Signers as of November 3, 2004

ACCADEMIA NAZIONALE DELLE SCIENZE, DETTA DEI XL
Prof. Gian Tommaso Scarascia Mugnozza - President

ANBI – ASSOCIAZIONE NAZIONALE DEI BIOTECNOLOGI ITALIANI
Dr. Francesco Lescai - President

ARNA – ASSOCIAZIONE RICERCATORI NUTRIZIONE ALIMENTI
Prof. Massimo Cocchi - President
Prof. Archimede Mordenti - Founder/President

ASPA – ASSOCIAZIONE SCIENTIFICA DI PRODUZIONE ANIMALE
Prof. Vincenzo Russo - President

FISV – FEDERAZIONE ITALIANA SCIENZE DELLA VITA
Prof. Jacopo Meldolesi - President

SIB – SOCIETÀ ITALIANA DI BIOCHIMICA E BIOLOGIA MOLECOLARE
Prof. Giampietro Ramponi - President

SIF - SOCIETÀ ITALIANA DI FARMACOLOGIA
Prof. Gianluigi Gessa - President

SIF - SOCIETÀ ITALIANA DI FISIOLOGIA
Prof. Maria Svelto - President

SIFV - SOCIETÀ ITALIANA DI FISIOLOGIA VEGETALE
Prof. Carlo Soave - President

SIGA – SOCIETÀ ITALIANA DI GENETICA AGRARIA
Prof. Michele Stanca - President

SIMGBM - SOCIETÀ ITALIANA DI MICROBIOLOGIA GENERALE E BIOTECNOLOGIE MICROBICHE
Prof. Davide Zannoni - President

SIPAV - SOCIETÀ ITALIANA DI PATOLOGIA VEGETALE
Prof. Giovanni Martelli - President

SITOX - SOCIETÀ ITALIANA DI TOSSICOLOGIA
Prof. Giorgio Cantelli Forti - President

SIV – SOCIETÀ ITALIANA DI VIROLOGIA
Prof. Giorgio Palù - President

SOCIETÀ ITALIANA DI CITOLOGIA
Dr. Pasquale Chieco - President

SISVET - SOCIETÀ ITALIANA DI SCIENZE VETERINARIE
Prof. Eraldo Seren - President

ACCADEMIA NAZIONALE DI AGRICOLTURA
Prof. Luigi Cavazza - President

SIA - SOCIETÀ ITALIANA DI AGRONOMIA
Prof. Giuliano Mosca - President

Food Safety and GMOs

Consensus Document

Introduction

Ever since man turned from hunter-gatherer into breeder and farmer, he has tamed animals and plants and altered - sometimes knowingly - their genetic makeup. As such, almost every crop currently farmed and animal raised in our world is in fact a genetically modified organism (GMO).

This process of selection and transformation has gone on fairly slowly for millennia. What has changed in the last 50 years, since the structure of DNA was discovered, is the awareness that to obtain desired results some of the organisms' genetically controlled functions have to be altered. At the same time, the technology for doing so has changed at dizzying speed.

Recombinant DNA technology is the basis of advanced biotechnologies, i.e. processes that use living organisms or parts of them to obtain goods and services with a view to improving the lives of humans. It allows us to produce new medicines, diagnostic and treatment tools, industrial and food products, animal breeds, vegetable varieties and forms of energy, faster and more cheaply than ever before. However, while public opinion is quick to accept the innovations and hope that biotechnology brings to the field of health, it is highly resistant when these same innovations are used in farming and food. This attitude stems from doubts and fears fueled by a lack of well-balanced information.

Therefore, we need to teach the public that modifying the genetic makeup of a bacterium in order to produce medicines, like antibiotics and insulin, and modifying a strain of corn to make it resistant to drought, disease or adverse environmental conditions is achieved through very same principles and technologies.

The present Learned Societies:
Accademia Nazionale delle Scienze, detta dei XL
ANBI - Associazione Nazionale dei Biotecnologi Italiani
ARNA - Associazione Ricercatori Nutrizione Alimenti
ASPA - Associazione Scientifica di Produzione Animale
FISV - Federazione Italiana Scienze della vita
SIB - Società Italiana di Biochimica e Biologia Molecolare
SIF - Società Italiana di Farmacologia
SIF - Società Italiana di Fisiologia
SIFV - Società Italiana di Fisiologia Vegetale
SIGA - Società Italiana di Genetica Agraria
SIMGBM - Società Italiana di Microbiologia Generale e Biotecnologie Microbiche
SIPAV - Società Italiana di Patologia Vegetale
SITOX - Società Italiana di Tossicologia
SIV – Società Italiana di Virologia
Società Italiana di Citologia

deem it necessary to shift the debate over genetically modified organisms to a more balanced, scientific plane. It is crucial that we start over from the scientific data obtained from the numerous studies carried out on the safety of GMOs.

