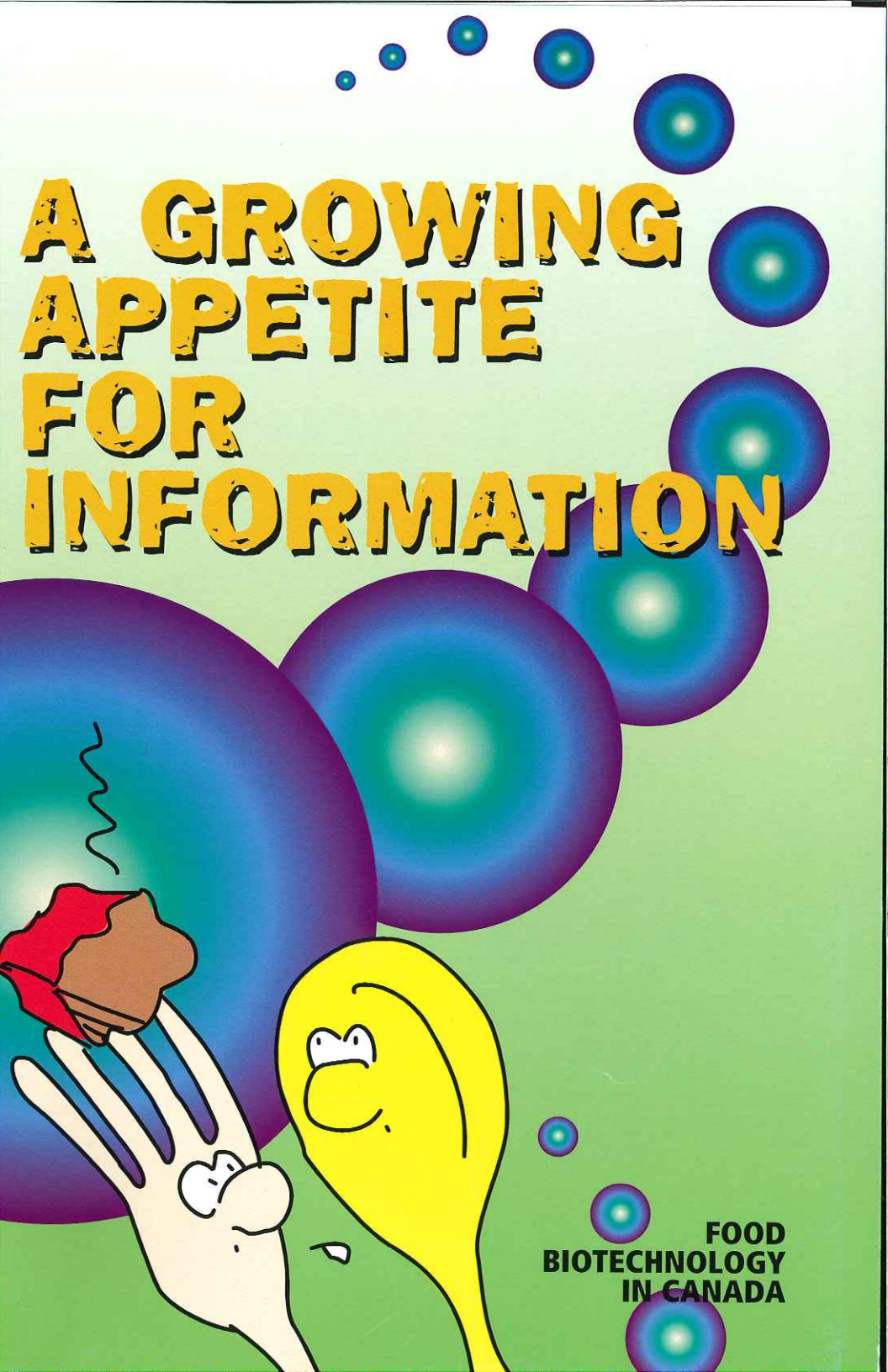
A GROWING APPETITE FOR INFORMATION



FOOD BIOTECHNOLOGY IN CANADA

HAT AKES MODERN OTECHNOLOGY CK

'Every living thing on the planet is built from the same types of molecules, and at the molecular level of life, every living thing functions in fundamentally the same way, whether a human, a goldfish, a maple tree, or an earthworm.

'Biotechnology operates at that molecular level of life, where the seemingly solid boundaries between species disappear. Down among the molecules, there is really no difference between a person and a bacterium. What biotechnology does is choreograph the complex dances among molecules that ultimately make every living thing what it is.'

Eric Grace
Biotechnology Unzipped, Trifolium Books, 1997

THE STORY BEHIND THIS BOOKLET

Modern biotechnology is a very powerful tool. Its power can impress and intimidate. The arguments for and against are similarly powerful ... and bewildering.

Intended as a bias-free zone, this booklet provides a basic introduction to food biotechnology in Canada. We look at products already on the market and those being developed, how products are approved in Canada, a dash of science, and a listing of Canadian government ministries, organizations, and associations interested in food biotechnology.

A Growing Appetite For Information is co-produced by the Consumers' Association of Canada and the Food Biotechnology Communications Network.

We welcome your comments. Please write to us!

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FOOD BIOTECH IN CANADA

There's a story behind each of the thousands of food items that line Canadian supermarket shelves.

Some have undergone a Cinderella conversion, like the cow's milk that becomes a premium ice cream. Others have exotic origins, crossing oceans to become a fiery stir-fry sauce. Or consider fresh sweet corn picked at dawn, shipped at noon, and served at a starlit barbecue.

