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The New York Times article "'DNA Typewriters' Can Record a Cell's History" details the public release of new findings in cellular engineering. Summary: New findings: The solution to the mystery of where all the pieces of DNA history go: For years, scientists have been piecing together where a cell comes from, what its DNA ancestry is—one fertilized egg turns into trillions of cells, how does that happen? In the past, scientists would meet cells in their development stages and be at a loss as to how bodies were formed, how organs grew, how wounds repaired themselves. Now, there can be a DNA history of every cell that ever is, in real time. Recent advancements give the cellular world the capability of acquiring a history of its own as well. Known as genetic barcodes, researchers use CRISPR to infect intentionally mutated cells to take random cuts within their DNA during replication. Such errors are passed down to offspring, denoting where the cells originated and what they achieved in the interim. Researchers did this with zebrafish embryos almost instantly. The DNA barcoding allowed researchers to see the lineages of different cells and assess how they transformed. A "DNA typewriter" implies that researchers can add genetic notches in order, like a tally; it's a history of a cell's duplication, a history of sorts, in order for it to be read. It gives scientists the information they need to record what is happening inside and with cells—when a T cell acknowledges a virus or when a skin cell reacts to sunlight. Final Result and Expectations: Ultimately, the scientists want them to be sentinels that determine human health—reporting on where they've been, how they've fought infection, or how they've been subjected to lethal assault. What's it leading to: "Recorder mice" are the next step so that every cell in every organism will know what it has done since its inception up until now, maybe learning why certain things grow better in organs or what the "rules" are for certain cells. Who's doing it: Researchers from various labs are working on this cross-internationally. Other labs are lobbying for the specifics so that researchers can trace the cells in real time without having to euthanize. Why it's necessary: This would be a great step for developmental biology as well as anything clinically and health-related. Understanding what cells do—whys as well—and having a time-stamped roster can explain why life is the way it is, providing new avenues for therapeutic and diagnostic purposes.

This article relates to how DNA can become a typewriter of its kind. Essentially, researchers give cells the opportunity to record what happened over their lifespan. Researchers can keep track—as this insertion acts like a barcode—by having the cell keep the barcode when it divides, as subsequent progenitors will also have the barcode. Thus, researchers know what a given cell was and from whence it came and what it did in its shorter lifespan—whether it made a protein or responded to other signals. This happened recently, for example, where this technology was applied to a recent study of zebrafish embryos that demonstrated how a few cells with the barcodes indicated to the researchers, in the end, where blood cells came from, tracing the way with thousands of other progenitor cells. Thus, the development of a DNA typewriter that allows for addition, as opposed to doing it all at once, is the genetic barcode, and is an addition to findings that were already established prior. This DNA typewriter does the same for other markers, when needed, in a successive fashion. Thus, while much more work is still needed, technology like this will allow researchers to answer questions about developmental biology, how oncogenes come about, and how different genetic signals provide specific cell fates over time. Instead of intervening and attempting to solve the problem in real-time, they can figure out what happened in days, weeks, and months past.

References:

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