Innovations in neuroscience trigger shifting views in the treatment of mental illness

As advancements in neuroscience pave the way for scientists to examine the brain more clearly, we are experiencing a paradigm shift in understanding how the brain works. Scientists are now seeing the brain as a vast circuit of interconnected networks, rather than as separate regions that communicate linearly. This new understanding is transforming psychiatry, as researchers shift away from psychiatric drug development to more innovative treatments for mental illness, using technologies like deep brain stimulation.

The majority of psychiatric drugs were developed in the 1950s and 60s, writes Steven Hyman, former head of the National Institutes of Mental Health. Although new drugs have been developed in the last half century, little improvement has been made in their effectiveness. Today's psychiatric drugs, Hyman writes, target the same processes in the brain as the drugs developed in the 1960s and do little to treat the underlying causes of mental illnesses.

Expanding on this issue, Gary Greenberg, author of *The Book of Woe: the DSM and the Unmasking of Psychiatry,* writes in a recent New Yorker blog that starting in 1990s, scientists determined that the popular class of anti-depressants, selective serotonin reuptake inhibitors (e.g. Prozac, Zoloft, etc) do not fully address the underlying causes of depression. These drugs allow serotonin, a neurotransmitter associated with mood, to remain in high levels in the brain, relieving patients from symptoms of depression. But many patients did not respond to the drugs and numerous studies involving placebos failed to show any significant effect. Mental illness, it turned out, is apparently caused by something more complex than the widely accepted theory of 'chemical imbalance.'

A combination of stagnation in developing novel psychiatric drugs and the flood of new research in neuroscience has led major research institutes to start rethinking their funding strategies.

As Vaughan Bell, clinical psychologist and visiting researcher at the Institute for Psychiatry at King's College, London writes in *The Guardian*, the National Institutes of Health is moving away from drug research and towards researching the brain as a "series of networks" that are interconnected.

Bell also reports on optogenetics, one of the several innovative developments in neuroscience. Used primarily in mice, this technique involves creating neurons that can be stimulated by flashes of light. Scientists use a benign virus to insert a "light-activated" gene into the mouse's genome so that a light flashed into its brain activates targeted neurons. While animal research using optogenetics has led to insights into the underlying causes of OCD, depression and even cardiac arrhythmia (irregular heartbeat), this technique has not been developed for use in humans, and if it ever was, it would be costly and highly invasive.

Another new technique, deep brain stimulation (DBS), involves the use of electrodes placed deep within the brain that provide "continuous electrical impulses that, depending on where they are placed, can either inhibit or stimulate neural activity," writes Tom Chivers in Britain's *The Telegraph*. According to Chivers, Helena Mayberg, a neurologist at Emory University in Atlanta and one of the leading researchers in deep

brain stimulation, targeted an area in the brain associated with sleep, motivation, reward and pleasure, and used DBS to stimulate an inhibitory circuit to 'turn down' activity in that area. The technique seemed to work in depressed patients, two thirds of whom showed a 40 percent decrease in symptoms one year after the therapy. Though DBS has shown promise, Chivers reports, far more research is needed to advance this therapy past trial stage.

In a blog accompanying his report, he addresses the shift in perception about mental illness stimulated by DBS research. New technologies have allowed scientists to have a clearer view of brain activities, which could lead to new treatments of the most debilitating mental disorders.

"Your brain is not a bowl of soup, add salt and stir. It's a wiring network of billions of neurons organized into units, choreographed, communicating with each other with exquisite precision," Mayberg told him. We can start thinking about the brain as an organ that goes wrong, like a kidney. "We used to think of it as a weakness of character, and thank God we got rid of that, or at least we're trying," she said. "Now, we think of it as a circuit disorder."

Additional Resources:

- "Revolution Stalled," Science Translational Medicine
- "Obama's Brain," New Yorker