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Drug Designing through Genetically Engineered Plants

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Abstract

In recent years, genetically modified (or GM) plants have been and continued to receive a significant number of media attention. Nevertheless, the public is largely unaware of the real nature or the pros and cons of a GM plant, particularly as concerning the range of applications to be used. Two key areas of concern appeared from the first generation of GM crops, namely environmental and health risk. With the gradual introduction of GM plants into the European Union, public concern about potential health problems is likely to grow. While the 'health campaigns' are now common to the press, their published information is often unreliable and irrepressible to the scientific evidence available. In the production of new therapeutic agents from the botanical sources, modern biotechnology has regenerated the interest. With nearly 500 biopharmaceuticals licensed or produced globally and the processing capability are limited, the requirement for efficient methods of pharmaceutical protein synthesis is evident. Plants are also available to produce "mammalian anti-corps, blood substance equivalents, vaccinations, hormones, cytokines as well as other medicinal agents," which are biologically active proteins by genetic modification methods. A correct host plants and cell proliferation system collection, such as a determination whether a nutrition plant or even a non - edible crop is much more suitable, is involved in an effective biopharmaceutical production for the plants.

Key words: Biotechnology, Biopharmaceutical, Cytokines, Genetically modified (GM) plants, Mammalian antibodies, Therapeutic agents

Introduction

The use of plants or their extracts for the treatment of human disease goes back to at least the Neanderthal period and to the earliest stages of civilization. Botanical gardens offered ample material for medicinal use in the 16th century, and herbal medicine flourished until the 17th century, when further modern 'pharmacological' treatments were discovered [1]. The active principle was then identified and, in many cases, cleaned for the therapeutic use in many medicinal plants. Roughly a quarter of current prescription drugs still have a botanical origin today.

For thousands of years, conventional breeding methods have been used to produce plants with favorable characteristics. The desirable characteristics are selected, combined and spread over several generations by repeated sexual crossings. This is a long process for producing new varieties for up to 15 years. In addition for allowing the introduction of a small number of genes to greatly accelerate this process, genetic engineering also enables the barrier to

sexual incompatibility between the plants to be overtaken and the available gene pool to be substantially expanded.

The potential in obtaining the new therapeutic agents from botanical sources has grown with modern biotechnology. Plants are also able to manufacture a variety of proteins, involving mammalian antioxidants, blood replacements, vaccines as well as the application of genetic modification. (GE) [2]. Recently, the foreign proteins have been made viable in genetically modified plants, for example, in microbial fermentation or mammalian cell culture in traditional production systems. GE plants that function as biological reactors can efficiently produce larger quantities of recombinant protein than mammalian cells [3]. Plant-derived proteins are especially attractive because they are exempt from the human diseases and mammalian virus vectors. Large amounts of biomass can easily be harvested in the field and processed before processing. Plants thus offer the potential to produce recombinant proteins effectively and in large-scale, with the greater privilege from the human contaminants.

Transgenic (GM) plants are the ones modified by the recombinant DNA technology. This may include the expression of a gene which is not originating with the plant or the alteration of the endogenous genes. A particular trait or characteristic of the plant is given to the protein encoded by the gene. The system is ideal for a number of purposes such as engineering Abiotic stress tolerance, like drought, excessively high temperatures or salinity including biotic stresses like pests and pathogens, usually impact plant performance and sustainability tolerance. The technique may also be utilized to increase the nutritional quality of the crop, which is particularly suitable in developing countries. Recombinant GM plants and consumer products including monoclonal immunity, vaccinations, plastic materials and biofuels upcoming generation young generation are now also being produced [4].

Over the last two decades over 95 biopharmaceutical products, including mellitus diabetes, growth diseases, neurological and genetic diseases, inflammatory conditions and blood dyscrasia, have been approved by one or more regulatory authorities in order to treat a variety of human diseases [5]. Around 500 agents worldwide, about 370 biopharmaceuticals in America, including 178 cancer agents or related diseases, 47 infection-afflicted agents and the remainder for a range of major medical conditions, are known to be under the production of important medical conditions worldwide (Fig. 1) [6].

