

The Origins of Health and Disease

By George S. Taliadouros, MD, FACOG and Christine Norris

As scientists study the causes and effects of chronic diseases such as cardiovascular disease, type 2 diabetes, asthma, cancers, osteoporosis, and neuropsychiatric disorders, they are discovering that a person's future risk of developing these problems may be tied to what occurred while in the womb. This new field of inquiry, known as the developmental origins of health and disease, hopes to ensure the health of women of reproductive age so that their children can enjoy lives free of debilitating diseases that may be mostly preventable with better prenatal care.

The International Society for Developmental Origins of Health and Disease (DOHaD) was recently formed to identify, quantify, and evaluate strategies to modify prenatal and perinatal determinants of adverse adult health outcomes. This group of policymakers and researchers also holds a yearly interdisciplinary congress to expand this field of thought.

The Maternal Fetal and Neonatal Physiology division of DOHaD has conducted studies showing that small body size at birth and during infancy is associated with increased rates of coronary heart disease and its major biological risk factors—elevated blood pressure, insulin resistance, and abnormal lipid metabolism and blood coagulation. These findings led to the “fetal origins hypothesis,” the theory that elevated lipids in the bloodstream and abnormal sugar metabolism which lead to coronary heart disease and type 2 diabetes originate through fetal adaptations to undernutrition. These adaptations, scientists believe, permanently alter the structure and function of the body, a process known as programming.

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According to DOHaD research, the fetus reacts to undernutrition by diverting oxygenated blood away from the trunk to favor the brain and altering the hormones that regulate growth and maturation, including insulin, insulin-like growth factors, and glucocorticoids. In DOHaD laboratories and clinics, scientists are exploring the processes which underlie programming to focus on the long-term effects of fetal blood diversion on vascular and renal function and the alteration of the growth hormones' structure in the development of metabolic syndrome and osteoporosis. The group also is examining maternal cardiovascular adaptations in early pregnancy in relation to growth through pregnancy and body proportions at birth. The DOHaD's Institute of Human Nutrition is studying the requirements for protein and amino acids during fetal development and is investigating how the mother's metabolism adapts to undernutrition, as well as their role in programming.



The American College of Obstetricians and Gynecologists (ACOG) recently published guidelines for all women planning pregnancy to have a reproductive health plan. It has long been recognized that medical, social, and environmental problems can affect the course of a pregnancy and its outcome and the future health of the offspring. Since half of the pregnancies in the United States are unintended, achieving reproductive health is an ongoing process and a component of a larger health care goal.

The ACOG and the American Academy of Pediatrics advise physicians to include the following four components in preconception care:

- physical assessment, including physical examination, and medical and family histories
- vaccinations for conditions such as rubella and hepatitis B
- screening for genetic disorders or infectious diseases such as sexually transmitted diseases
- counseling patients about not smoking, not drinking alcohol, maintaining a healthy body weight, and taking folic acid supplements.

It's also recommended that all women planning pregnancy be screened and properly treated for thyroid disease, the most common endocrine disorder. It occurs when the thyroid gland doesn't function properly, either producing too much hormone (hyperthyroidism) or too little hormone (hypothyroidism).

If left untreated, hypothyroidism can lead to mental retardation and other cognitive problems in newborns. That's why early testing

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and the proper treatment is necessary. According to research I conducted on the effects of subclinical hypothyroidism on the mental and psychomotor development of the fetus ("Healthy Pregnancy for a Healthy Child"), the timing and level of thyroid replacement medication given to pregnant women should be closely monitored to take into account the extent of changes that occur during pregnancy. Pregnant women with hypothyroidism also should be taking in enough iodine either through their food choices or through

dietary supplements. (For more on DVIF&G's research on hypothyroidism and pregnancy, please visit www.dvifg.com, click on "Press Center," then "Press Releases" and finally "DVIF&G Issues Medical Alert.")

The role of maternal diet in the long-term health of a child has also been closely studied. For example, a study published in the journal *Environmental Health Perspectives* found that the more fish with low mercury content a mother consumed while pregnant, the higher her child's score would be on a cognitive test. Another study published in the journal *Circulation* found that the higher the mother's calcium intake, the lower would be the child's blood pressure.

Conversely, if the pregnant woman smokes, the likelihood of reduced fetal growth is strong and is also associated with an increased risk of obesity in the offspring. If the mother develops gestational diabetes, the child will have a greater risk of becoming obese and insulin resistant. Other factors, such as weighing over 9 pounds at birth or the effect of body composition on placental function, are risk factors that cannot be controlled by the pregnant woman, but new research indicates that knowing these risk factors in advance of



The DVIF&G Staff is responsible for bringing one healthy baby into the world every other day.

conception can help physicians develop a healthy pregnancy plan to minimize complications.

