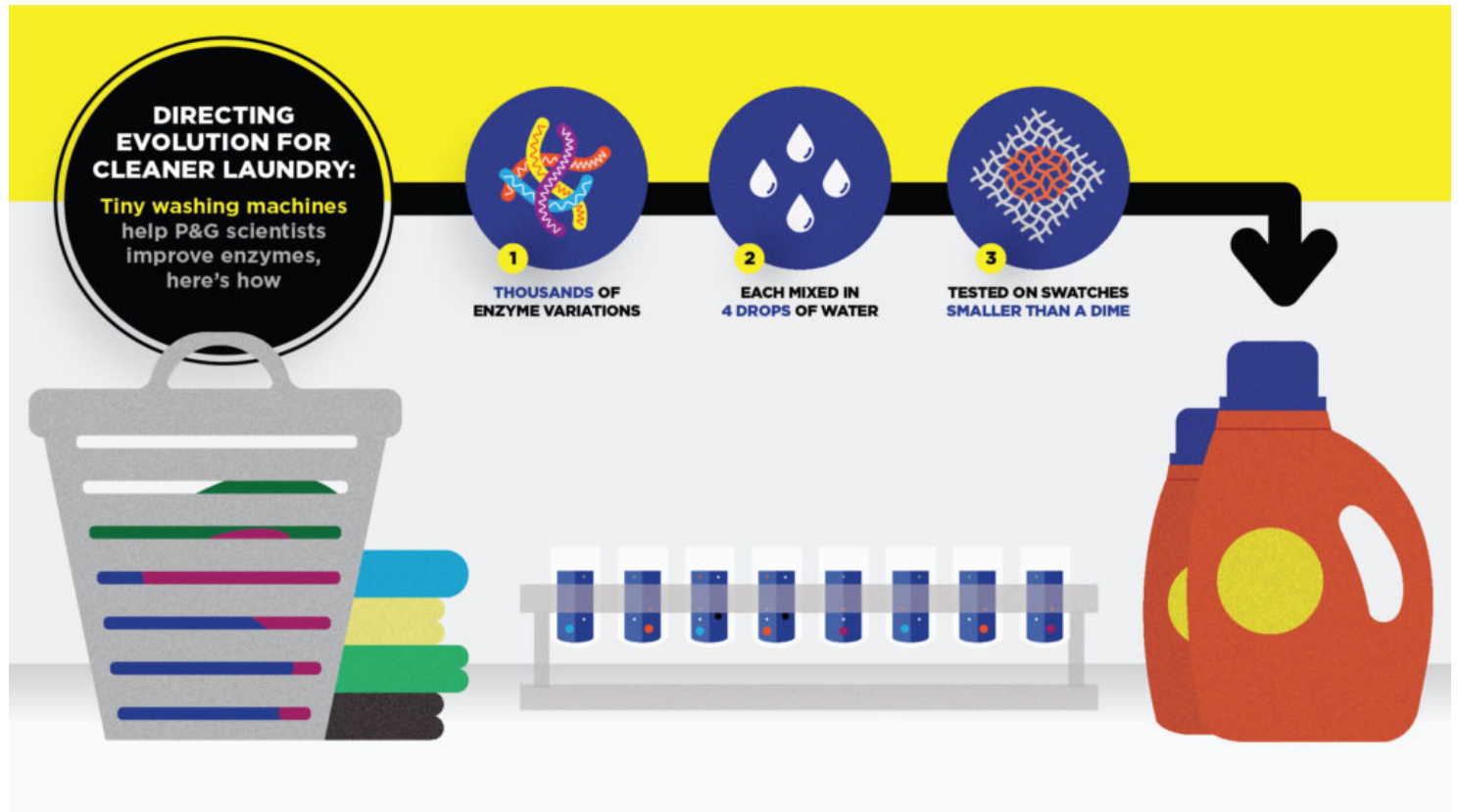


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Enzymes, directed evolution, and the science of clean laundry



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Turns out some of those everyday household products you may not think about much — but couldn't live without — are a lot more complex than they get credit for. Take laundry detergent. That bottle of Tide sitting next to your washer is powered by enzymes that bring about specific biochemical reactions in the wash. But not all enzymes are created equal. Thanks to a technique known as directed evolution, enzymes can be modified to work in unique ways — a process that has revolutionized laundry detergent.

Essentially natural selection on steroids, P&G scientists use directed evolution to encourage enzymes to evolve in a specific manner, manipulating them toward desired outcomes, such as being active at extreme temperatures and consuming the soils that stain laundry. This year marks the 50th anniversary of enzyme usage in household detergents, like Tide.

We often think of machinery as doing the heavy lifting when it comes to laundry, but the most cutting-edge technology — happening at the molecular level — is packed into a single drop of Tide.

Here are five things you probably didn't know about your detergent, and the ways that enzymes and directed evolution make the chore of laundry ... less of a chore!

1. Enzymes play it cool (and even cold)

Enzymes are typically most active at body temperature or warmer, when they do things like help mammals break down their food. With directed evolution, P&G scientists can push enzymatic activity into colder and colder temperatures. “Washing in cold water is an easy way for people to save energy and technologies like enzymes help people achieve outstanding results in cold water and quick washes, too,” said Phil Souter, the associate director of research and development at Procter & Gamble. And because up to 80% of the energy use from one load of laundry comes from heating the water, directed evolution means good things for the environment.

2. Enzymes eat up yuck that soap just can't

Seventy percent of the soil deposited on clothes comes from us. Sweat and sebum consist primarily of body oils and water, but also contain protein components that soap doesn't effectively remove. These leftover proteins accumulate on clothes and make them dingy and stinky. Directed evolution helps enzymes attack these proteins, which means better performing detergent, and cleaner, longer-lasting clothes.

3. Enzymes that are friendlier keep your laundry cleaner

While natural selection produces enzymes that are highly specific to the molecules they interact with, directed evolution achieves the opposite effect. It tweaks enzymes so they are more promiscuous — eating up a wider variety of stains. Say goodbye to club soda and salt. Enzymes also reduce the quantity of petrochemicals inside a cleaning agent, leading to more earth-friendly detergent. Because enzymes are naturally occurring and biodegradable, they're inherently sustainable. The enzymes in laundry detergents are also sensitive skin-friendly.

4. Enzymes are natural born cannibals (directed evolution fixes that)

Certain enzymes are designed by nature to break down proteins, which is problematic because they are made of proteins themselves. If left unchecked, laundry enzymes can digest themselves instead of stains. Directed evolution manipulates this feature and ensures the same superior performance in every load, from the first to last pour in every bottle of detergent.

5. Enzymes are overachievers that just don't quit

Enzymes are the ultramarathoners of detergent technology: thanks to their catalytic qualities, they are able to keep going and going and going. That gives P&G the opportunity to produce more compact products that use fewer resources. Producing, packaging, and transporting these products is less expensive and resource intensive.



It may seem as simple as just adding detergent and taking away clean, stain-free garments, but detergents are quite complex and are more than just soap and enzymes. [Visit our website](#)¹ to learn more about how ingredients in laundry detergent actually work.

Links

1. <https://tide.com/en-us/about-tide/innovation/how-detergent-ingredients-work>

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