CRIME Times

Linking Brain Dysfunction to Disordered/Criminal/Psychopathic Behavior

Volume 12, Number 3, 2006

Adult ADHD risks revealed by study

Adults with ADHD are at far greater risk than their peers for criminal arrests, divorce, depression, and career problems, according to a new study. The report, by Joseph Biederman and colleagues, adds to a large body of evidence showing that ADHD has severe life-long effects. (See a related report by the same research group, focusing on teens and young adults, in *Crime Times* Vol. 12, No. 2, 2006, page 1.)

Past investigations into the outcomes of adults with ADHD have focused on adults referred to mental health clinics. Because findings from clinical groups do not always generalize to the population as a whole, Biederman and colleagues instead studied a community sample of 500 adults who responded affirmatively to a survey asking if they had been diagnosed with ADHD at some point in their adult lives. A group of adults without ADHD, matched for gender and age, served as controls. Participants were evenly divided between men and women, and the mean age for both groups was in the early 30s. Of the ADHD adults, about two-thirds had been diagnosed before the age of 18.

Biederman and colleagues report that 37% of the adults

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ADHD and long-term troubles: Not just a risk for boys

It's well established that boys with ADHD are at increased risk of developing adult antisocial behavior and addictive, mood, or anxiety disorders (see related articles on this page and in *Crime Times* Volume 12, Number 2, 2006, page 1). But little is known about the adult outcomes of girls with ADHD, because the disorder is much less common in girls than in boys. A new study, however, indicates that girls with ADHD often grow up to be troubled teens.

Stephen Hinshaw and colleagues recently performed a follow-up evaluation of 209 girls with or without ADHD. All of the girls initially were recruited for a study five years earlier. At the time of the follow-up, the girls ranged in age from 11 to 18.

The researchers report that while many ADHD girls improved, and nearly one-third no longer qualified for the diagnosis, the girls with ADHD continued to show a greater number of externalizing ("acting-out") behaviors and had significant deficits in areas including social skills, peer relations, and academic performance. About four-fifths of the ADHD girls had required social services such as special education, tutoring, or psychotherapy, compared to only one-seventh of the comparison girls. Half of the ADHD girls exhibited oppositional defiant disorder, compared to only 7% of the control group. Rates of conduct disorder were also higher (18% vs. 1%) in girls with "combined" ADHD (a subgroup of ADHD involving hyperactivity, impulsivity, and inattention) than in controls.

Hinshaw, who called the results "surprising and discouraging," told the *Washington Post* that the findings are clear evidence that for girls as well as boys, "This is not a short-term disorder."

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"Prospective follow-up of girls with attention-deficit/hyperactivity disorder into adolescence: evidence for continuing cross-domain impairment," Stephen P. Hinshaw, Elizabeth B. Owens, Nilofar Sami, and Samantha Fargeon, *Journal of Consulting and Clinical Psychology*, Vol. 74, No. 3, 2006, 489-99. Address: Stephen Hinshaw, Department of Psychology, Tolman Hall #1650, University of California, Berkeley, CA 94720-1650, Hinshaw@berkeley.edu.

—and—

"At last, attention shifts to girls: Symptoms may differ, but ADHD risks are as real as for boys, study finds," Sandra G. Boodman, *Washington Post*, July 11, 2006.

SPECIAL ISSUE:
ADHD (Attention Deficit Hyperactivity Disorder)
Pages 1-5

Statistics show a powerful link between attention deficit hyperactivity disorder and serious life problems in adulthood. A 2002 study, for example, found that 46% of adult male prisoners had suffered from childhood ADHD, with another 18% having probable childhood ADHD. By exploring the biological roots of ADHD, we come closer to understanding and effectively addressing criminality and other adult life problems as well.

Simple nutritional therapy reduces symptoms of ADHD

A combination of vitamin B6 and magnesium can markedly reduce the symptoms of attention deficit hyperactivity disorder (ADHD), according to a recent French study.

