Do plants have the potential to vaccinate against HIV?

March 13 2006

Scientists have developed a new kind of molecule which they believe could ultimately lead to the development of a vaccine against HIV using genetically modified tobacco. Writing in Plant Biotechnology Journal, Dr Patricia Obregon and colleagues from St George's, University of London along with researchers at the University of Warwick say they have overcome a major barrier that has so far frustrated attempts to turn plants into economically viable “bioreactors” for vaccines.

By creating fusion molecules, the researchers have found a way to make plants produce more of the molecules (antigens) needed for vaccines. At the same time, they may also have discovered a way of producing better targeted vaccines.

Obregon and her colleagues in Dr Julian Ma's laboratory are working with the p24 core protein of the Human Immunodeficiency Virus (HIV). This protein plays a central role in eliciting the immune response to HIV infection, and is therefore likely to be an integral part of any multicomponent vaccine for HIV.

Plants have already been used to produce many types of vaccine molecules, but a consistent problem has been achieving adequate levels of protein expression in order to make them viable as bioreactors for vaccines.

Obregon and her colleagues have found a way to significantly boost HIV-1 p24 protein production in plants by producing an entirely new

molecule – a fusion of the HIV-1 p24 protein and part of another protein, human immunoglobulin A (IgA) - a major component of the immune system. The team found that the HIV-1p24 antigen produced in this way elicited appropriate immune response in mice.

The results have important implications for the economic viability of using plants as bioreactors to produce vaccines against HIV and other diseases. According to Obregon: “Using antibody-antigen fusion molecules may represent a generic strategy to increase the expression of recombinant proteins in plants. It could open the door to cheaper biopharmaceuticals. Plant-derived pharmaceuticals are of great interest because of their enormous potential for economy and scale of production. This technology could lead to production of modern medicines that will also be accessible to poor populations in developing countries – which is where these medicines are needed the most.”

The results could also lead to the development of more effective vaccines. By using specific immunoglobulin sequences in the fusion molecule, antigens could be targeted to specific cells in the immune system, the authors say.

Source: Blackwell Publishing Ltd