Schizophrenia enters the molecular diagnostics era

February 12 2014, by Constanze Böttcher

Credit: keepingtime_ca

With a drop of blood and some laboratory analyses, doctors have been able to tell patients whether they suffer from diabetes or some sort of cancer. Measuring changes in the cells or molecules of human tissues or fluids, by detecting so-called biomarkers, has aided the diagnosis of various diseases for some time. But when it comes to severe mental illnesses, such as schizophrenia, "patients are just diagnosed by asking questions," says Sabine Bahn, head of the Cambridge Centre for Neuropsychiatric Research, at the University of Cambridge, UK. "This hasn't changed over the last 100 years."

About 2% of the population worldwide suffer from schizophrenia or bipolar disorder. Many of them do not receive appropriate treatment. On average, it takes two to five years to diagnose the disorder. "A blood-based biomarker test, additional to conventional clinical diagnosis, could enable earlier diagnosis and better treatment," Bahn tells youris.com. Early intervention, for example by psychoeducation and psychotherapy or low-dose medication, could soon become possible.

At present, no biomarkers for schizophrenia are commercially available. Within the EU-funded project SchizDX, Bahn and colleagues therefore aim at developing a low-cost blood test for diagnosing and treating schizophrenia and other psychiatric disorders.

As part of the project, the researchers have validated a blood serum test for diagnosing schizophrenia using samples from 572 schizophrenia patients and 235 healthy persons as control group. The final test consists of a so-called biomarker assay panel and includes 51 different proteins. The statistical analysis of the combination of these proteins yields results that "give a probability [that a patient is] suffering from the disorder," Bahn explains. In this case, the test was able to correctly diagnose 83% of the schizophrenic patients.

The test, named VeriPsych, has been commercially available in the USA for about 18 months and has been ordered by 32 clinical centres, according to Bahn. Despite "positive feedback" the test has been taken from the market due to some "shortcomings," she says. "Analysing 51 proteins costs about US$2,700 per patient. That is very expensive and a real hurdle to get the test more widely accepted," Bahn remarks. Besides, customers want a more differential diagnostic test, for example to distinguish bipolar disorder, depression and schizophrenia, Bahn adds.

Experts consider this kind of research as very important. "Biomarkers

for psychiatric disorders are extremely desirable," says Johannes Thome, director of the department of psychiatry and psychotherapy at Rostock University Medical Center, in Germany. While he recognises that the international criteria for diagnosing schizophrenia are consensus-based and work well in practice, he points to the need for evidence-based diagnosis criteria. A gap that biomarkers may be able to fill.

But Thome is also sceptical whether reliable biomarkers will soon be found. He emphasises that the various different causes of such complex disorders as schizophrenia or depression are often unknown. "It is not like a myocardial infarction or diabetes. We try to look for biomarkers for a disease that is a more of a collective term than a real entity," he tells youris.com. "As long as we have not understood the biological bases of schizophrenia, I remain doubtful whether the present research strategies are suitable," he adds. Thome recognises, however, that the search for biomarkers may also aid in finding these bases underlining the disease.

Other experts are critical of the general approach used for discovering biomarkers. Problems that arise when comparing persons suffering from a certain disease to a group of healthy people, so-called case-control designs, could arise. "We found in our research that there is typically an up to threefold overestimation of diagnostic accuracy of biomarkers using healthy controls," explains Patrick Bossuyt, professor of clinical epidemiology at the Academic Medical Center in Amsterdam, the Netherlands. This may be especially true for complex diseases such as schizophrenia, he adds. Other studies have found similar results. In Bossuyt's view, "a useful biomarker should be in discordance with conventional diagnosis. Otherwise, you just replicate the accepted way of making a diagnosis".

He also believes that these methodological problems may be the reason why there are not many biomarkers in everyday clinical use, despite

huge research efforts. "A good example is cancer research. There has been less than a handful biomarkers licensed over the past 10 years," Bossuyt says. He therefore favours a different approach. Researchers should look whether biomarkers can be used for the prognosis of a certain disease or for evaluating whether patients respond to a certain therapy. "In that case, the use of biomarkers may make sense," Bossuyt adds.

Bahn herself emphasises the importance of a diagnostic tool when it comes to such a severe disorder as schizophrenia. A blood-based test may aid in helping patients "to view their illness as a biological disorder," Bahn says. However, she also acknowledges the challenges: "If it were easy to diagnose schizophrenia, there would already be an easy solution. But that does not exist," she notes.

Therefore, even after the project is finished, the quest for biomarkers continues. The aim is to develop biomarker panels of about 10 to 20 proteins as a more differential diagnostic tool. "We have so far identified blood biomarker signatures for distinguishing schizophrenia, bipolar disorder and depression and also for predicting drug response," Bahn explains. The results from several patient cohorts are "encouraging," she adds. There will now be larger prospective clinical trials.

More information: Ioannidis JA, Panagiotou OA. "Comparison of Effect Sizes Associated With Biomarkers Reported in Highly Cited Individual Articles and in Subsequent Meta-analyses." *JAMA*. 2011;305(21):2200-2210. DOI: 10.1001/jama.2011.713.

Anne W.S. Rutjes, Johannes B. Reitsma, Marcello Di Nisio, Nynke Smidt, Jeroen C. van Rijn, and Patrick M.M. Bossuyt. "Evidence of bias and variation in diagnostic accuracy studies." *CMAJ*. 2006 February 14; 174(4): 469–476. doi: 10.1503/cmaj.050090

Emanuel Schwarz, Rauf Izmailov, Michael Spain, Anthony Barnes,et al. "Validation of a Blood-Based Laboratory Test to Aid in the Confirmation of a Diagnosis of Schizophrenia." *Biomark Insights*. 2010; 5: 39–47. Published online 2010 May 12. www.ncbi.nlm.nih.gov/pmc/articles/PMC2879227/