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THE DIABETES AND PREGNANCY NEWSLETTER: *SWEET SUCCESS*

Similarities and Differences-The Accelerator Hypothesis

By Jane Darany RN, MS
Former Program Manager CDAPP-Region 7

After many years of research, including recent completed trials to try to prevent type 1 diabetes, disappointing results have stimulated a change in thinking regarding how the various types of diabetes are affected by genetic, immunoregulatory, and lifestyle factors. Despite vigorous and extensive research efforts, type 1 diabetes has doubled in the last 25 years in industrialized countries. In addition, there has been a huge increase in type 2 diabetes and gestational diabetes. The question now under consideration is what is causing the beta-cell damage and the immense increase in both types of diabetes?

The Accelerator Hypothesis has been described by Wilkin and associates (1) to explain what is being observed. The Accelerator Hypothesis states that both type 1 and type 2 diabetes are one and the same disorder of insulin resistance, but they are set against different genetic backgrounds. Insulin resistance, driven by modern lifestyle influences of being overfed and under exercised, accelerates the loss of beta cells in both type 1 and type 2 diabetes. Autoimmunity, driven by beta cell up regulation induced by insulin resistance in persons with certain immune

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Beyond the Numbers: Attachment Theory and Research Related to Diabetes

Charlene Canger, MFT, LCSW
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Ciechanowski PS, Katon WJ, Russo JE, Walker EA. The patient-provider relationship attachment theory and adherence to treatment in diabetes. American Journal of Psychiatry, January 2001, 158:1, 29-35.

Introduction

Getting patients to do "what they're supposed to do" is not always easy, as health providers know all too well. Clearly many variables influence a patient not cooperating with provider

recommendations, such as, not fully understanding the complexity of the disease and rationale for treatment, differing cultural issues, exacerbating psychiatric problems and/or overwhelm with more basic struggles of living- no transportation, health insurance, food, etc. Paul Ciechanowski and colleagues at the University of Washington postulated that there was another variable that accounted for non-adherence in

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Beyond the Numbers: Attachment Theory and Research Related to Diabetes

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many patients. Using diabetic patients whose compliance could be more easily measured biologically, the researchers tested their belief that a dismissing attachment style, developed early in life, still influenced how patients interact with their health providers.

Overview of Attachment Theory

Attachment theory, as many readers are aware, was first described by John Bowlby in the 1950's, proposes that we all internalize our earliest experiences with significant caregivers and how we experienced our emotional needs being met. From those earliest experiences we determine both our worthiness of care and whether others can be trusted to provide care or nurture us. In psychological jargon these cognitive models are called "internal working models" and directly influence our interactions with others and how we interpret those interactions throughout our entire life. Researchers categorize four attachment styles: secure, dismissing, preoccupied, and fearful. Securely attached adults (60% of the population) most likely had consistently responsive care giving in their earliest years of life and are at ease depending on and being cared for by others. Those with dismissive attachment styles (25% of adult population), likely received consistently unresponsive early care giving and have compensated by being overly self-reliant ("I can do it alone, thank you") and uncomfortable trusting others to nurture or provide care. Preoccupied individuals had inconsistently responsive emotional care giving and, as a result, become exceedingly vigilant and "clingy" in relationships with a strong need to please others. Finally those with fearful attachment style experienced harsh and rejecting care giving and now always anticipate rejection of their needs, often using an approach-avoidance ("Come here, go away") style of relating.

Dismissing Attachment Style and Diabetes

Ciechanowski's study results noted that those patients with dismissing attachment style had a statistically significant higher glycosylated

hemoglobin levels than the other compromised attachment styles of fearful and preoccupied. When the quality of patient-provider communication was addressed, the association became more pronounced among patients with a dismissing style. When the researchers focused on only those subjects treated with oral hypoglycemics, they found that those with a dismissing attachment style rated their communication with providers as poor and had twice as many relapses in oral adherence than those with other attachment styles. The research demonstrates that some attention to what the patient brings to the relationship with providers- how the patient perceives the provider, is important and directly influence their care.

Other research

Other research has determined that a dismissive attachment style is correlated to fewer visits to health care professionals, greater rejection of treatment providers, less self-disclosure, and poorer use of treatment. Likewise other studies noted that patient satisfaction with their provider is associated with improved diabetes treatment adherence.