Marianne Mousain-Bosc and colleagues evaluated the response of 40 children with ADHD to eight weeks or more of treatment with B6 and magnesium (6 milligrams per kilogram per day of magnesium and 0.6 milligrams per kilogram per day of vitamin B6). The researchers evaluated the children's symptoms before and after the intervention and measured their levels of intraerythrocyte magnesium (Erc-Mg).

Mousain-Bosc and colleagues report that B6/magnesium treatment, if continued for at least two months, significantly reduced hyperactivity, agitation, and aggression and improved school function in nearly all participants. Initial Erc-Mg levels were lower in ADHD participants than in controls, and treatment caused Erc-Mg levels to rise, although not to the levels of the control group.

Children with ADHD who exhibited the highest initial Erc-Mg levels showed the greatest improvement. This suggests, the researchers say, that the initial level of depletion affects how quickly children improve.

When the researchers withdrew B6/magnesium treatment at the end of the study, ADHD symptoms returned within a few weeks and Erc-Mg levels dropped.

The researchers say their findings are consistent with earlier research implicating intracellular magnesium deficiency in ADHD, and with clinical and anecdotal evidence that many children with ADHD improve when taking B6 and magnesium. While magnesium is typically viewed as an adjunct treatment used to enhance B6 therapy, the researchers say their results indicate that magnesium itself has potent anti-ADHD effects.

In a recent interview in *Le Journal Santé*, Mousain-Bosc noted that she and her colleagues have now treated nearly 140 young ADHD patients with combined B6 and magnesium, some for as long as three years, and "the results are very encouraging."

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"Improvement of neurobehavioral disorders in children supplemented with magnesium-vitamin B6. I. Attention deficit hyperactivity disorder," M. Mousain-Bosc, M. Roche, A. Polge, D. Pradai-Prat, J. Rapin, and J. P. Bali, *Magnesium Research*, Vol. 19, No. 1, March 2006, 46-52. Address: Jean-Pierre Bali, Explorations Fonctionnelles du Systeme Nerveux, Centre Hospitalier Universitaire Caremeau, Nimes, France.

Why Crime Times?

The more we learn about the brain dysfunction that underlies much delinquency and criminal behavior, the more successful we will be in truly rehabilitating offenders and preventing at-risk children from turning to lives of crime. The purpose of *Crime Times*, a free publication sponsored by the Wacker Foundation, is to foster this effort by reporting state-of-the-art worldwide research on biological causes and treatment of aberrant behavior. It is our hope that physicians, researchers, educators, law enforcement professionals, and parents can use the information in *Crime Times* to build a better, safer future for at-risk children and for the communities in which they live.

ADHD in adults raises risk of serious life problems

(continued from page 1)

with ADHD, compared to 18% of the controls, had been arrested. In addition, they say, "Adults who reported having been diagnosed with ADHD were significantly more likely to engage in antisocial and addictive behaviors than the control group," although there were no differences between the groups in the rate of alcoholism.

In addition, members of the ADHD group were nearly twice as likely to be divorced, and only 19% had college degrees, compared to 26% of the controls. The ADHD adults also experienced more job changes, and at the time of the survey, 14% of these individuals were looking for work, compared to only 5% of the controls. Adults with ADHD were much more likely to report feeling depressed on a frequent basis and to have negative relationships with peers. ADHD also was associated with a greater number of traffic violations.

"Taken together with other studies on adult ADHD," Biederman and colleagues say, "these findings support the idea that, when diagnosed in the community, ADHD is a clinically significant and highly disabling disorder in adults."

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"Functional impairments in adults with self-reports of diagnosed ADHD: A controlled study of 1001 adults in the community," Joseph Biederman, Stephen V. Faraone, Thomas J. Spencer, Eric Mick, Michael C. Monuteaux, and Megan Aleardi, *Journal of Clinical Psychiatry*, Vol. 67, No. 4, April 2006, 524-40. Address: Joseph Biederman, Massachusetts General Hospital, Pediatric Psychopharmacology Unit, Yawkey Center for Outpatient Care, YAW-6A-6900, 32 Fruit Street, Boston, MA 02114, jbiederman@partners.org.

From the CRIME TIMES mailbox:

To the Editor:

Our association fully shares the views of The Wacker Foundation on the role of genetics and neurobiology in behavior disorders in general, and especially on the connection between ADHD and criminal delinquency.

