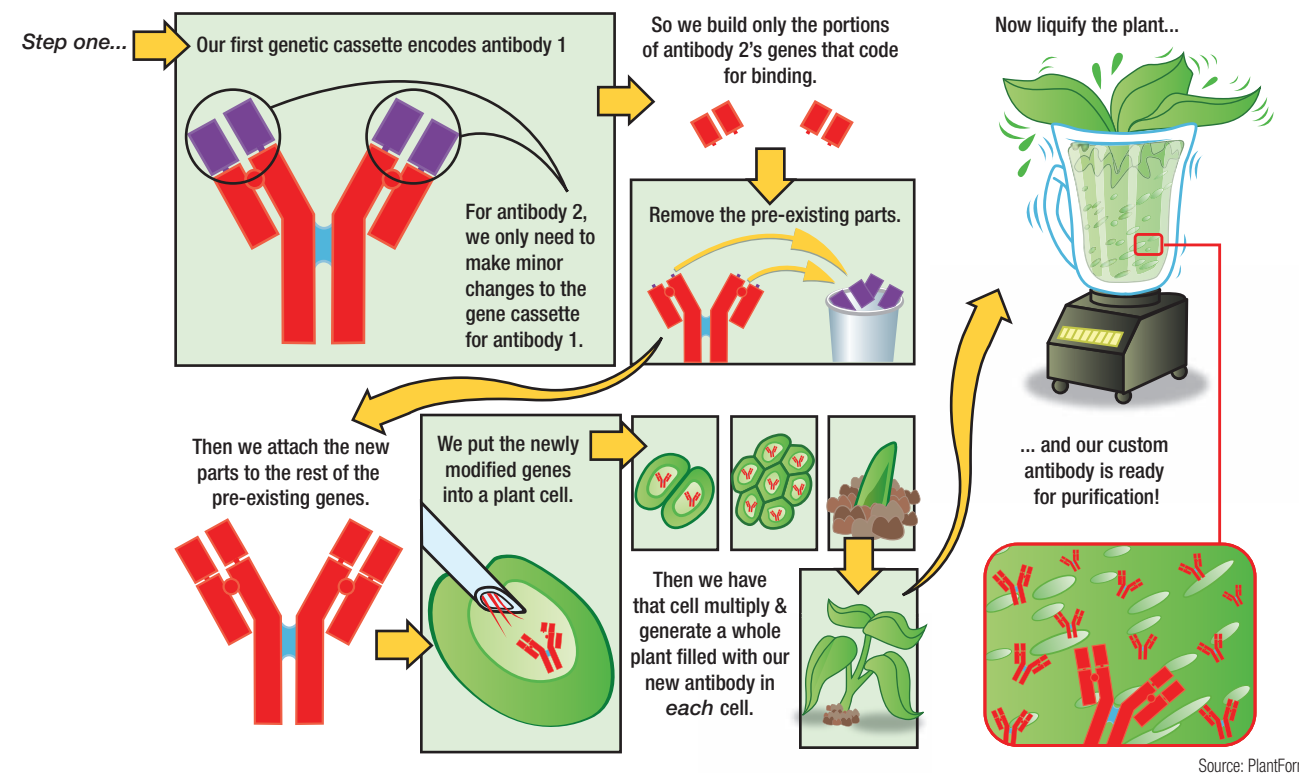
Of course, the irony of using tobacco plants to treat cancer isn't lost on the company's founders. "Let's just say the tobacco companies aren't lined up to support us," Hall says.

Since PlantForm is still in the process of securing investors, a clinical trial of its cancer antibody drug is still at least three years away.

The company, which aims to eventually go public on the Toronto Stock Exchange, also has its sights set on creating an inexpensive vaccine to treat cryptosporidiosis, a diarrheal disease caused by microscopic parasites, that's particularly virulent in Africa and many developing countries. It has applied to the Bill & Melinda Gates



PLUG AND PLAY: GENES ARE MOVED INTO THE TOBACCO PLANT



At left, University of Guelph masters student Ashley Meyers works on a project to engineer an antibody for treating the toxins produced by cobra bites.

Photography | E. Brian Clark

Foundation for \$100,000 in startup funds to develop the vaccine.

