Exploring the Neuropathology of Autism Spectrum Disorders

In Search of Biological Markers at the Molecular & Cellular Levels
NAARRATIVE is published four times a year by the National Alliance for Autism Research (NAAR).

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Established in 1994, NAAR is the first organization in the country dedicated to funding and accelerating autism research that seeks to determine the causes, prevention, effective treatments and, ultimately, cure for autism spectrum disorders. To date, NAAR has committed a total of $14.9 million to directly fund 169 autism research projects worldwide - more than any other non-governmental organization.

NAARRATIVE Summer 2003

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Science & Research

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As I pass the two year anniversary of my Presidency, and my three years as a Trustee, I am astounded at the growth of this organization.

When I joined the Board in 2000, NAAR awarded $1.5 million in research grants; this year NAAR is committing $4.9 million. In May of 2000, NAAR held its inaugural Walk F.A.R. for NAAR event in Pittsburgh, and this year, we are scheduled for 24 walks across this country.

As I recently remarked before supporters in Miami, I cringe internally when I'm applauded for NAAR's success because in my heart, I know that the real credit belongs to the thousands of volunteers, often unacknowledged, who willingly sacrifice resources as well as precious time to themselves or with their families to advance our cause. To each volunteer, I am profoundly in your debt.

As a result of your collective effort, NAAR is now this nation's largest, non-governmental funding source of autism research. Since our first set of awards in 1997, we have, to date, cumulatively awarded almost $15 million to fund 169 projects and fellowships worldwide. For some time, NAAR had been well known to the cognoscenti at the National Institutes of Health and the Centers for Disease Control and Prevention; now, in part because of our growth, key members of Congress as well as the mass media are also getting to know NAAR.

But for me, NAAR's success is also bittersweet.

In stark contrast, the last three years have not been ones of real change nor substantive growth for my daughter, Helen, who is fast approaching her 11th birthday. As parents, we can't achieve our goal one moment too soon. Each day that passes represents another day ravaged by autism. And yet, the beauty of the resiliency of the human spirit means that each new day brings renewed hope.

For the nine years now that I have had to confront Helen's autism, I am finally at peace with myself. The guilt and the instinctive knee-jerk need to blame, while not completely dissipated, are at least well reined. I have come to accept that while I can't figure out what and when something went so horribly wrong, I can do everything to ensure that research isn't limited by money nor manpower.

Who amongst us have not vowed to our child that we will always love them, protect them and always be their strongest advocate?

I am truly grateful for NAAR. Through this magnificent organization, I have found a way to uphold my promises to Helen.
With all that is written and said about autism, it may seem surprising that researchers still know relatively little about the brain pathology in individuals with autism spectrum disorders. There are still brain areas whose anatomy has not been formally studied or reported.

Because all of the behaviors we regard as autistic are generated from the brain, understanding the structure and function is essential to finding treatments. A more detailed understanding of the pathological anatomy of autism also allows us to test viral, immunologic, toxic and other environmentally-based hypotheses surrounding the potential cause or causes of autism to see if certain risk factors related to those hypotheses cause brain abnormalities.

While clinical standards for the diagnosis of autism are the result of the examination of hundreds of individual patients, our limited knowledge of neuropathological changes associated with autism spectrum disorders is based on the studies of approximately 50 brains of people with autism - a very small number, especially when compared to tissue-based research of other neurological conditions, such as Alzheimer’s, with many thousands of cases.

The good news is that experts from other areas are interested in exploring pathology in autism and sophisticated research methods used for investigations of other brain disorders, laboriously developed over the years, can now be applied to autism brain research.

One of the factors restricting this research was the lack of brain tissue dedicated to autism research. However, due to the success of the Autism Tissue Program, the National Alliance for Autism Research (NAAR) has been able to support a collaborative effort using state-of-the-art stereology to study the neuroanatomy in autism down to a cellular level.

Stereology enables researchers to obtain three dimensional information, including number, length, surface and/or volume, from tissue sections.

In 2002, NAAR awarded two grants totaling $218,700 to fund this international pilot study led by Jerzy Wegiel, V.M.D., Ph.D., of the Department of Developmental Neurobiology at the Institute for Basic Research in Staten Island, NY; and Christoph Schmitz, M.D., of the Department of Anatomy at the University of Rostock in Germany.

The project, now well under way, is designed to create the first ever atlas of the autism brain at several ages as an open resource allowing researchers and clinicians to examine differences in a brain affected by autism. The atlas is significant for many reasons, including the role it may have in helping to identify a biological marker for the diagnosis of autism.

"We have to expect that the pathology, or tissue examination, will identify differences in the brain of someone with autism," said Dr. Wegiel. "We are looking for a common denominator."

Dr. Wegiel and Dr. Schmitz are sharing 10 intact brain hemispheres, provided by the Autism Tissue Program, to study 17 different brain regions focusing on memory, motor, language and chemical neurotransmitter systems, comparing them with control tissue from individuals - age and gender matched - without autism. Dr. Wegiel and his team at the Institute for Basic Research are focusing on the basal ganglia, brainstem and cerebellum, while Dr. Schmitz and his team at the University of Rostock are focusing on the cerebral cortex.

Both projects were reviewed and approved by both the NAAR Scientific Advisory Board and the Autism
Brain Atlas Project (continued from page 4)

Tissue Program's Tissue Advisory Board.

Interestingly, NAAR approved Dr. Schmitz's project in 2001, on the condition that tissue would be available. When Dr. Schmitz applied for tissue from the Autism Tissue Program, the Tissue Advisory Board reviewed it, along with Dr. Wegiel's application.

Eventually, the tissue board brought the researchers together to form a collaborative effort based on the protocols developed by Dr. Schmitz. All of the sectioning and transfer of materials are being performed in Dr. Wegiel's laboratory.

"We are continuing the work of pioneers in brain research, like Margaret Bauman and Thomas Kemper," said Dr. Wegiel. "What makes our project unique is that we have a selected strategy of evaluation and are working with standardized protocols."

The aim of this study is to:

- detect patterns of developmental abnormalities in the brains of people with autism
- integrate quantitative measures of developmental abnormalities with mathematical models of progression of age-related changes
- correlate morphometric measures of developmental abnormalities with clinical features of autism

To achieve these goals, researchers are using imaging techniques, computer-based image analysis, and computer-based stereology to initially develop five models of pathological changes in the memory, motor, cholinergic and serotoninergic systems and brainstem; and ultimately, develop a global model of pathological changes in the autism brain.

These models are designed to give investigators an accurate definition of both the pattern of changes present in all people with autism as well as sub-patterns that potentially reflect different causes of autism.

In addition, researchers hope to integrate clinical observations and patterns of neuropathological changes into behavioral correlations and detect patterns of age-associated changes in people with autism.