Our association was founded over 20 years ago by parents of children with ADHD and maintains local chapters in 40 cities and communities all over Germany. Alone, the accumulated reports of generations of parents in our support groups are sufficiently convincing, that solely sociological approaches fail to address the real problems and needs of persons with ADHD because they tend to deny, ignore or underestimate the important role of genetics and neurobiology in this disorder and its social consequences for those afflicted. This experience-based conclusion is fully supported by the exciting scientific advances in our understanding of the neurobiological aspects of behavior, especially in the last 20 years.

Yet still, in spite of all the overwhelming science- and experience-based evidence, society, politicians, many relevant professions and the media are still wary of accepting that there is often more behind delinquent and antisocial behavior than just the expression of the results of freely made "wrong" decisions by individuals who purportedly would have been just as free to make the "right" decisions, but opted for the "wrong" ones out of their own free will. Neuroscience has meanwhile delivered enough knowledge and facts that seriously contest such simple explanations. *[Editor's note: Indeed! Crime Times has published more than 10 years worth of research revealing the role of biological factors in delinquency and criminality.]*

....This, of course, is by no means to say that we are all helpless victims of our biologically pre-determined fate and therefore not accountable for our actions.

But we can no longer ignore that human behavior is more than just the result of freely made choices out of a variety of different alternatives on the basis of equal opportunities and the same starting line for all. The full recognition and acceptance of the genetic and biological contributions to delinquent behavior would have consequences for all involved: society, our judicial/ punitive/correctional system, and the educational, medical and therapeutic professions. These consequences would mean that we would have to say goodbye to the common practice of just looking for who is to blame, if nothing else helps. Because the buck always stops at the same place: the "guilty" individual and/or his parents. If "the system" fails, or the teacher, the psychologist, the doctor, etc., they are all protected and unified by the explicit or implicit notion that they do not make mistakes, and if their efforts were to no avail, then it can only be the fault of the respective individual ("non-compliance") and/or his parents (who apparently didn't "raise him right"). We could save a lot of money which is being invested in building and maintaining penitentiaries and other "correctional" institutions by investing it into prevention programs, by helping children and youths with ADHD and other behavioral problems (and their families) effectively, before they develop delinquent or criminal behavior. But we will only be able to practice effective prevention if we recognize, accept and deal with the genetic and neurobiological aspects of behavior in doing so.

The practice of solving behavioral problems by identifying those who we can put to blame (always the individual and/or his parents), and dealing with them accordingly, is still popular and widespread, but, by all that serious science has proven and common sense tells us, obsolete.

Michael Townson, Chairman
AdS e.V.
Support Association for the Advancement of Children, Youths and Adults with Attention Deficit/ Hyperactivity Disorder
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Maternal smoking, ADHD in children again linked

Two new studies strongly implicate maternal smoking as a risk factor for childhood learning and behavior problems, replicating earlier findings (see *Crime Times* Volume 11, Number 4, page 3).

In the first study, Karen Markussen Linnet and colleagues conducted a follow-up of 1355 children whose mothers' smoking habits were recorded during pregnancy. When the children were three, the researchers used parent questionnaires to identify symptoms of hyperactivity, distractibility, aggression, hostility, anxiety, and fearfulness.

"Compared with children of non-smokers," they report, "children born to women who smoked 10 or more cigarettes per day had a 60% increased risk of hyperactivity and distractibility perceived by the parents." The findings remained true when the researchers controlled for

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Surprising findings show complex gene effects on ADHD

Data from a new study reveal how genes can affect thinking and behavior, sometimes in unexpected ways.

Tanya Froehlich and colleagues measured the lead levels and ADHD symptoms of 172 boys and girls. Eight percent of the children were diagnosed with ADHD, but one-quarter exhibited some ADHD symptoms.

The researchers discovered that children with one variant of DRD4, a gene involved in regulating brain levels of dopamine, had greater difficulty performing tasks involving executive function—planning, organization, and the ability to revise strategies in response to new information.