"This type of diarrhea is one of the leading causes of death in Africa," says Goldberg. "People who are immune-compromised, and that includes young people, very old people ... and people with AIDS, they often die from diarrhea-related diseases. You think about what's wrong with Africa and, first of all, it's disease-ridden. If you can get rid of malaria and you can get rid of the deaths due to diarrhea, it would be a lot more stable place and people would have a much more hopeful chance of living a normal life."

PlantForm's founders are confident their technology will be profitable for the company's shareholders — a group that includes the founders and five other investors — but they say just as important it will help them achieve their goal of making health care more accessible. "We see it as bringing therapy drugs to people who can't afford them," says Stewart, the company's chief executive officer. "We'll still have to satisfy our investor's demands ... but this is about finding a way to apply this innovative technology to do some-

thing we believe in."

PlantForm isn't the only biotech company that is using tobacco plants to develop therapeutic drugs. Medicago Inc., a biotech startup in Quebec City, expects to start clinical trials of an avian flu vaccine produced using tobacco plants later this year. And scientists at Stanford University in California have conducted human tests of a cancer fighting vaccine that was grown in tobacco plants.

The trio behind PlantForm has been working on the company's business plan since 2007. Hall and Goldberg worked together at the University of Guelph and their daughters are best friends. "I would see him from time to time since our daughters are friends and he would tell me about his technology and he would say, 'You're in business, help me commercialize this,'" Goldberg recalls.

Goldberg, chief executive officer of GlobalTox, a Guelph-based consulting firm that specializes in product testing and registration, human and environmental toxicology and risk assessment, met Stewart when Stewart applied for a job at GlobalTox. Stewart had just been

laid off from his job as director of research at Cangene, Canada's largest publicly traded biotech firm. "I said to him, 'You're way overqualified for that job, but let's keep in touch and see if we can find something to work together on in the future,'" Goldberg says.

Coincidentally, Stewart knew Hall through his work at Cangene. The three men quickly discovered that they meshed as a team. Hall is the science guy; Goldberg, a toxicologist, is an expert in getting a company regulated according to government standards; and Stewart brings valuable biotech business experience to the startup. "It was quite fortuitous that he was there exactly when we needed him," Goldberg says of Stewart. "And he's great because he's got exactly the right background for a startup biotech company. (Cangene) is publicly traded, so he knows all the ins and outs of being a publicly traded company."

When Hall explained the concept behind PlantForm, Goldberg and Stewart not only were impressed, they were eager to get to work. "As someone from the drug industry, I knew Chris was really on to something here," Stewart says.

It took the trio a long time to arrive at the decision to produce a generic equivalent of Herceptin because there were so many possibilities, says Goldberg. "We would sit down for a couple of hours at a time, two, three or four times, and say, 'Well, what about this, and what about that.' And we'd write down a list on the board of all the different diseases that were treatable using this technology, or all the different antibodies you could produce or all the different vaccines you could produce."

PlantForm was incorporated last April, with Stewart as CEO, Hall as chief scientific officer and Goldberg as board chair. The company filed its first patent on the vaccine technology in October. Goldberg says it plans to file another three patents. In January, it negotiated a licensing agreement with the University of Guelph, allowing it to commercialize the technology Hall developed.

One week after the first patent was filed, PlantForm was named one of Canada's Top 10 life sciences companies by the Ottawa Centre for Research and Innovation. The annual awards are intended to showcase promising life

sciences companies to investors and partners. Receiving the award is "quite a feather in our cap," says Goldberg. He notes that the other nine companies are much farther along in their development than PlantForm. "So I think this bodes very well. It suggests that even at this early stage, we've got our act together and we've got a very feasible and reasonable plan, we have an excellent management team, we have incredible and unique and breakthrough technology."

PlantForm, whose seed funding included a \$150,000 grant from the Ontario Centres of Excellence, is actively looking for investors. Goldberg says the company ultimately will need to raise about \$50 million to achieve its goals. It's a large sum, but the market it is going after is huge. Global vaccine sales, worth \$16.3 billion US in 2007, are growing at a clip of 16.5 per cent a year.

Despite the mind-boggling numbers, PlantForm's mission remains simple — creating the best plant derived therapeutic drugs. "We want to make high-quality drugs at a low cost so they are safe, effective and also affordable," Stewart says. ■