Unlike most postmortem studies involving brains of people with autism, which have typically characterized only relative measures of the number of neurons, the Brain Atlas Project provides two absolute measures: the volume of brain structure and the total number of neurons.

This project integrates static two-dimensional reconstructions of brain structures and dynamic models of evolution of changes with time.

Researchers anticipate that the data obtained will be able to confirm or refute some of the proposed theories of the etiology and pathology of autism.

Interested in Doing More to Advance Autism Research?

NAAR & the Autism Tissue Program Can Show You How...

Many parents of children with autism spectrum disorders suffer from a sense of not being able to do enough to help their children and others faced with this devastating disorder.

But we can all make a difference and play a pivotal role to advance research and, someday, find a cure.

How? It's as easy as registering you and your family as brain tissue donors with the Autism Tissue Program, a parent-led brain tissue donation program sponsored by NAAR that is dedicated to autism research.

Organ and tissue donation programs play a critical role in research efforts focused on finding treatments and cures for many diseases and disorders, including autism.

The Autism Tissue Program makes post-mortem brain tissue available to as many qualified scientists as possible to advance autism research and solve the mysteries of this devastating disorder. Without brain tissue - the most fundamental, rare and essential resource - studies that could lead to the treatment and eventual cure of autism cannot be done.

By registering as a donor with the Autism Tissue Program, you are giving the gift of hope to children and adults with autism spectrum disorders.

To register, call (877) 333-0999, or visit www.MemoriesofHope.org.
E ven for anyone who cared about autism spectrum disorders, attending scientific meetings in 1996 was frustrating.

So many disciplines in the neurosciences seemed to be taking off with all sorts of monumental accomplishments. The literature about rapidly-changing science often seemed more like fiction than science.

At the same time, very little published research pertained to autism. To change this dire situation, NAAR decided, first and pivotally, to identify accomplished scientists who had never studied autism and persuade them to change their research focus to autism.

Partly as a result of our efforts, I have been pleasantly surprised over the years by the number of prominent scientists who have actually changed the focus of their own research to study autism. We are proud to say that several of these scientists have come from NAAR's own scientific advisory board. They were originally recruited for their expertise in areas unrelated to autism. During their service on NAAR's all-volunteer Scientific Advisory Board, they became interested in our children's plight. Dr. Manuel Casanova, of the School of Medicine, Medical College of Georgia, is one of these scientists.

We first met Dr. Casanova when NAAR was seeking a scientific advisor for our Scientific Advisory Board. He is considered one of the world's experts on the technical aspects of handling brain tissue. In fact, Dr. Casanova was instrumental in the organization of our now very successful Autism Tissue Program.

His own research focused on schizophrenia. Although he lacked a personal connection with autism, Dr. Casanova completely embraced the task of serving our organization in any way possible. He always made himself available for the numerous tasks that NAAR called upon him to do. Despite the personal sacrifice that he made in time and energy to help us, I was always surprised - and touched - by the gratitude Dr. Casanova expressed for our efforts supporting autism research. Moreover, as I learned, he is the parent of a child with a serious medical problem. Over the years, Dr. Casanova has made every effort - as father and scientist - to help his child. Over time, his compassion and incredible dedication to NAAR's mission became clearer.

Dr. Casanova is now doing some of the most exciting and novel work in all of autism research. I would like to briefly describe his research and discuss some of its implications for the future of autism treatment and prevention.

To fully appreciate his work, I'll briefly describe what we currently know about neuroanatomy in general and in individuals with autism.

In truth, brain sciences or the neurosciences, are still in their infancy. Other organs of the body have been studied systematically for many decades. Yet we have only recently been able to study the human brain, primarily because of its relative inaccessibility. Ironically, in this era of high tech medical procedures, we must first learn how to probe beneath the brain's bony protection - the skull. The brain's delicacy has also deterred research. For example, when doctors suspect pathology in the liver, they can quite easily secure a biopsy and directly examine the tissue. Brain biopsy, although possible, is reserved for the most serious problems. As late as the 1970's, the only "safe" way to look at the brain was an x-ray that yielded almost no information. Since then, a succession of new techniques has become available, starting with the CT scan, followed by the PET scan and the MRI. As these techniques evolved, we can now study the structure - and even the functioning - of the brain safely and at a reasonable cost.
Another method of studying the brain, postmortem examination, has been available for a long time. Although available for research, the methods used were relatively crude and full of technical obstacles. For example, the time between death and preserving the tissue can lead to massive changes, often making the tissue virtually useless for study. Then too, until recently, the sheer number of brain cells and the complexity of their connections made their examination impossible. Today, with the aid of high-speed computers and scanning devices, researchers can use much more sophisticated methods to study neuroanatomy.

Unlike the brain, an organ such as the liver comprises only a few types of cells. Sixty percent of liver cells are hepatocytes, accounting for 90% of the organ’s volume. Therefore, the liver is largely homogeneous. Studying any part of the liver is very similar to studying any other part. This is not true of the brain. Although it is said that the “neuron” is the fundamental type of cell involved in brain functioning, in reality many types of neurons exist. These cells have been classified into different types using the diverse neurochemicals that they use to communicate (such as serotonin, dopamine, etc.). Brain cells also grow connections called dendrites that link them efficiently to other cells. These connections link several cells to form pathways, sometimes called a circuit. This complexity is increased further by each cell’s communication with a huge number of other cells; thus pathways cannot be considered “closed” circuits. Cells can enhance, or inhibit, the functioning of a given circuit.

To understand the brain’s full complexity, one must recognize that the brain holds literally 10 billion brain cells with 60 trillion connections, or “synapses.”

With this backdrop in mind, let us consider what we know about the brain in individuals with autism.

Among all the biologic abnormalities identified thus far in autism, the current evidence for anatomical abnormalities is actually the strongest. As we have seen in both scanning and brain tissue examination, some of these findings have been highly reproducible.

Various brain structures in autism are clearly abnormal. Despite this evidence, research has seldom gone beyond labeling a structure in the brain as either too large or too small. We also have information about abnormal numbers of cells in various areas and some suggestions of abnormal distribution of cells. In reality, these insights provide scant evidence of what actually is “wrong” with the brains of autistic patients.

In fact, until we can more clearly distinguish the brains of individuals with autism from the brains of neurotypical individuals, these shortcomings will continue to thwart our desire to know “what went wrong.” As a result, the likelihood of securing meaningful treatments will also remain remote.

However, as new, more powerful neuroimaging techniques become available, they will clearly improve our ability to learn far more about autism. The availability of postmortem tissue through the Autism Tissue Program has made an enormous impact. This has enabled a total of 30 investigators to undertake brain research in autism from the perspectives of neuroanatomy as well as neurochemistry and genetics.

