PROTEIN PATTERNS IN BLOOD REVEAL CANCER'S SECRETS

Scientists may soon be able to obtain information about every tissue in the body from a finger prick's worth of blood. By looking for patterns of proteins in blood serum, NCI researchers, along with colleagues at the Food and Drug Administration (FDA), have developed a method to identify cancers at the earliest, most treatable stage. This work is likely to translate into better survival for patients with cancers that, like ovarian cancer, are usually diagnosed tragically late.

"If blood is coursing through every tissue of the body, remnants of what is happening within the tissues should be shed into the circulation," says NCI scientist Lance Liotta. He has turned his theory into a simple blood test that is winning attention for its ability to detect difficult cancers, such as ovarian cancer, at very early stages. The test also shows potential as a way to monitor therapy.

The NCI-FDA Clinical Proteomics Program has coupled the science of proteomics—the study of cell proteins—with sophisticated artificial intelligence programs. The scientists use a technique called mass spectroscopy to analyze serum protein patterns and software developed by partner Correlogic Systems, Inc. to sweep through thousands of protein fragments. The technique shows promise in lung, prostate, breast, and pancreatic cancers—with the most striking results in ovarian cancer.

In controlled experiments, proteomics was able to differentiate blood samples from patients with ovarian cancer, including early-stage cancer, with those from unaffected individuals. Currently, only 2 out of 10 ovarian cancers are diagnosed at an early stage, when prognosis is excellent. With an early-stage diagnosis, 95 percent of women are expected to live 5 years, compared with 20 percent or less of women diagnosed with late-stage disease.

The information-rich proteins represent "the underlying biological truth of what's going on in the patient's body," explains NCI's Lance Liotta, M.D., Ph.D., co-director of the proteomics program. "From a sample of blood, we can get a physiologic image of what's going on inside the body, and diagnose early-stage cancer while it's curable."

Proteomics is also showing an exciting potential to monitor a patient's response to a molecularly targeted cancer drug, which could prove useful in designing patient-tailored therapies.

Researchers are anxious to reap the clinical benefits of these discoveries. Says FDA co-director of the program, Emanuel Petricoin, Ph.D., "With our agencies' combined talents, we expect the new technologies under development to move quickly from bench to bedside."

Petricoin EF, Ornstein DK, Paweletz CP, Ardekani A, Hackett PS, Hitt BA, Velassco A, Trucco C, Wiegand L, Wood K, Simone CB, Levine PJ, Linehan WM, Emmert-Buck MR, Steinberg SM, Kohn EC, Liotta LA. Serum proteomic patterns for detection of prostate cancer. *Journal of the National Cancer Institute,* October 16, 2002; 94(20):1576–1578.