BIOTECHNOLOGY TIMELINE

CELEBRATING INNOVATION IN CANADIAN BIOTECHNOLOGY

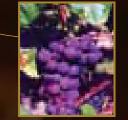
BIOTECanada

Council For
Biotechnology
Information
good ideas are growing

8,000 BC
Humans domesticate plant crops and livestock.

Potatoes are first cultivated for food.

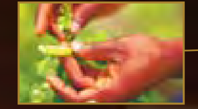
4,000 BC
Egyptians master the art of winemaking.



2,000 BC
Egyptians and Sumerians learn brewing and cheese making.

500 BC
In China, moldy soybean curds become the first antibiotic to treat infections/aliments.

300 BC
Greeks develop grafting techniques for plant breeding.

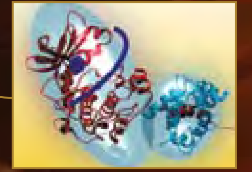


1663
English physicist, mathematician and inventor Robert Hooke discovers the existence of the cell.

1668
Jean Talon establishes Canada's first brewery in Quebec City using two biotechnology-related practices: yeast and fermentation.

1675
Dutch student of natural history and microscope maker Antonij van Leeuwenhoek discovers bacteria.

1833
First enzyme discovered and isolated.

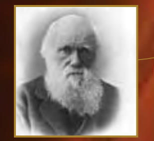


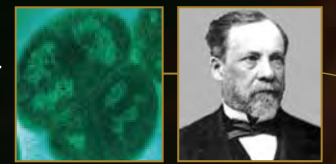
1838
Swedish chemist Jöns Jakob Berzelius discovers proteins.

1839–1855
German scientists Matthias Schleiden and Theodor Schwann propose that all organisms are composed of cells.

Prussian physician Rudolf Virchow declares "every cell originates from another cell."

1859
Charles Darwin's landmark book ***The Origin of Species*** is published.



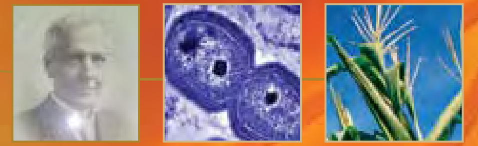


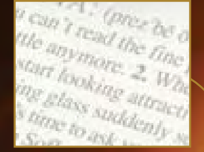
1861
French chemist Louis Pasteur develops pasteurization, a process that protects food by heating it to kill dangerous microbes.

1865
Gregor Mendel, the father of modern genetics, discovers laws of heredity.

1870–1910
Father of modern plant breeding Luther Burbank develops over 800 new strains of fruits, vegetables and flowers. His blight-resistant Burbank potato was heavily planted in Ireland.

Botanist William James Beal produces the first experimental corn hybrid in the laboratory.

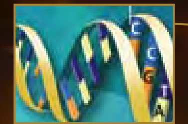




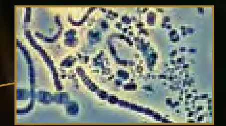
1919
The word "biotechnology" is used in print for the first time.

1922
In Toronto, Dr. Frederick Banting and his assistant Charles Best discover insulin as a treatment for diabetes.

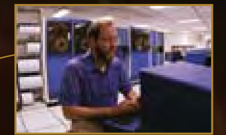
1928
Scottish bacteriologist Sir Alexander Fleming discovers penicillin as an antibiotic.



1941
Danish microbiologist A. Justin coins the term "genetic engineering," a technique involving the transfer of a select piece of genetic material from one organism to another.



1942
Penicillin is first mass-produced using microbes.



1943
Canadian scientist Oswald Theodore Avery isolates pure DNA.

1944
Oswald Theodore Avery and his collaborators, Canadian scientists Colin MacLeod and Maclyn McCarthy, lay the groundwork for modern genetics and molecular biology. They prove conclusively that DNA contained within the nucleus of a cell is genetic material. Prior to their work, genetic material was assumed to be protein.

1953
James Watson and Francis Crick are the first to describe the double helix structure of DNA.

1955
The Salk polio vaccine is licensed in North America. Connaught Laboratories (now Sanofi Pasteur Limited) establishes a global gold standard for the Salk polio vaccine and the vaccine's international export in 1957.

1958
DNA is produced in a test tube for the first time.

1968
Marshall W. Nirenberg and Har Gobind Khorana are awarded the Nobel Prize for deciphering the genetic codes of the 20 amino acids, leading researchers later on to conclude that the genetic code is universal among all living things.

1970
Norman Borlaug becomes the first plant breeder to win a Nobel Prize, for his work on new wheat varieties that increase yield 70 per cent. This marks the beginning of the Green Revolution in world agriculture.

1970
American microbiologist Daniel Nathans discovers the first restriction enzyme that can cut DNA into pieces for various studies and applications. The restriction enzyme technique becomes a fundamental tool in modern genetic research, helping to create the biotechnology industry and providing the basis for the Human Genome Project.

1971
First complete synthesis of a gene.

First gene-spliced DNA from different organisms.

1972
DNA ligase, which links DNA fragments together, is used for the first time.

First synthetic recombinant molecule created by combining DNA from two viruses.

1973
Stanley Cohen and Herbert Boyer develop recombinant DNA technology, considered to be the birth of modern biotechnology. They complete the first successful genetic engineering experiment by inserting a gene from an African clawed toad into bacterial DNA.

1974
Canadian scientists Baldur Stefansson and Keith Downey develop an early form of canola from oilseed through plant breeding techniques. Canola is low in erucic acid and glucosinolate, the substances that make oilseed rape bitter.

1976
The sequence of nucleic acid base pairs that combine to make DNA is determined for the first time for a specific gene.