The most compelling evidence of anatomical abnormalities in individuals with autism has involved the lower portions of the brain: that is, the brain stem and the cerebellum. Some evidence for abnormalities has appeared in other structures such as the amygdala and the hippocampus. An extremely important part of the brain (and the largest) is the cerebral cortex. Although many of the symptoms noted in autism seem to be functions of the cerebral cortex, it has been difficult neuroanatomically to document any abnormalities.

Dr. Casanova has spent many years of his career studying a tiny structure found in the cerebral cortex called the “minicolumn.”

These structures consist of 80-100 neurons arranged radially like pearls on a string; they are found in all areas of the cortex. Minicolumns are believed to comprise the smallest level of functional organization in the cortex. That is, these normal cells line up in space in such a way as to enable them to function together. These structures are very hard to “see.”

Imagine flying over a farm. Suppose the farmer planted his tomatoes in clusters with just a little extra space between the clumps. Unless one was looking for this arrangement, it might not be obvious.
In addition, one might notice it only if one were looking at just the right angle. This could explain why minicolumns have received little attention until now.

There also exists a structure called the "macrocolumn" that consists of 60-80 minicolumns. Within this structure, each minicolumn might function as a "processing unit." That is, each individual brain cell in the cortex by itself is probably incapable of performing meaningful work in such a complicated system. Rather, the brain cells perform work within the minicolumn that then receives and sends processed messages. The minicolumns receive messages from distant parts of the brain but also communicate with other minicolumns in the cortex.

A key to grasping the function of minicolumns is understanding the role of a sophisticated group of "inhibitory circuits" within them. Different types of inhibitory fibers modulate the functioning of the minicolumns in various, very subtle ways. Therefore, they can undertake the sophisticated processing of which the brain is capable.

All of this was quite academic to those of us interested in autism until Dr. Casanova published a paper in the prestigious journal, Neurology, last year. In that article, Dr. Casanova and his colleagues reported abnormalities in the structure of minicolumns in the brains of autistic individuals. Specifically, they found that, in the brains of individuals with autism, the minicolumns were more numerous but smaller than in "controls" (individuals unaffected by disease). They also found less space between the minicolumns in the autistic brains.

In a separate publication, they reported that one brain of an individual with Asperger Syndrome revealed similar results. Although this research team has found abnormalities in other brain diseases and disorders, such as schizophrenia and learning disabilities, the nature of the abnormalities in autism was completely different and, in fact, more dramatic. As in all scientific studies, Dr. Casanova's research findings will require further study and replication. However, if these findings are substantiated, what would they indicate about autistic disorder?

First, from a point of view of brain development, one must ask why the minicolumns are abnormal. At this point, its causes are unknown. It is believed that minicolumns are formed by both genetic as well as environmental influences. By studying the factors that form the minicolumn, it would be possible to model the factors that may cause the differences found in the autistic brains. It should also be noted that because minicolumns are found in all primates, animal models could be created with direct bearings on autism.

Another and perhaps more immediately testable clue could help explain how the brain functions in autism. For example, it is widely observed that individuals with autism have "processing problems," such as auditory processing or what is commonly called sensory integration problems. At this time, no one knows what "processing" or "integration" mean on a cellular level. Dr. Casanova's neuroanatomic findings could provide a model to explain this.

One model for how the brain malfunctions in autism has been described as the "temporal binding deficit hypothesis of autism." In typical development the brain not only develops specializations but also "integrates" the different functions. However, in autism the functionally specialized brain regions become increasingly isolated from each other. Those cognitive faculties that require the integration of numerous brain regions do not develop while those that rely on more localized neuronal activity function well. This could explain the existence of splinter skills - and even the development of extraordinary talents known as savant skills - while at the same time leaving the affected individuals with significant problems in generalizing what they learn.

Recent research has also focused on the electrical activity measured on EEG in the frequency known as "gamma." It seems that groups of cells fire at about 40 Hz, resulting in an oscillatory pattern.
As they do so, they communicate their functioning to other remote areas of the brain, making those areas fire at that same frequency. In order for proper "coupling" to take place, the timing has to be just right. It could be hypothesized that, in autism, the brain is unable to communicate between brain regions because some areas cannot fire at the correct frequency. This phenomenon has been labeled "hypocoupling," leading to the failure of local networks of cells to correlate temporally with one another.

Dr. Casanova speculates that these electrophysiological phenomena can be explained by the abnormalities in the minicolumns that he has observed in individuals with autism. Because it contains smaller and too numerous minicolumns, the cortex in autism may be firing too many processing units at once. As a result, these uncoordinated units cannot respond sufficiently to produce the correct oscillatory cycles. To produce these cycles, thousands of cells must fire coherently.

This theory could lead directly and immediately to clinically relevant information. We know that seizures are caused by abnormal electrical activity. In seizure disorder, if too many cells (as opposed to just the right amount of cells) fire in synchrony, the brain is overwhelmed; it "shorts out," to use the electronics metaphor. Seizure disorder is very common in individuals with autism. Even more common is "epileptoid activity" seen on the EEG, which are seizure-like rather than actual clinical seizures. The abnormalities that Dr. Casanova identified in minicolumns offer an attractive new hypothesis as a cause of seizure activity in individuals with autism.

As those of us familiar with autistic children know well, children learn during a rather narrow "window" of external stimulation. Many autistic children seem unable to respond to low levels of stimuli. It is often difficult to secure their attention without specifically calling for it, such as saying, "look at me" or even at times directing their faces.

At the same time, too much stimulation, as in a noisy classroom, prevents many individuals with autism from focusing. Unable to pay attention, they often get agitated. These observations suggest a unifying explanation: the individual may need just the right amount of stimulation in order for the brain to process information efficiently. This observation has led those who practice applied behavior analysis to maximize learning by orchestrating classroom conditions. Put another way, they must target just the right amount of "arousal." Dr. Casanova's minicolumn findings might also explain the relevance of arousal. If the processing units are poorly synchronized, then over- or under-arousal could easily occur.

This research may lead, hopefully, to the use of pharmaceutical interventions to regulate the function of the minicolumns. As stated above, we know that inhibitory fibers exist within the minicolumns. If we could regulate the firing of these units, then we could mitigate the increased seizure activity and thus, enhance the brain's ability to learn more effectively.

All of us at NAAR have been excited by Dr. Casanova's recent involvement in autism research and by his intriguing findings. We were saddened - but also heartened - by his decision last fall to resign from NAAR's Scientific Advisory Board after six years of volunteer service. We were saddened by NAAR's loss of a great asset to its evaluation process. However, we were also heartened by his reason for resigning. Dr. Casanova wished to apply to NAAR for funding to further pursue his autism research and knew that NAAR's policy precluded it from funding its own advisors. As such, Dr. Casanova's resignation from NAAR's Scientific Advisory Board means one less distinguished advisor for NAAR - but it also represents one additional distinguished scientist devoting his efforts to autism research.