However, before we review the current scientific knowledge about the safety of GMOs in agriculture, we would like to recall some key points that should underlie any discussion hinging on the analysis of scientific data:

1. Science, or more specifically scientific knowledge, is not made of absolutes but constantly strives for a better understanding of the facts. For this reason knowledge is not static and absolute, but apt to be improved and perfected.

2. Reserach should be cultivated and valued in such a way that existing findings are not lost to visions or theories that, by disowning those findings, jeopardize the good that science has already produced or could produce for humankind[1].

3. Technology is born when scientific knowledge becomes applicable to reality.

4. What makes a technology successful is not its "perfection," but its ability to satisfy specific needs more appropriately than was previously possible. Only an evaluation that considers the ratio of costs to benefits can afford an equable judgment of any given technology.

5. Opinions can only be properly informed if they are based on an analysis of the best available knowledge.

The aim of this document is to present the world's current knowledge regarding the safety of GMOs in food, so that everyone will be fully informed about the state of the art and thus free to take a position on the issue.

This text has been written after careful evaluation of the most significant literature and of the opinions of the various Learned Societies and international organizations, including those listed below:

Food and Agriculture Organization - FAO
World Health Organization - WHO
The Royal Society of London
U.S. National Academy of Sciences
The Royal Society of Canada
Accademia Nazionale delle Scienze e Accademia Nazionale dei Lincei
Brazilian Academy of Sciences
Chinese Academy of Sciences
Indian National Science Academy
Mexican Academy of Sciences
Third World Academy of Sciences
Australian Academy of Science
Council for Agricultural Science and Technology
Consiglio Scientifico per le Biotecnologie in Agricoltura – Regione Lombardia

Biotechnology and GMOs

According to a widely accepted definition[2], a biotechnology is any technique that uses living organisms or parts of them to obtain goods or services. This includes both "classic" biotechnologies (based mainly on the use of certain fermenting microorganisms) and "advanced" ones, which use the findings of genetic engineering and molecular biology for the selection of new organisms and the creation of new products[3].

GMOs, or genetically modified organisms, are a product of advanced biotechnology because they are organisms whose DNA has been specially altered through genetic engineering techniques that allow the isolation and transfer of particular DNA sequences from one organism to another (recombinant DNA)[4].

GMOs and Nature

The public often makes a sharp distinction between what is "natural" and what is "genetically modified," viewing GMOs as something radically different from what we find on our tables every day. For those who know the history of human development, such a position is untenable unless we consider farming itself to be unnatural. Agriculture, in fact, stems from the selection by humans of vegetable and animal genotypes on the basis of criteria contrary to what occurs in nature (retention of seeds on the ear, short height, etc.). This selection, initially empirical and then increasingly aimed at specific results, has been so significant that most crops and farm animals are now unfit to survive in natural ecosystems.

Some species have been crossed with others that are very distant, in genetic terms, in order to introduce useful genes: the tomato has been crossed with at least four wild species; rye has been crossed with wheat (the two are genetically quite different) to obtain triticale, a grain that does not exist in nature; and tritordeum is a hybrid of wheat and barley. More than 2,000 vegetable varieties have been obtained through radiation with x-, gamma- or other rays[5]. One example is "Creso" durum wheat, selected over 30 years ago from the output of "Cappelli" seeds treated with x-rays, which is still grown extensively and is part of the pedigree of several new strains of the durum wheat used to make pasta.

The new technologies, mimicking processes that occur in nature[6], afford targeted DNA alterations that are far more predictable and controllable than the ones that have been accepted up to now by virtue of their "naturalness."

Finally, we should remember that organisms share so much of their genetic makeup that we can learn how certain human genes work by studying their genetic correspondents in mice or even brewer's yeast. Genes can also be transferred intact and active among genetically distant species, proving how universal is the language used to write them.

