

NATHAN:

Why does your fridge start to smell, and where does that icky black liquid come from? Wouldn't life just be easier if things didn't rot? If things lasted forever? Well, maybe, but probably not. According to the USDA, the average American household wastes 25% of its food, and a lot of restaurants are even worse.

So if we didn't have decomposition, what would happen to the food we throw away? Food in landfills normally gets dealt with by bacteria, fungi, and protists that allow the nutrients in food to return to the soil, and eventually, other living things. These decomposers also break down other dead stuff, like trees. In fact, they're pretty much the only thing that can eat wood.

So in a world without rot, while your home may not have to worry about being eaten by termites who rely on protists in their stomach, pretty soon, forests and landfills would be flooded with a lot of dead stuff. How do we avoid this problem? Well, basically, in your fridge, on a forest floor, in a dumpster, almost anywhere, there are fungi, bacteria, and protists that live entirely by eating dead stuff.

These dead things can be more or less divided into three categories. Carbohydrates-- sugar and starches. Lipids-- think fats. And proteins, like meats. All of these are chemically different, so they each get broken down by different enzymes in different ways before being absorbed by decomposers. For example, proteases break down proteins into amino acids, the cell's building blocks. Lipids rely on lipases, and carbohydrates on things like amylase and cellulases.

So how does a perfectly nice broccoli floret start giving off this foul black liquid? Fruits and vegetables are almost entirely made of water. So, on the most basic level, you could say that cells are like extremely complex water balloons. The exterior, or cell wall, is made of cellulose, a complex carbohydrate that gets broken down by enzymes into small sugars the cell can get energy from. When a bacteria or fungi uses cellulase to eat the exterior of a cell, it's like if I were to pop the balloon. That's the muck you see in your fridge. That's how you get that icky black liquid.

What about that stink? For fruits and vegetables, a lot of time, the smell happens after the icky black liquid forms. Other bacteria that weren't involved in the initial colonization move in and start to stink everything up. Meat gets smelly when lipases break down fat in the meat into

glycerol and fatty acids to energy sources. And fatty acids are kind of gross. And so while your food rotting may smell absolutely terrible, because of it, the environment is able to recycle crucial nutrients it needs. And, well, that's why we have all this.