There are never enough occasions to express our profound gratitude to NAAR's Scientific Advisory Board for their enormous commitment of time, energy and talent to our loved ones and our cause. We wish to express them today to Dr. Casanova.

**Funding Update:** NAAR is pleased to announce that it has awarded a two-year, $120,000 grant to Dr. Casanova to expand his investigation of minicolumn abnormalities in autism. NAAR's Scientific Advisory Board strongly recommended funding Dr. Casanova's proposal at its seventh annual meeting.

Eric London, M.D., is a psychiatrist in private practice and co-founder of NAAR. He is also the father of a teenage son with autism.
### Science & Research: 2003 Awards & Fellowships

**Hot of the Presses**

**NAAR Commits Nearly $5 million to Research in 2003!**

This just in... The National Alliance for Autism Research (NAAR) is pleased to announce it has committed an unprecedented $4.92 million in 2003 to fund 50 research grants and fellowships in the U.S., Canada and Europe. NAAR’s 2003 research awards include 35 pilot studies, 13 pre- and post-doctoral fellowships and two training programs. A full description of the 2003 awards will be featured in the next edition of the *NAARRATIVE*.

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<tr>
<th>Name</th>
<th>Institution</th>
<th>Award Amount</th>
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<tr>
<td>Susan Biren, Ph.D.</td>
<td>Brandeis University (Waltham, MA)</td>
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<td>Patrick Bolton, Ph.D.</td>
<td>The Institute of Psychiatry at King’s College (London, England)</td>
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<td>Cornell University (Ithaca, NY)</td>
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(Please see 2003 Research Awards on page 11)
2003 Research Awards (continued from page 10)

Paul Thorsen, M.D., Ph.D.
NANCEA at Department of Epidemiology and Social Medicine/Aarhus University (Denmark)
Exposure to Pharmaceuticals in Pregnancy & Development of Autistic Disorder
Two-year award - $118,454

Jochen Tiesch, Ph.D.
University of California at San Diego (La Jolla, CA)
The MESA Project: Modeling the Emergence of Shared Attention
Two-year award - $120,000

Michael Ullman, Ph.D.
Georgetown University (Washington, DC)
Neurocognitive Correlates of Language in Autism
Two-year award - $118,575

John Welsh, Ph.D.
Oregon Health & Science University (Portland, OR)
Inferior Olive & Autism: Electrical Synapses, Neuronal Synchrony & Cognition
Two-year award - $101,639

Justin Williams, M.B.B.S., MSc
University of Aberdeen (Aberdeen, England)
Functional Neuroimaging Studies of Action, Facial and Object-directed Imitation
Two-year award - $119,977

Peter Zandi, Ph.D.
Johns Hopkins School of Public Health (Baltimore, MD)
Maternal-fetal Incompatibility and Autism Risk
One-year award - $59,998

Xiaoxi Zhuang, Ph.D.
University of Chicago (Chicago, IL)
Behavioral Effects of Hyper- and Hypo-Serotonergic Function in Transgenic Mouse Models
Two-year award - $120,000

Lonnie Zwaigenbaum, M.D.
McMaster University (Hamilton, Ontario)
Investigating the Emergence of Familial Traits in Autism
Two-year award - $120,000

Pre-Doctoral Fellowships

Centre for Molecular Medicine & Therapeutics, Vancouver, British Columbia
Mentor: Elizabeth Simpson, Ph.D.
Fellow: K.Y. Bibiana Wong
Mouse Models of Autism: Behavior and Genetics

Vanderbilt University, Nashville, TN
Mentor: James Sutcliffe, Ph.D.
Fellow: Jacob McCauley
Genetic Analysis of Serotonergic and GABA-ergic Genes in Autism

University of Massachusetts, Boston, MA
Mentor: Alice Carter, Ph.D.
Fellow: Chantal Jennifer Kuhn
The Impact of Parental Autism-related Cognitions on Interventions

Johns Hopkins School of Public Health, Baltimore, MD
Mentor: Craig Newschaffer, Ph.D.
Fellow: Keely Chesack-Postawa
Epidemiology of Autism Spectrum Disorders

Universidad Miguel Hernandez, San Juan de Alicante (Spain)
Mentor: Jorge J. Prieto, M.D., Ph.D.
Fellow: Edith Lopez Hurtado
Immunocytochemical and Morphometrical Analysis of Double Bouquet Cells Microcircuitry in the Cerebral Cortex of Autistic Patients

Princeton University, Princeton, NJ
Mentor: Samuel Wang, Ph.D.
Fellow: Megan Sullivan
Multiphoton Investigation of Sensory Encoding in the Mammalian Cerebellum

Post-Doctoral Fellowships

Cambridge University, Cambridge (England)
Mentor: Simon Baron-Cohen, Ph.D.
Fellow: Christopher D. Ashwin, Ph.D.
Social Emotional Processing

University of Michigan, Ann Arbor, MI
Mentor: Jeffrey Hutler, Ph.D.
Fellow: Hong Zhang, Ph.D.
Quantitative Neuroanatomical Training: New Methods to Reveal Structural Changes in the Cortex of Individuals with Autism

The Institute of Psychiatry at King’s College, London (England)
Mentor: Francesca Happe, Ph.D.
Fellow: Apama Nadig, Ph.D.
A Language Processing View of Pragmatic Impairments in Autism Spectrum Disorders

University of Medicine & Dentistry of New Jersey/ Robert Wood Johnson Medical School, Piscataway, NJ
Mentor: Emanuel DiCicco-Bloom, M.D.
Fellow: Kristina Sennvik, Ph.D.
Neurodevelopmental Origins of Autism Brain Abnormalities

Yale University School of Medicine, New Haven, CT
Mentor: Paul Bloom, Ph.D.
Fellow: Melissa Allen Preissler, Ph.D.
Symbolic Understanding in Children with Autism

Columbia University - College of Physicians and Surgeons, New York, NY
Mentor: Carol Mason, Ph.D.
Fellow: Phillip Butterey, Ph.D.
Regulation of the Purkinje Cell, Dendritic Growth, Spine Formation and Synaptogenesis

Vanderbilt University, Nashville, TN
Mentor: Wendy Stone, Ph.D.
Fellow: Lynette M. Henderson, Ph.D.
Developing a Downward Extension of the STAT

This list is current as of June 16, 2003; subject to change pending final award confirmations.

