

## THE VALUE OF PATIENCE ... AND COLLABORATION

### CANADIAN EARLY CHILDHOOD DEVELOPMENT RESEARCH IN 2002

by Richard E. Tremblay, CEECD Director

**Many years ago, I saw a fascinating documentary on the life of Marie Curie. The program emphasized the amount of time and energy she invested to isolate one-tenth of a gram of pure uranium chloride from pitchblende: more than three years of painstaking work in an old shed. Indeed, the value of patience becomes obvious when we look back at how long it took to understand each law of nature.**

Understanding child development is no different. When we look at this issue of the CEECD Bulletin, one conclusion emerges clearly: there is no quick fix for understanding the laws that govern the development of humans, especially the laws for providing effective help to the less fortunate. Using the same methodology as last year<sup>1</sup> we selected 10 of the best scientific papers published on early childhood development in 2002 by teams of investigators that included at least one member based in a Canadian institution.

Two of the 10 papers used data from a study that assessed 1,037 children at regular intervals from their birth in 1972-1973. Taking three decades or more for a study would certainly have impressed Marie Curie. While it does take more time to follow the development of a human from birth to adulthood than to extract uranium, there are many other

differences between Curie's work and present-day research in human development.

The profile of McMaster University's Malcolm Sears, highlights some of these differences: collaboration among many investigators, concerted work across generations of scholars, cooperation among different disciplines, joint projects among institutions, and international collaborations. No human can prospectively study the development of other humans from birth to old age; no single scientific discipline can explain the multiple dimensions of human development; and no institution has the expertise to be completely self-sufficient.

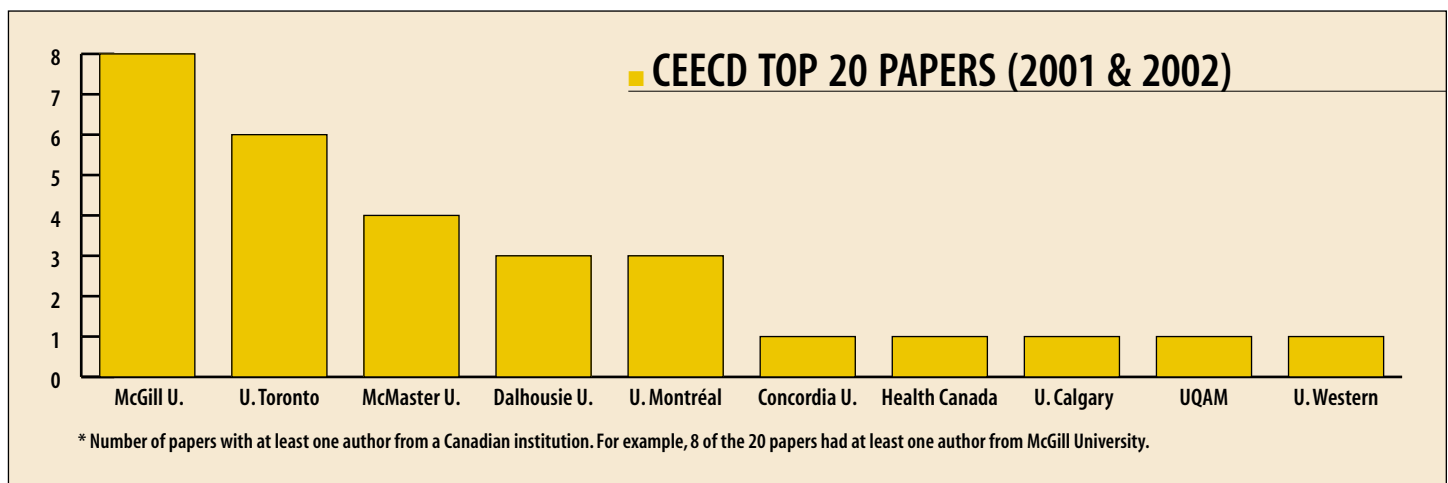
Louise Arseneault, a young investigator born and educated in Montréal, is at the University of London in England studying the New Zealand subjects that Malcolm Sears, born in New Zealand a generation earlier, is now studying in Hamilton, Ontario. Meanwhile, Lisa

Broidy, a young American investigator who works at the University of New Mexico, led a team of experts from four different countries to compare the New Zealand subjects with similar subjects from Canada and the U.S.

