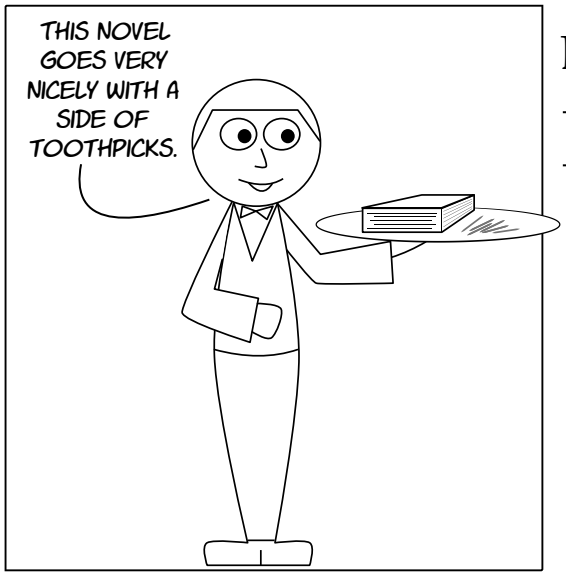
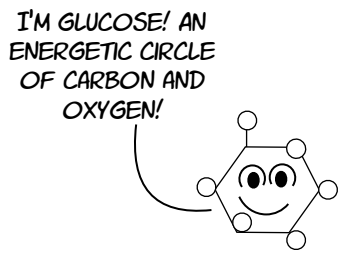
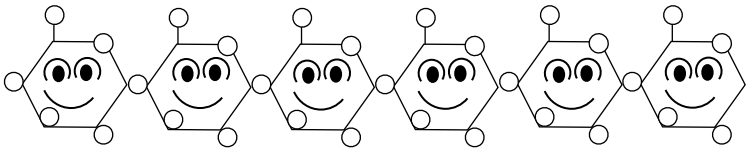
HOW COME *RESTAURANTS* DON'T SERVE WOOD?

A story about enzymes and polymers. And termites too.

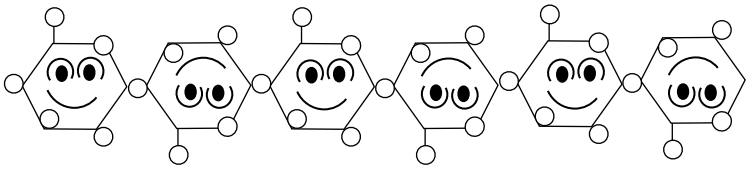


A termite can eat a piece of wood and get energy from it. A cow can eat grass and get energy from that. But if you eat wood or grass it's called *fiber.* Your body can't digest it and it passes straight on through. Have you ever wondered why? Why can you live for weeks on a diet of potatoes, but not newspapers or twigs? Let's start with taking a look at the main building blocks of wood and food: cellulose and starch.





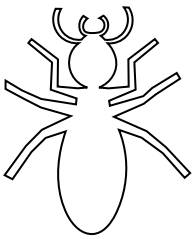
String glucose together like this, and you get starch—A big ingredient in things like potatoes and corn and rice and wheat.



String glucose together like this, and you get cellulose—the main ingredient in things like leaves and straw and wood.

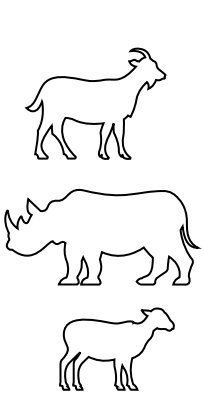
CAN YOU SPOT THE DIFFERENCE BETWEEN STARCH AND CELLULOSE?

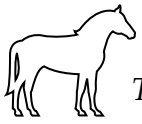
Cellulose and starch are both polymers made of the same building unit: glucose. The difference between them is HOW the glucose molecules are linked together. In starch, all the molecules are facing the same way. We call this an alpha linkage. In cellulose, every other glucose is flipped upside down. We call this a beta linkage. When you eat starch, your body can break that alpha linkage apart so each of your cells can eat the glucose. But beta linkages are tricky. They can only be broken by bacteria and fungi with the cellulase enzyme. NOT A SINGLE ANIMAL has this enzyme. So then how in the world do termites eat wood? How do horses cows, goats, and sheep eat grass?



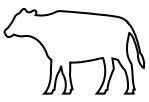
THE TERMITE

Termites have special bacteria living in their stomachs that digest cellulose for them, breaking it apart into glucose. Give a termite an antibiotic, and it would starve to death no matter how much wood it ate. The termite can only digest wood with the help of it's special "termite gut microbes."