Autism Training Programs

NAAR is collaborating with the Canadian Institute of Neurosciences, Mental Health and Addiction to co-sponsor a pair of six-year, interdisciplinary autism training programs, known as the “Training Programs in Autism Research.” NAAR will invest approximately $200,000 annually for six years as a co-sponsor of this unique program - the first of its kind in Canada to focus on autism.
As we reviewed in the first part of this two-part series, psychopharmacological research over the past several decades has given us a safe and effective supply of medications that can be applied to the treatment of autism spectrum disorders.

These medications effectively treat a variety of symptoms and behaviors that are common in individuals with autism spectrum disorders, including hyperactivity, impulsivity, attentional difficulties, anxiety, obsessive-compulsive symptomatology, repetitive motor behaviors, depression, mood swings, agitation, aggression, self-injurious behavior and insomnia.

It is critical to point out that the goal of medication as well as other treatments for autism is to maximize an individual's functioning. There are currently no "cures."

Also, it is paramount to remember that, while the situation is quite complex, the prescription of medication for autism is not purely a "shot in the dark." A physician should not simply prescribe whatever first comes to mind.

Clear target symptoms need to be established, information about transient and long-lasting possible side effects should be outlined, dosing should start low and escalate carefully, and a trial must be conducted for an adequate length of time.

Additionally, medications must be prescribed systematically. There is no room for "magic concoctions." Medications must be prescribed one at a time so that effectiveness and side effects can be accurately determined.

In the first part of this series, we focused on using neuroleptics to treat autism spectrum disorders. In part two, we will examine three other major groups of medications: anti-depressant/anti-anxiety agents, stimulants and mood stabilizers.

Antidepressant and Anti-Anxiety Agents
Serotonin re-uptake inhibitors, such as fluoxetine (Prozac), sertraline (Zoloft), paroxetine (Paxil), fluvoxamine (Luvox), citalopram (Celexa), escitalopram (Lexapro) and clomipramine (Anafranil) have been of great interest in autism over the past 10 years because of their effectiveness in treating obsessive-compulsive symptomatology.

Repetitive, ritualized, seemingly "compulsive" behavior has been recognized as a major part of autism since its earliest description by Leo Kanner in the 1940s.

Modern diagnostic criteria for autism include repetitive and stereotyped body movements such as arm-flapping, spinning, and running back and forth (motor stereotypies). Simple rituals, such as lining up objects, opening and closing doors, insisting on objects being in a particular place or daily procedures being carried out in a specific way, also form part of modern diagnostic criteria.

In addition, more classic "obsessive-compulsive" rituals, such as hoarding, washing, counting, and touching rituals, are sometimes seen in autism. These repetitive behavior patterns can be associated with severe anxiety, tantrums and aggressive behavior toward self and others. They may also be highly time-consuming and disruptive to learning.

This group of medications also held interest for autism researchers because of the consistent finding of elevated levels of serotonin in the bloodstream in approximately one-third of individuals with autism. Although this group of medications exerts effects on multiple neurotransmitter systems, these agents are potent blockers of serotonin re-uptake into cells and could potentially reverse some of the serotonin dysregulation in autism.

The three serotonin re-uptake blockers that have been the most researched in autism are clomipramine.
(Anafranil), fluvoxamine (Luvox), and fluoxetine (Prozac).

Studies report these agents can reduce the frequency and intensity of repetitive, ritualized behaviors including motor stereotypes and more classic compulsions. In addition, improvements in other autistic symptoms have also been noted.

For instance, some children show improvements in eye contact, social initiation, and responsiveness. Others show decreased withdrawal and expanded repertoire of interests. Decreased irritability, tantrums, and aggression toward self and others have also been noted. Improvements in initiating, shifting and sustaining attention are also observed, with improvements in "connectedness" to the environment and therefore less internal preoccupation. Many of these associated benefits may relate to the potent anti-anxiety effects of these medications, although there may also be a direct "alerting" effect related to improvements in certain aspects of joint attention.

Serotonin reuptake blockers differ in their side effect profiles, with clomipramine (Anafranil) having a greater frequency and severity of adverse effects compared to the others.

The most common side effects of all these agents are hyperactive, impulsive behavior and sleep disturbance. Both of these side effects are dose-related and can be minimized with careful and conservative dose titration. Clomipramine (Anafranil) may also cause dry mouth, dizziness, and constipation (so-called anticholinergic side effects) as well as heart rhythm changes (baseline EKG monitoring is necessary) and a lowering of the seizure threshold (making it a more problematic medication in individuals with seizures). However, in healthy patients without seizures and with normal heart functioning, clomipramine is generally safe and well tolerated.

Recent reports from the United Kingdom have suggested a higher association of paroxetine (Paxil) use and suicidality in depressed children. The implications of this finding for individuals with autism spectrum disorders are unclear. However, if a child is already doing well on this medication this should be of no concern.

Each of the serotonin reuptake blockers has been commonly used to treat children and has been found to be generally safe, with side effect frequency and severity being similar to that seen in adults. Usually, one of the other agents is tried before clomipramine (Anafranil) because of its increased side effect profile.

A trial of a serotonin reuptake blocker might be considered whenever compulsive behavior, anxiety symptoms, or poor joint attention (severe self-directedness) is significantly impeding developmental, educational, or social progress. A good trial takes 10 to 12 weeks, minimizes the dose, and carefully monitors target symptoms as well as potential side effects.

To date, there has been very limited research of other types of antidepressant medications in autism.

Tricyclic anti-depressants such as desipramine (Norpramin), imipramine (Tofranil), nortriptyline (Pamelor), amitriptyline (Elavil) as well as bupropion (Wellbutrin), a dopamine reuptake blocker, are sometimes used to treat depression as well as inattention, impulsivity and hyperactivity (attention deficit hyperactivity disorder (ADHD) symptoms) in the non-autistic population. They occasionally have a role for treating these symptoms in individuals with autism, but variable clinical response and side effects limit their utility.

Anti-anxiety agents such as buspirone (Buspar) and benzodiazepines (Valium, Klonapin, Ativan, and Xanax, for example) have been studied little in autism. They are sometimes useful, particularly as an adjunct to a serotonin reuptake blocker, in the treatment of anxiety. However, behavioral side effects such as disinhibition, crying, and irritability limit the use of benzodiazepines.

**Stimulants & Other Medications Used for Attention Deficit Hyperactivity Disorder (ADHD)**

Despite the widespread use of stimulant medications for the treatment of inattention, impulsivity and hyperactivity in children diagnosed with ADHD, these agents have not been studied much in individuals with autism, although clinicians frequently prescribe them. Methylphenidate (Ritalin), dextroamphetamine (Dexedrine), and a
The National Alliance for Autism Research held its Third Annual Conference from March 29 - April 1 in Washington, D.C., which was attended by more than 100 volunteers, trustees and staff members.

