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Imagine that the garbage collector does not come to empty your bins and lets the garbage pile up. I bet you would notice that very quickly and contact the city to resume garbage collection. But what about garbage disposal that we can't see, like the ones in our cells. The cell is the basic unit of life, and each cell is made up of about 42 million functional building blocks called proteins. These proteins need to be disposed of or recycled after they have performed their function, are worn out, or become faulty. When unwanted proteins in the body are not recognized as garbage, they pile up, leading to diseases like heart disease, brain disease, or cancer.

What if we could find a way to make sure that cells always recognize unwanted proteins as garbage? This is what my research is about, but first, let's understand how garbage disposal works in our cells. While the garbage collector knows what to take because it's in the bin, cells use a protein tag called ubiquitin or Ub to identify garbage proteins. However, the Ub cannot attach to the unwanted proteins by itself. Instead, it needs the help of a category of enzymes called E3. There are many forms of this enzyme that are specific to the kinds of proteins they can attach Ub to, and eliminate.

In my project, I designed a protein called UbVIP, that acts much like a magnet: one end attracts the target garbage protein, and the other end attracts an E3. When that connection is made, the Ub is transferred to the garbage protein so that it can be recognized and disposed of. In the lab, I put UbVIP into cells and found that my target protein was disposed of. What is great about this UbVIP? It can let any E3 tag any garbage protein, even if it not normally the protein it works on. My next step is to investigate whether it is as effective for other garbage proteins.

Why is this important? Disease treatment is getting more precise, where drugs are made to target the faulty proteins, but up to 85% of disease-causing proteins are still 'undruggable'. My research will expand drug development tools available such that more E3 can be recruited to tag these 'undruggable' proteins and get rid of them.

So, while we don't need to worry about the garbage collector picking up garbage in the city, I am glad my work is finding a solution to make sure that garbage proteins are picked up in the cell.

grab Ub and attach it to different proteinsspecific enzymes found within the E3 category.