How Old Is Biotechnology?

The word biotechnology can be traced to 1917, when it was used to refer to a large-scale production of materials from microbes grown in vats. But the roots of the technology are as familiar and as ancient as baking yeast breads - traceable back 6,000 years.

- **4000 BC**: Classical biotechnology: Dairy farming develops in the Middle East; Egyptians use yeasts to bake leavened bread and to make wine.
- **3000 BC**: Peruvians select and cultivate potatoes.
- **2000 BC**: Egyptians, Sumerians and Chinese develop techniques of fermentation, brewing and cheese-making.
- **500 BC**: Mediterraneans develop marinating and Europeans develop salting, which leads to curing and pickling to flavor and preserve food.
- **1500 AD**: Acidic cooking techniques lead to sauerkraut and yogurt - two examples of using beneficial bacteria to flavor and preserve food. Aztecs make cakes from Spirulina algae.
How Old Is Biotechnology? (continued)

- **1861**: French chemist Louis Pasteur develops pasteurization - preserving food by heating it to destroy harmful microbes.
- **1865**: Austrian botanist and monk Gregor Mendel describes his experiments in heredity, founding the field of genetics.
- **1879**: William James Beal develops the first experimental hybrid corn
- **1910**: American biologist Thomas Hunt Morgan discovers that genes are located on chromosomes.
- **1928**: F. Griffith discovers genetic transformation - genes can transfer from one strain of bacteria to another.
- **1941**: Danish microbiologist A. Jost coins the term *genetic engineering* in a lecture on sexual reproduction in yeast.
How Old Is Biotechnology? (continued)

<table>
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<tr>
<th>Year</th>
<th>Event</th>
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<td>1943</td>
<td>Oswald Avery, Colin MacLead and Maclyn McCarty use bacteria to show that DNA carries the cell's genetic information.</td>
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<td>1953</td>
<td>James Watson and Francis Crick describe the double helix of DNA, using x-ray diffraction patterns of Rosalind Franklin and Maurice Wilkins.</td>
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<td>Early 1970's</td>
<td>Paul Berg, Stanley Cohen and Herbert Boyer develop ways to cut and splice DNA, introducing recombinant DNA techniques.</td>
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<td>1975</td>
<td>Scientists organize the Asilomar conference to discuss regulating recombinant DNA experiments. George Kohler and Cesar Milstein show that fusing cells can generate monoclonal antibodies.</td>
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<td>1982</td>
<td>First genetically engineered product - human insulin produced by Eli Lilly and Company using E. coli bacteria - is approved for use by diabetics.</td>
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<td>1984</td>
<td>Kary Mullis develops polymerase chain reaction (PCR) to mass-produce specific DNA fragments.</td>
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- **1986**: First release into the environment of a genetically engineered plant (a tobacco).
- **1987**: First release of genetically engineered microbes in field experiments.
- **1990**: Pfizer Inc., introduces Chymax chymosin, and enzyme used in cheese-making - first product of recombinant DNA technology in the U.S. food supply.
- **1993**: After nearly 10 years of scientific review and political controversy, the U.S. Food and Drug Administration (FDA) approves Monstanto Co.'s version of rBGH/rBST to increase milk production.
- **1994**: Calgene, Inc., markets the FLAVRSAVR tomato - first genetically engineered whole food in the U.S. food supply.