The annual conference provides a venue for NAAR leadership to discuss how the organization should continue to grow and enables volunteers from across the country to meet each other and share ideas about making Walk F.A.R. for NAAR events and other initiatives as successful as possible.

The event also provides NAAR the opportunity to review the past year’s accomplishments and recognize the efforts of the talented and dedicated volunteers who bring the organization to life.

Glenn R. Tringali, NAAR’s chief executive officer, gave an inspiring presentation on achievements and opportunities, which summarized the past year’s accomplishments and touched on goals for this year.

What made the 2003 conference unique was direct volunteer participation. NAAR volunteers made several presentations on a wide variety of topics. Volunteer presenters included:

- Renee Georgi, Pittsburgh volunteer leader and co-chair of the 2000 and 2001 Pittsburgh Walks, assisted with a presentation on NAAR’s new Speaker’s Bureau program.
- Lennie Gladstone, co-chair of the 2001 and 2003 National Capital Area Walks, discussed corporate sponsorship.
- Debbie Hilibrand, trustee and co-chair of the 2002 and 2003 Westchester/Fairfield Walks, focused on team recruitment strategies.
- Karen London, NAAR’s co-founder, reviewed organizational policies and procedures.
- Eric London, M.D., NAAR’s co-founder, discussed the state of the science in autism research.
- Dolores Rezendes, co-chair of the 2002 New England Walk and vice president of NAAR’s New England chapter, focused on marketing & publicity.

Volunteers also moderated breakfast roundtables that covered even more areas, such as planning Kick-Off events (led by Marcy Wenning, co-chair of the 2003 Greater Boston Walk), Walk Award presentations (led by Grace Rodriguez, co-chair of the 2003 Broward/Palm Beach Walk, with staff member Jackie Merens), Walk Logistics (led by dedicated New England Walk logistics chair, Anthony Pascetta), and Chapter and Walk Accounting (led by NAAR Treasurer Mark Krinsky, with Rich Stapleton, NAAR’s controller.)

Dr. Lonnie Zwaigenbaum, of McMaster University in Hamilton, Ontario, presented a lecture on his NAAR-funded study of infant siblings of children with autism, also known as the Baby Sibs project. This allowed volunteers to see, first hand, the research that NAAR is making possible.

In addition, NAAR senior staff members Lisa Gallipoli, Andy Shih and Joe Guzzardo, and Walk consultant Joan Mound, made presentations.
NAAR volunteers did more than make presentations and talk about the Walk program. They also took part in NAAR’s first “Hill Day” in Washington, D.C.

To prepare, NAAR volunteers took part in a workshop that reviewed how the National Institutes of Health (NIH) fund research, including autism. Dr. Steven Foote, of the National Institute of Mental Health, gave a detailed presentation on the NIH autism research agenda and applauded NAAR’s work to foster research collaborations.

In addition, Ed Long, Ph.D., of Capitol Associates, which handles government relations for NAAR, moderated a presentation that reviewed appropriate protocol for volunteers visiting with their elected officials, including a review of materials and general do’s and don’ts.

NAAR was honored to have former U.S. Congressman Peter Kyros as a guest speaker for part of this presentation. Congressman Kyros helped inspire volunteers and provided a little comic relief from the day’s long program. On the eve of “Hill Day,” NAAR Trustee Ann Gibbons hosted a reception at her home in suburban Washington, D.C. for volunteers and staff as they prepared to meet with their representatives.

In all, more than 60 NAAR volunteers and staff kicked off National Autism Awareness Month on April 1 by meeting with their legislators to ask for their support in increasing federal funding for autism research in Fiscal Year 2004.

Specifically, NAAR volunteers asked their legislators to support language that calls on the NIH to expand basic and applied research portfolios, to coordinate and finance a tissue bank and to work more closely with the Interagency Autism Coordinating Committee to develop, implement and fund autism research. NAAR volunteers also asked their legislators to support an additional $7 million to expand the Centers for Disease Control & Prevention (CDC) autism epidemiology program.

In addition, NAAR volunteers explained the critical role that research plays in the quest to unlock the mysteries of autism and asked their legislators to join the Congressional Autism Caucus.

NAAR is grateful for all volunteers who invested their time to take part in the Third Annual Conference and appreciates all comments made on the conference evaluations, which help in planning next year’s event.

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**Awards from the 2003 NAAR Conference**

**2003 London Award**
Margie Pascetta & Dolores Rezendes

**Bronze Circle Walks in 2002** ($50,000 - $99,999)
- Buffalo: Monica Moshenko & Anita Brenon Bickert
- Iowa: chair: Pat Shoff

**Silver Circle Walks in 2002** ($100,000 - $249,000)
- Southern New Jersey: chair: Todd & Debbie Schmidt
- Broward County (FL): chairs: Dianne Orr & Ellen Blackbum
- Palm Beach County (FL): chair: Grace Rodriguez

**Gold Circle Walks in 2002** ($250,000 - $499,999)
- Northern New Jersey: chairs: MaryBeth Rothman & Mary DeMauro
- Central New Jersey: chair: Jim Brady
- Miami/Dade (FL): chairs: Dr. Nina Sanchez & Hilda Bennett
- Pittsburgh: chairs: Marty Edgar & Jackie Kulich
- Seattle: chair: Bart Rind, Linda Bresler & Linda Suuman
- Westchester/Fairfield: chair: Debbie Hilibrand, Debra Marchese & David Gortz

**Crystal Circle Walks in 2002** ($750,000+)
- Long Island (New York): chair: Karen Cerise
- New England: chairs: Margie Pascetta & Dolores Rezendes

**Top Fundraising Team**
- Owen & Johnny’s Team ($250,000)
  led by the Cerise & Ryan families, of Long Island

**Greatest % Increase**
- Pittsburgh (2); & New England (1)

**Highest Inaugural Walk**
- Southern New Jersey (3); Seattle (2); Westchester/Fairfield (1)

**Highest Fundraiser**
- Westchester/Fairfield (3); Long Island (2); New England (1)
Supporting autism research was certainly “in style” at the Waldorf=Astoria on June 3, as the National Alliance for Autism Research honored Burton M. Tansky, President and CEO of the Neiman Marcus Group, Inc., at NAAR’s 2003 Award Dinner.

More than 450 guests, including many leaders of the retail and fashion magazine industries, attended the event, helping to raise hundreds of thousands of dollars for autism research. Including the totals from the 2003 event, NAAR’s three Award Dinners have raised a collective total of nearly $2 million for autism research.