Indeed, each story is developed by a hardworking cast of characters that includes farmers, researchers, shippers, processors and shopkeepers. This cast combines the factors of climate, geography, economics, and marketing to deliver an ever increasingly diverse selection of food products to meet Canadian needs for taste, convenience, nutrition and price.

Lately, Canadians have begun taking a second look at food. New food products, like those from biotechnology, are re-engaging public interest in food production and processing. For some, this science seems poised to make good on the promise of producing a safe, sustainable and affordable food supply. For others, what science can do, and the pace of change, is confusing, even troubling.

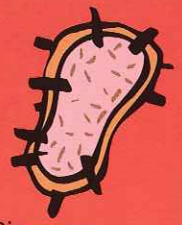
Whether people are for, against, undecided, or somewhere in the middle, many want a behind-the-scenes look at food before it hits the supermarket shelves.

THE NEED FOR ACCURATE, CREDIBLE INFORMATION

'A key question at the heart of biotechnology discussions is the matter of consumer confidence and comfort with the new DNA-based technologies. Research shows that while Canadians have heard of biotechnology, their understanding of it is limited. Citizens want to know that the potential risks associated with such technologies are being adequately addressed. This means that governments and stakeholders must go beyond scientific reassurance; they must also ensure that Canadians get the information they need from a source and in a form that they find useful and credible.'

Renewal of the Canadian Biotechnology Strategy, Canadian Biotechnology Strategy Task Force, 1998

BIOTECHNOLOGY: SOMETHING OLD, SOMETHING NEW



Biotechnology can be a confusing term, but let's take the word apart. Bio means biology, the science of living things. Technology means the tools and processes used to make products. Together, it means using biology to make new products and in our context, food products. The Canadian Environmental Protection Act provides a more technical definition: **'the application of science and engineering in the direct or indirect use of living organisms, or parts or products of living organisms, in their natural or modified forms.'**

Many traditional production methods and familiar foods fit into this basic definition. Grafting plants, breeding animals for desirable traits, and using enzymes to make cheese, and yeast to make bread rise are all examples.

Modern biotechnology, however, is a giant leap in scientific capacity - and to some, it's off and running at an Olympian pace. Genetic engineering, for example, helps scientists do what was once thought impossible: move genes, the hereditary units of living things, from one species to another. It's now possible to transfer genetic material between species that would otherwise never breed.

CANADIAN FOODS WITH A DASH OF BIOTECH

These capabilities are fine, but why, you may ask, should they be done. There are a number of products approved in Canada that illustrate some of the early goals of biotechnology:

HERBICIDES

Both corn and soybean are incredibly versatile crops that can be found in thousands of food and consumer products. Weeds are their major adversary, competing for space, moisture and nutrients. Until recently, farmers have had to use a mix of herbicides, each controlling a specific type of weed, several times throughout the growing season.

The development of broad-spectrum herbicides now allows growers to control a wider range of weeds in a single spray.

With the help of biotechnology, plants have been developed that tolerate these herbicides. This allows farmers to spray less often and use fewer chemicals.

NUTRITION

Canola is the combination of two words - Canadian and oil. Canola was developed by Canadian plant breeders through traditional plant breeding techniques, specifically for its nutritional qualities. The seeds are crushed to obtain canola oil for human consumption and the remainder is processed into canola meal, which is used as livestock feed. Already recognized for its health benefits, research is now being done to further improve on canola's nutritional profile.

PESTICIDES

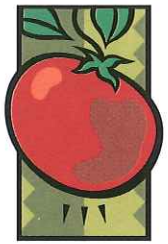
The Colorado potato beetle has been devastating to potato crops in North America for many years, but farmers now have another approach available to them to control this pest. The NatureMark™ potato has been modified to produce a protein that acts as a natural insecticide to the Colorado potato beetle, but does not harm animals or humans. This change means that farmers don't have to use insecticides to control the beetle, and this benefits farmers, consumers, and the environment. Farmers who decide to plant NatureMark™ potatoes also are required to plant a small area of traditional potato varieties nearby. This practice is used to reduce the development of resistance in the beetles and to help maintain a balance in the surrounding ecosystem.

FOOD PROCESSING METHODS

To turn milk into curd, cheese-makers have traditionally used an enzyme called rennet, which is taken from calves. Researchers developed a synthetic replacement for rennet called 'chymosin' (pronounced 'ky-mo-sin'). Chymosin has several advantages over rennet. It's purer, less expensive, and does not use animals. Chymosin is now used in the majority of cheese manufactured in Canada.

QUALITY

The FlavrSavr™ tomato, although approved in Canada, is not currently sold in Canada. This tomato was developed to stay fresh longer, by identifying the gene responsible for ripening, removing it and re-inserting into the tomato backwards. This change did keep the tomato in a ripe, firm shape for a longer period of time. However, after market trial, researchers returned to product development stage to try the technology in other tomato varieties.



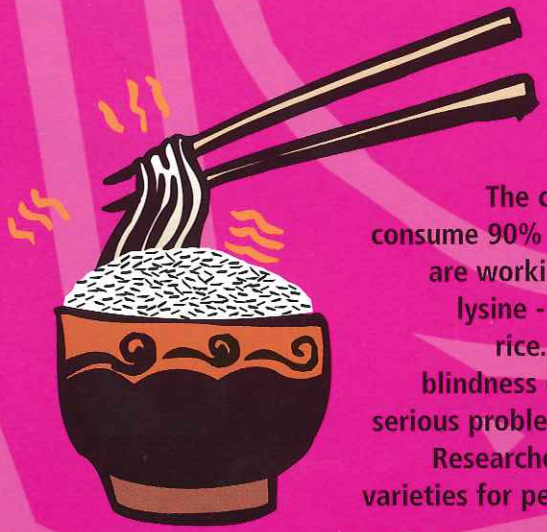
For more information on approved products in Canada, contact the Canadian Food Inspection Agency at (613) 225-2342. Or check their website at:

www.cfia-acia.agr.ca

What are the goals of current research? Some of them may not be immediately obvious, but all have implications for the food we eat. Here are some sample food products and processes being developed here in Canada and around the world.