However, there was a twist: While children with this high-risk gene variant were more likely to exhibit ADHD symptoms, lead exposure did not increase their risk. In contrast, children with the low-risk variant were less likely to have ADHD symptoms—but for these children, lead exposure significantly increased the risk of having ADHD. Says Froelich, "In an environment contaminated with lead, a genetic variation that was protective becomes disadvantageous."

The researchers also found that elevated lead exposure impaired performance in planning and attentional flexibility in boys more than in girls. "This suggests," says Dr. Froehlich, "that, for these executive functions, boys are more vulnerable to the adverse effects of lead exposure. This is also consistent with the established fact that boys have higher rates of ADHD than girls."

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"Study links ADHD cognitive and behavioral problems to genetic and environmental interactions," news release, Cincinnati Children's Hospital Medical Center, May 1, 2006; and "Lead exposure tied to ADHD symptoms," Serena Gordon, *HealthDay*, May 1, 2006.

QUOTABLE

"Their ability to appraise themselves, their problems, their needs, or their handicaps is essentially lacking, and they view situations with gross inaccuracy. With little thought or concern or plan for tomorrow they jump in to respond to the detail they have noted, with the result that their behavior is forever ill conceived, illogical and self defeating.

"They make inappropriate connections, and they have difficulty assigning priorities or values consistent with reality or even with their own frames of reference. Lack of perspective, poor reasoning capacity, short attention span, problems in planning ahead, ease of feeling stressed, problems in the area of communication, and poor and shallow human relations are so common as to be the rule…."

—Camilla M. Anderson, M.D., former chief psychiatrist in what was, at that time, the world's largest women's prison, quoted in The Dyslogic Syndrome*, by John Wacker, 1976*

"Having a bad diet is now a better predictor of future violence than past violent behavior. In fact, predicting future criminal behavior from a criminal past has statistically little better than a random chance of being correct. Likewise, a diagnosis of psychopathy, generally perceived as being a better predictor than a criminal past, is still miles behind what you can predict just from looking at what a person eats."

—Researcher Bernard Gesch, author of a landmark study on diet and criminal behavior, quoted by Pat Thomas in The Ecologist*, April 2006*

Maternal smoking, ADHD in children again linked

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several other lifestyle factors.

While Markussen Linnet and colleagues did not find a correlation between maternal smoking during pregnancy and hostility or aggression in children, a recent study by L. S. Wakschlag and colleagues did. Wakschlag et al. studied 448 boys participating in the Pittsburgh Youth Study and found that tobacco-exposed boys were significantly more likely to develop oppositional defiant disorder (ODD), or to have combined ODD and ADHD, than other children. They also were more likely to develop delinquent behavior early in life.

The researchers conclude, "[E]xposure-related conduct problems appear to be characterized by socially resistant and impulsively aggressive behavior."

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"Cigarette smoking during pregnancy and hyperactive-distractible preschoolers: A follow-up study," K. Markussen Linnet, C. Obel, E. Bonde, P. Hove Thomsen, N. Jorgen Secher, K. Wisborg, and T. Brink Henricksen, *Acta Paediatrica*, Vol. 95, No. 6, June 2006, 694-700. Address: K. Markussen Linnet, Perinatal Epidemiology Research Unit, Department of Obstetrics and Paediatrics, Aarhus University Hospital, Skejby Sygehus, Denmark.

—and—

"Is prenatal smoking associated with a developmental pattern of conduct problems in young boys?" L. S. Wakschlag, K. E. Pickett, K. E. Kasza, and R. Loeber, *Journal of the American Academy of Child and Adolescent Psychiatry*, Vol. 45, No. 4, April 2006, 461-7. Address: L. S. Wakschlag, Institute for Juvenile Research, Department of Psychiatry, University of Illinois at Chicago, Chicago, IL 60608, lwakschlag@psych.uic.edu.

—BOOK REVIEW—
ATTENTION DEFICIT DISORDER:
The Unfocused Mind in Children and Adults

by Thomas E. Brown, Ph.D.
Yale University Press
September 2005

Parents and professionals dealing with children or adults with attention deficit disorder (ADD) will find valuable information in this book that is not readily available in books pertaining to learning and behavioral disorders.

