Illustrated Vignettes

A sampling of watershed ideas, events & personalities from our first 100 years

Departmental Newsletter feature for Centenary Year, 2007–08

A CENTURY OF LEARNING • A CENTURY OF CARING
1907 - 2007
Psychiatry
UNIVERSITY OF TORONTO

The Psychiatric Impact of Brain Imaging

In 1989 Prof. Vivian M. Rakoff, then U. of T. Chair of Psychiatry and Director, Clarke Institute, broke ground for constructing Canada's first positron emission tomography (PET) centre for psychiatry.

In October 1992 Dr. Alan Wilson, Chief Radiochemist, demonstrated the new Vivian M. Rakoff PET Centre's technology. Photos: CAMH Archives.

The human brain was largely a mystery until the advent of modern brain imaging. The now-primitive XRay gave us our first glance of the living brain when it was introduced for use in psychiatry in the 1960s. Psychiatrists were now able to see an image of the living brain for the first time. The progression of modern brain imaging technology was highly impacted by the invention and use of non-invasive PET technology for psychiatry in the mid-1980s. Now, the very chemistry of the living brain was subject to examination while a patient remained alive, conscious, and unharmed. The main challenge that had, until the advent of modern medical imaging, plagued psychiatry was the inability to physically assess and treat the affected organ – the living brain.

The Vivian M. Rakoff PET Centre, housed at the CAMH College Street site (formerly the Clarke Institute of Psychiatry), opened its doors in 1992 thanks to government funding secured by its namesake four years prior. PET technology is used in psychiatry primarily to understand the pathophysiology of illnesses and to assess the effects of pharmacological treatment. The PET Centre serves today as a worldwide leader in psychiatry research, providing the psychiatric community with leading-edge breakthroughs. With these successes, Dr. Houle, the PET Centre director, has obtained external funding for two new state-of-the-art PET scanners and an additional cyclotron, thereby expanding the facility into the most productive research PET centre in psychiatry worldwide, particularly in the areas of major depressive disorder and schizophrenia.

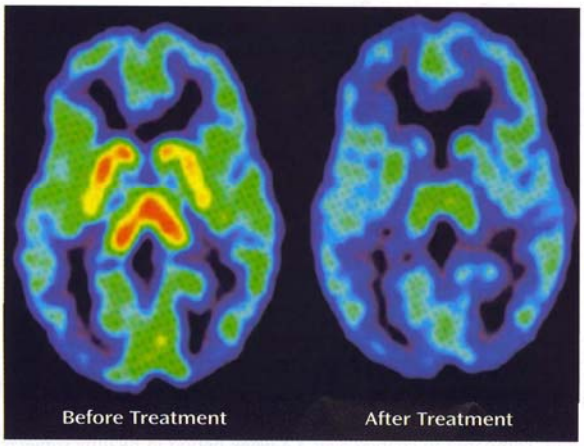
Significant breakthroughs in the area of major depressive disorder occurred via a combination of novel radioligand development by chief radiochemist Dr. Alan Wilson, and innovative applications in major depressive disorder led by Dr. Jeffrey Meyer. As head of the neurochemical imaging program in mood disorders, Dr. Meyer led a series of discoveries that related monoamine abnormalities to specific symptoms, and delineated key mechanisms of monoamine loss. These discoveries were collectively linked together in a 2006 study in the Archives of General Psychiatry describing elevated levels of MAO-A in the depressed brain and a new explanation for the monoamine abnormalities (also called "chemical imbalance") in living depressed subjects. In a different set of studies, Dr. Meyer applied the [^{11}C] DASB radioligand technology (created by Drs. Wilson and Houle) and established for the first time that at therapeutic dosing of antidepressants, 80 per cent of serotonin transporter sites are blocked. This 80 per cent target is now the benchmark for determining the dose of new antidepressants in development worldwide, thereby speeding up the development of next generation antidepressants.

Dr. Kapur, formerly the University's Canada Research Chair in Schizophrenia and Therapeutic Neurosciences, and Vice President for Research at CAMH, explored the role of the neurotransmitters dopamine and serotonin in reaction to antipsychotic medications in a range of studies. A key finding in the mid-1990s was that antipsychotic medications blocked a high proportion of target sites at low dose. This finding occurred at the same time that Dr. Zipursky's group in the schizophrenia division found that low doses of antipsychotic treatment can be therapeutic in clinical trial. As a result, Dr. Kapur's findings provided a compelling case for lower doses of antipsychotics, thereby optimizing treatment while considerably reducing many associated crippling side-effects.

Brain imaging has expanded psychiatry's armamentarium for understanding and addressing the biological basis of mental illness, through uncovering empirical evidence to identify and clinically address its demonstrably disabling aspects. As for the future, with no technology in the field of medicine advancing more rapidly than brain imaging, the implications for psychiatric developments seem vast and limitless.

The CAMH professional team for PET imaging, photographed in the mid-1990s, included (l. to r.) Drs. Jean DaSilva, Shitij Kapur, Alan Wilson and the Director, Dr. Sylvain Houle.

FIGURE 1. Effect of Citalopram[a] on [^{11}C]DASB PET Scan of the Serotonin Transporter in a Depressed Subject



An example of research at the PET Centre as reported by Jeffrey Meyer *et al*., "Occupancy of Serotonin Transporters by Paroxetine and Citalopram During Treatment of Depression: A [^{11}C]DASB PET Imaging Study," *Am. J. Psychiatry* 2001; 158: 1843–9.

References and further information:

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