

What Causes Mental Retardation and Cerebral Palsy?

A Summary of the Report From the Task Force on Joint Assessment of Prenatal and Perinatal Factors Associated with Brain Disorders

Mental retardation is present in approximately 780,000 school age children. Cerebral palsy affects 750,000 Americans, and nearly 2,000,000 individuals have epilepsy. Countless individuals suffer combinations of these neurologic disabilities.

In an effort to assess our current state of knowledge about the pre- and perinatal factors associated with these brain disorders and to set research goals for the coming decade, the National Institute of Child Health and Human Development (NICHD) and the National Institute of Neurologic and Communicative Disorders and Stroke (NINCDS), appointed a task force to survey current knowledge about pregnancy- and birth-related events that account for the continued incidence of neurologic handicap among infants and children. This report, titled *Prenatal and Perinatal Factors Associated with Brain Disorders*, represents a watershed in our thinking about the causes of mental retardation and cerebral palsy and epilepsy.

Despite major advances in obstetric and neonatal medicine, physicians, patients, and attorneys still believe that the major causes of these brain disorders are related to birth trauma and the problems of labor. The committee found that *only* cerebral palsy could be related to perinatal insults. Only when mental retardation or epilepsy were found in association with cerebral palsy, could ischemia or hypoxia be causally related. The committee stated 'although it was once simple to say that a specific event such as birth trauma or asphyxia caused these brain disorders, it is not usually possible to pinpoint a single cause and its effect'.

Cerebral Palsy

Cerebral palsy was found to be associated with prematurity, growth retardation and asphyxia at birth. The asphyxiated infant, documented by an Apgar score of less than 3 at 10-15 min, neurologic abnormalities in the newborn period and neonatal seizures, had a dramatically increased risk of later cerebral palsy. However, the majority of children with these risk factors had no evidence of neurologic dysfunction. More than 75% of children who had later cerebral palsy did not demonstrate these risk factors in the neonatal period.

Mental Retardation

Severe mental retardation is primarily genetic, biochemical, viral and developmental and not related to birth events. Only when it was

associated with cerebral palsy, did severe mental retardation possibly link to asphyxia.

Mild retardation, the most common degree of retardation, appears not to be related to pregnancy or birth events, but rather to social and environmental conditions. Associated factors, including maternal life styles, poor nutrition, cigarette smoking, alcohol and drug abuse, increase the likelihood of mild retardation. Prematurity and intrauterine growth retardation are commonly linked to these life styles. The risk of these problems was also correlated with the risk of being raised in an impoverished environment with less opportunity for optimal neurologic and intellectual development.

Epilepsy

Epilepsy did not appear to be related to pre- or perinatal events except when associated with cerebral palsy.

Current Challenges and Directions for Research

The committee noted that major challenges for the future included identifying women at high risk for bearing a neurologically handicapped child. For some such women, lowering the risk may begin before pregnancy, by management of conditions leading to risk and changes in life style. During pregnancy identification of the fetus with growth retardation may be an important area for reducing risk. The amount of damage due to hypoxia or ischemia depends both on its duration and severity, *and* on the infant's biologic reserve and repair capabilities. Most infants who experience difficult labors do *not* develop later neurologic handicaps; most infants who demonstrate later brain disorders had no evidence of problems during the perinatal period.

Premature infants are subject to the additional stress of hypoxia, respiratory distress and intraventricular hemorrhage. Prematurity was found to be the salient birth-related risk factor for later cerebral palsy. Understanding premature labor, and prevention of prematurity are the most important challenges in preventing later brain disorders.

Major challenges now lie in detecting asphyxia earlier and knowing both its severity and duration. Neurologic damage to the fetus from asphyxia depends on the duration of the asphyxia, its severity, and on the gestational age of the fetus. Criteria which take into account these factors need to be developed for intervention.

Despite the committee's extensive review of current knowledge, its conclusion was that little is certain about the pre- and perinatal causes of *most* cases of cerebral palsy, mental retardation and epilepsy. Future research that increases our understanding of normal brain development and the myriad factors such as cell differentiation, migration, proliferation and synapse formation, which play a role in CNS development would improve our understanding of some causes of retardation and cerebral palsy. Understanding the mechanisms of brain plasticity and repair would improve our ability to ascribe abnormalities to specific events, to predict their consequences, and perhaps to improve repair. Understanding of the genetic and biochemical abnormalities that cause retardation might allow new technology to offer hope for some forms of severe retardation. Understanding the pathogenesis of prematurity and low birth weight and developing methods for their early detection, as well as new approaches to intervention should be priorities for obstetrical research. Understanding the effects of fetal asphyxia and the mechanism by which it appears to produce progressive damage during the first hours or days of life might allow the development of strategies for the postnatal management of brain edema, hypoperfusion and other problems following asphyxia. The use of animal models might allow researchers to develop and study new intervention techniques.

Such studies could lead to better understanding of the pre- and perinatal causes of these disabling brain disorders and to prevention and treatment of infants and children affected by them.

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Reference

National Institute of Child Health and Human Development (NICHD): Prenatal and Perinatal Factors Associated with Brain Disorders.

Copies of the 450-page report may be obtained free of charge by writing to:

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