Explaining that "the core problem in ADHD is not lack of willpower, but chronic, often lifelong impairment of the 'executive' or management functions of the brain," Brown describes how this impairment can make the responsibilities of adult life—holding down a job, raising a family, handling finances, and developing relationships—a constant struggle. He also discusses the variety of behavioral, learning, and psychiatric disorders that overlap with ADD, including conduct disorder, oppositional defiant disorder, bipolar disorder, and Asperger syndrome.

Brown offers an extensive dissertation on the six areas of functioning—activation, focus, effort, emotion, memory, and action—affected by impairments in executive function (which he defines as brain circuits that prioritize, integrate, and regulate other cognitive functions). In addition, he provides a highly informed discussion of ADD treatment options at different ages, although the important role of nutrition and toxins receives little attention.

Overall, this work by Brown—who is an assistant clinical professor of psychiatry at Yale University School of Medicine, and Associate Director of the Yale Clinic for Attention and Related Disorders—is an excellent resource for parents and professionals interested in the neurological roots of ADD. Dr. Brown's website, at www.drthomasebrown.com, contains additional articles and information.

QUOTES FROM ATTENTION DEFICIT DISORDER: THE UNFOCUSED MIND *by Thomas E. Brown, Ph.D.*

(A)DD syndrome is essentially a chemical problem, specifically an impairment in the chemical system that supports rapid and efficient communication in the brain's management system.

Even today many educators and clinicians do not realize that those executive functions crucial to effective performance as a student can be severely impaired even in individuals who are very bright and talented. In many schools and families, bright but disorganized and poorly performing students with ADHD are still seen as stubbornly lazy, unmotivated, or defiant. Well-intentioned but uninformed teachers and parents often punish these bright, extremely inconsistent students for what appears to be a lack of motivation or a refusal to do what they need to do.

(T)here are many parents of children with ADD syndrome, some of whom have successfully raised other children, who have worked very hard with multiple strategies to elicit cooperation from their child, only to find that even carefully executed advice from experts fails to help.

(F)or many adolescents there is not a good fit between their developing capacities and the demands of their environment. Their ability to negotiate the increasingly complex demands of adolescence is inconsistent and sometimes wildly erratic. For most adolescents who suffer from ADD syndrome, this process of major transitions is even more difficult: for some, it is overwhelming.

Many mental health workers assume that interpersonal problems are always caused by unrecognized emotional conflicts. For some individuals, however, interpersonal difficulties are more fundamentally rooted in an inability clearly to say what one is thinking or to understand correctly what others are trying to say.

(E)xecutive functions are basic and essential to the integrated operation of many diverse activities of the mind; consequently, individuals with weaknesses in the development of their executive functions are likely to be more vulnerable to many other types of psychiatric impairments, just as anyone with weak bones is more vulnerable to fractures and one with a weak immune system is more vulnerable to a wide variety of infections.

A substantial body of research has demonstrated that genetic factors play a very large role in the etiology of ADHD. Steven Faraone and colleagues (1998) and Rosemary Tannock (1998) have summarized findings of multiple twin and adoption studies that indicate high heritability rates for ADHD and components of ADHD: from .75 to .98, with an average of about .80.

Their capacity to tolerate frustration and change their behavior may not be sufficiently developed, and unlike most other children, they seem unable to respond to anticipated rewards or even to harsh punishments.

The early drinking/alcoholism connection: is a biological double-whammy to blame?

People who start drinking by the age of 14 are five times more likely to become alcoholics than people who hold off on drinking until the age of 21, with genes strongly implicated as a reason for the association between early drinking and alcoholism. However, a new study suggests an additional reason for the relationship: early exposure of the brain to alcohol may short-circuit the growth of brain cells, impairing the learning and memory processes that protect against addiction. Thus, young drinkers may suffer a double-whammy: first from the genes that predispose them to early drinking, and then from the damage to brain cells that drinking causes.