MILK - Getting the lactose out and the iron in

Milk products are being changed to remove ingredients such as lactose, to which some people are sensitive, or to eliminate allergy-causing proteins. Other research is trying to add ingredients that milk lacks, such as lactoferrin. This essential form of iron is found in human milk but not in cow's milk.



RICE - battling blindness

The countries of Asia produce and consume 90% of the world's rice. Scientists are working to increase the amount of lysine - an important amino acid - in rice. This would reduce childhood blindness caused by lysine deficiency, a serious problem in countries such as China. Researchers are also trying to develop varieties for people who are allergic to rice.

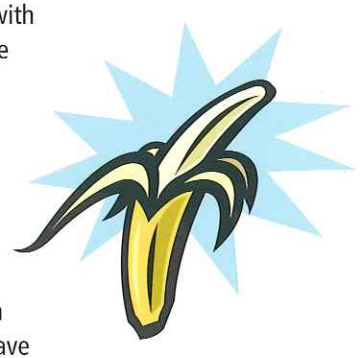
coming soon

'It is estimated that biological knowledge is currently doubling every five years, and in the field of genetics, the quantity of information is doubling every twenty-four months. The commercial possibilities, say the scientists, are limited only by the span of the human imagination and the whims and caprices of the marketplace.'

Jeremy Rifkin, *The Biotech Century,* Tarcher/Putnam, 1998

EDIBLE VACCINES - a simpler means of disease prevention

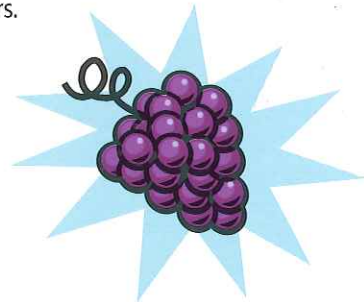
In many countries, cholera and other diarrheal diseases are the leading cause of death. By introducing the cholera gene into potatoes, researchers in California have developed what looks like a simple, nutritious, and effective way to deliver a vaccine against cholera. Initial results estimate that eating one transgenic potato per month, with periodic boosters, could provide sufficient immunity. This work builds on the use of modified raw fruit, such as bananas, to deliver vaccines. Methods for appropriate distribution are being investigated.



Similar research is underway in Australia, where researchers have developed the world's first plant-derived oral vaccine for measles. This method could offer several benefits: reaching infants who are too young for inoculations, and eliminating related costs and storage difficulties with conventional injection methods.

COLD-HARDY GRAPES FOR A CANADIAN CLIMATE

Grape varieties destined for wine cannot withstand harsh winters. Scientists at the University of Guelph are trying to build cold tolerance by transferring a cold-tolerance gene from a wild cousin of broccoli. In a five-year field trial involving an Ontario winery, 75 transgenic grapevines are being compared to regular ones for winter hardiness. It's estimated that by increasing cold tolerance by 2° Celsius, crop output could double in size. The transgenic process could have implications for a wide range of crops.



PERSPECTIVES...

Please contact these organizations for their complete position statements.

CONSUMERS' ASSOCIATION OF CANADA

The consumer interest in biotechnology lies in the protection of consumers' rights to information, to safety, quality and choice, to be heard and to participate in decision making as applications of biotechnology are developed in healthcare and food production. (1989)

AGRICULTURAL INSTITUTE OF CANADA

The Agricultural Institute of Canada (AIC) supports the responsible use of biotechnology as a tool for the advancement of science and technology towards a more sustainable future. (1998)

AGCARE

Farmers see new technologies as tools to further their goal of producing an abundance of wholesome, nutritious food, with the added benefits of reducing input costs and environmental effects. Why and how biotechnology products are used will vary from farm to farm to meet the specific management needs of the farmer to meet this goal. (1988).

CANADIAN FEDERATION OF AGRICULTURE

The Canadian Federation of Agriculture recognizes in principle the rational and responsible use of new technologies in agriculture and agri-food. Included in these new technologies is the development and use of genetically modified plants. (1994)

UNION OF CONCERNED SCIENTISTS

UCS promotes an economically and environmentally sustainable agriculture system, believing the current industrial nature of modern agriculture is not sustainable. UCS attempts to evaluate new technologies for their potential to advance sustainable agriculture and to ensure that the products of the technology are properly regulated.

THE COUNCIL OF CANADIANS

With respect to genetically engineered foods: the life enhancing or life saving benefits must be demonstrable; independent peer review must determine with scientific certainty no adverse impacts for humans or the natural environment; GE products must be clearly labelled in order to permit informed choice. (1999)

NATIONAL FARMERS' UNION

Government policies must safeguard the common good for all Canadians. We believe that small and medium-sized farmers must be involved in policy decisions affecting their businesses; that Health Canada's budget must be sufficient to conduct independent, long-term public research to ensure that every genetically modified technology that is released is safe; and that prior to release, all research is available for timely public and peer review. (1999)

CANADIAN ORGANIC GROWERS

Canadian Organic Growers believes that genetic engineering (GE) contradicts the tenets of organic growing and is detrimental to environmental stability and food quality. GE plants, seeds, pollen, microbes and DNA threaten the natural complexity on which organic agriculture and the food system is based. Inadequate research has been done on the potential long-term hazards on the environment and on humans by the introduction of GE into the food chain. (1999)