Granted, Marie Curie was born Marie Sklodowska in Poland and worked in France, interacting with scientists from around the world; but the present magnitude of international collaborations studying child development is far beyond Marie's experience. This situation has put great pressure on universities, and on countries, to attract and keep the best.

**From the 2002 crop, it is obvious that Canadian institutions support investigators that rank among the best in the world. However, we need more top-quality Canadian studies to keep attracting the best scholars.** 🦋

(1) CEECD Bulletin, vol.1, No. 3, December 2002



# DR. MALCOLM SEARS: UNRAVELING ORIGINS AND CONSEQUENCES OF ASTHMA

by Liz Warwick

**Dr. Malcolm Sears never expected to have his career focus on asthma and allergies, particularly in young children. “When I started at medical school in New Zealand, I intended to go into family practice,” says Dr. Sears, Research Director of the Firestone Institute for Respiratory Health in Hamilton, Ontario. Fortunately for the millions of people who suffer from asthma, Dr. Sears became intrigued by the disease during a residency and fellowship in respiratory medicine. After continuing his studies at the University of Washington, he returned to New Zealand in 1973 as a faculty member at the University of Otago.**

Over five years, Dr. Sears became increasingly concerned about why so many in the New Zealand population were suffering—and some even dying—from asthma. Then, a colleague mentioned a longitudinal study of children being conducted in his own medical school.

## A GROUNDBREAKING STUDY

Researchers at the University of Otago were following over 1,000 children born in 1972-1973, collecting a variety of data, from infant feeding habits to parents' socio-economic status. The work was called the Dunedin Multidisciplinary Health and Development Research Study. Dr. Sears approached the study's director and obtained permission to include studies of asthma and allergies. His team began their detailed research when the children were nine years old, continuing to the present.

The Dunedin study has since gained widespread recognition for the quality of its data, allowing researchers to examine physical, emotional, cognitive, and social development from pregnancy to adulthood. During that time, Dr. Sears continued his work on asthma, exploring the causes of its development in children. In 1990, Sears was recruited by McMaster University to teach in the Faculty of Medicine and direct the Firestone Institute of Respiratory Health.

## ASTHMA IN THE EARLY YEARS

Dr. Sears' own work has revealed that asthma has its roots in the prenatal and early childhood years. “Children who end up as adult asthmatics have had impaired lung function that dates back to the early years. They generally do not become asthmatics in their teens,” he says.

Asthma is an affection of the immune system. Thus, researchers are focusing on how and why children's immune systems become hypersensitive in those early years. Indoor environmental allergens seem to play a significant role in the disturbing increase in childhood asthma. Dr. Sears is also interested in the “hygiene hypothesis” which suggests that an overly clean environment may in fact predispose children to allergies and asthma. His own research has shown that children living in households with cats and dogs were less likely to be allergic and to suffer from asthma. However, why that occurs has yet to be explained. “Epidemiological studies give you outcomes, but not necessarily the mechanisms behind those outcomes,” says Dr. Sears. “We're going to need some very detailed studies to help us understand what sets up a child for being allergic or asthmatic.”



*“Unless the underlying mechanisms that drive allergies and asthma are understood, prevention is next to impossible”*

## A NEW CANADIAN BIRTH COHORT

Some answers may come from a new longitudinal study that Dr. Sears and colleagues hope to begin in Canada. It may one day rival the Dunedin study. “Because the first detailed study of asthma with the Dunedin group started when the children were age nine, we had to build a lot of infor-

# ENVIRONMENTAL ENRICHMENT COMPENSATES FOR EARLY ADVERSITY

by Liz Warwick

mation retrospectively," says Dr. Sears. "A lot of details we wanted simply were not there." Now, with this proposed new birth cohort, he has the opportunity to collect data from the early years.

Dr. Sears is keenly aware that information found in these studies have the potential to create a firestorm of negative publicity. Last year, he published an article based on data from the Dunedin group, looking at the relationship between breastfeeding and asthma rates. To his surprise, Dr. Sears found that breastfeeding did not protect against asthma and even seemed to increase a child's risk of developing the disease. Sears is careful to note, "There are 101 good reasons to breastfeed. We've just taken away one of those reasons." The study again points to the need for further research. "We need to understand the mechanism that underlies these findings," he says.

