Medical Xpress

Genomic test could help detect radioactivity exposure from terrorist attacks

April 3 2007

In the event of a nuclear or radiological catastrophe -- such as a nuclear accident or a "dirty bomb" -- thousands of people would be exposed to radiation, with no way of quickly determining how much of the deadly substance has seeped inside their bodies. Scientists at Duke University Medical Center have developed a new blood test to rapidly detect levels of radiation exposure so that potentially life-saving treatments could be administered to the people who need them most.

There appears to be a critical window of 48 to 72 hours for administering treatments aimed at halting the devastating effects of radiation, said senior study investigator John Chute, M.D., an associate professor of medicine in the Duke Adult Bone Marrow and Stem Cell Transplant Program. But existing tests for measuring radiation exposure take several days and are not practical for testing large numbers of patients at once.

"If a terrorist attack involving radioactive material were to occur, hospitals might be overrun with people seeking treatment, many of whom have actually been exposed and many of whom are simply panicked," Chute said. "We have to be able to efficiently screen a large number of people for radiation exposure in order to respond effectively to a mass casualty event."

The new test scans thousands of genes from a blood sample to identify distinct genomic "signatures" reflecting varying radiation doses. Patients can then be handled according to whether they received no exposure to radiation, an intermediate level of exposure that may respond to medical therapies or an inevitably lethal dose.

The researchers published their findings April 3, 2007, in the journal Public Library of Science (PLoS) Medicine. The research was funded by the National Institute of Allergy and Infectious Diseases.

High doses of radiation can damage or wipe out a person's blood and immune systems, leading in some cases to bone marrow failure accompanied by infections, bleeding and a potentially heightened lifetime risk of cancer. Since the symptoms of radiation exposure can take days or weeks to develop, it could be difficult to identify individuals truly exposed without a practical test to make this distinction, the researchers said. Current treatments for radiation exposure aim to bolster the blood and immune systems before the damage becomes too severe.

Previous studies by researchers at the Duke Institute for Genome Sciences & Policy have used genomic technology to identify genes that can predict prognosis and response to chemotherapy within several types of cancers. In the current study, the Duke team used a similar strategy to determine which genes change in response to different levels of radiation exposure.

The researchers subjected mice to low, intermediate and high doses of radiation and looked for the impact of each dose on specific genes in the blood. They found that each dose resulted in distinct profiles, or signatures, representing 75 to 100 genes that could be used to predict the degree of exposure.

They also analyzed blood from human patients receiving bone marrow transplants who were treated with high doses of radiation prior to transplant and found specific gene profiles that distinguished the individuals that were exposed to radiation from those that were not with an accuracy of 90 percent.

“The goal now is to refine this test to the point that if a disaster were to occur, we could draw blood from thousands of people and have results back in time for treatment to have effect,” said Joseph Nevins, Ph.D., a professor of molecular genetics at Duke's Institute for Genome Sciences & Policy and co-investigator on the study.

These findings also could point to new treatments for victims of a radiological catastrophe, said lead study investigator Holly K. Dressman, Ph.D., an associate professor of molecular genetics at the Duke Institute for Genome Sciences & Policy. “By identifying genes that are major players in the response to radiation, we hope to compile a list of future targets for protection against its harmful effects.”

The researchers are currently refining the test by looking at the effects of time from exposure, gender, age and additional genetic factors on the ability of the test to predict radiation dose, Dressman said.

Source: Duke University Medical Center

Citation: Genomic test could help detect radioactivity exposure from terrorist attacks (2007, April 3) retrieved 25 April 2024 from https://medicalxpress.com/news/2007-04-genomic-radioactivity-exposure-terrorist.html