THE CITIZENS CONFERENCE ON FOOD BIOTECHNOLOGY

Is this a beneficial technology for all of society? Is this a safe technology? Can the use of this technology respect the individuality of humankind? We conclude that the answer is yes, if we make it so. Our recommendations are intended to ensure that biotechnology belongs to us all. (1999)

CANADIAN COUNCIL OF GROCERY DISTRIBUTORS

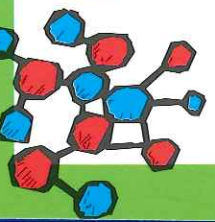
CCGD is confident that the Canadian Novel Food Guidelines provide the assurance of safety of biotechnology products equal to that of all new foods entering the marketplace. CCGD will provide a consistent approach to genetically modified foods, and provide credible information. CCGD will be involved in labelling in response to consumer inquiries and regulatory issues. (1998)

FOOD SAFETY - THE CANADIAN WAY

Canadian foods have an enviable worldwide reputation for safety. This is made possible by the combined effort of government regulatory agencies, consumer associations, medical and health professional associations, food retailer associations, industry, scientists, farmers and the consumer in the marketplace.

Genetically modified foods are regulated by Health Canada under a category known as 'novel foods'. Novel foods include:

- **those that have not previously been used as food**
- **foods resulting from genetic modification, and**
- **foods modified from traditional products using new processes or microorganisms not previously used.**



How is the safety of foods developed through biotechnology assured? **Health Canada** and the **Canadian Food Inspection Agency** share responsibilities for the safety of novel foods developed using agricultural biotechnology.

HEALTH CANADA IS RESPONSIBLE FOR:

- the approval of novel foods
- food labelling policies with respect to health and food safety matters - such as nutritional content, allergens, toxins, etc.

This applies to all foods, including those derived from genetic engineering and other biotechnology processes.

CANADIAN FOOD INSPECTION AGENCY IS RESPONSIBLE FOR:

conducting safety assessments on:

- fertilizers
- seeds
- plants
- animals
- animal vaccines or diagnostics
- feeds, and
- food labelling policies with respect to non-health and safety matters.

Before a product is approved, the assessments of Health Canada and the Canadian Food Inspection Agency determine the safety or potential risks to human, plant and animal health, and the environment.

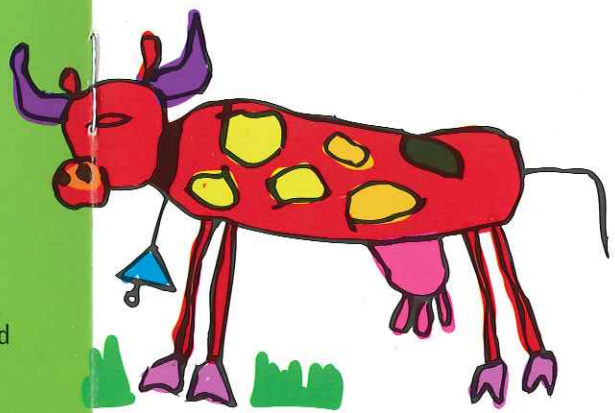
These agencies assess products of biotechnology on a case-by-case basis. Canadian assessment criteria is based upon the best available science and, with international standards, the best independent resources available.

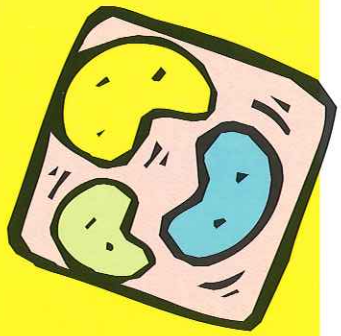
Both agencies have assessment criteria and decision documents available to the public. For more information on the process, check their websites listed on the final page.

Although the agencies do not do the testing themselves, they do require the applicant for the new agricultural product to provide:

- the methods
- the data and results, and
- comparative information from other products.

The applicant pays for the research and the approvals. Agency staff with the necessary expertise evaluate the research results through an extensive process. If the work does not meet the standards, more research will be requested. The product will be approved only if it is considered safe for humans, animals, plants and the environment. Depending on the product, prior to commercial production, approval, registration or licensing might be required.

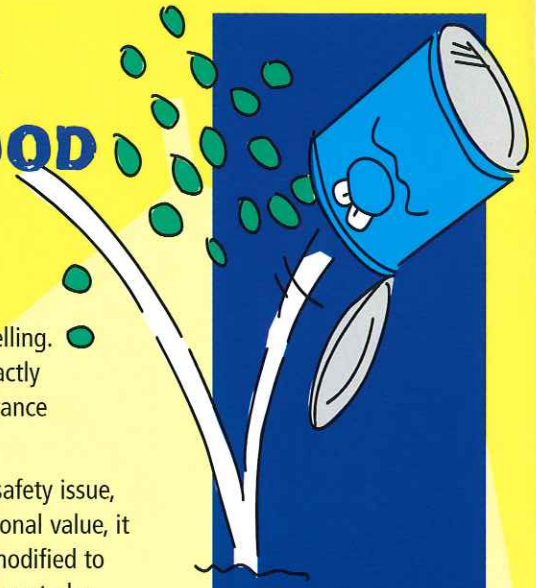




WHAT INFORMATION IS NEEDED TO ASSESS A NEW PLANT VARIETY?