## LONG-TERM EFFECTS OF ASTHMA

"Reducing asthma rates will also have an impact on the children's overall development," adds Dr. Sears. Asthma, the most common chronic respiratory disease in children, is responsible for over one-quarter of school absences. Daily medication, visits to the emergency room, sleepless nights from wheezing—all these take their toll on children and their families. "There is a great deal of stress associated with asthma," says Dr. Sears. "There may be frustrations because of limitations on exercise. Then there is the whole issue of having to keep treating the disease for the rest of the person's life."

As asthma rates in children continue to climb, the need for research becomes ever more pressing. "Unless the causes that drive allergies and asthma are understood, prevention is next to impossible," says Dr. Sears.

Only by unraveling the complex interplay of genetic and environmental factors will researchers be able to guarantee that all children can breathe normally. 🐾

**If early maternal separation is not good for humans, it is clearly dangerous for many other species. Studies show that separating a baby rodent or monkey from its mother provokes a series of biological and behavioural changes in the young animal. Maternal separation (MS) increases an animal's responses to stress, and those changes affect gene expression. However, until recently, scientists had not looked as closely at the issue of reversibility. In other words, once MS has taken its toll, can the effects be modified or reversed in some way? And does the reversibility occur only at the level of behaviour or does the change extend to the gene expression?**

A group of McGill researchers has tackled this question, looking at the impact of an "enriched environment" (cages with special toys) for rats that had been separated from their mothers three hours daily in the first two weeks of life. After undergoing separation, rats were then put into the more enriched environment.

Through a series of tests, researchers found that the enrichment made the animals less fearful and less stressed when exposed to new situations. However, the enrichment did not reverse the adverse effect on gene expression that had been done. Rather, the animals had developed ways to compensate for the early maternal separation but the effects on gene expression remained.

"The study offers intriguing ideas to those working in the early childhood field," says Janice MacAulay, Acting Executive Director of the Canadian Association of Family Resource Programs. "It is important to emphasize that this is rat behaviour. But the study establishes that in spite of less than



*"Those early years are precious. We need to help families to provide in every way we can that nurturing environment"*

ideal conditions at the early stages, when rats were provided with greater enrichment, there was some mediation of the negative effects of those early experiences." While the enrichment did not "fix" the damage, it did attenuate the effects of early adversity.

The study also highlights the need for further research into both the timing and the kinds of services provided to young children. "Those early years are precious. We need to help families in every way we can to provide that nurturing environment," she says.

Given the extensive developmental changes that occur in the early years, more research should focus on the timing of services. "We need to see if there are optimal times for certain interventions," MacAulay says. Researchers should also be exploring the kinds of services and programs offered. 🐾

Ref.: Francis DD, Diorio J, Plotsky PM, Meaney MJ. Environmental Enrichment Reverses the Effects of Maternal Separation on Stress Reactivity. *Journal of Neuroscience* 2002;22(18):7840-7843.

# CHILDHOOD SOCIOECONOMIC

## STATUS IMPACTS ADULT HEALTH

by Liz Warwick

**Researchers call it “the social predisposition in health!” It means that adults living in poor socioeconomic conditions are generally not as healthy as those in the middle class and less healthy than those in the top economic strata.**

**N**ew research from the Dunedin Multidisciplinary Health and Development Study, a longitudinal study of over 1,000 children born in New Zealand in 1972-1973, shows that this predisposition emerges in childhood. Researchers assessed members of the study at age 26, looking at a wide variety of health measures, including body mass index, blood pressure, major depression, substance abuse, etc. Then they looked for associations between these health outcomes and childhood and adult socioeconomic status.

Researchers found that low socioeconomic status in the early years had a significant impact on all areas of adult health. By almost every health measure, children raised in low socioeconomic households had poorer health as adults than their more affluent counterparts. Even upward mobility did not mitigate or reverse the negative effects. Only depression and substance abuse were more strongly linked to adult socioeconomic status.

### RESOURCES NEEDED FOR CHILDREN

Given the pervasive and long-term negative effects experienced by those in the lower socioeconomic levels, researchers suggest that new studies should look at the effect on children’s health of 1) how class-biased health care and 2) differences in health-promoting parenting practices. More work is also needed into the kinds of stress experienced by children in different socioe-



*“These findings provide strong impetus for policy makers, practitioners, and researchers to direct energy and resources towards childhood as a way of improving population health”*

conomic stratas. “These findings provide strong impetus for policy makers, practitioners, and researchers to direct energy and resources towards childhood as a way of improving population health,” says Katherine Scott, Senior Policy Associate, Canadian Council on Social Development. She adds that more research is needed into the effects of poverty on individual and population health.