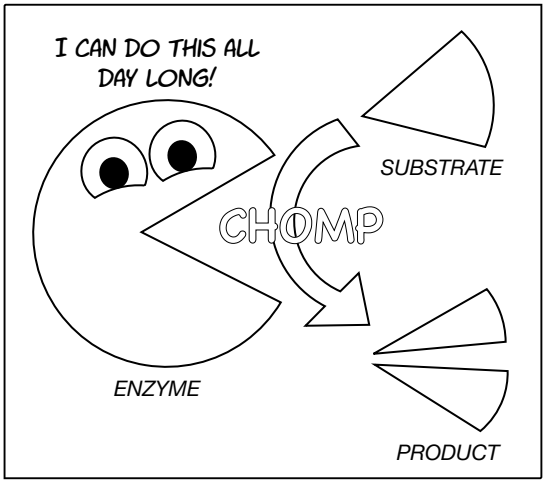


THE HERBIVORES



Herbivores also digest grass with the help of bacteria. Some herbivores (cows) have 4 stomachs to provide even better homes for those important little microbes. Others, like the camel and hippopotamus, have 3 stomachs. And horses have just 1, plus a long "water gut" that provides the perfect place for the bacteria to do their work.

ENZYMES



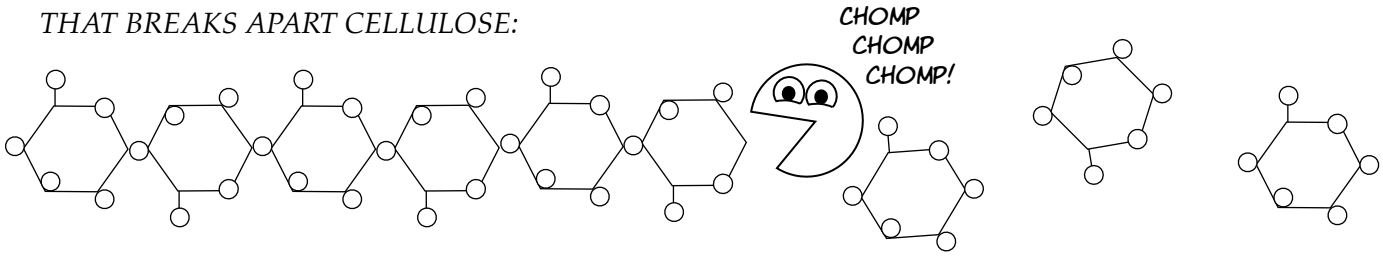
An enzyme is like a small machine that takes thing A (the substrate) and turns it into thing B (the product). Enzymes are very specific with their jobs. Almost always, an enzyme will do only one job and it will do that same job over and over and over and over again.

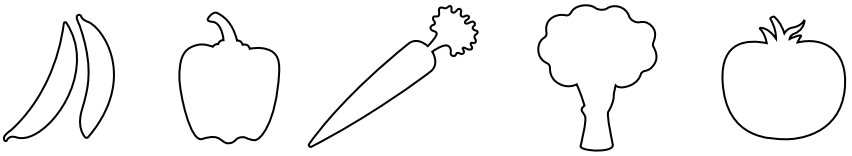
WHAT'S WITH ALL THE -ASE NAMES?

*It's tradition to name an enzyme after it's substrate, and then put "ase" (rhymes with face) on the end of the word. So the enzyme cellul**ase** digests cellulose, lip**ase** breaks down fats (lipids), prote**ase**s digest proteins, the enzyme telomer**ase** builds telomeres—a specific part of DNA. My favorite enzyme name of all is a very famous one called RuBisCO. At first glance, it looks like RuBisCO missed out and didn't get it's -ase, but actually, it got TWO of them. RuBisCO is nickname for Ribulose-1,5-bisphosphate carboxyl**ase**/oxygen**ase**.*

CELLULASE

AN IMPORTANT LITTLE ENZYME THAT BREAKS APART CELLULOSE:

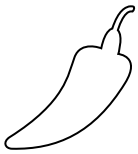


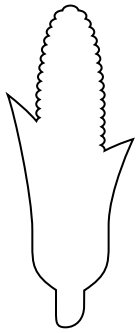


DARK GREEN VEGETABLES, LEGUMES, AND WHOLE GRAINS ARE THE FOODS WITH THE MOST FIBER.

WHY FIBER IS IMPORTANT

We can't digest cellulose, but does that mean we don't want to eat it? Not so fast! If you were able to digest absolutely *everything* you ate, well, that would be a bit of a problem. How would you get rid of things your body didn't want? Cellulose—also known as fiber—is a very important part of our diet. One quick example: Too much cholesterol in your blood can lead to heart attacks. How does your body get rid of excess cholesterol? It puts it into your gut, and if you have enough fiber, the fiber binds to the cholesterol and takes it out with the trash. If you don't have enough fiber, the cholesterol is reabsorbed into the bloodstream. Uh oh! And that's just one of the many benefits of having enough fiber in your diet.





IF YOU ATE WOOD OR SAWDUST, IT WOULD PASS THROUGH YOUR DIGESTIVE TRACT MUCH LIKE OTHER FIBER DOES. BUT SOME OF THE THINGS THAT GO WITH IT (LIGNINS) AREN'T VERY HEALTHY. PAPER ISN'T A GOOD SOURCE OF DIETARY FIBER EITHER BECAUSE OF THE GLUES AND BLEACH IT CONTAINS. WITH GREEN LEAFY VEGETABLES AND LEGUMES, ON THE OTHER HAND, YOU GET FIBER AND NUTRITIOUS VITAMINS AND MINERALS.

SCIENCE MOM
JENNYBALLIF.COM