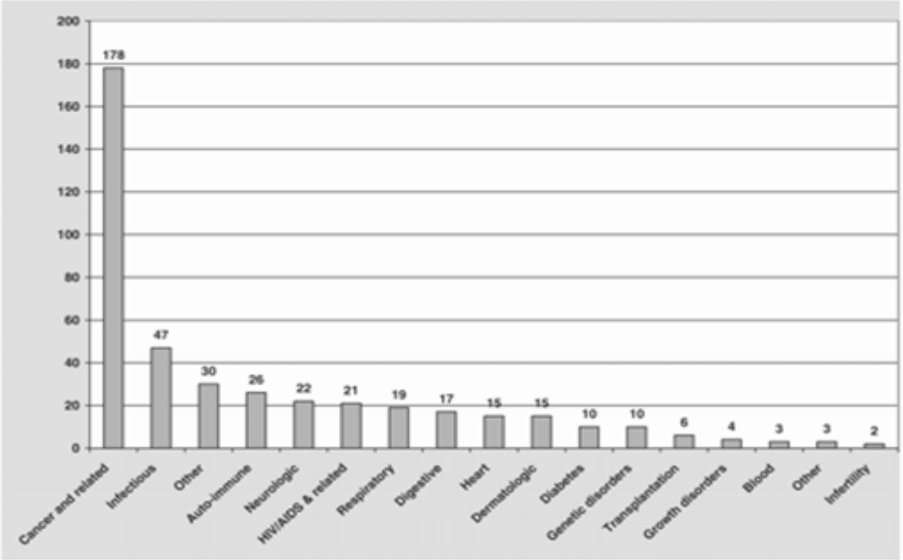

Fig.1: Number of biopharmaceuticals under development, by disease class as of 2003.

Recombining proteins, monoclonal antibodies, oligonucleotides, antisense and other protein agents, such as hormones and immunomodulating medicines, belong to these therapeutic entities (Fig. 2) [7]. A significant increase in the number of new proteins and peptide drugs is the product of rapid molecular biological developments, which have been shown by the success of the human genome project, which helps to identify several potential therapeutic interventions. Unfortunately, by the end of the current decade, it is estimated that our capacity to produce such proteins as much as possible will be well below the demand. Although none of the products currently available on market is produced in plants, biotechnology products consisting of the proteins and perhaps also DNA-based vaccines are the potential plant-based candidates.

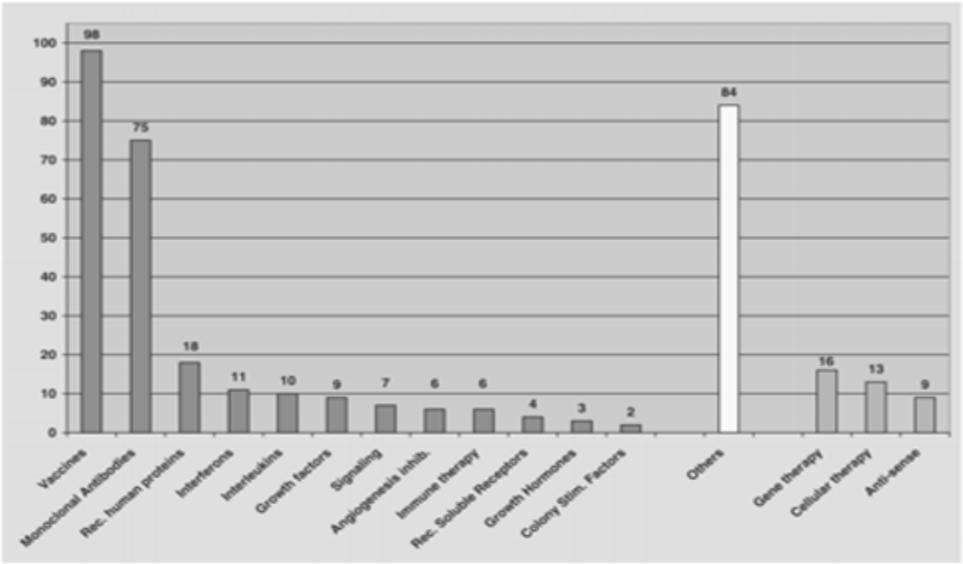

Fig.2: Number of biopharmaceuticals under development, by type of agent.

Advances in Genetic Engineering:

The progressions that have been created throughout the area of genetic work are explained as: Many efforts have been made to transfer some beneficial textile properties to the micro-organisms where they can be reproduced more easily by bulk fermentation processes. According to some of the researchers, the spider DNA is transported in bacteria to create proteins that are immune and resilient to use in bulletproof vessels.

According to another researcher, cysteine appears to be the limited amino acid for the synthesis of wool and the original approach consisted of increasing its output by transferring cysteine biosynthesis from bacterial genes to the sheep genome. This aimed at improving the sheep's wool quality and modifying the fiber characteristics [8].

Viruses are now engineered to invade, alter and create its own drugs for DNA of its body's particular cells. As a consequence, nearly all ailments are prevented or healed by body. The stem cells that is leading in genetics has the ability to cure hemophilia. One of the researcher reports that in order to boost the continued production of a functional coagulation factor, that gene therapy for haemophilus includes transferring genetic information for restricted number of somatic cells of the patient suffering from hemophilia [9]. The FVIII and FIX genes were cloned and a sequence of various vectors, cells, cell lines and methods were used in order to achieve the expression of these factors. The duplicating and analysis of the genetic factor that programs for the influences FVIII and FIX in human coagulation raise the possibility of gene therapy in the treatment of hemophilia. Gene therapy for haemophilia is currently focussed on the technology of gene addition in the patient's cells with defective coagulation factors such as FVIII, FIX and FVII, Linked DNA sequencing with necessary predictor and improver components to the usual functional clotting factors.

