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A Case Study:

Edible vaccines : A panacea for developing countries

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SUMMARY

Vaccines have played a major role in combating various life threatening diseases and provide a protective sheath against a host of bacterial and viral infections. However, painful modes of delivery, increasing cost and risk of infection due to contamination have forced the scientists to develop alternative sources of vaccine production and delivery. A viable alternative has emerged in the form of "Edible vaccine", developed through genetic engineering using suitable host plant. Vaccines can be produced in plant parts that can be consumed raw and therefore, are labeled as edible vaccines. With encouraging results in limited human trials the edible vaccine program promises to give a disease free future to our coming generations.

Key words : Edible vaccine.

In ancient times, when the molecular basis of cause of disease and the process (es) of recovery were not clear, people who recovered from a disease, rather than succumbing to it, appeared to be immune from a second bout of the same illness. Such observations initiated the crucial discovery of vaccines. Edward Jenner, a doctor from England, discovered a way to vaccinate against one of the most dreaded disease of that time, smallpox. Jenner's technique of inoculating with cowpox to protect against smallpox spread quickly throughout Europe. Louis Pasteur when injected some chicken with an old bacterium culture thought to be causative agent of fowl cholera, Pasteur observed that, though the chickens suffered the illness but to his surprise they recovered. After recovery even when the chickens were infected with the fresh culture they showed no sign of the illness. Giving birth to the hypothesis that aging has caused the decrease in the virulence of the pathogen and such an attenuated strain can be used to protect against the disease. Pasteur in the accolade of Jenner's work called the process as "vaccination", after "vacca", the Latin word for cow and the substance used to vaccinate was called a "vaccine". We have progressed from a time when vaccination was rarely exercised, and initially Jenner's concept about vaccination was not widely accepted. However, some 210 years later to the time when we have come to a scenario where vaccines are so common that most children receive multiple vaccinations even before they reach their first birthday. The practices of large scale vaccinations lead to a marked decrease in diseases which once ravaged the world's population.

Vaccination causes the stimulation of the immune system to prepare it for the event of an invasion from a particular pathogen for which the immune system has been primed. The disease causing organisms contain molecules called "antigens" which stimulate the immune response. The resulting immune response is multi-fold and includes the synthesis of proteins called "antibodies". These proteins bind to the disease causing organisms and lead to their eventual destruction. Interestingly, a group of cells called "memory cells" are produced in an immune response. These are cells which remain in the blood stream, sometimes for the whole life span of the host, ready to mount a quick protective immune response against subsequent infections with the particular disease causing agent which induced their production. If such an infection were to occur, the memory cells would respond so quickly that the resulting immune response could inactivate the disease causing agents and symptoms would be prevented.

The phenomenon like constantly varying strains of the pathogen, antigenic shift and so far other unrevealed mechanisms, lead to the difference in the peptide sequences of the individual pathogen strains, making it hard to determine which peptide sequence is to be primed to the immune system.

Typically, vaccines against human diseases have been composed of killed or attenuated live organisms or

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