Researchers are also studying the effect of the fetal environment on long-term health. For example, if the mother is clinically depressed and not treated, or if the pregnant woman is under a lot of stress, the fetus will be affected with negative long-term health outcomes. Studies show that children born to clinically depressed mothers have lower birth weights, a higher risk of premature birth, and complications at birth. They also experience delayed language and cognitive development, as well as increased behavioral problems. Scientists believe that these effects are partially caused by reduced blood flow and abnormal hormone levels to the fetus caused by stress and depression. That's why developing a preconception health plan is key. If these problems can be detected and treated *before* conception, then the long-term health of the child will be optimized.

There also is much interest in how the newborn develops. Pediatricians are advised to help mothers discourage accelerated weight gain during infancy because it can lead to becoming overweight, insulin resistant, and hypertensive as adults. This correlation was even found to be true in cases where premature infants gained weight too rapidly. To prevent this from happening, doctors are recommending that every woman breast-feed her infant exclusively for the first six months of life. Where breast-feeding cannot be performed, pediatricians are recommending formula with lower fat content.

A *Journal of the Medical Association (JAMA)* study published this year also found that spacing children at least 18 months apart but not more than five years apart was associated with a lowered risk of having a preterm birth, a low birth weight infant, and an infant that's small for its gestational age.

Armed with this new research into the developmental origins of health and disease, we can help develop healthy outcomes for mother and child throughout their lives. With this knowl-

edge and healthy lifestyle choices, we believe that many chronic diseases can be prevented.

At DVIF&G we've long known that the health of the mother greatly affects her ability to carry full-term and the future health of her child. That's why we developed expertise and a series of diagnostic tests to detect maternal preconception conditions that can have irreversible and lifelong effects on the fetus. These effects include insulin resistance (IR) commonly seen in patients with polycystic ovaries (PCO), hypothyroidism, and mood and stress disorders. We also carry on effective therapies for those conditions and institute the Stork's Nutrition Program®, a program exclusive to our practice, that provides medical nutrition therapy to pregnant women to optimize the health outcomes of both mother and child.

Thank you, DVIF&G

October 11, 2006

Dear Staff:

Where do we begin? It has been an incredible path for us. We are eternally grateful to have encountered such an amazing group of people. You have truly made a difference in our lives. Initially we were hesitant and incredulous, but your caring ways have been the determining factor. You possess such a positive willingness to help that it becomes contagious. There are many other offices that simply run a "business." In your case, you truly understand that aside from the business aspect, we are human beings. It is this characteristic that sets you aside from the rest. We simply want to thank you for caring. We will miss you!

Gracias,

Troy and Tzeitel Rosado

Share Your Baby Pictures

If you would like to share your baby's photos with other DVIF&G patients, you can upload them at dvifg.com, the DVIF&G website. Just fill out the necessary information, upload your photo, and your child's picture will be included. What a great way to share your joy and to give others hope.



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Happy Birthday to . . .



Adian Michael Jacquet and **Kiley Morgan Jacquet**, born on September 10, 2005, to Rhonda and AJ Jacquet.

Vicki Yu, born on July 5, 2006, to Quing Ren and Wei Yu.

Nathan Curtis Baxter, born on October 9, 2006, to Sharon and Christopher Baxter.

Benjamin Weaver-Hutton, and **Shaun Weaver-Hutton**, born on October 20, 2006, to Julie Ann Weaver and Vallerie Hutton

Sarah Megan Godor, born on October 26, 2006, to Sonia and Chris Godor.

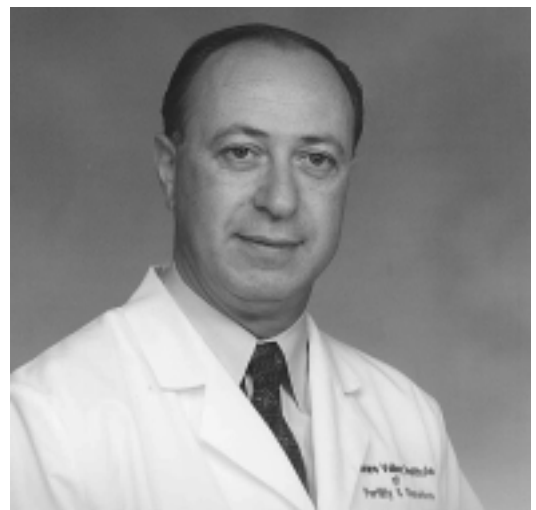
Hope Katherine Rontos, born on November 1, 2006, to Karin and Dan Rontos.

Landon Honeyford, born on November 24, 2006, to Jennifer and Ron Honeyford.

Alyssa Rathbone, born on November 11, 2006, to Nicole and Doug Rathbone.

Kevin Michael Dick, Jr., born on December 6, 2006, to Robin and Kevin Dick.

All of the babies and parents are doing well. Thank you, DVIF&G!



George S. Taliadouros, M.D., FACOG, the founder of DVIF&G, recently spoke about "Preconception Health Issues" to members of the OB-GYN staff at Capital Health System in Trenton. For more on this topic, please read this issue's cover story, "The Origins of Health and Disease."