Richard Cohen, president & CEO of Ermenegildo Zegna North America, served as Master of Ceremonies for the evening as well as Executive Vice Chair of the Dinner Committee. Mr. Tansky was honoree of the event, which was chaired by Stephanie George, President of InStyle Magazine, and Steven Kornajcik, Senior Vice President, Marketing & Creative Services at Neiman Marcus. Honorary Chair of the event was Joe Torre, manager of the New York Yankees.

“It is an honor for NAAR to recognize Mr. Tansky and the vital role the Neiman Marcus Group has played to raise awareness and critically needed funds for autism research,” said Karen London, NAAR’s co-founder and vice president of Development. “We are also extremely grateful for the hard work and generosity of our dinner chairs, Stephanie George and Steven Kornajcik and the entire Dinner Committee, for our Master of Ceremonies, Richard Cohen, and for Nancy Lurie Marks and her family, who have all made this event possible.”

After a moving presentation produced by the Digital Studio at Time, Inc., inspiring remarks were made by NAAR Trustee Jeffrey Lurie, owner of the Philadelphia Eagles, and NAAR Honor Board Member Nancy Lurie Marks.

Following dinner, stirring entertainment was provided by Tony Award-nominated Broadway veteran Christine Andreas.

Mr. Cohen, Ms. George and Mr. Kornajcik then presented Mr. Tansky with the 2003 NAAR Award.

After receiving the award, Mr. Tansky discussed the importance of supporting NAAR’s mission and how research offers the greatest hope for families affected by autism.

“We all know someone who deals with the challenges of autism everyday, whether it is a family member, friend or colleague,” Mr. Tansky said. “The work of NAAR is so important. An estimated one million people are currently living with autism and the numbers are growing. But through research, advances are being made that are beginning to shed light on the darkness of this disorder.”

NAAR thanks all who attended and supported the 2003 Award Dinner and who made the evening such a success.
More Scenes from the 2003 NAAR Award Dinner

(from left) New York Giants Running Back Tiki Barber, and Master of Ceremonies Richard Cohen, President & CEO of Ermenegildo Zegna North America, at the 2003 Award Dinner.

(from left) Fashion Model Patti Hansen, NAAR supporter Melena Sorena, NAAR Trustee Debbie Hillbrand, and NAAR supporter Robin Moms, at the 2003 Award Dinner.

(from left) NAAR President Prisca Chen Marvin with Neiman Marcus President & CEO Burton M. Tansky, and his wife, Rita, at the 2003 Award Dinner.

(from left) New York Giants Head Coach Jim Fassel and Giants Running Back Tiki Barber, talk with NAAR Trustee Jeffrey Lurie, owner of the Philadelphia Eagles.

NAAR Taking Part in 4th Annual World Congress & Exposition on Disabilities

The National Alliance for Autism Research is taking part in the 4th annual World Congress & Exposition on Disabilities, which takes place September 18-20, at the Orange County Convention Center in Orlando, FL. NAAR’s booth number is 8091 and will be located in the Non-profit Pavilion.

The WCD brings together people with disabilities, their families and caregivers, physicians, direct support professionals, healthcare professionals, educators and others to share the latest information on research and treatment on a wide range of disabilities and disorders, including autism spectrum disorders. For more information on the event, visit www.wcdexpo.com.
Supporting NAAR - On Foot & On Stage...

People from all across the country are coming up with innovative ways to support NAAR and advance autism research. We are limited only by our imagination. Here’s to those who are breaking new ground!

PITTSBURGH VOLUNTEERS - SHOOT PAR FOR NAAR

NAAR’s Pittsburgh volunteers organized the Shoot Par for NAAR Golf Classic, which netted nearly $50,000 for NAAR! The event, chaired by John Zotter and David Fitzsimmons, was held May 5th at St. Clair Country Club in Upper St. Clair, PA.

PETER HANSON - BOSTON MARATHON

For the second consecutive year, Peter Hanson has run the Boston Marathon in honor of his son, Conor, who has autism, and raised thousands for NAAR. This year, he raised $9,079! Peter would like to thank all who supported his efforts this year, and NAAR would like to thank both Peter and all of his supporters for their tremendous support. Peter is recruiting additional marathon runners to help him support autism research even more next year. Great job, Peter!

FLORIDA VOLUNTEERS - NIGHTS ON THE TOWN

Volunteers in Florida have held a number NAAR benefits. Several hundred people turned out at Hooligans in Pinecrest on June 17th for Miami-Dade County Commissioner Jimmy Morales’ 2nd Annual “Karaoke Challenge,” which raised $4,200. Other Florida events included the “Night Out for NAAR,” held on May 3rd at Radius Night Club in Boca Raton. The event, organized by NAAR’s Palm Beach volunteers, raised about $2,500. And on May 23rd, Joyce Dooley Rodriguez, of the Miami law firm Holland & Knight, organized a statewide casual day for the firm’s employees, raising about $2,700. Thank you!

YVONNE KUNG - WALK EVENT AT WESTMONT HIGH SCHOOL

Yvonne Kung, of Campbell, CA., organized a mini Walk event at Westmont High School in Campbell, CA., last Spring as a community service project. The event raised $830 for NAAR. Great work, Yvonne!

JESSE MOJICA - EL BEAUTY PARLOR

Jesse Mojica is the parent of a child with autism and Westchester/Fairfield Walk committee member. He co-directed the play “El Beauty Parlor,” which ran in January at the Copacabana in New York, and made the play a benefit for NAAR, raising $2,000. Gracias!

JACOBSON SINAI ACADEMY - MINI WALK EVENT

Jacobson Sinai Academy in North Miami Beach, FL., hosted a mini Walk event held on March 4th that raised approximately $2,500. Jacobson Sinai student Andrea Bennett, daughter of 2002 Miami-Dade Walk co-chair Hilda Bennett, presented the idea of doing a walk to her peers and it was accepted. Great job, Andrea! And thanks for all who supported this excellent event!

The Autism Coalition’s Night of Too Many Stars comedy special, which was broadcast on NBC and Comedy Central, shined a much needed light on the need for more research. NAAR Honorary Board member Aidan Quinn (right) with fellow NAAR Honorary Board member Doug Flutie, who also attended, represented NAAR at the event, which raised $1.8 million for research & education.

2003 SPRING WALK F.A.R. FOR NAAR

Cumberland, MD Walk F.A.R. for NAAR
Allegany College, Cumberland, MD
Saturday, April 5, 2003
300 walkers and $30,000 raised!

Carolina Walk F.A.R. for NAAR
Lowe’s Motor Speedway, Charlotte, NC
Saturday, May 10, 2003
Over 500 walkers and $100,000 raised!

Rochester Walk F.A.R. for NAAR
The Marketplace Mall, Rochester, NY
Sunday, May 18, 2003
Over 600 walkers and $40,000 raised!