Beverly Peel, Manager of Children’s Programs for the Federation of Saskatchewan Indian Nations, says the study confirms what she sees daily in Aboriginal communities: a pressing need for basic services for children. “We need more funding for children’s programs and for housing,” she says. Peel adds that additional research needs to be

done specifically focusing on Aboriginal communities. However, there are barriers to be overcome. “The area of consent and ethics of researchers is a huge issue for First Nations. Research is needed and wanted but I feel that this will not take place until the university researchers understand the implications for First Nations,” she says. 🐾

Ref.: Poulton R, Caspi A, Milne BJ, Thomson WM, Taylor A, Sears MR, Moffitt TE. Association Between Children’s Experience of Socioeconomic Disadvantage and Adult Health: A life-Course Study. *Lancet* 2002;360(9346):1640-1645.

# A MORNING-AFTER PILL FOR DRINKERS?

by Liz Warwick

**The dangers of drinking during pregnancy are well documented. Fetus exposed to alcohol in utero may suffer permanent nervous system damage, cognitive and behavioural problems and growth retardation, as well as specific facial anomalies. Given these devastating effects, researchers have begun looking for ways to protect the fetus from its mother's alcohol consumption. A recent study suggests that a protein called pituitary adenylate cyclase-activating polypeptide, or PACAP, may offer such protection.**

Researchers took cells from rat cerebellums (an area of the brain known to be involved with physical coordination as well as sequencing and planning) and soaked them either in alcohol (ethanol) or in a mixture of alcohol and various levels of PACAP. The cells exposed to alcohol had a higher rate of cell death, or apoptosis. However, cells exposed to alcohol and PACAP were less likely to die. In fact, the researchers found a PACAP dose that completely prevented the alcohol-induced cell death. The researchers then tried waiting a few hours before adding PACAP to the alcohol-exposed cells. PACAP's beneficial effects on the cells could be found even when added two hours after the initial exposure to alcohol.

*"This study gives us a better understanding of how alcohol has a direct damaging effect on the developing brain cells,"* says Dr. Gail Andrew, medical director of the Glenrose Rehabilitation Hospital's Fetal Alcohol Spectrum Disorder Project Clinic in Edmonton. *"Many children have problems with sequencing and we know that the cerebellum plays a key role in sequencing. These deficits we are seeing are probably a reflection of cerebella dysfunction caused by alcohol."* Additional studies, such as those involving functional magnetic resonance imaging (MRI), might help researchers see the brain damage more clearly.

While the study offers intriguing implications for alcohol's effects on the developing brain, Dr. Andrew wonders if the idea

of a "morning-after pill" for drinkers sends a problematic message to the public. *"It gives a false sense of security, and almost a message that drinking in pregnancy is not harmful,"* she says. *"It does not address the fundamental question of why pregnant women drink adverse amounts of alcohol."* The reasons are extremely difficult to

address, particularly among the Aboriginal women Dr. Andrew sees at her clinic. She points out that even if a pill could counteract the effects of prenatal drinking, a woman who drinks heavily may not be able to parent her child properly, leading to a host of psychosocial problems. *"Yes, we need to invest in research that looks at the basic brain science. But we need to invest equally in finding out what are the best ways of getting the prevention message across,"* says Dr. Andrew. 🦋

Ref.: Vaudry D, Roussel C, Basille M, Falluel-Morel A, Pamantung TF, Fontaine M, Fournier A, Vaudry H, Gonzalez BJ. Pituitary Adenylate Cyclase-Activating Polypeptide Protects Rat Cerebellar Granule Neurons Against Ethanol-Induced Apoptotic Cell Death. *Proceedings of the National Academy of Sciences of the United States of America* 2002;99(9):6398-6403.

