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The Tobacco Plant Revival: Helping the World Fight Influenza

Medicago Inc., Québec, Québec

The exile of the tobacco plant is over: tobacco plants have shown they can act as safe and speedy factories for producing pandemic flu vaccines, thanks to Quebec City's biotechnology company Medicigo Inc.

Medicago redeems the tobacco plant by using it as the basis for growing vaccines against the flu. The company grows virus-like particles that mimic the influenza virus – the Avian and Swine flu strains in particular – in the plants, which are then processed into vaccines, says Andy Sheldon, president and CEO of Medicigo.

“We use the cells within the tobacco plants to produce proteins which can be useful to man,” says Sheldon. This process is currently one of the fastest methods for the production of vaccines. Start-to-finish manufacturing of an influenza vaccine can be done in as little as 14 days, compared to the six months it takes for the traditional manufacturing method in eggs.

“Speed is of the essence” when it comes to vaccine production as pandemic flus can take less than six months to circle the globe, says Sheldon. Already many nations are predicting a backlog of H1N1 vaccine production as approved manufacturers struggle to meet quotas. The reason, says Sheldon, is that the traditional egg-based vaccines are manufactured with whole, mutated, non-disease causing viruses supplied by the World Health Organization (WHO), and these whole viruses are only providing one quarter to one half of the current vaccine “yield.” Medicigo's tobacco plant-based vaccines do not rely on these whole viruses, which allows the company to produce good vaccine yields.

The trick to using plant-based vaccines is that the tobacco plant is programmed to produce particles that are made to look like a virus, allowing them to be recognized readily by the body's immune system; however they lack the core genetic material, making them non-infectious and unable to replicate. Because these cells aren't really virus cells, but just impersonating them sufficiently to stimulate the immune system into producing antibodies, it provides protection against influenza virus infection.



Programming the tobacco cells to produce proteins needed for a vaccine is relatively straightforward science, “we just need the DNA code, which comes through the Internet,” says Sheldon. Using this DNA code, they synthesize genes that are then transferred into greenhouse grown tobacco plants. Within six days, enough “virus like particles” are produced in the plants that they can be harvested and manufactured into a vaccine.

Medicago begins human trials of its avian flu vaccine this September and expects to see strong results. Progress on the H1N1 vaccine is also strong. In July 2009, animal studies showed that a single dose of Medicigo's vaccine induced a positive immune response against a new strain of H1N1 virus in 100% of vaccinated animals.

As pandemic influenzas become more frequent, new methods to develop vaccines are increasingly important to ramp up vaccine production, says Sheldon. Using virus like particles produced in tobacco plants is one way to do this.

While the tobacco plant languishes under its bad boy image for good reason, Medicigo sees a different and more positive future for it – and for the world facing Avian and Swine influenzas.