

Automation Technology Speeds DNA Analysis

Lawrence Livermore Natl Lab



In the event of a disease outbreak or biochemical terrorist attack, identifying the pathological agents as quickly as possible is critical for mitigating losses. Technology developed at Lawrence Livermore National Laboratory in Livermore, Calif., now automates the molecular analytical process.

“ *The technology reduces the time spent obtaining DNA identification from several hours to several minutes.* ”

Lawrence Livermore National Laboratory (LLNL) is a U.S. Department of Energy research laboratory managed by the University of California. The new automation technology, involving a micro-machined chemical reaction chamber with rapid and precise thermal control, was developed from 1994-1995 by LLNL researchers Allen Northrup, Raymond Mariella, Anthony Carrano and Joseph Balch. Initial funding was provided by the Defense Advanced Research Projects Agency, an arm of the U.S. Department of Defense.

What makes this technology unique is the improvement in the thermal control over the reaction occurring in the reaction chamber. Before this technology was developed, a single heating/cooling cycle for copying a DNA strand could take up to four to five minutes, and 30-40 cycles would require several hours for full amplification and identification. Not only do long cycle times delay the DNA identification, but they also permit extraneous reactions to occur in the sample and interfere with the analysis. LLNL technology is a more efficient way to reproduce exact copies of DNA sequences, decreasing the cycle time to as little as several seconds to copy a single strand of DNA, and the full amplification process to a matter of minutes.

The technology was licensed by LLNL to Cepheid, a California-based startup company founded in 1997 to develop and commercialize genetic analysis systems for the clinical assessment, biothreat and life sciences markets. Core products being marketed today by Cepheid that are licensed under this technology are Smart Cycler® and GeneXpert real-time thermocyclers, which can quickly perform a variety of genetic tests. Cepheid is to continue developing a broader array of tests for the scientific and medical communities.

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