*"This study gives us a better understanding of how alcohol has a direct damaging effect on the developing brain cells"*



# BREASTFEEDING MIGHT NOT PROTECT AGAINST ALLERGIES AND ASTHMA

by Hélène Katz

**Breastfeeding has long been said to reduce the risk of developing allergies and asthma in childhood. However, a team of Canadian and New Zealand researchers recently used data from a longitudinal study to examine whether breastfeeding prevented allergy and asthma between 9 and 26 years of age.**

The researchers looked at more than 1,000 children in New Zealand, who had been assessed every two to five years from the ages of 9 to 26 years. The information they collected included how long each child was breastfed, the age at which cow's milk and other foods were introduced in the diet, the results of allergy skin tests, lung function and the presence of bronchitis, hay fever and asthma.

Forty-nine per cent of the children being studied were breastfed for at least four weeks while 51% were not. The researchers found that children who were breastfed were more likely to have asthma as well as allergies to cats, house dust mites and grass pollen than those who were not breastfed. This was not related to whether parents had hay fever or asthma.

Paediatrician Dr. Jack Newman started the first hospital-based breastfeeding clinic in Canada in 1984 at Toronto's Hospital for Sick Children. "The major strength of this study is its long period of follow-up," he says. Dr. Newman notes, however, that future research into the impact of breastfeeding on allergies and asthma should distinguish between babies who were exclusively breastfed for at least four to six months, those who were exclusively formula-fed and those who had both breast milk and formula.



The study's lead researcher, Dr. Malcolm Sears, agrees, adding that: "The study should never be used to tell women not to breastfeed. There are a hundred and one good reasons to breastfeed a baby," says Dr.

*"The study should never be used to tell women not to breastfeed. There are a hundred and one good reasons to breastfeed a baby. The study says that preventing allergy and asthma might not be one of them"*

Sears. "The study says that preventing allergy and asthma might not be one of them." Dr. Sears notes that further research is needed into why breastfeeding seems to have the effects it does. "It is a signal to try and understand the mechanism of how allergies and asthma come about." 🐾

Ref.: Sears MR, Greene JM, Willan AR, Taylor DR, Flannery EM, Cowan JO, Herbison GP, Poulton R. Long-Term Relation Between Breastfeeding and Development of Atopy and Asthma in Children and Young Adults: a Longitudinal Study. *Lancet* 2002;360(9337):901-907.

PHOTO: FINOLHSSC

# LINKING INFANT MORTALITY, PRENATAL TESTING AND PREGNANCY TERMINATION

by Liz Warwick

**A country's infant mortality rate often points to the state of its health development. In Canada, the infant mortality rate has declined significantly over the past three decades. However, between 1991 and 1995, it stagnated between 6.1 and 6.4 per 1,000 live births. Then, in 1996, the rate dropped steeply to 5.6, dipping again in 1997 to 5.5. The reason for the sudden decline was unclear. Were infant deaths? (whether caused by sudden infant death syndrome (SIDS), congenital anomalies, infections or other causes) decreasing globally, or had there been a decline in some specific causes of infant deaths?**

Canadian researchers began examining the birth and death registries kept by the country's provincial and territorial governments for the years 1991 through 1997. Problems with the data collected in Ontario meant the province's statistics were excluded from the study. As with other industrialized countries, Canadian data showed that congenital anomalies are a leading cause of death, both prenatally and in the first year of life. However, the researchers discovered that the infant mortality rates for congenital anomalies were stable from 1991 to 1995, but declined by 21% in 1996 and had remained low in 1997.

The researchers then examined fetal deaths from pregnancy terminations. They found a substantial increase (up 578% from 1991 to 1997), with the sharpest increase starting in 1995. The researchers noted that these changes were happening against the backdrop of an increasing use of prenatal testing for congenital anomalies and

selective termination of affected pregnancies. They concluded that this rise in testing and pregnancy termination for congenital anomalies is related to the overall decrease in Canada's infant mortality rate.

*"The study raises important questions about access to prenatal testing across the country,"* says Dr. André Lalonde, Executive Vice-President of the Society of Obstetricians and Gynecologists of Canada. *"We have to make sure there is good access to prenatal testing. This may not be a problem in major urban centres, but what about women in rural areas?"*

Dr. Lalonde also pointed out that the study found significantly higher infant death rates due to congenital anomalies in the Yukon, Saskatchewan and Newfoundland. *"Further research is needed to explain these differences. Researchers should also begin looking at the impact of early prenatal testing, which can detect fetal anomalies as early as 11 to 13 weeks."* Finally, Dr. Lalonde urged Canadian and Ontario government officials to correct the Ontario birth and death registries. *"Ontario women account for 30 to 40 % of all Canadian births,"* he noted. *"Data must be corrected."* 🐾

Ref.: Liu SL, Joseph KS, Kramer MS, Allen A, Sauvé R, Rusen ID, Wen SW, for the Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System. Relationship of Prenatal Diagnosis and Pregnancy Termination to Overall Infant Mortality in Canada. *JAMA - Journal of the American Medical Association* 2002;287(12):1561-1567.