- **how different is this plant from traditional plant varieties?**
- **can this plant become a weed, i.e., become wild?**
- **can this plant breed with wild relatives to create new weeds?**
- **could this plant or its products negatively affect humans or livestock?**
- **are there any unintended effects of this plant on other plants and insects?**
- **do any nutritional differences exist that would affect animal feed?**
- **is this plant variety an improvement on current varieties?**

LABELLING GENETICALLY MODIFIED FOOD PRODUCTS



Should it be mandatory that genetically modified foods be labelled? First, let's understand Canada's current rules on labelling. Genetically modified foods are treated exactly the same as other new foods seeking entrance to the marketplace.

Whenever a product involves a health or safety issue, such as allergenicity or a change in nutritional value, it must be labelled. For example, a tomato modified to contain higher levels of lycopene would have to be labelled to identify the change.

Food manufacturers do have the option to use voluntary labelling standards to promote the fact that they have been modified, or not modified, through genetic engineering. For example, to introduce the NatureMark™ potato in the Maritimes in 1996, the bag was clearly branded, and contained the statement 'improved through plant biotechnology.'

IN ALL CASES, LABELLING MUST BE UNDERSTANDABLE, TRUTHFUL AND NOT MISLEADING.

Labelling seems straightforward until highly processed foods and those derived from major commodity crops like soybeans, corn and canola are brought into the picture. Many processed foods are made from a combination of ingredients from a variety of sources. At present, widespread systems are not in place to grow, harvest, transport, and process modified and non-modified crops in separate 'streams'. That makes tracking difficult. Tests do exist that identify whether crops and ingredients have been genetically altered. However, they have some limitations on what they can test for, commercial availability, and cost-effectiveness.

Found in some fruits and vegetables, lycopene is a powerful antioxidant. Consumption of lycopene also lowers the risk of certain chronic diseases, including cancer and heart disease. Manufacturers of processed tomato products are beginning to list lycopene levels in their products.

It might seem an easy solution to simply add the words 'may contain' that sometimes appear on labels. The original intent of the wording was to allow food processors to substitute ingredients, depending on price and availability. It also alerts consumers to the possible presence of a substance they are trying to avoid, such as something to which they are allergic, or, in this case, something genetically modified.

However, if, in the absence of a reliable system to track genetically modified ingredients, companies resort to using the 'may contain' phrasing in all cases, the once-meaningful warning would soon lose its meaning. Enforcing label accuracy would also be very difficult in the current system.

Canada is playing a leading role internationally in the development of an effective labelling policy. Rather than a mandatory labelling approach, the federal government supports a voluntary system plus the need to communicate by a number of means such as internet, news releases, and point of sale techniques.

ALLERGIES: GENETIC ENGINEERING AS BAD GUY AND GOOD GUY

Allergic reactions to foods can range from mild to life-threatening. These reactions are the result of particular proteins. People who react violently to even trace amounts of a food allergen take extreme precautions to avoid suspect foods. Strict labelling guidelines are helping them play it safe.

Governments, industries, and scientists around the world are well aware that our newfound capacity to move genes between food crops could potentially impact allergenicity levels. The International Food Biotechnology Council, in collaboration with the ILSI Allergy and Immunology Institute, is studying the issue in detail.

While genetic engineering may raise concerns, it may also offer a solution to some allergen problems. Researchers are looking at ways to deploy the new technology so as to reduce or eliminate specific allergenic proteins in crops.

HOW DO CANADA'S LABELLING PRACTICES COMPARE TO OTHER COUNTRIES?

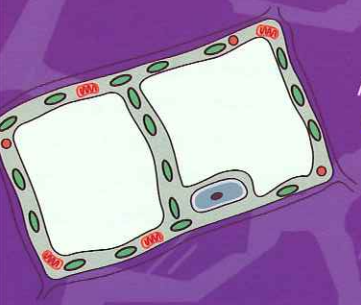
'Canada is a member of the Codex Alimentarius Commission, an international standards-setting body for food. Through its Food Labelling Committee, which is chaired by Canada, Codex is developing guidelines for the labelling of foods derived from biotechnology. Clearly the development of our national guidelines on labelling must be done in conjunction with the development of standards at the international level.'

Information Bulletin,
Biotechnology Strategies and Coordination Office, Canadian Food Inspection Agency
April 1997

BASIC BIOTECH SCIENCE KIT

Biotechnology is rooted in the disciplines of biology, genetics, biochemistry, microbiology, environmental science, and applied technology. For the layperson, familiarity with a few key points and terms can help make sense of the public debate.

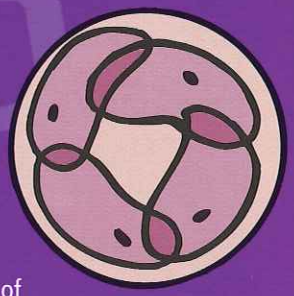
Peering through a microscope, the first thing we see are cells.



CELLS - THE SMALLEST UNITS OF LIFE

All living things - plants, animals, bacteria - are made of **cells**, which are the smallest units of life. Each cell has the ability to breathe, use energy and replicate (i.e., copy itself). At the centre of a cell is the nucleus, which works almost like the human brain. And inside the **nucleus** are rod-shaped structures called **chromosomes**, the carriers of heredity that do the replication work.

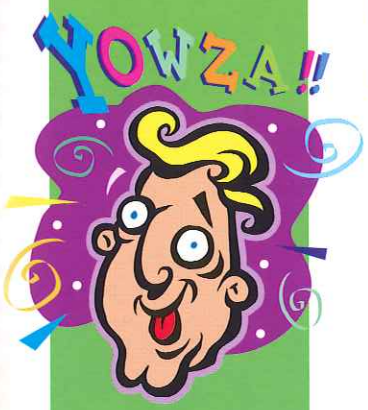
DNA - SOFTWARE FOR REPLICATION



If we could magnify further and do some unraveling, we could see that each chromosome was made up of a tightly-packed and spooled string of a complex chemical called **DNA**. DNA has the set of instructions, or software, to build **proteins** - the compounds of which all life are made.

