The ADDed Brain:
A Biological Marker for ADHD

After all of the presentations and all of the consensus building, panelists at the National Institute of Health Conference on ADHD were still left with no consistant means of confirming the diagnosis.

Find out More in the **Special Archived Edition of ADDitions**

But a report released yesterday, November 24, 1998, may provide just that.

Rearchers from Stanford, in a paper titled "Selective effects of methylphenidate in attention deficit hyperactivity disorder: A functional magnetic resonance study" report that there is a biological marker for ADD. While this clearly contradicts the statement of the Consensus Panel, it does provide answers as to what causes the ADD brain to be different.

Some key points from the report:

1. ADD brains ARE different.

This is a crucial point. ADD has a tangible cause. It is not the result of environment or poor parenting. How do we know this?

The Functional MRI (fMRI) used in this study visualizes changes in the hemodynamic properties of blood irrigating neuronal tissue that is engaged in the performance of a task. It is noninvasive and suitable for use with children.

Each child in the study was scanned using fMRI in two sessions, one off-Ritalin and one on-Ritalin, at least 1 week apart. For off-Ritalin scans, ADHD subjects went off medication for 36 hr before scanning. For on-Ritalin scans, ADHD subjects took their regularly prescribed dose (range 7.5-30 mg) and controls (Non-ADD subjects) took 10 mg, 2.0-2.5 hr before scanning.

Baseline (off-Ritalin) frontal and striatal activation during response inhibition differed in ADHD and control groups: Frontal activation was greater in ADHD children on the response-controlled task, and striatal activation was reduced in ADHD children on the stimulus-controlled task.

This is consistant with what we already know. Images produced using single photon emmission-computed tomography (SPECT), and positron-emission tomography (PET) have also shown reduced metabolism in frontal and striatal regions in ADHD. Structural MRI studies find reduced volumes in a number of brain regions in ADHD, including the frontal lobes and striatum.

2. There is a difference in how Ritalin affects ADD and Non-ADD children.

Why is this important?

Critics of ADD, such as Peter Breggin (*see our editorial "What is Peter Breggin's Deal?"*) and others have long contended that Ritalin would improve the performance of **ANY** child, not just those who have ADD.

During the Stanford research, children performed two go/no-go tasks with and without Ritalin. ADHD children had impaired inhibitory control on both tasks. While the drug improved response inhibition in both ADD and Non-ADD control groups on one task, **only the ADHD children showed improvement on the other task.**

Quoting from the study:
Off-drug frontal-striatal activation during response inhibition differed between ADHD and healthy children: ADHD children had greater frontal activation on one task and reduced striatal activation on the other task. Drug effects differed between ADHD and healthy children: The drug improved response inhibition in both groups on one task and only in ADHD children on the other task. The drug modulated brain activation during response inhibition on only one task: It increased frontal activation to an equal extent in both groups. In contrast, it increased striatal activation in ADHD children but reduced it in healthy children. These results suggest that ADHD is characterized by atypical frontal-striatal function and that methylphenidate affects striatal activation differently in ADHD than in healthy children.

3. Impulse control is part of ADD and may be controlled by using Ritalin.

Again, from the study:

"Ritalin had different effects in ADHD and control groups: Ritalin (ritalin) improved response inhibition in ADHD children on both tasks. In contrast, Ritalin improved response inhibition in control children only on the stimulus-controlled task. Ritalin affected activation only on the stimulus-controlled task in both groups. Ritalin increased frontal activation in both groups to an equal extent. Ritalin increased striatal activation in ADHD children but reduced it in control children."...

"Greater than normal frontal activation in ADHD children may reflect greater inhibitory effort."

In other words, ADHD children must work harder than their Non-ADD peers in order to accomplish the same level of impulse control.

While fMRI may be useful in providing information about ADHD and how the ADHD brain functions, it is probably too expensive to be used as a routine diagnostic procedure.

This study was conducted by Chandan J. Vaidya,, Glenn Austin, Gary Kirkorian, Hugh W. Ridlehuber, John E. Desmond*,§, Gary H. Glover§, and John D. E. Gabrieli**

** Department of Psychology, Stanford University, Stanford, CA 94305; Community/Academia Coalition, 451 Cherry Lane, Los Altos, CA 94022; and § Department of Radiology, Stanford University, Stanford, CA 94305*