Fulton Crews and colleagues administered three different amounts of ethanol to male rats when the rats were between 35 and 40 days old (the "adolescent" period for rats). The researchers report that alcohol powerfully inhibited the proliferation of neural progenitor cells (NPC), an effect that was dose-dependent but occurred at all levels of alcohol exposure. In adolescence, the researchers say, NPC contribute to the growth of new brain cells in areas of the forebrain and the hippocampus. Crews et al. say their analysis also showed a reduced formation of new cells in the rats' brains 28 days after exposure to alcohol.

The researchers say, "The extensive proliferation and survival of adolescent NPC may contribute to the plasticity and maturation of the brain that occurs during the transition from adolescence to adulthood." The researchers add, "Adult NPC are hypothesized to contribute to learning and memory, as well as affective state and mood. Thus, our findings of decreased NPC proliferation and lost neurons one month after a single dose of ethanol suggest that adolescent binge drinking could disrupt learning, affective state and other behaviors undergoing maturation during adolescent brain development."

Crews and colleagues note that one-third of high school students and 44% of college students "binge drink" at least once every two weeks, consuming an average of 14 drinks per episode. This amount, the researchers say, is sufficient to achieve blood levels similar to the highest dose of alcohol used in their study–a dose that almost completely blocked NPC proliferation.

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"Neurogenesis in adolescent brain is potently inhibited by ethanol," F. T. Crews, A. Mdzinarishvili, D. Kim, J. He, and K. Nixon, *Neuroscience*, Vol. 137, 2006, 437-445. Address: Fulton Crews, Department of Pharmaceutical Sciences, University of Kentucky, 725 Rose Street, Lexington, KY 40536-0509, ftcrews@med.unc.edu.

Sensory issues can trigger rage, other behavior problems

Physicians treating children who experience frequent episodes of explosive rage should investigate the possibility that sensory issues play a role, according to a recent case report.

Physician Michael Cheng and occupational therapist Jennifer Boggett-Carsjens treated a nine-year-old diagnosed as having bipolar disorder, attention deficit hyperactivity disorder, oppositional defiant disorder, and nonverbal learning disability. Because of his daily rage attacks, the boy had been placed in a special education classroom where teachers noted that a wide range of triggers—noisy rooms, being touched by others, etc.—could precipitate violent attacks.

Cheng and Boggett-Carsjens taught the boy sensory modulation techniques and coping strategies, and planned multiple ways to reduce the amount of sensory input he received (for instance, by giving him earplugs and headphones with music to mask outside noise). They report that within weeks, he was calmer and more focused. He finished the school year in a regular classroom, began getting good grades, and received an award for being the most improved student. The next year, he entered a gifted program where he excelled.

"Since affect regulation is a higher order function," the authors say, "it makes intuitive sense that problems with affect regulation may result from problems with earlier developmental stages, such as sensory processing." Such problems, they note, can manifest as anger, sadness, hyperactivity, or distractibility. They note that children with behavior problems due to sensory issues often exhibit a "good days and bad days" pattern, because it is the cumulative emotional overload from either hypersensitivity or hyposensitivity that eventually triggers outbursts.

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"Consider sensory processing disorders in the explosive child: case report and review," Michael Cheng and Jennifer Boggett-Carsjens, *Canadian Child and Adolescent Psychiatry Review*, Vol. 14, No. 2, May 2005; and "Making sense of things: An overview of sensory processing and regulation," presentation by Michael Cheng to Crossroads, May 20, 2005. Address for either: Michael Cheng, Children's Hospital of Eastern Ontario, McArthur Site, Suite 200, 311 McArthur Avenue, Ottawa, Ontario, K1L 8M3, Canada.

Childhood depression responds quickly to omega-3 treatment

Major depression is becoming more common in children, and dramatically increases the risk of substance abuse and suicide. A new study indicates that a simple treatment—supplementation with omega-3 fatty acids—can reduce or even eliminate the symptoms of major childhood depression, quickly and without side effects.

Hanah Nemets and colleagues enlisted 28 children in a double-blind, placebo-controlled study of the effects of omega-3 fatty acids on first-time episodes of major depression. Of these, 20 children completed at least one month of the study, while eight (most of them in the placebo group) dropped out for reasons unrelated to the treatment. The children ranged in age from 8 to 12, and had been depressed for an average of slightly more than three months.