An even closer look would reveal that DNA is shaped like a twisted, spiral ladder or **helix**. Each rung of the ladder consists of two **nucleotides** (three linked molecules) loosely joined together. The 'runners' of the ladder are made of a complex sugar and phosphates.

A **gene** - the smallest part of a chromosome containing enough information to replicate itself - is no more than a section of the DNA ladder. One gene has the information for one specific protein. DNA has the ability to reproduce itself. First, it splits down the middle. Unattached nucleotides match with attached nucleotides (to form rungs) and other components to re-form two separate DNA ladders. This recombined DNA can then continue the procedure and work with other compounds to create proteins - for living tissue or for other functions, such as **enzymes**.

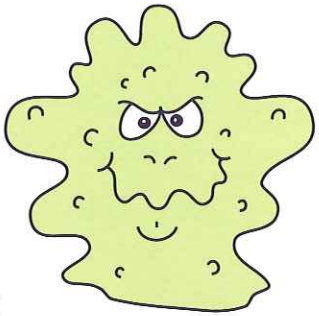


HOW MUCH DNA IS IN THE BODY?

ABOUT ENOUGH TO REACH THE SUN AND BACK AGAIN ...500 TIMES!

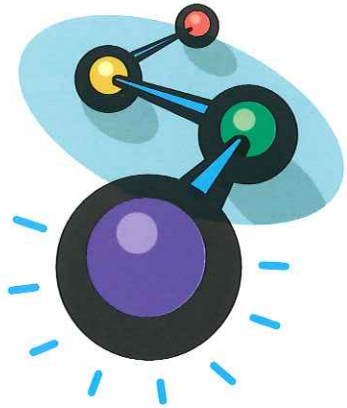
BACTERIAL DNA - THE BASIS OF MODERN BIOTECHNOLOGY

Bacteria are single-celled organisms with no nucleus or chromosomes. Instead, they have independent circles of DNA known as **plasmids**. Bacterial enzymes can quickly 'cut and paste' plasmids to recombine DNA. And, plasmids can readily transfer DNA components from one bacteria to another. In this way, bacteria can quickly change (or mutate) the 'software' in their DNA to adapt to their environment.



Bacteria are prone to viral (**bacteriophage**) infections. **Viruses** use bacteria to replicate themselves. The viruses insert their genetic information inside the bacteria, cutting and pasting with the bacteria (recombining) DNA, and using the bacteria's resources to create more viruses.

Researchers apply the principles of bacterial and viral replication, as well as the organisms themselves (as carriers or 'vectors'), to develop industrial processes to transfer DNA from one organism to the next.



GLOSSARY OF BASIC BIOTECH TERMS

Information about biotechnology is necessarily filled with scientific terminology. This can be intimidating, especially for the non-scientist. Listed below are basic definitions of common biotech words, not all of which were mentioned in this booklet.

Agrobacterium
- A common soil bacterium that can naturally carry genetic information (DNA) into plant cells.

Amino Acid
- Building blocks of proteins.

Antibiotic
- A substance, naturally produced by a microorganism, capable of preventing the growth of other micro-organisms, particularly bacteria.

Bacterium (pl bacteria)
- An organism consisting of one simple cell. Bacteria occur naturally almost everywhere on earth.

Base
- A component of the DNA molecule. There are four different bases in DNA and, for short, they are called A, C, T and G.

Biological process
- A process that involves a reaction normally carried out in a living organism.

Cell
- The smallest structural unit of all living organisms that can survive independently.

Chromosome
- A string of many genes. Each chromosome is a densely coiled molecule of DNA and looks like a tiny thread when observed with a microscope.

Chymosin
- An enzyme that causes milk to clot during cheese-making.

Cloning
- Producing large numbers of identical cells or organisms from a single ancestor.

DNA
- This is short for deoxyribonucleic acid, DNA contains the information which determines the structure of proteins.

Double helix
- The three-dimensional structure of DNA, in which two strands are coiled in a helix (spiral shape).

Enzyme
- Proteins that regulate the chemical reactions inside every living cell and organism.

Expression
- The appearance of a particular characteristic specified by a gene, for example, flower colour.

Gene
- A segment of DNA, carrying genetic instructions to make one protein, like a recipe.

Gene construct
- A sequence of DNA artificially constructed by genetic engineering, like altering an existing recipe.

Gene technology
See genetic modification.

Genetic code
- The sequence of bases in DNA which provides the information necessary for a given characteristic.

Genetic diversity
- The huge variety in DNA sequences found in different organisms, that is responsible for the huge variety of plants and animals in the world.

Genetic engineering
See genetic modification.

Genetic manipulation
See genetic modification.

Genetic modification
- Describes a series of techniques used to transfer the genes from one organism to another, or to alter the expression of an organism's genes.

Genetic marker
- Sequence of DNA that can easily be identified and which therefore can be used as a reference point for mapping other genes.

Genotype
- The genetic make-up of an individual organism.

Heredity
- The transfer of genetic information from parents to their offspring by reproduction, for example leaf shape.

Marker gene
- A gene that is used to identify and select organisms in which genetic modification has been successful.

Microbe
- Any organism that can be seen only with a microscope.

Nucleus
- The structure within cells that contain DNA.

Organism
- A living plant, animal or microbe.

Patent
- A legal contract to protect a new invention.

Phenotype
- The outward appearance of an organism which results from the interaction of both genetic and environmental effects.

Plasmid
- A small, self-replicating ring of DNA found in many bacteria and some yeasts.