National Capital Area Walk F.A.R. for NAAR
Montgomery County Fairgrounds, Gaithersburg, MD
Sunday, May 18, 2003
5,000 walkers and nearly $500,000 raised!

Pittsburgh WALK F.A.R. for NAAR
Heinz Field, Pittsburgh, PA
Sunday, June 8, 2003
Over 6,000 walkers & over $450,000 raised!

Westchester/Fairfield WALK F.A.R. for NAAR
Manhattanville College, Purchase, NY
Sunday, June 8, 2003
7,000 walkers & nearly $500,000 raised!

Delaware Valley WALK F.A.R. for NAAR
Cooper River Park, Pennsauken, NJ
Sunday, June 8, 2003
2,000 walkers & more than $205,000 raised!

Seattle WALK F.A.R. for NAAR
Marymoor Park, Redmond, WA
Sunday, June 8, 2003
Over 1,500 walkers & over $185,000 raised!

Iowa WALK F.A.R. for NAAR
Gray’s Lake, Des Moines, IA
Saturday, June 14, 2003
600 walkers & nearly $50,000 raised!

Check the back page for our 2003 Fall Walk schedule!
Pharmacological Interventions
(continued from page 13)

dextroamphetamine/amphetamine composite (Adderall) are the most commonly prescribed stimulants.

Indeed, they can improve focus, decrease distractibility as well as decrease impulsivity and hyperactivity in autism, but their use is frequently limited by behavioral side effects including increased perseveration, increased repetitive behaviors, and irritability. In my experience, they are better tolerated and therefore more useful in the Asperger’s population. Dosage needs to be carefully titrated because behavioral side effects are often dose-related and can be often avoided if dose is minimized.

A second group of frequently prescribed medications for ADHD are the norepinephrine blockers (alpha-2-agonists) clonidine (Catapress) and guanfacine (Tenex).

These agents have less direct effect on focusing than the stimulants but are useful in treating impulsivity and hyperactivity as well as sleep difficulties, which are frequently present in the ADHD population. To date, little research has been conducted on these agents in the autistic population. In my experience, they can be useful in treating hyperactivity and impulsivity in some autistic individuals with sedation and irritability being the most common side effects. Clonidine is also useful for treating insomnia in autism.

In January 2003, Strattera became available for the treatment of ADHD. Strattera is a non-stimulant medication with a novel mechanism of action (selective norepinephrine reuptake inhibitor). It is showing promise for use in autism to treat inattention, hyperactivity and impulsivity. It is generally very low in side effects and well tolerated.

Mood Stabilizers
The most commonly used medications for treating intense, rapid mood shifts are anti-seizure medications such as valproic acid (Depakene or Depakote), carbamazepine (Tegretol), gabapentin (Neurontin), lamotrigine (Lamictal) and topiramate (Topamax).

Lithium is also an effective mood stabilizer. These medications are most commonly used in children and adults with bipolar disorders and other conditions with prominent mood swings.

They also have been studied very little in terms of their effect on autism, but in my experience are quite helpful for treating severe mood swings, outbursts, and episodic aggressive behavior. Side effects vary from mild to potentially severe depending upon the agent, and blood monitoring is required for some of these agents, which may limit their use. However, overall they are generally well tolerated and helpful with this group of target symptoms.

Conclusion
We currently have available to us a number of medications which can help improve the quality of life for individuals with autism and their families. Most of these medications address associated behaviors frequently present in autism such as outbursts, aggression, anxiety, inattention, hyperactivity and insomnia. However, “core autistic symptoms” such as repetitive behaviors and “self-directedness” can also be reduced in some cases.

There are no medications that directly address cognitive impairments such as language difficulties or deficits in abstract thinking and social understanding, although the medications may enable individuals with autism to better learn from educational, behavioral, or other psychosocial interventions that address these deficits.

We are living in an age in which our understanding of brain development and genetics is exploding.

New psychopharmacological agents are entering the market each year, and many of these agents can be borrowed by clinicians treating autism. Funding for psychopharmacological research in autism has dramatically risen, and the number of interested researchers is on the rise. As we gain a better understanding of the basic underlying causes of autism, more specific treatments can be developed.

Autism treatment has a very bright future.

C.T. Gordon, III, M.D., is a child psychiatrist in private practice and a NAAR trustee. He is also the father of a teenage son with autism.
Walk F.A.R. for NAAR - 2003 Fall Walk Schedule

Atlanta Walk F.A.R. for NAAR
Saturday, September 6th
Piedmont Park, Atlanta, GA
To register, call (404) 344-3229

Western New England Walk F.A.R. for NAAR
Saturday, September 13th
Ashley Reservoir, Holyoke, MA
To register, call (888) 627-6227

Buffalo-Niagara Walk F.A.R. for NAAR
Sunday, September 14th
Delaware Park, Buffalo, NY
To register, call (716) 522-9185

Greater Boston Walk F.A.R. for NAAR
Saturday, September 20th
MDC Artesani Park, Brighton, MA
To register, call (888) 627-6227

Central New Jersey Walk F.A.R. for NAAR
Sunday, September 21st
Mercer County Park, W. Windsor, NJ
To register, call (888) 777-6227

Southern New England
Walk F.A.R. for NAAR
Saturday, October 4th
Roger Williams Park, Providence, RI
To register, call (888) 627-6227

St. Louis Walk F.A.R. for NAAR
Saturday, October 4th
Forest Park, St. Louis, MO
To register, call (314) 835-1426

Northern New England
Walk F.A.R. for NAAR
Sunday, October 5th
Veterans Park, Manchester, NH
To register, call (888) 627-6227

Denver Walk F.A.R. for NAAR
Saturday, October 11th
City Park, Denver, CO
To register, call (720) 904-1448

North Central New Jersey
Walk F.A.R. for NAAR
Sunday, October 12th
Nomahegan Park, Cranford, NJ
To register, call (888) 777-6227

Palm Beach/Broward
Walk F.A.R. for NAAR
Sunday, October 12th
Office Depot Corporate Headquarters
Delray Beach, FL
To register, call (800) 610-6227

Northern New Jersey
Walk F.A.R. for NAAR
Saturday, October 18
Giants Stadium, East Rutherford, NJ
To register, call (888) 777-6227

Southwestern Florida Walk F.A.R. for NAAR
Saturday, October 25th
Gilchrist Park, Punta Gorda, FL
To register, call (941) 697-9772

Miami-Dade Walk F.A.R. for NAAR
Sunday, October 26th
Crandon Park, Key Biscayne, FL
To register, call (800) 610-6227

Long Island Walk F.A.R. for NAAR
Sunday, October 26th
Eisenhower Park, East Meadow, NY
To register, call (516) 327-4646

For more information on any Walk F.A.R. for NAAR event, call (888) 777-NAAR, or visit www.autismwalk.org