*"The study raises important questions about access to prenatal testing across the country"*

# OUCH!

## DOCTOR, THAT HURTS!

by Hélène Katz

**Do newborns remember painful events? Until recently, physicians thought that newborns did not feel pain. A group of Canadian researchers looked at infants who repeatedly underwent painful procedures as part of their medical care. Researchers wanted to find out whether newborns learn to anticipate pain and if they respond more intensely to it during a subsequent painful procedure.**

Infants in the study were divided into two groups: those whose mothers had diabetes and those whose mothers had uneventful pregnancies. Infants of diabetic mothers were pricked in the heel to draw a blood sample within the first hour after birth and then every two to four hours during the first 24 hours. This was done to monitor the newborns' blood sugar level. Normal infants were matched to those of diabetic mothers according to birth weight, sex, vaginal or caesarean delivery and anesthetic (used or not) during labour and delivery. After 24 hours, a blood sample from each infant had been obtained.

The procedure consisted of three parts: (1) babies reacting normally; (2) cleaning the skin and preparing for the procedure, (3) needle puncturing the skin and collecting the blood sample. Infants' faces were videotaped during the entire procedure and pain was later rated using grimacing, global facial expressions, etc.

Newborns who had blood drawn repeatedly during their first 24 to 36 hours of life learned to anticipate pain, compared with infants who had not gone through repeated painful procedures. So cleansing was seen as a sign that a painful event was about to occur. Babies not only learned to



*“This study helps practitioners understand infants’ reactions to pain and shows they need to consider giving them painkillers before performing painful procedures”*

anticipate pain, but the pain they experienced in response to having blood drawn from their vein was greater than that of other infants.

The researchers do not know how long this effect lasts, whether it wears off and at what age. This study suggests that if pain is properly managed during painful medical procedures, it could prevent infants from developing greater sensitivity to pain and from learning to anticipate pain.

Dr. Wendy Roberts, Director of the Child Development Centre at the Toronto Hospital for Sick Children and associate professor of pediatrics at the University of Toronto, says: “This study helps practition-

ers understand infants’ reactions to pain and shows they need to consider giving them painkillers before performing painful procedures.”

She points out that knowledge about babies feeling pain has already changed practices with respect to circumcision. “A lot more people are giving local anaesthetic for circumcision whereas before the attitude was to do it as quickly as possible and the babies would not remember the pain.” 🐾

Ref.: Taddio A, Shah V, Gilbert-MacLeod C, Katz J. Conditioning and Hyperalgesia in Newborns Exposed to Repeated Heel Lances. *JAMA - Journal of the American Medical Association* 2002;288(7):857-861.

# PREDICTING

## MOTOR DEVELOPMENT FOR CEREBRAL PALSY

by Hélène Katz

**When parents are told that their child has cerebral palsy, they usually want to know how severe the condition is and whether their child will ever be able to walk. These questions have generally been difficult to answer because there has been no reliable way to classify the severity of cerebral palsy, nor has long-term information on which to base opinions been available.**

A team of researchers wanted to describe the gross motor development of children with varying degrees of cerebral palsy. They hoped that following the same children for a period of up to four years would allow them to find patterns on which to base predictions for parents.

This study included 657 children between the ages of 1 and 13. The extent of their cerebral palsy varied; it was assessed using the Gross Motor Function Classification System (GMFCS). This classifies children into five levels, depending on their gross motor activity and which of four age groups they fall into.

Each child's motor function was also assessed with the Gross Motor Function Measure (GMFM), a widely used tool with a scale of 0 to 100 that was developed for children with cerebral palsy or Down syndrome. It evaluates change in the gross motor function of children diagnosed with cerebral palsy, using activities that a typical five-year-old could accomplish.

Children under the age of six were assessed every six months while older children were evaluated every 9 to 12 months. As expected, there was a systematic and significant change in motor function over time, related to the severity of the children's cerebral palsy. Therefore, the

child's age and GMFCS level can be used to predict his/her prognosis for gross motor development.