Protein
- A molecule composed of many amino acids. There are many types of protein with a range of functions.

RNA
- Ribonucleic acid. A similar molecule to DNA but with a slightly different structure. Plays an intermediary role in converting the information from DNA to those parts of the cell where proteins are made.

Species
- A group of organisms which are capable of interbreeding to produce viable offspring.

Transgenic
- An organism containing genetic material artificially placed there from another organism by the technique of genetic modification.

Viable
- Living matter, like cells or DNA molecules, that is capable or replication.

CONTACTS

FOR MORE NFORMATION CONTACT:

AGCare
(Agricultural Groups Concerned About Resources and the Environment)
90 Woodlawn Road West, Guelph, Ontario N1H 1B2
tel: 519-837-1326 fax: 519-837-1674
e-mail: agcare@agcare.org
web: http://www.agcare.org
- provides crop producers' perspectives on biotechnology development, sustainable agriculture, and responsible use of new farm technologies
- offers information kits and media backgrounders

Agriculture and Agri-Food Canada
Communications Branch
Sir John Calling Building, Rm. E122
930 Carling Ave., Ottawa, ON K1A 0C1
e-mail: commbr@em.agr.ca
web: http://www.agr.ca
- contact point for information dissemination on many aspects of biotechnology that involve multi disciplines, commodities and government departments

Ag-West Biotech Inc.
101-111 Research Drive, Saskatoon,
Saskatchewan S7N 3R2
tel: 306-975-1939 fax: 306-975-1966
e-mail: agwest@agwest.sk.ca
web: http://www.agwest.sk.ca
- supports growth of Saskatchewan's agricultural biotechnology industries and commercialization of related food and non-food technologies
- produces pamphlets, Ag Biotech Bulletin, biotech demonstration labs (SABIC), and background on regulatory issues (SARAS)

BIOTECanada
420-130 Albert Street, Ottawa, ON K1P 5G4
tel: 613-230-5585 fax: 613-563-8850
e-mail: info@biotech.ca
web: http://www.biotech.ca
- industry voice on advocacy, human resources, communications, and international issues
- also advises on public awareness and education

BIOTECanada Human Resources Council
420-130 Albert Street, Ottawa, ON K1P 5G4
tel: 613-235-1402 fax: 613-233-7541
e-mail: bhrc@biotech.ca
- develops qualified, skilled and experienced people for jobs in the Canadian biotechnology sector
- offers training and certification programs, career development and custom designed programs

BioAtlantech
P.O. Box 636, Stn. A, Fredericton, NB E3B 5A6
tel: 506-444-2444 fax: 506-444-5662
e-mail: jgartley@fundy.net
web: http://www.bioatlantech.nb.ca
- promotes investment, partnerships, research and development and development of skilled workforce
- information relating to Atlantic Canada

Canadian Environmental Network
945 Wellington Street, Suite 300, Ottawa, ON K1Y 2X5
Tel: 613-728-9810
e-mail: cen@web.net web: www.cen.web.net
- provides general information and perspectives on environmental issues

Canadian Food Inspection Agency
Office of Biotechnology
59 Camelot Drive, Nepean, Ontario K1A 0Y9
Tel: 613-225-2342 Fax: 613-228-6604
web: http://www.cfia-acia.agr.ca/
- offers general information on biotechnology, regulatory system for agricultural products of biotechnology, and products regulated by the Canadian Food Inspection Agency
- provides information on specific regulatory requirements for safety and environmental assessments of plants, animal feeds, biofertilizers (supplements) and veterinary biologics

Canadian Institute for Environmental Law and Policy
Suite 400, 517 College Street, Toronto, ON M6G 4A2
Tel: 416-923-3529 Fax: 416-923-5949
e-mail: cielap@web.apc.org
web: http://www.web.net/cielap/
- offers general information, as well as social and ethical perspectives on environmental issues
- published *The Citizen's Guide to Biotechnology*, 1995

Canadian Organic Growers
P.O. Box 6408, Station J, Ottawa, Ontario K2A 3Y6
Tel: 613-231-9047 Fax: 613-256-4453
e-mail: COGinfo@gks.com web: www.gks.index.html
- provides general informaton from organic growers' perspective

Canadian Federation of Agriculture
1101-75 Albert Street, Ottawa, Ontario K1P 5E7
tel: 613-236-3633 fax: 613-236-5749
e-mail: cfafca@fox.nstn.ca web: http://www.cfa-fca.ca
- represents over 200,000 farm family members in Canada providing a unified voice on agriculture and food
- information on biotechnology at a national and international level

Canadian Produce Marketing Association
1101 Prince of Wales Drive, Suite 310,
Ottawa, Ontario K2C 3W1
Tel: 613-226-4187 Fax: 613-226-2984
e-mail: question@cpma.ca web: http://www.cpma.ca
- answers queries relating to biotechnology and fresh fruits and vegetables
- provides list of contacts for growers and distributors of fresh produce

Environment Canada
e-mail: enviroinfo@ec.gc.ca
web: http://www.ec.gc.ca/
- information on biotechnology as it relates to Canadian Environmental Protection Act

Consumers' Association of Canada
267 O'Connor Street, Suite 307, Ottawa, ON K2P 1V3
tel: 613-238-2533 fax: 613-563-2254
e-mail: info@consumer.ca web: www.consumer.ca
- volunteer association that represents and informs consumers and advocates action on their behalf to improve quality of life

Action, Reseau Consommateur
1215 Visitation Bureau 103, Montreal, QU H2L 3B5
tel: 514-521-6820 fax: 514-521-0736
- provides general information on consumer opinions based in Quebec
- offers position papers

