

Genetically engineered plant –made vaccines in response to emerging trends.

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ABSTRACT

The use of plants as production systems for vaccine antigens has been actively investigated over the last 15 years. Plant molecular biology and biotechnology have enhanced and expanded the medicinal applications of plants in many ways. Plants can be engineered to act as bioreactors for vaccine and therapeutic production, and their metabolic pathways can be manipulated to increase compounds of benefit or decrease detrimental compounds. While some of these activities can be achieved through mutagenesis and traditional plant breeding, the most direct and exacting path is through genetic modification or transformation of plant cells. Expressing recombinant proteins in transgenic plants has been actively researched for the past 20 years, resulting in a fast and flexible production system. The knowledge, tools and techniques have been steadily building, and have now reached the point where commercial production of biopharmaceuticals by transgenic plants is a certainty. Vaccines are one of the most successful public health achievements of the last century. Systematic immunisation programs have reduced the burden of infectious diseases on a global scale. Furthermore, the requirement to keep vaccines within the cold-chain throughout manufacture, transport and storage is often impractical and prohibitively expensive in developing countries—the very regions where vaccines are most needed. In contrast, plant-made vaccines (PMVs) can be produced at a lower cost using basic greenhouse agricultural methods, and do not need to be kept within such narrow temperature ranges. This increases the feasibility of developing countries producing vaccines locally at a small-scale to target the specific needs of the region. Additionally, the ability of plant-production technologies to rapidly produce large quantities of strain-specific vaccine demonstrates their potential use in combating pandemics. PMVs are a proven technology that has the potential to play an important role in increasing global health, both in the context of the 2015 Millennium Development Goals and beyond.