The safety of GM food

The development of GMOs has raised many questions about the potential health, environmental, economic and social implications of using them in agriculture, particularly for food that winds up on our tables. What still raises the most serious concern is the possibility that they can cause allergies, antibiotic resistance in microbial human pathogens, or unforeseeable long-term consequences. These issues have to be addressed very carefully and scientifically in order to ensure food safety for all and the knowledge needed to make informed decisions. We should note that Europe has been conducting research on these matters since 1985, and since 1990 has had ad hoc regulatory systems in place designed to assess the potential health and environmental impact of the use of GMOs.

Evaluation procedures

Before GMOs are authorized for cultivation and sale, they undergo a substantial number of tests to ensure their safety. The product's characteristics, including with regard to food safety, are gathered into a dossier[7] that is available for consultation. Under current European regulations, the public must also be consulted before the general release of a GMO[8].

Procedures are very different between the United States and the European Union, although they require similar kinds of tests. In the U.S. the procedure is based on the determination of substantial equivalence, hence on a measure of the quantitative reaction and the degree of exposure posed to the general consumer (dose, duration and frequency) in order to estimate the probability and severity of GMO-associated risks[9]. Europe, on the other hand, has passed regulations based more on certification of the process than of the product. While no toxicity testing is required for products obtained with conventional methods, GMOs are subject to special regulations, including a horizontal directive[10] that covers these products from R&D through release in the market and vertical rules govering specific areas like food safety and traceability[11].

In both the U.S. and the European approach, the first step in evaluating GMOs is to study the toxicological properties of the original plant and the new manufactured protein, and to prepare a dossier that addresses the agricultural, botanical, ecological, nutritional and toxicological aspects as appropriate. In plants currently on the market, the transgene serves to express a protein that is responsible for a characteristic considered desirable (pest resistance, tolerance to herbicides, increased vitamin content, and so forth). That protein must be evaluated carefully for toxicity and as a potential allergen. If the tests are negative, i.e. the protein is not toxic or allergenic, then the transgenic plant can be evaluated to see whether it is "substantially equivalent" to similar, non-GM varieties.

Substantial equivalence

The concept of substantial equivalence was developed independently from GMOs and is pronounced after thorough investigation, as opposed to *a priori* assumption. It dates to the 1950s, when it was used to evaluate new plant varieties, as it was an excellent means of establishing whether they were equivalent to existing crops. The main advantage of this kind of appraisal is its independence from the system with which the new cultivar was obtained (crossing, mutagenesis, embryo rescue, somaclonal variation or gene transfer), since it only compares the phenotypic, functional and metabolic properties of the new variety with those of the original. That way, it can be assured that new varieties released to the market do not have impaired nutritional value[12].

It was not until 1993 that the OECD[13] spoke out in favor of using the concept to compare GMOs against conventional products, at least for the most important features. The importance of this preliminary analysis - although there is certainly room for improvement - is recognized by all of the major international organizations[14].

More specifically, before a judgment of substantial equivalence is made, the product will be tested for several hundred biochemical, genetic and protein properties and will undergo nutritional testing in animals[15].

If the European Food Saftey Authority (EFSA[16]) decides that the genetic, protein and metabolic analyses[17] of a GM cultivar or its product determine that it is substantially equivalent to the conventional variety, and the toxicity and allergen assays are negative, then the new strain or product is judged fit for human or animal consumption[18] If the tests demonstrate toxicity or lack of substantial equivalence, further investigations are required. In the end, the dossier will either be rejected or approved anyway on condition that the contradindications be stated on the product's label.

Toxicity analysis

In Europe, the evaluation of the safety of GM foods was governed by Regulation 258/97 ("Novel Food"), until its replacement by Regulation 1849/03 in April 2004. All GMO-derived products currently found on the market have been evaluated according to these rules. The assessment procedure consists of four stages: 1) the molecular profiling of the transgene and its product; 2) the determination of toxicity caused by the transgene; 3) the determination of other unpredictable harmful effects; and 4) the morphological analysis of the GMO and an assessment of its behavior in the field[19].

The procedure, therefore, entails the formal evaluation of the safety of the product and its ingredients in traditional toxicity assays, plus a comparative toxicity test between the GMO and its conventional counterpart. The results of these tests are judged differently depending on several variables: whether the product is being marketed as food; whether the transgene interferes with the plant's gene expression profile; whether the transgene is involved in a metabolic pathway or triggers a new one. The regulations also require that the level of the transgenic protein be measured and that it be determined whether the protein can penetrate the intestine or whether it penetrates it normally because it is already present in conventional foods.

