

# Baby's Brain Development: Connecting the Dots



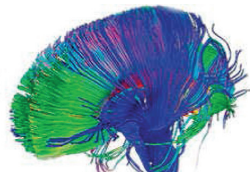
*What is an infant thinking?*

*How does the environment, parental interactions, and surroundings impact the way an infant grows and thrives?*

These questions – and many more – are what Wyeth Nutrition is setting out on a mission to uncover. Over the next four years, Wyeth Nutrition, through the Foundation for the National Institutes of Health, is funding the **Baby Connectome Project**. This research initiative of the National Institutes of Health is dedicated to solving some of the greatest mysteries of early child brain development.

## TRANSLATING RESEARCH INTO MEANINGFUL OUTCOMES

Children are the future of our family, our community and our planet. They deserve the best start to put them on a path for a long and healthy life. Providing the right nutrition to infants and children is crucial for brain development and overall health.



The **Baby Connectome Project** will analyze the brains of healthy children from birth through age five.

The findings of the research will enable physicians and parents to:

- Better understand children's mental, emotional, and behavioral development

- Offer parents guidance for enhancing healthy interaction with their child
- Understand the brains of children with learning disabilities and disorders to improve diagnosis and treatment
- Support policymakers in shaping positive health services and intervention programs

## UNCOVERING THE UNKNOWN

The collaboration will seek to unravel many facts still unknown to the scientific and medical community:

### WHAT ARE...

#### THE PHYSICAL CHANGES TAKING PLACE IN A BABY AND YOUNG CHILD'S BRAIN?



- size
- structure
- brain signals
- changes in blood oxygenation
- flow

#### THE FACTORS THAT INFLUENCE HOW A CHILD BEHAVES AND LEARNS?



- motor skills
- play and social skills
- writing
- self-care and organization



- language development
- speech awareness
- cognitive thinking
- sensory processing

#### THE SURROUNDINGS AND SENSORY EXPERIENCES THAT MOST IMPACT EARLY CHILDHOOD DEVELOPMENT?



**Biological:** Gender, general health, mental health



**Experiences:** Touch, smell, taste, sight, hearing, learning, physical activity, sleep



**Interpersonal Relationships:** Parenting styles and social networks



**Environmental:** Housing, income, employment, education

# NEW TECHNOLOGY TO ADDRESS AGE-OLD CHALLENGES



## Identifying and assessing pediatric brain function is not simple because of infants':

|                                   |  |
|-----------------------------------|--|
| Small brains                      | Patient motion                                   |
| Rapidly changing physiology       | Increased metabolism                             |
| A high degree of brain plasticity | An incomplete understanding of brain development |

But new magnetic resonance imaging (MRI) technology is making previous challenges now possible by answering questions about structural and functional organization and development using new physiological/anatomical measurements in a non-invasive and safe way<sup>1,2,3</sup>

## Different forms of non-invasive MRI will include:

Diffusion weighted MRI (dMRI) to measure structural connections, inferred from the motion of water particles

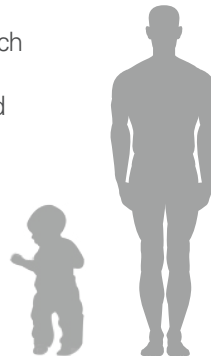
Perfusion MRI (pMRI) to monitor blood perfusion by tagging fast moving hydrogen protons in the blood stream and monitoring the tissues to which they are deposited

Functional MRI (fMRI) to obtain blood oxygen level-dependent signal which is associated with brain activity and is an important method for monitoring brain function

## About the Human Connectome Project

The Baby Connectome Project builds upon the research from the Human Connectome Project (HCP), which analyzed 1900 healthy adult brains including twins and non-twin siblings.

The goal of the HCP is to provide a better understanding of brain connectivity, its relationship to human behavior, and contributions from environmental and genetic factors that account for differences in individual brain circuitry.



### Did you know?

Data from the HCP project revealed that bundles of nerves within the brain are laid out much like Manhattan streets, running in two directions. In flat areas of the grid, the brain fibers overlap at precise 90 degree angles and weave together much like a fabric.



**Wyeth®|Nutrition**

In collaboration with the Foundation for the National Institutes of Health with support from Wyeth Nutrition

**1** Leyman, Jacob, Takahashi, Emi. Multivariate analyses applied to fetal, neonatal and pediatric MRI of neurodevelopmental disorders. *Clinical neuroimaging* (Impact Factor: 2.53). 10/2015; 9:532-544. DOI: 10.1016/j.nicl.2015.09.017 **2** Leyman, Jacob, Takahashi, Emi. Multivariate analyses applied to fetal, neonatal and pediatric MRI of neurodevelopmental disorders. *Clinical neuroimaging* (Impact Factor: 2.53). 10/2015; 9:532-544. DOI: 10.1016/j.nicl.2015.09.017 **3** Craddock RC, Tungaraza RL, Milham MP. Connectomics and new approaches for analyzing human brain functional connectivity. *Gigascience*. 2015 Mar 25;4:13. doi: 10.1186/s13742-015-0045-x. eCollection 2015.

By closing this vast knowledge gap, together researchers, pediatricians and policymakers worldwide can better understand childhood development and help parents raise future healthy generations.

### ABOUT WYETH NUTRITION

For the past 100 years, Wyeth Nutrition has pioneered innovative nutrition science with premium-quality products that meet the needs of infants, young children and adults. Through innovative discovery research, high-quality clinical trials, world-class manufacturing and product safety standards, we deliver scientifically sound solutions that offer parents confidence, help nourish children and support healthy futures. By partnering with mothers, doctors and scientists, we continue to discover and learn what is needed to ensure the best advancement for the health and well-being of future generations. To learn more about Wyeth Nutrition, visit [www.wyethnutrition.com](http://www.wyethnutrition.com).

### ABOUT THE FOUNDATION FOR THE NATIONAL INSTITUTES OF HEALTH

The Foundation for the National Institutes of Health creates and manages alliances with public and private institutions in support of the mission of the NIH, the world's premier medical research agency. The Foundation, also known as the FNIH, works with its partners to accelerate biomedical research and strategies against diseases and health concerns in the United States and across the globe. The FNIH organizes and administers research projects; supports education and training of new researchers; organizes educational events and symposia; and administers a series of funds supporting a wide range of health issues. Established by Congress in 1990, the FNIH is a not-for-profit 501(c)(3) charitable organization. For additional information about the FNIH, please visit <http://fnihi.org>.