Genetically Modifying a Plant:

The manufacturing of GM crops is diverse. There are two main microbes that spontaneously pass DNA to plant species: Agrobacterium tumefaciens as well as the "mutation blast" that emit microscopic DNA-coating fragments into another cell membranes of plant. Aimed and revived independent plant cells by tissue culture techniques in whole GM plants [10]. The focus on the human health has been addressed in three areas of this process.

i) Identification of the transformed cells by utilizing selectable markers.
ii) Transferring extraneous DNA into the plant genome.
iii) The potential for Enhanced mutations throughout the GMPs compared with non-GMPs compared to tissue-cultivation approaches utilized in the creation and reconfiguration of DNA only at location of the incorporation of exogenous genes.

A gene with a selectable marker identifying the antibiotic resistance (e.g. kanamycin, which destroys the normal non-GM plant cells) is typically co-transported with the gene of interest, which allows the GM tissue differentiation and the regeneration of GM plants to allow for aiding the transformation process. Technological research has shown that, after GM food

intake for the microbial community, there is indeed a possibility that antibiotic resistance will extend to the soils or individual gut. Even so, certain resistant bacteria are extracted from microbes and seem to be popular in the microbial species. Kanamycin does have the classification of GRAS (usually safe) and was used without any known problems from over 13 years.

Production, Safety and Efficacy:

Medication research is a unique, multidisciplinary process that leads to the development of new, unsatisfactory therapeutic agents to disease states. In the search for new biopharmaceuticals, both therapeutic efficacy and safety criteria assess medical needs and the perceived probability of technological success. For the safety testing of a new biopharmaceutical, several factors are needed to be considered [11]. Due to the protein aspect of most biopharmaceutical products, only those related to the primary pharmacological activity are likely to have few no-allergic adverse reactions other than those which are anticipated to the pharmacological activity. Moreover, good practice in the laboratory and good manufacturing practices are both important for the plant-based pharmaceuticals, as set out for the other modes of pharmaceutical development. It is important to have thoroughly characterized, contaminant-free products and sufficient quality assurance before the experimental or therapeutic use is undertaken so that the product itself and the effects of the treatment are reproducible [12]. New plant-based pharmaceutical products must be subjected to the same cleanliness, quality control and safety standards as ingredients from bacterium or mammalian cell systems or the other traditional sources as vaccine manufacturing.

In some cases the sites used for growing genetically modified plants have, in contrast to the use of plant biotechnology, been damaged or destroyed by individuals, creating more security concerns. In part the monitoring and security of fields and the use of enclosed surroundings (greenhouses) for small-scale operations may address these issues. The relatively small and favorable economics of biopharmaceutical operations requires the placement of field operations at geopolitical locations which have been selected for the optimum safety with raw or refined materials being transported subsequently.

Food Applications for GM plants:

About 1.3 billion individual worldwide on less just one dollar a week and cannot connect directly food safely. 840 million individual in the western world have chronic hunger and live below 8000 kJ / day (2000 Kcal / day) [13]. Most are peasants in developed countries who've been wholly reliant because of their own living standards and lives and families on smallholder farming. They usually do not have the ability to fertilize their crop or to purchase fertilizers or pesticide that contribute to low growth, reduced yield or parasite sensitivity. More than 95% including its populace of developed countries is already born during the next forty years and thus the world population is projected to double. Food output is expected to rise through at least a 50% to satisfy these increasing demands, considering the decline in

fertile water and land supply [14]. One of a number of different approaches to address these problems is genetically modified plant technologies. In particular, the genetic modified plants are currently being researched in order to increase the crop yield or boost their nutritional content directly.

Conclusion

There are advantages and disadvantages with the use of genetics. Although the possibility of devastation due to the abuse of genetic engineering is very high, the potential benefits of safe and responsible continuing in this area are very shocking. In order to avoid the legal and divisive issues, the use of cloning must be vigilant. Researchers now create a human DNA map and do the same for the other animals and plants. The next step is to understand the functioning of each DNA section. A number of NGOs and Genetically engineered plants are vigorously opposed by media outlets. Crops intended to minimize hunger throughout the developing countries, such as Golden Rice, were attacked for reasons of taking a terrible taste and of eating about 7 kilograms of Golden Rice, which according to the product founder, and is over-estimated more than fifteen times.

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