Half of the children received daily doses of 400 mg of eicosapentaenoic acid (EPA) and 200 mg of docosahexaenoic acid (DHA), both omega-3 fatty acids. This ratio of EPA to DHA, Nemets and colleagues say, is similar to the ratio found in most over-the-counter omega-3 supplements. Children in the placebo group received capsules containing either olive oil or safflower oil.

The researchers tested the children at intervals during the 16-week study, using three assessments: the Childhood Depression Rating Scale (CDRS), the Clinical Global Impression scale (CGI), and the Childhood Depression Inventory (CDI). The first two tests are scored by clinicians, while test subjects evaluate their own symptoms on the remaining test.

Nemets and colleagues report that the effects of omega-3 administration were highly significant. "Among the children on omega-3 treatment," they say, "seven out of ten had a greater than 50% reduction in CDRS scores. Of those on placebo, zero out of 10 had a greater than 50% reduction in CDRS scores." They add that four of the ten children in the omega-3 group met commonly used criteria for remission, while no children in the placebo group had CDRS scores indicating a remission. Results of the CGI and the self-rated CDI revealed similar improvements. Analysis showed significant effects of treatment at the 8-week, 12-week, and 16-week testing points.

"There were no clinically relevant side effects reported," the researchers say, and patients were unable to tell whether they were receiving the active treatment or the placebo.

The researchers conclude, "Omega-3 fatty acids may have therapeutic benefits in childhood depression." They note that a similar study they conducted earlier showed that the nutrients benefit adults with depression as well. In that study, participants received only EPA, as an add-on to drug therapy.

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"Omega-3 treatment of childhood depression: a controlled, double-blind pilot study," Hanah Nemets, Boris Nemets, Alan Apter, Ziva Bracha, and R. H. Belmaker, *American Journal of Psychiatry*, Vol. 163, No. 6, June 2006, 1098-1100. Address: R. H. Belmaker, Beer-Sheva Mental Health Center, P.O. Box 4600, Beer-Sheva, Israel, belmaker@bgu.ac.il.

Nonstick chemicals change behavior in mice

High exposure to the fluorinated chemicals used to make nonstick cookware radically alters the behavior of mice, according to a new study.

Niclas Johansson and colleagues administered a single oral dose of either perfluorooctanesulfonic acid (PFOS) or perfluorooctanoic acid (PFOA) to mice. Both are nonstick chemicals that have been detected in human infants at birth.

The mice were exposed to high or low doses of either chemical at the age of 10 days, which corresponds to the post-birth brain growth spurt in humans. At two and four months of age, each mouse was placed in a new cage, and the researchers evaluated its ability to adapt to its surroundings. Untreated and low-dose mice reacted anxiously at first but soon settled down, while mice exposed to high doses of the chemicals remained agitated—evidence that they could not process new stimuli correctly.

The high-exposure mice also reacted abnormally to injected nicotine, which made other mice more active but put heavily-exposed mice to sleep. The researchers say this indicates that nonstick chemicals affect the brain's acetylcholinergic system, which responds to nicotine.

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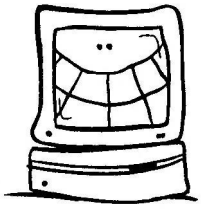
"Nonstick chemicals upset behavior," Janet Raloff, *Science News*, Vol. 169, March 25, 2006, p. 190.



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QUOTABLE "Neurologists and neuropsychologists who have been practicing for a few decades or more often comment on the changing character of their caseloads. More than a few of my colleagues (myself included) have dealt with four-year-olds who pull knives on their mothers, something that would have been astonishingly rare twenty years ago. Overall, more children are presenting with diffuse difficulties—not discrete learning disabilities where everything else is more or less intact, but difficulties spread across multiple cognitive, sensorimotor, social, and emotional domains. And the scale of this is enormous: 17% of children in the United States have some kind of attentional or learning problem, and a significant number of them are on medications of one kind or another."

Pediatric neurologist Martha Herbert, M.D., in the Wild Duck Review*, 2000*

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