

Tobacco – A Double Edged Sword

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Abstract

The tobacco plant is the cause for millions of cancer cases worldwide. This plant now offers physicians a way to rapidly make vaccines that are able to fight cancer like Non Hodgkin's lymphoma by upregulating the patient's own immune mechanism to fight cancer. The Tobacco plant is a member of Solanaceae family and usually gets infected by a virus known as Tobacco Mosaic Virus (TMV). Viral replication occurs very rapidly in this plant and hence when the gene extracted from the patient's malignant cell is infused into the tobacco leaves which are infected by this virus, it generates the production of cell- surface antigen within a very short span. This antigen after purification is then injected into the same patient evoking the production of tailor-made antibodies and thus upregulating the patient's immune system. The aim of this therapy is to build up one's own immune system to fight against his/her own cancer. This short article highlights the method by which the tobacco plant could thus act as a double edged sword.

KEYWORDS: Tobacco plant , TMV, Non Hodgkin's Lymphoma.

Introduction

The tobacco plant belongs to the family Solanaceae. Its biological name is ***Nicotiana tabacum*** . It is a perennial herbaceous plant that grows to a height of 2-3 meters. Its leaves are commercially grown and processed into tobacco in various different forms like bidi, cigars, cigarettes, hookah, pipe smoking, snuff, gutkha, mawa, khaini etc. The usage of these different forms of tobacco is an activity that is generally practiced by about 1/3rd of the adult population around the world. The World Health Organization (WHO) reports it to be the leading cause of death worldwide and estimates that it currently causes 5.4 million deaths per year(2).

The tobacco plant usually gets infected by a virus known as Tobacco mosaic virus (TMV). TMV is an RNA virus that causes a characteristic pattern on the leaves which is mottling and discoloration, and hence the name. It is a thermostable virus that can withstand upto 120° F or 50° C for 30 minutes on dried leaves. It has no effect on humans and animals. The plant infected with this virus offers an advantage of generating antibodies against Non Hodgkin's lymphoma in a very short period of time. The tobacco plant thus acts as a double edged sword which can cause cancer as well as treat cancer.

Non Hodgkin's lymphomas are a heterogenous group of lymphoproliferative malignancies which can involve lymph nodes, lymphoid organs as well as extranodal organs and tissues(3). Non-Hodgkin's lymphomas represent the sixth most common cancer in the United States as well as the sixth most common cause of cancer deaths(4). These include a broad range of neoplasms derived from the T cells and B cells and their precursors in the lymphoid system. Although they are not among the

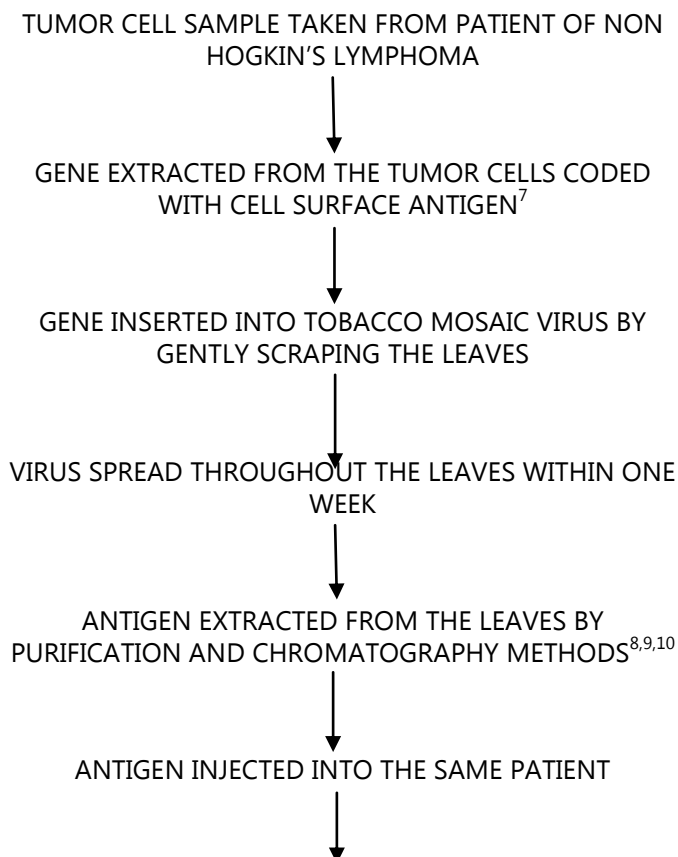
most common cancers, the lymphomas have attracted a great deal of interest among researchers. This is because of their interesting biology and varied responsiveness to therapy. About 80% of cases originate from B lymphocyte series. Tumors with a T lymphocyte derivation are less common(5,6).

In this cancer, a single antibody-producing B lymphocyte breaks free from normal growth controls and multiplies uncontrollably, producing many identical clones of itself. This form of cancer is unique because the malignant B cells in each patient carry a distinctive marker on their surface which is not normally found on the body's healthy cells(1,3,4). Hence by generating antibodies against this surface marker, one can stimulate the immune system and attack the lymphoma cells.

Researchers were able to produce these antibodies by using bacteria but they were found to be insoluble and hence were ineffective. Later, animal studies were carried out but they were very time consuming. It was at this point that the use of tobacco plant as an alternative method for protein production was developed, that could generate antibodies customized for each patient. These antibodies recognize the cell surface marker and target the malignant cells resulting in their destruction(4,7).

Thus a unique tailor-made vaccine can be produced for every patient to fight his/her own cancer.

PROCEDURE



ANTIBODIES FOR SPECIFIC CELL SURFACE ANTIGENS PRODUCED

↓
IMMUNE SYSTEM OF 70% PATIENT PERKED UP

ADVANTAGES

The advantages of this plant vaccine is that it is cheaper and carry minimal risk to the patient, as against the animal-grown vaccines. This procedure has no side effects and results in developing antibodies within 2-3 weeks. Hence personalized cancer vaccine for individual patient can be produced very effectively.

OTHER APPLICATIONS

Some other applications of tobacco plant in the field of plant technology include :-

1. The genetically modified tobacco plants are used to produce interleukin 10 to treat patient with type 1 diabetes(11) .
2. The Tobacco plant is also used to develop antibodies against HIV. EU Pharma Plant project -Germany's Fraunhofer, established the fundamental principles required to produce the HIV –neutralis 2G12 in these plants(12).
3. This plant is also used to produce vaccine for Norovirus infection which causes diahorrea and vomiting(13).
4. The tobacco plant is coated with 30 nanometer long chunks of platinum nanoparticles in order to create a fast switching transistor. These transistors could be manufactured into memory chips to replace conventional flash memory in electronic devices(14).

CONCLUSION

This is a short article which highlights the benevolent role of the tobacco plant as an angel who is used to cure cancer by production of customized, tailor made, specific antibodies and eliciting the immune system to fight against the patient's own cancer.

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