Fisheries and Oceans Canada
Communications Branch
200 Kent Street, 13th Floor, Station 13228
Ottawa, Ontario K1A 0E6
tel: 613-993-1516 fax: 613-990-1866
e-mail: info@dfo-mpo.gc.ca
web: www.dfo-mpo.gc.ca/
- information on biotechnology as it relates to Fisheries Act, aquaculture and aquatic organisms

Food Biotechnology Communications Network (FBCN)
1 Stone Road West, Guelph, ON N1G 4Y2
tel: 519-826-3440 fax: 519-826-3441
e-mail: diane@foodbiotech.org
web: http://www.foodbiotech.org
- comprehensive information referral service for questions relating to food biotechnology

National Farmers' Union
250C 2nd Avenue South, Saskatoon,
Saskatchewan S7K 2M1
tel: 306-652-9465 fax: 306-664-6226
e-mail: nfu@sk.sympatico.ca
web: http://www.nfu.ca
- a national farm family organization concerned about all aspects of life on farms and all members of farm families
- farmer perspective on biotech issues

Health Canada
Health Protection Branch,
Office of Food Biotechnology
Tunney's Pasture PL 0913A, Ottawa, Ontario K1A 0K9
tel: 613-957-2991 fax: 613-941-5366
e-mail: ofbfood@hc-sc.gc.ca
web: http://www.hc-sc.gc.ca/
- addresses regulatory process and approach to safety assessment of genetically modified foods for human health safety
- makes decision on new products
- various food biotechnology-specific publications available at website

Canadian Biotechnology Strategy Secretariat
7th Floor, Room 744-B, 235 Queen Street
Ottawa, Ontario K1A 0H5
fax: 613-941-5533 e-mail: cbs.scb@.ic.gc.ca
web: http//strategis.ic.gc.ca/cbs
- offers information relating to the federal government Canadian Biotechnology Strategy

Ontario Agri-Food Technologies
1 Stone Road W., Guelph, ON N1G 4Y2
tel: 519-826-4195 fax: 519-826-3389
e-mail: oaft@sentex.net
- promote research and commercialization in Ontario
- support technology development

Council of Canadians
502-151 Slater Street, Ottawa, Ontario K1P 5H3
tel: 613-233-2773 fax: 613-233-6776
e-mail: inquiries@canadians.org
web: http://www.canadians.org
- independent citizen's group providing a critical voice on key national issues
- information from a public perspective

Rural Advancement Foundation International (RAFI)
110 Osborne Street, Suite 202, Winnipeg, MB R3L 1Y5
tel: 204-453-5259 fax: 204-925-8034
e-mail: rafi@rafi.org web: http://www.rafi.ca
- focus on conservation, sustainability and socially responsible development of technologies useful to rural societies
- information on intellectual property rights and genetic diversity

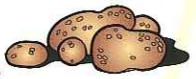
Agricultural Institute of Canada
Suite 1112, 141 Laurier Ave. W., Ottawa, Ontario K1P 5J3
tel: 613-232-9459 fax: 613-594-5190
e-mail: office@aic.ca web: http://www.aic.ca
- federation of provincial institutes of agrologists and scientific and agricultural organizations
- speakers bureau for biotechnology topics

National Institute of Nutrition
265 Carling Avenue, Suite 302
Ottawa, Ontario K1S 2E1
tel: 613-235-3355 fax: 613-235-7032
e-mail: nin@nin.ca web: http://www.nin.ca
- a national not-for-profit dedicated to providing leadership in promoting nutrition for the benefit of all Canadians.

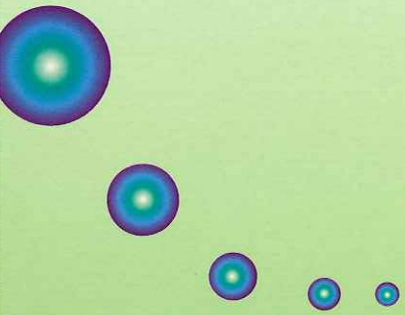
Crop Protection Institute of Canada
21 Four Seasons Place, Suite 627
Etobicoke, ON M9B 6J8
tel: 416-622-9771 fax: 416-622-6764
e-mail: cpic@cropro.org web: www.cropro.org
- representing the manufacturers, developers and distributors of plant life science solutions for agriculture, forestry and pest management.
- provides information on regulatory, safety and environmental issues relating to the use of agricultural chemicals and biotechnology in crops.

CROPS APPROVED FOR FOOD USE - JUNE 1999

PRODUCT	NUMBER OF APPROVALS	TRAIT
Canola	6 Novel Traits	Herbicide Tolerance
	3 Novel Traits	Hybridization System
	1 Novel Trait	High Oleic acid-Low Linoleic acid
	1 Novel Trait	Laurate and Myristate levels
Corn	7 Novel Traits	Herbicide Tolerance
	3 Novel Traits	Insect Resistance
	3 Novel Traits	Herbicide Tolerance, plus Insect Resistance
	2 Novel Traits	Hybridization System
Cotton Seed	2 Novel Traits	Herbicide Tolerance
	2 Novel Traits	Insect Resistance
	1 Novel Trait	Herbicide Tolerance, plus Virus Resistance
Flax	1 Novel Trait	Herbicide Tolerance
Potato	2 Novel Traits	Insect Resistance
	2 Novel Traits	Insect Resistance, plus Virus Resistance
Soybean	1 Novel Trait	Herbicide Tolerance
Squash	2 Novel Traits	Virus Resistance
Tomato	3 Novel Traits	Delayed Ripening


A novel trait (not genetically engineered) for herbicide tolerance in wheat has received environmental and animal feed use approval only.



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