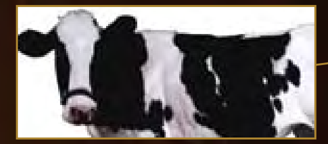
1977
Procedures are developed for rapidly sequencing long sections of DNA.

1978
Recombinant human insulin is first produced.

1981
The golden carp is the first transgenic animal to be cloned.

Canada's first biotechnology company, Allelix, is formed.

1982
The first recombinant DNA vaccine for livestock is developed.



1983
The first genetically engineered product, human insulin, is approved for sale in Canada.

Toronto doctor Tak Wah Mak discovers the T-Cell receptor.

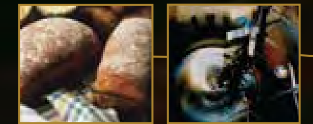
The petunia becomes first whole plant grown from a biotechnology process.

1986
University of Toronto professor John C. Polanyi receives the Nobel Prize for the development of reaction dynamics, a new field of research in chemistry that gives a detailed understanding of how chemical reactions take place.

1987
Genetically engineered hepatitis B vaccine approved for use in Canada.

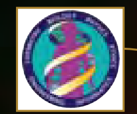
1989
Discovery of defective gene for cystic fibrosis by Dr. Lap-Chee Tsui at Toronto's Hospital for Sick Children.

Naturally occurring bacteria are used to help clean up the Exxon Valdez oil spill off the coast of Alaska.



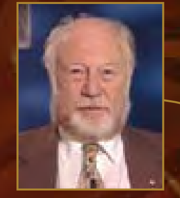
1990
The first food product modified by biotechnology, chymosin, is approved in Canada as a substitute for rennet, the enzyme used in cheese manufacturing to curdle milk.

Modified yeast, the first product of biotechnology, is approved in the U.K.



1990
World's first Human Genome Project launched.

1992
Canada's Human Genome Project announced.



1993
Canadian scientist Dr. Michael Smith wins the Nobel Prize in chemistry for his pioneering work on a method of reprogramming segments of DNA.

1995
The first genetically engineered potato, resistant to the Colorado potato beetle, is sold in Canada.

Canada is the first country in the world to grow biotech crops.

1996
Full commercial production of biotech canola, corn and soybeans begins in Canada.

1997
The world meets Dolly the sheep, the first cloned mammal.

UNESCO adopts the Universal Declaration on the Human Genome and Human Rights.

1998
University of Calgary's Dr. Patrick Lee develops a reovirus as a potential treatement for cancer.

1999
Construction of the world's first artificial cornea by Dr. May Griffith at University of Ottawa.

Canada has 42 foods derived from biotechnology, including canola, corn, cottonseed, flax, potato, soybean, squash and tomato. Health Canada, the Canadian Food Inspection Agency and Environment Canada continue to review the safety of foods derived from genetic enhancement.

EXPLOSION OF BIOTECHNOLOGY

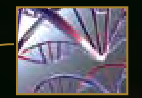
2000
Successful immunization (prevention and immunotherapy) of mice against Alzheimer's by Dr. Peter St. George-Hyslop at the University of Toronto.

Canada produces Starbuck II, the first cloned bull, derived from the world famous bull Hanoverhill Starbuck.

2001
Canada becomes one of more than 130 countries to sign the Cartagena Protocol on Biosafety. It provides an international framework for science-based rules and procedures on the acceptance of genetically enhanced crops.

The Faculty of Veterinary Medicine at University of Montreal uses cloning technology to produce three identical calves.

Aventis Pasteur begins construction of a state-of-the-art facility dedicated to cancer vaccines.



2003
The Human Genome Project, an international, 13-year effort to determine the sequences of the three billion chemical base pairs that make up human DNA, is completed. There are 20,000–25,000 genes in human DNA.

The world celebrates the fiftieth anniversary of Watson and Crick's discovery of the double helix structure of DNA.

Researchers at Canada's Michael Smith Genome Sciences Centre in British Columbia become the first to sequence the SARS genome.

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2004
The Supreme Court of Canada votes 5–4 in the case of Schmeiser v. Monsanto, maintaining Monsanto's patent on a gene providing greater certainty on intellectual property protection in Canada.

BIOTECanada launches the first annual National Biotechnology Week in September.

2005
Canada boasts more than 500 biotechnology firms in the country.

The billionth acre of a biotech crop was planted by one of 8.5 million farmers, in one of 21 countries.

Prince Edward Island's Novartis Aqua Health Business licenses the world's first commercial DNA Vaccine (APEX-IHN™) for a viral disease in salmon.

2006

Researchers from the Toronto Western Research Institute and the University of Toronto restore some movement in rats paralyzed from spinal cord injuries by using transplanted brain cells taken from adult mice.

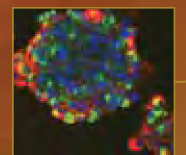
Calgary-based SemBioSys Genetics Inc. produces commercial quantities of human insulin from genetically modified safflower plants.

The first vaccine against certain types of the human papillomavirus is approved for use for girls and women in nine countries and the European Union.

A new animal model of temporal lobe epilepsy receives a U.S. patent. The model was developed by University of Prince Edward Island professors and enables researchers to better understand what causes the brain to develop abnormally.

2007
McMaster University researchers led by Dr. Mick Bhatia discover embryonic stem cells build their own environment to keep them in a state from which they can specialize, or become other cells. The discovery offers researchers a way to control stem cells to use them to repair damage by diseases.

Canadian and U.S. researchers detect a new gene (KIAA0350) involved in type I diabetes that could help in earlier detection and treatment of the disease most often associated with children.



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