In Europe, toxicity tests have been conducted for all GM products that have been approved for sale and consumption. In the case of transgenes that do not show sequence homology with genes codifying for toxic or allergenic products, toxicity assays are still required, while if the gene is found to be involved in a metabolic pathway, the toxicity testing is far more rigorous.

Allergenicity

Allergens are compounds that cause an immune system reaction - an allergy - in those who are sensitive to the product. Many foods are rich in allergens, including strawberries, apples, rice, kiwi, peanuts and shellfish. Peanuts can even lead to anaphylactic shock and in extreme cases to death. No preventive allergenicity testing is required for traditional foods, and only recently

have labeling requirements been introduced. In these cases, a person who is allergic to the food discovers the fact only after entering in contact with it.

When a transgenic plant is evaluated, one of the first rounds of testing it undergoes is for allergenicity. There are no absolute tests for this, but it the chance that a protein is allergenic can be accurately predicted, since allergens have certain common, recognizable characteristics. Allergenicity testing is required even if the protein's content in the food is less than 0.4%[20]. All approved products, in any case, are monitored for at least three years in the United States and for the entire life of the authorization in the European Union, so that any undesired effects on health or the environment come to light.

The OECD has implemened a procedure (also reviewed by FAO and WHO) based on the sequential collection of data. For example, if a gene derives from a food plant in which it is normally expressed without giving rise to allergies, the assay can be limited to constant exposure to the product. If the protein has a sequence homologous to that of an allergen (six or more identical contiguous amino acids; 35% homology for the entire protein), it must be tested using specific serums and eventually, if necessary, in vivo. The allergenic potential of a protein whose allergenicity is unknown is established with in vitro and live human tests. If the protein is bacterial in origin it undergoes digestion and denaturation resistance assays, again both in vitro and in vivo.

In glyphosate-resistant soy, for example, the transgene is a bacterial form of an enzyme resistant to herbicide. To test its potential allergenicity, it was determined that the GM enzyme is not is not homologous with any allergens; it is easily broken down, has no glycolysis sites in common with allergens and is not glycosylated in plants; makes up 0.02% of total protein; and is susceptible to heat. The transgene was also evaluated for changes in the endogeneous levels of natural allergens. All of this allowed the protein to be declared non-allergenic. Even so, post-release monitoring was required for a further four years[21] [22] [23].

Gene transfer

One concern regarding the use of GMOs in agriculture is the possibility that the transgenes could alter the consumer's DNA. DNA is broken down quickly in the intestinal tract. Nevertheless, the cells of the stomach and the intestine could absorb fragments of DNA[24] [25] large enough to contain entire genes, as reported in the literature[26]. However, as these same researchers demonstrate, this feature is not particular to transgenes since all DNA ingested undergoes the same process.

Antibiotic resistance

Some GMOs on the market contain, in addition to the gene in question, another gene that confers resistance to an antibiotic. Although the use of these genes will be gradually abandoned[27], 90% of today's authorized transgenic plants contain the gene nptll that encodes resistance to kanamycin. The other 10% are resistant to two other antibiotics: ampicillin (bla) and hygromycin (hpt). These antibiotics, at any rate, are rarely used in medicine either because they are toxic for humans as well (kanamycin and hygromycin) or because resistance among microorganisms has long been wide-scale. Therefore, there is a far greater chance that a human pathogen will acquire resistance from bacteria already present in the intestine or in the soil than from foods made from transgenic plants[28].

Under laboratory conditions, the transformation rate (number of transforming cells to number of cells exposed to transgenic DNA) among bacteria is 1 x 10^{-5}, i.e. one in a hundred thousand, while the transformation rate for the same gene from a leaf to a bacterium[29] is about 1 x 10^{-8} (one in a hundred million). This means it is highly unlikely that resistance will be transferred from GM plants to bacteria in the soil and the intestinal tract[30]. In any case, GM products with no genes for antibiotic resistance have been on the market now for several years. MON810, which accounts for roughly 80% of all GM corn, contains no selection markers.

Long-term effects

The question of the long-term safety of GM food is highly controversial. The scientific community, including at worlwide institutions like FAO and WHO, has long debated the topic31. At the end of the day, based on experience not only with GMOs, the general conclusion is that there is no evidence correlating particular toxicological effects with GMOs, so it is highly unlikely that there are long-term effects different from those associated with conventional crops. The consultation process at WHO and the European Union, in any case, has highlighted the need to carry out long-term toxicity tests and monitoring to assure the greatest possible safety of any kind of food.