Dr. Louise Koclas, a paediatrician in the neonatology clinic at the Montreal Children's Hospital, heads a team that works with children who have cerebral palsy. *"Using the GMFCS makes it easier for therapists to assess each child's potential and explain the prognosis to parents. The curves*

*allow us to see when the child will reach a plateau and when most have reached their potential. This means therapists can set rehabilitation therapy objectives in a clearer and more targeted way,"* she says.

She would like to see some long-term research explore these children's future into adolescence. *"If a child reaches his/her motor objectives early, what is his/her potential with respect to adolescence? Do they maintain or improve?"* she wonders. Dr. Koclas would also be interested to learn about the impact of new therapies, such as the use of botox, on the children's motor skill development and the use of the GMFCS. 🦿



*"Using the GMFCS makes it easier for therapists to assess each child's potential and explain the prognosis to parents"*

Ref.: Rosenbaum PL, Walter SD, Hanna SE, Palisano RJ, Russell DJ, Raina P, Wood E, Bartlett DJ, Galuppi BE. Prognosis for Gross Motor Function in Cerebral Palsy: Creation of Motor Development Curves. *JAMA - Journal of the American Medical Association* 2002;288(11):1357-1363.

## BRAIN SCANS

# REVEAL DIFFERENCES IN ADHD CHILDREN

by Liz Warwick

**Attention deficit/hyperactivity disorder (ADHD) is the most common childhood psychiatric disorder. Studies suggest that ADHD reflects subtle changes or abnormalities in the central nervous system. Researchers have therefore turned to medical imaging techniques such as MRI (magnetic resonance imaging) to look for differences in various brain areas in people suffering from the disorder. The results have shown that ADHD patients have smaller brain volumes in specific areas, but these results have been challenged due to small sample sizes and little or no accounting for the effects of stimulant medications such as Ritalin.**

**T**hen a group of researchers designed a study that would compare, over a 10-year period, both medicated and unmedicated young ADHD patients to healthy children. Each child received at least one and as many as four brain scans. These scans focused on specific areas of the brain (the cerebrum, the cerebellum and the caudate nucleus) as well as the total grey and white matter of the four major brain lobes.

The ADHD children, whether they previously had received medication or not, had significantly smaller brain volumes compared to healthy children. These differences persisted with age. In fact, the researchers concluded that the ADHD symptoms appear to reflect fixed earlier neurobiological insults or abnormalities. They suggested future studies should focus on children under the age of five.

*"This study adds to the growing body of evidence that ADHD is neurobiologically based,"* says Dr. Christina Fiedorowicz, a neuropsychologist and member of the Professional Advisory Committee of the Learning Disabilities Association of Canada. *"Factors such as low socio-economic status*

*may exacerbate the condition, but it is a neurobiological dysfunction. If ADHD has to do with the early environment, whether prenatally or postnatally, we should put greater emphasis on those early years,"* Dr. Fiedorowicz adds.

The study also holds out the promise that one day, clinicians will be able to use brain scans to diagnose the disorder. *"Currently, diagnosing ADHD is very difficult and requires a complex neuropsychological assessment,"* she says. An MRI – a relatively non-invasive procedure – may eventually supplement or even replace this lengthy process.

While the study focuses on the origins of ADHD, it does not address strategies for dealing with it. *"Parents become overwhelmed and they need help in dealing with these children who are more demanding. We need more careful evaluation of strategies and interventions that are effective over the long run,"* says Dr. Fiedorowicz. Educators also need help coping with ADHD children. *"They need to know that while medication can help, it is not the only answer.*



*"Currently, diagnosing ADHD is very difficult and requires a complex neuropsychological assessment"*

*We have to start looking at behavioural management and teaching strategies." 🐾*

Ref.: Castellanos FX, Lee PP, Sharp W, Jeffries NO, Greenstein DK, Clasen LS, Blumenthal JD, James RS, Ebens CL, Walter JM, Zijdenbos A, Evans AC, Giedd JN, Rapoport JL. Developmental Trajectories of Brain Volume Abnormalities in Children and Adolescents with Attention-Deficit/Hyperactivity Disorder. *JAMA - Journal of the American Medical Association* 2002;288(14):1740-1748.

