DNA sequencing advances could enable faster, cost-effective genetic screening

Prashant Nagpal (Pra-Chant Nog-Paul)

CU Boulder researchers are developing advanced single-molecule DNA sequencing techniques that could radically impact genetic screening, paving the way for advances in vaccine development, early cancer detection and organ transplants.

According to Prashant Nagpal, an assistant professor in CU Boulder’s Department of Chemical and Biological Engineering, the new testing methods can quickly and inexpensively sequence any genome.

CUT 1 “So we are developing a test for DNA sequencing either using electronics or with light to sequence a whole single strand of DNA from bacteria or a human in less than 100 seconds for less than a dollar.” (:14)

The new methods — one of which is based in nanoscale quantum electronics and one in optics — could one day allow a person to sequence his or her genome using simple equipment such as a cotton swab.

CUT 2 “What we are trying to work on is, basically, taking the swap — a very simple do-it-yourself kit that any single person could potentially use — and just use light or electronics and basically decode the sequence.” (:12)

Nagpal says this work could dramatically impact humanity in a variety ways, from personalized medicine to agriculture and beyond.

CUT 3 “Rapid advancement in personalized medicine. More therapies, which use biomarkers and classifies people not as statistic but, essentially, as human beings. (:12) For agriculture developing better and better crops to feed this growing population. And forensics, anthropology, a number of different things that we can only envision but we can't foresee the ripple effect that it could have in advancing science.” (:29)

The research is still in the early stages, and Nagpal says that the next step would be to apply the sequencing methods to more complex bacterial samples. In the future, he envisions a portable DIY sequencing kit that would cost around $1. A person could take a DNA swab, put it onto the microchip and wait 100 seconds to receive data that could reveal potentially risky genetic markers for cancer, for example, or provide crucial information for doctors attempting to match organs to transplant recipients.