Animal feed

Much research has been conducted on the effect of specific GMOs in animal feed. There have been studies on chickens, cows and pigs reared on feed containing GM products engineered for pest resistance or herbicide tolerance. These studies have addressed the nutritional differences between GM and non-GM varieties, their effects on milk and egg production, and related qualitative factors. For cows, the studies have gone on for two years and found no significant differences between a GM and a non-GM diet.

Conclusions

The following conclusions can be drawn from the above discussion of GMOs and food safety:

- GMOs are governed by rules that are unparalleled elsewhere in the food industry, so they are more strictly controlled than any other food product. What's more, they must undergo the full range of food safety tests before they are authorized for sale.

- It would be wise to concentrate research not on the technology used to produce these crops, but on their engineered genetic features on a case-by-case basis.

- GMOs now on the market have passed all tests and been properly authorized, so on the basis of current knowledge, they should be considered safe for both human and animal consumption.

- Therefore, the dualistic stance on GM food (i.e. one is either "pro" or "anti") should be abandoned in favor of rational consensus based on knowledge of the process and its products.

These conclusions are consistent with those expressed by the most prestigious national and international scientific organizations. European Union Research Commissioner Philippe Busquin, following a 15-year EU study (1985-2000) involving 400 public research institutions and costing 70 million euros, came to the same conclusion: *"the research demonstrates that genetically modified crops and the products thus far developed and marketed, according to standard risk evaluation procedures, present no risk to human health or the environment. In fact, the use of a more precise technology and the more accurate testing during the regulation phase probably make these crops and products even safer than conventional ones."*[32].

Officially presented November 3, 2004

[1] *Guns, Germs and Steel - Diamond, J. (1997). Italian edition: Armi, Acciaio e malattie, Ed. Enaudi.*

[2] *www.oecd.org*

[3] *Directive 2001/18 on the deliberate emission into the environment of genetically modified organisms. http://europa.eu.int/eurlex*

[4] *Suslow, TV et al. (2002) Biotechnology Provides New Tools for Plant Breeding. University of California. Division of Agriculture and Natural Resources. http://anrcatalog.ucdavis.edu for a summary of the main genetic engineering techniques.*

[5] *http://www-mvd.iaea.org/Refs//MutBree-Rev-1.pdf, http://www-mgr.iaea.org/MGR/default.htm*

[6] *Seishiro Aoki and Kunihiko Syo, Horizontal gene transfer and mutation: Ngrol genesin: the genome of Nicotiana glauca. PNAS, November 9, 1999, vol. 96 no. 23, 13229–1323.*

[7] *EU Directives 90/220 and 2001/18, EU Regulations 258/97 and 1829/2003.*

[8] *Attachment VIII to EU Directive 2001/18.*

[9] *USEPA, 2001. Bacillus thuringiensis Plant-Incorporated Protectants. Biopesticide Registration Action Document, Oct. 15, 2001. U.S. Environmental Protection Agency, Washington, DC, 2001. Bt can be used as a paradigm for analysis and assessment protocols regarding the toxicological and especially allergenic properties of GM crops.*

[10] *EU Directive 2001/18 on the deliberate emission into the environment of genetically modified organisms, which replaced Directive 90/220; http://europa.eu.int/eurlex*

[11] *EU Regulation 1829/2003: EU rules for the authorization and monitoring of genetically modified food and feed (ex 258/97); EU Regulation 1830/2003: traceability and labelling of genetically modified organisms (ex 49 and 50/2000); http://europa.eu.int/eurlex.*

[12] *Expert panel, 2001 Expert panel report. Elements of precaution: recommendations for the regulation of food biotechnology in Canada, The Royal Society of Canada, Ottawa, Ontario, 2001.*

[13] *OECD Safety evaluation, 1993 OECD Safety evaluation of foods derived by modern biotechnology: concepts and principles. Paris, 1993.*

[14] *e.g. FAO/WHO. Safety aspects of genetically modified foods of plant origin. Report of a Joint Food and Agriculture Organization/World Health Organization Consultation. FAO/WHO. Rome, 2000.*

[15] *These tests are run for a minimum of 28 days. See OECD, 1995. OECD Guidelines for the Testing of Chemicals. Test No. 407: Repeated Dose 28-day Oral Toxicity Study in Rodents (adopted 27th July 1995). In the case of corn resistant to the herbicide glyphosate, for example, the study sample was 500 chicks fed for 40 days.*