# PROMISING GENETIC LINK FOR SPECIFIC LANGUAGE IMPAIRMENT

by Liz Warwick

**In most children, normal language development depends on opportunity, good hearing and the absence of underlying neurological problems. Unfortunately, even under these conditions, about 7% of children entering school will show signs of specific language impairment (SLI), a deficit that prevents them from developing language normally.**

**M**any SLI children will have trouble learning to read and may be diagnosed with dyslexia. They tend to perform poorly on language and reading tests and may have trouble processing rapidly changing sensory information within a short period of time.

The deficit tends to cluster in families. Recent studies with twins indicate that SLI children may have some unique genetic components that influence their language acquisition. There have also been some interesting associations between SLI and environmental factors, such as toxemia in pregnancy and hypertension.

Recently, a group of researchers studied the DNA samples drawn from five Canadian families of Celtic heritage. The families, which had originally been identified for a linkage study of schizophrenia, also showed a history of language or reading problems. The researchers used three different SLI classifications to identify families with at least two members suffering from SLI.

The researchers then carried out several different analyses of the genes. They found a significant link between chromosome 13 and susceptibility to SLI, as well as evidence that two other areas, one on chromosome 2 and the other on chromosome 17, play a role in the development of the deficit. They also found an interesting link between the area on chromosome 13 – 13q21 – and autism, but noted that SLI and autism appear to involve many dif-



*“We need to know if interventions should occur at a specific time and if specific interventions have more impact than others”*

ferent genes, so a common gene would not be completely responsible for both.

Deborah Lake, a psychologist at the Kinsmen Children’s Centre in Saskatoon, notes: *“There is a sampling issue here. They drew this data from a group that had been linked to schizophrenia. The sample was also quite homogeneous. They need to do this same thing with a new, more heterogeneous sample. They need replication.”*

*“Studies into the genetic component of language difficulties such as SLI, may one day help practitioners improve both their diagnoses and interventions,”* says Lake. *“Genetics has become extraordinarily complex and interesting. It will help us understand how inherited traits and environment*

*interact. Determining genetic markers for specific disorders will certainly improve diagnoses,”* she says. However, Lake points out that people may be clinically diagnosed with a disorder, for example Rett syndrome, without showing the genetic marker.

*“When it comes to language problems such as SLI, more research is needed in the area of effective interventions. We need to know if interventions should occur at a specific time and if specific interventions have more impact than others,”* Lake adds. ❦

Ref.: Bartlett CW, Flax JF, Logue MW, Vieland VJ, Bassett AS, Tallal P, Brzustowicz LM. A Major Susceptibility Locus for Specific Language Impairment is Located on 13q21. *American Journal of Human Genetics* 2002;71(1):45-55.

# BRAIN INJURIES AFFECT CHILDREN'S WORKING MEMORY

by Liz Warwick

**People who suffer a traumatic brain injury (TBI) often complain that reading comprehension and the ability to organize projects have become more difficult. Researchers have pinpointed working memory problems as a source of these difficulties.**

A group of researchers decided to investigate the effects of a TBI on children's working memory. They used two different tasks – one focusing on a semantic word task and the other on a phonological task. These tasks were also done with a group of children without brain injuries.

Children who had suffered a TBI showed impaired working memory. The researchers found that TBI had a selective effect on the ability to match letters, but not on the ability to match rhyming letters. As well,

children with TBI were more likely to give "false alarms". The researchers suggest that these false alarms indicate diminished inhibition in children, a side effect often seen in certain brain-injured patients.

*"It is well known that children or adults who have suffered a traumatic brain injury will be likely to sustain memory problems," says Dr. Harry Bawden, a pediatric neuropsychologist at the IWK Grace Health Centre in Halifax. "This study explores a particular kind of working memory and is another indicator that we should pay attention to the memory abilities of individuals with TBI and help them deal with the problems."*

Dr. Bawden adds that there is a pressing need for more long-term services and supports for brain-injured children once they leave the hospital.



He further suggests that brain-imaging techniques be used to explore how different areas of the brain may be affected by TBI. *"Imaging studies would certainly help in understanding what certain areas of the brain do and what tasks involve which areas."* 🦋

Ref.: Levin HS, Hanten G, Chang CC, Zhang LF, Schachar R, Ewing-Cobbs L, Max JE. Working Memory After Traumatic Brain Injury in Children. *Annals of Neurology* 2002;52(1);82-88.

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