

# Biotechnology

### What is Biotechnology?

Biotechnology includes new tools that were inspired by living things. We see examples of biotechnology in farming, manufacturing, and in medicine. This is very similar to biomanufacturing, but biotechnology focuses on specific tools. In these areas, biotechnology helps us change genes in living things to make them better. We can change genes to help plants grow better or to help people with genetic diseases. Each area of biotechnology does things a little bit differently.

### Key terms

- **Biomanufacturing:** A process that produces commercially relevant biological materials.
- **Gene:** A collection of DNA found in chromosomes that controls what characteristics are passed on to a person, animal, or plant.
- **Genetic diversity:** the total number of genetic traits possible in a population of organisms.



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### Agricultural Biotechnology

In agriculture, **biotechnology** looks like **genetically modified** plants and animals. That means, scientists can make changes to the **DNA** of plants or animals, so they develop a certain way. This idea isn't new. There are many types of apples. This is because we liked certain things about certain apples. Farmers selected those apples over others because their customers liked them more. Today, scientists can select specific **genes**. Scientists can pick genes to keep plants and animals healthy and increase the amount of food produced.

## Industrial Biotechnology

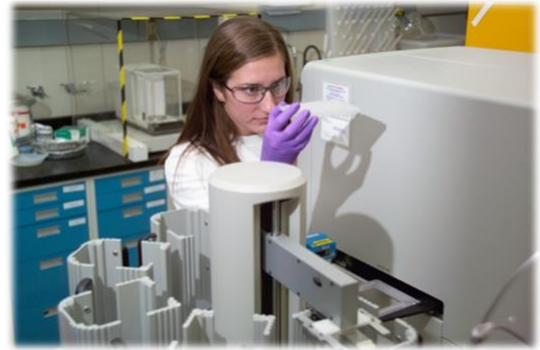
**Industrial biotechnology**, sometimes called **biomanufacturing**, helps us make chemicals, energy, and materials. It can do this by using processes we find in nature and using them to help us. One example is cheese! Cheese starts out as milk, but how does it become cheese? Well, bacteria **ferment** it. **Fermentation** is a process in which bacteria, fungi, or yeast eat some chemicals and make them hotter. The bacteria make the milk hotter and make new chemicals, which turn the milk into cheese. A similar thing happens to bread and yogurt.

## Connection to Cyberbiosecurity

Biotechnology can do some amazing things. A lot of those things we will eventually eat. This includes our lunches today, or medicines we take when we are sick. While most of the processes come from nature, we usually recreate the processes in a lab or factory. Those factories are run by computers. Making sure those computers stay protected is very important. If those computers are not working right, some people could get sick. Having people in charge of keeping those computers safe, keeps us safe too!

## Medical Biotechnology

**Medical biotechnology** is like **industrial biotechnology**, but it focuses specifically on medicine. For example, we see fungi, like mushrooms, all the time. Well, some of these fungi can protect themselves from bacteria. This is just something they can do on their own. Some scientists thought the fungi might be able to help us too. By studying how the fungi protect themselves we can create medicine. This is how we got penicillin.



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## CAIA

### Scientist Spotlight

**Sabrina Amorim** is an Animal Scientist with Master's of Science in Genetics and Animal Breeding, and currently a Ph.D. Student in the [School of Animal Sciences](#) at Virginia Tech. Her research interest includes quantitative genetics and image analyses of high-throughput phenotyping data. She is interested in better understanding the genetic architecture of economically important traits in livestock and applying and developing ways to use statistics to predict the occurrence of traits. Sabrina is a CAIA Graduate Student Affiliate.



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# Acknowledgements

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David Smilnak, *Ph.D. Student, Department of Agricultural, Leadership, and Community Education*

Sabrina Amorim, *Ph.D. Student, Department of Animal and Poultry Science*

Jaylan Day, *Undergraduate Student, Department of Chemistry*

Madison Powell, *Undergraduate Student, Department of Agricultural, Leadership, and Community Education*

Emily Mullins, *Undergraduate Student, Department of Agricultural, Leadership, and Community Education*

Dr. Hannah Scherer, *Associate Professor and Extension Specialist Teaching and Learning, Department of Agricultural, Leadership, and Community Education*

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