Findings could lead to a blood test for lung cancer

May 12 2011

Researchers have identified characteristic patterns of molecules called microRNA (miRNA) in the blood of people with lung cancer that might reveal both the presence and aggressiveness of the disease, and perhaps who is at risk of developing it. These patterns may be detectable up to two years before the tumor is found by computed tomography (CT) scans.

The findings could lead to a blood test for lung cancer, according to a researcher with the Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute who helped lead study.

"We found patterns of abnormal microRNAs in the plasma of people with lung cancer and showed that it might be possible to use these patterns to detect lung cancer in a blood sample," says principal investigator Dr. Carlo M. Croce, professor of molecular virology, immunology and medical genetics, and director of the Human Cancer Genetics program.

"These abnormal microRNAs were present in blood serum well before the tumors were detected by a sensitive method such as spiral CT scan, suggesting they might have strong predictive, diagnostic and prognostic potential."

The findings were published in a recent issue of the *Proceedings of the National Academy of Sciences.*

Croce and his collaborators initially identified the molecular patterns in tissue samples collected from patients participating in a clinical trial examining the use of spiral CT scans to screen for lung cancer. The trial involved 1,035 individuals aged 50 years or older who had smoked at least a pack of cigarettes a day for 20 years or more. All patients underwent a CT scan every year for five years and provided blood, sputum and urine samples.

The researchers initially analyzed 28 tumor samples and 24 samples of normal-lung tissue for their miRNA profiles. They identified miRNAs that could discriminate between lung tumor and normal lung tissue. They also found patterns of miRNAs that distinguished tumors with faster growth rates and that correlated with poor disease-free survival.

Then Croce and his colleagues analyzed blood samples that had been collected more than a year before the individual's lung cancer was detected by spiral CT. They discovered a signature of 15 miRNAs that could identify 18 of 20 individuals whose cancer was later detected by spiral CT.

To verify that finding, they applied the signature to a second set of blood samples collected during a similar but unrelated lung-cancer trial. Here, the signature correctly identified 12 of 15 patients whose lung tumors were detected more than a year later by spiral CT. The researchers estimated that the signature were detectable in blood up to 28 months prior to spiral CT detection.

The researchers also found miRNA signatures in the blood that were associated with the following:

- Lung-cancer diagnosis – a signature identified 16 of 19 patients with lung cancer in set one, and 12 of 16 patients in set two.

- Poor prognosis – a signature identified five of five patients with poor prognosis in set one; four of five in set two.

- Good prognosis – a signature identified five of 15 patients in set one, and five of 11 patients in set two.

"Our goal was to identify biomarkers that could predict tumor development and prognosis to improve lung-cancer diagnosis and treatment," Croce says. "Overall, these findings strengthen the observation that circulating miRNA in plasma is detectable well before clinical disease detection by spiral CT, indicating the possibility of identifying high-risk patients on the basis of miRNA profiling."

Provided by Ohio State University Medical Center