Healing Power of Plants

PlantForm Pursues Cancer Cure

By Tracy Tjaden

It costs up to $40,000 to treat one patient with the breast cancer drug Herceptin

Don Stewart often gets a quizzical look when he explains that tobacco is a key ally in his quest to find new drugs to treat cancer.

Stewart is the President and CEO of PlantForm Corp., a Canadian company that is using new technology licensed from the University of Guelph to introduce genes into plants to develop low-cost antibodies, protein drugs and vaccines for cancer and other critical illnesses.

In addition to its applications in medicine and health, plant biotechnology is also being used in agriculture, Stewart told a crowd of 1,000 at the Farm Forum Event in Saskatoon in late November. Plant genetics are being used in the areas of insecticides, plant pathogens and herbicide resistance.

PlantForm's technology platform, which uses fast-growing tobacco plants, was developed by Dr Christopher Hall, the Canada Research Chair in Recombinant Antibody Technology and the company's Chief Scientific Officer.

This platform is different from the cell culture and other fermentation systems used to produce most biologic drugs on the market today; it's fast, efficient, highly versatile (for new product development) and easily scalable. Company officials say it's capable of reducing manufacturing costs by up to 90%.

PlantForm currently has three projects underway:

1. Developing a biosimilar drug alternative to Herceptin, a key drug used to treat breast cancer. Effective alternatives are highly sought after, given the cost of $40,000 to $100,000 to treat one patient with a round of Herceptin, which comes off patent in Europe in 2015. Stewart says PlantForm's new drug could be ready by 2016. "There is a big market for this product," he says. "It's high risk, high reward." The company is also developing biosimilar versions of two other cancer drugs.
2. Developing 'innovator antibodies' for the treatment of human immunodeficiency virus (HIV/AIDS) funded by the Government of Canada and the Bill & Melinda Gates Foundation.
3. PlantForm has also been contracted by a US agency that funds research to counter bioterrorism. In September, wPlantForm began using its gene technology to work on a nerve-gas antidote, explains Stewart. "We've been asked to see if we can produce an existing antidote faster than it currently can be made," Stewart explains. "So if a terrorist organization used nerve gas as a weapon, enough antidote would be available to treat the first responders very quickly."

In addressing Canada's Senate Standing Committee on Agriculture and Forestry in May 2012, Hall explained that the biologic drugs created by PlantForm are essentially antibodies raised in plants. The scientists move the genes for the production of antibodies from mice into plants, and then get the plants to express the antibodies, which are then extracted and prepared.

"Our production platform is to take antibody genes from animals," Hall told the committee. Then, move them in the DNA into tobacco plants. "Those plants that are breeding true and producing the antibody, can be ground up in large grinders. We get a purée, which looks something like a smoothy. You can then filter this and do various purification processes to prepare the antibodies in pure form."

Plants are used because of their low capital and production costs, and ease of production, harvest and storage. In other words, they are a cheap form of bioreactor with reduced development timelines.

Hall told the committee the market for biosimilar drugs is massive and largely untapped, and that PlantForm's technology platform will substantially reduce the cost of goods entering this marketplace. For example, the cost per vial of Herceptin is about $3,500. "If we look at traditional biosimilars produced in animal cells, the cost would come down to about $2,500, and if we look at PlantForm's system, our costs would be about half of the name brand's. This would allow us to go into the marketplace by reducing the cost of goods but not affecting the profit margins initially, which is very important."

Dr. Don Stewart

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Chief Executive Officer, PlantForm Corporation

Dr. Don Stewart, an entrepreneur and scientist, is a founder of PlantForm Corporation and assumes the roles of President and Chief Executive Officer. Dr. Stewart brings 25 years management experience in the biotechnology industry to this role. Dr. Stewart is also the founder and President of Alba Biologics Group, a consulting company, providing expertise on drug candidate evaluation, development and manufacturing strategies.

Founded in 2008, PlantForm has licensed the rights to a powerful technology for the manufacture of biological drugs in plants and will establish the commercial applications of the platform for biosimilar antibodies. The initial focus is on a biosimilar version of trastuzumab (Herceptin), the $6 billion breast cancer drug which is being followed by other biosimilar drug candidates in the oncology area. PlantForm has shown its biosimilar trastuzumab drug can be manufactured at low cost using tobacco plants, and has found the properties of the plant-derived and name brand versions are directly comparable.

Previously as the Director Research and Development for Cangene Corporation, Dr. Stewart was responsible for the company's Mississauga based research and development group. Cangene is one of Canada's leading biopharmaceutical companies and in his role Dr. Stewart led programs on the development of innovative monoclonal antibodies and biosimilar protein drugs. Dr. Stewart group worked on the biosimilar hGH drug Accretropin, licensed by FDA in 2008, and his group developed processes for other biosimilar cytokines and interferon drugs. Dr. Stewart gained experience in other aspects of therapeutic drug development while responsible for cGMP manufacturing for clinical trials, animal efficacy and toxicology studies and a clinical trial.

Dr. Stewart graduated with a Ph.D from the University of London, UK and gained academic experience at the University of Alberta in Edmonton, Canada.