Research # 1- Bromelain: Enemy of Proteins Everywhere
Tom Scheve

Columbus first laid eyes on a pineapple in 1493, although pineapple wasn't native to the Caribbean islands where they met. Though commonly thought of as a traditional Hawaiian food, the sweet, spiky fruit originally hails from Brazil.

In the 1890s, researchers began isolating and studying bromelain, a natural protein-digesting enzymes found in pineapples. They discovered that bromelain is quite effective at dividing proteins such as collagen.

Although bromelain is found in every part of the pineapple, it's most plentiful in the stem. Most commercially grown pineapple is sliced, canned or juiced. The remains are rich with this corrosive substance, which is then extracted. Powdered bromelain is used for tenderizing meat, as well as treating inflammation, swelling, indigestion and even excessive blood clotting. Bromelain works in these capacities due to its ability to separate amino acids. Amino acids are organic compounds within living cells.

Research #2- Temperature Effects on Enzyme Activity
Scott Stagg

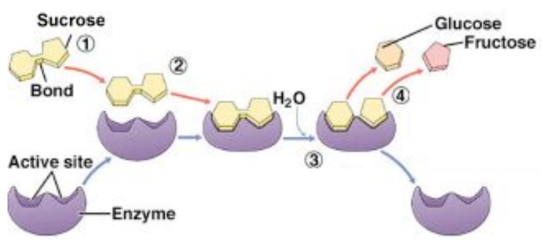
Every enzyme has a temperature range of optimum activity. Outside that temperature range the enzyme is rendered inactive and is said to be totally inhibited. This occurs because as the temperature changes this supplies enough energy to break the protein structure. When this structure is disturbed and changed, this causes a change in the active site. The active site is altered in its conformation beyond its ability to accommodate the substrate molecules it was intended to speed up.

Most enzymes (and there are hundreds within the human organism) within the human cells will shut down at a body temperature below a certain value which varies according to each individual. This can happen if body temperature gets too low (hypothermia) or too high (hyperthermia).

Research #3- Enzymes: A Quantitative Approach
Cara Council-Garcia

Many chemical reactions such as some metabolic processes are essential for an organism to survive but, paradoxically, are not quick enough to sustain life. Biological catalysts, or enzymes, are chemical agents that influence the rate of a reaction without changing the reaction. An enzyme is a protein that allows reactions to occur at much higher rates. With the help of enzymes, those slow reactions can occur quickly enough to sustain life.

Enzymes are substrate-specific. This means they are very “picky” and only react with specific substrates to form products. In a normal enzymatic reaction the enzyme and substrate collide randomly in a solution and join at the enzyme’s active site. This collision works much like a lock and key effect. The active site has a specific shape that only a particular substrate fits into. When the two are joined they react and the substrate is converted into a product. Once the reaction is complete the enzyme and newly formed product separate with the enzyme left unchanged. Below is an example of the enzymatic reaction between the sugar, sucrose, and its enzyme, sucrase. In the end, sucrose is converted to glucose and fructose.



Enzymes are proteins that function based on their 3-D shape. The easiest way to change the 3-D shape of a protein is to heat it. At high temperatures the protein will denature, or lose its 3-D shape, and no longer function. Temperature can also affect a reaction by increasing or decreasing the rate of collision between enzyme and substrate. If heat is increased than molecules (in this case enzyme and substrate) will move more quickly in solution, collide at higher rates and react more quickly. Conversely, if the temperature is decreased than those same molecules will move more slowly, collide less frequently and therefore, react more slowly. Using the above information, one would expect that with increasing heat the enzymatic reaction rate will also increase, BUT, only to a certain point. If the temperature is too high, than the enzyme will denature and the reaction will not run.

Research #4- Enzymes Make the World Go 'Round
Andrew Rader

Enzymes are proteins that act as catalysts and help complex reactions occur. You all know about cars and the assembly lines where they are made. There are giant robots helping people do specific tasks. Some lift the whole cars, some lift doors, and some just put bolts on. Enzymes are like those giant robots. They grab one or two pieces, do something to them, and then release them. Once their job is done, they move to the next piece and do the same thing again. There are little protein robots inside your cells. Enzymes complete very, very specific jobs and do nothing else. The robot that was designed to move a car door can't put brakes on the car. The specialized robot arms just can't do the job. Enzymes are the same. They can only work with specific molecules and only do specific tasks. For example, you might have a protein in a cell. Even with hundreds of amino acids in the chain, the overall shape changes if one amino acid is different. That tiny shape change could stop the enzyme from doing its job.

There are four steps in the process of an enzyme at work:

1. An enzyme and a substrate are in the same area. The substrate is the biological molecule that the enzyme will work on.

2. The enzyme grabs on to the substrate at a special area called the active site. Enzymes are very, very specific and don't just grab on to any molecule. The active site is a specially shaped area of the enzyme that fits around the substrate. The active site is like the grasping handle of the robot on the assembly line. It can only pick up one part.

3. A process called catalysis happens. Catalysis is when the substrate is changed. It could be broken down or combined with another molecule to make something new.

4. The enzyme lets go. This is a big deal. When the enzyme lets go, it returns to normal, ready to work on another molecule of substrate. The first molecule is no longer the same. It is now called the product.

Research #5- How Cells Work
Marshall Brain

At any given moment, all of the work being done inside any cell is being done by enzymes. If you understand enzymes, you understand cells. A bacterium like E. coli has about 1,000 different types of enzymes floating around in the cytoplasm at any given time.

Enzymes have extremely interesting properties that make them little chemical-reaction machines. The purpose of an enzyme in a cell is to allow the cell to carry out chemical reactions very quickly. These reactions allow the cell to build things or take things apart as needed. This is how a cell grows and reproduces. At the most basic level, a cell is really a little bag full of chemical reactions that are made possible by enzymes!

Enzymes are made from amino acids, and they are proteins. When an enzyme is formed, it is made by stringing together between 100 and 1,000 amino acids in a very specific and unique order. The chain of amino acids then folds into a unique shape. That shape allows the enzyme to carry out specific chemical reactions -- an enzyme acts as a very efficient catalyst for a specific chemical reaction. The enzyme speeds that reaction up tremendously.

For example, the sugar maltose is made from two glucose molecules bonded together. The enzyme maltase is shaped in such a way that it can break the bond and free the two glucose pieces. The only thing maltase can do is break maltose molecules, but it can do that very rapidly and efficiently. Other types of enzymes can put atoms and molecules together. Breaking molecules apart and putting molecules together is what enzymes do, and there is a specific enzyme for each chemical reaction needed to make the cell work properly.