[16] *To understand the complexity of producing the dossier and the EFSA's risk evaluation procedures, see the 66-page "Draft Guidance Document for the Risk Assessment of Genetically Modified Plants and Derived Food and Feed"; http://www.efsa.eu.int/*

[17] *The analysis refers not only to the nature of the GM product but also to its level. The problem arises when the gene has multiple effects, i.e. when it causes complex metabolic changes. In these cases the control panel also determines the duration of the toxicity study and any need for special tests.*

[18] *In Europe, however, the final decision is not up to the technical committees; once they have expressed their approval the product then has to go through the political channel. That explains why there are GM foods in Europe that are deemed fit for consumption but are nevertheless unauthorized.*

[19] *Replaced since April 2004 by Regulation 1829/2003 ("Food & Feed").*

[20] *A quantity generally insufficient to trigger an allergic reaction. Metcalf D.D., J.D. Astwood, R. Townsand, H.A. Sampson, S.L. Taylor, R.L. Fuchs. Assessment of the allergenic potential of foods derived from genetically engeneered crop plants, Crit. Rev. Fd. Science Nutr. 36, suppl., S165, 1996.*

[21] *Burks A. W., R.L. Fuchs. Assessment of the 4ac endogenous allergens in glyphosate-tolerant and commercial soybean varieties. J. Allergy Clin. Immunol. 96: 1008, 1995.*

[22] *Harrison L.A., M.R. Baily, M.W. Naylor, J.E. Ream, B.G. Hammond, D.L. Nida, B.L. Burnett, T.E. Nickson, T.A. Mitsky, M.L. Taylor, R.L. Fuchs, S.R. Padgette. The expressed protein in glyphosate-tolerant soybean, 5-enolpyruvyilshikimate-3-phosphate synthase from Agrobacterium sp. Strain CP4, is rapidy digested in vitro and is not toxic to acutely gavaged mice. J. Nutr. 126: 728, 1996.*

[23] *Padgette S. R., N.B. Taylor, D.L. Nida, M.R. Baily, J. MacDonald, L.R. Holden, R.L. Fuchs. The composition of glyphosate-tolerant soybean seeds is equivalent to that of convertional soybeans, J. Nutr., 126: 702, 1996.*

[24] *Duggan P.S., P.A. Chambers, J. Heritage, J.M. Forbes. Survival of free DNA encoding antibiotic resistance from transgenic maize and transformation activity of DNA in ovine saliva, ovine rumen fluid and silage effluent. FEMS Microbiology Letters 191: 71-77, 2000.*

[25] *Einspanier R., A. Klotz, A. Kraft, K. Aulirch, R. Poser, F. Schwagele, G. Jahreis, G. Flaschowsky. The fate of forage plant DNA in farm animals; a collaborative case study investigating cattle and chicken fed recombinant plant material. European Food Research Technology 212: 2-12, 2001.*

[26] *Netherwood, T. et al. Assessing the survival of transgenic plant DNA in the human gastrointestinal tract, Nature Biotechnology 22, 204 - 209 (01 Feb. 2004).*

[27] *EU Directive 2001/18*

[28] *VIB (2001) Safety aspects. Safety of Genetically Modified Crops.*

[29] *Smalla, K. (1993). Prevalence of nptII and Tn5 in kanamycin resistant bacteria from different environments. FEMS Microbiol. Ecol. 13:47; Frank Gebhard And Kornelia Smalla. Transformation Of Acinetobacter Sp. Strain Bd413 By Transgenic Sugar Beet Dna. Applied And Environmental Microbiology, Apr. 1998, pp. 1550–1554; Kay, E. et al. (2002) In situ transfer of antibiotic resistance genes from transgenic (transplastonic) tobacco plants to bacteria. Applied Environmental Microbiology, 68:3345-3351.*

[30] *Netherwood, T. et al. (2004) Assessing the survival of transgenic plant DNA in the human gastrointestinal tract. Nature Biotechnology, 22:204-209.*

[31] *FAO/WHO, 2001a FAO/WHO. Evaluation of allergenicity of genetically modified foods. Report of a Joint Food and Agriculture Organization/World Health Organization Consultation. FAO/WHO. Rome, 2001*

[32] *European Union – Review of results of 15-year study on GMOs; http://europa.eu.int/comm/research/quality-of-life/gmo/ European Union – Web page on GMOs. http://europa.eu.int/comm/food/fs/gmo/gmo_index_en.html*