

Preterm infants exposed to stressors in NICU display reduced brain size

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New research shows that exposure to stressors in the Neonatal Intensive Care Unit (NICU) is associated with alterations in the brain structure and function of very preterm infants. According to the study now available in *Annals of Neurology*, a journal published by Wiley-Blackwell on behalf of the American Neurological Association and Child Neurology Society, infants who experienced early exposure to stress displayed decreased brain size, functional connectivity, and abnormal motor behavior.

Infants born prior to the 37th week of pregnancy are considered preterm, which occurs in 9.6% of all births worldwide, according to the Bulletin of the [World Health Organization](#) (WHO). A report by The National Institute of Child Health and Human Development confirms that preterm birth occurs in 12% of all pregnancies in the U.S. In addition to increased [mortality risk](#), prior studies have shown that up to 10% of very [preterm infants](#) (22-32 weeks gestation) have cerebral palsy, nearly 40% display mild motor deficiency, and up to 60% experience cognitive impairments, social difficulties and emotional issues.

Babies who are premature are commonly admitted to the NICU for specialized medical attention, allowing time for immature organs to further develop. While interventional studies have demonstrated that exposure to stressors in the NICU may be harmful and reducing stress in premature infants improved outcomes, it is unknown how stressors in neonatal units impacts infant brain development. The present study, led by Drs. Terrie Inder and Gillian Smith, both Washington University researchers at St. Louis Children's Hospital in Missouri, is the first to

report on the effects of stress among hospitalized preterm infants and its impact on brain development.

For their observational study, the research team recruited 44 preterm infants within 24 hours of birth from November 2008 to December 2009. Study participants were less than 30 weeks gestation, or very preterm, and stress was measured by using the Neonatal Infant Stressor Scale (NISS)—a scale consisting of 36 interventions that contribute to infant stress, ranging from diaper change to intubation. Magnetic resonance imaging (MRI) and neurobehavioral examinations were used to evaluate cerebral structure and function.

Results show that the average daily exposure to stressors was greatest in the first 14 days following birth. The greater number of stressors that an infant was exposed to was associated with decreased frontal and parietal brain width. Researchers also reported altered brain microstructure and [functional connectivity](#) within the temporal lobes in infants with early stress exposure. Abnormal movement pattern and reflex scores were lower among preterm infants exposed to higher stress in the first two weeks of life.

"Our findings suggest that stress exposure reduces the [brain size](#) in early preterm infants and long-term consequences are unknown," said Dr. Inder. "However, prior research has found that brain volume at (term) birth is a predictor of neurodevelopmental outcomes later in childhood." The authors suggest that further research of stress exposure on the preterm brain, independent of illness severity, is needed to improve outcomes for premature infants.

More information: "NICU Stress Associated with Brain Development in Preterm Infants," Gillian C. Smith, Jordan Gutovich, Christopher Smyser, Roberta Pineda, Carol Newnham, Tiong H. Tjoeng, Claudine Vavasseur, Michael Wallendorf, Jeffrey Neil and Terrie Inder. *Annals of*

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