Patient-Provider relationships

This and related studies give credence to the impact of the relationship variables as a significant contributor to adherence to diabetes treatment and chronic illness. It must be acknowledged that many providers, due to their sensitivity to interpersonal concerns in the care of disease, compensate and adapt to the needs of their patients, guiding them to better adherence while attending to their attachment style. Attention to a positive working relationship is seen as a treatment goal and practical interventions that support this are woven in to care. At various Sweet Success sites, this is seen in brief but thoughtful calls for missed appointments, sincere expressions of care for the patient and circumstances of her life, supportive responses to small, positive changes made by the patient and tolerance for "not doing it right", attempts to remedy breaches in the breaches in the relationship, etc. This takes

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Choline and Fetal Development

Geetha Desai, MS, RD, CDE, CLE

Choline is the key metabolic precursor of two crucial physiological compounds- phosphatidylcholine and acetylcholine. This nutrient plays diverse supporting roles in human physiology-it strengthens cell membranes, plays an integral role in keeping homocysteine levels in check, is vital to the synthesis of the neurotransmitter, acetylcholine, insulates nerve fibers as a component of sphingomyelin and aids in memory development and cognition.

Adequate maternal choline stores are vital to a healthy pregnancy. Because there is a high rate of choline transfer from mother to fetus, pregnancy places high demands on maternal choline stores, and because human milk is rich in choline, the

need for these reserves does not diminish after birth; rather it increases to meet the demands of rapidly growing and developing infant. Alternate maternal choline intake is critical not only for proper fetal brain development, but also for maintaining normal maternal homocysteine levels. Elevated maternal homocysteine has been associated with an increased incidence of birth defects.

Although choline is produced endogenously, it is thought that the output from de novo synthesis is not adequate to keep up with human needs over the life cycle. It is found primarily in the form of lecithin in foods such as beef liver, oatmeal, soybeans, iceberg lettuce, and cauliflower. Scientists are now just beginning to appreciate

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Similarities and Differences-The Accelerator Hypothesis

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response genes (HLA) accelerates the loss even more.

The difference between type 1 and type 2 may be the tempo at which beta cells loss occurs. Now that type 2 is occurring more rapidly and at younger ages, it is getting harder to distinguish between type 1 and type 2. Terms like "double diabetes" and "type 1 and 2" are really ways to conceptualize the same convergence in pathogenesis.

Lifestyle intervention may well be what will likely reduce the incidence of both type 1 and 2 diabetes at the public health level. In industrialized countries, the national body mass index (BMI) has shifted upward by 20% during the last 25 years. Insulin resistance follows the shift in BMI. Children and adults are heavier now. Both can be at risk for either type 1 or 2 diabetes. Public and personal education are needed on a massive scale to try to turn the tide of diabetes occurrence. This needs to be coupled with public pressure on the food industry to change the way some food products are made. This is particularly true when high fructose corn syrup is used as a sweetener and when trans fats are used. Education about what is a

normal serving size of various foods, along with promotion of exercise are needed. Public pressure is needed on schools to make exercise options available again and communities to provide safe environments for outside exercise such as walking and bike paths, playgrounds, parks, and other public use areas.

Research continues in immune intervention. More efforts to reduce insulin resistance with use of insulin sensitizers may end up having a dramatic impact.

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**Beyond the Numbers: Attachment Theory and Research
 Related to Diabetes**

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considerable work on the provider's part and can also be frustrating when someone is busy, pressed for time, and more focused on the urgency of testing results. A team perspective is useful to determine all the complex variables and how successful interventions will be.

Conclusion

This interesting study addresses how attachment styles affect adherence to diabetes treatment with type 1 and type 2 diabetes care. It is interesting to reflect on the impact of maternal-fetal attachment in pregnancy and how it too affects self-care and treatment adherence in our work.

There are interesting studies that address that which will be described in future issues. It also should be added that attachment styles are not limited to our patients but also reflect our own manner of relating which impacts, in turn, both our professional and personal relationships. How to understand and implement attachment research into our work- both formally and informally- to aid in improving a patient's ability to care for themselves and, by extension their unborn child remains the task of those providers interested in taking on the challenge.



Choline and Fetal Development

Geetha Desai, MS, RD, CDE, CLE

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choline's vital role in cardiovascular health, memory function and perhaps most importantly, fetal brain development.

Like folate, choline has been shown to decrease the incidence of neural tube defects. One study showed that the risk of having a baby with neural tube defect was four times greater for women in the lowest quartile of the choline intake compared to those in the highest. Choline functions as a methyl donor in the synthesis of methionine from homocysteine. It is thought that choline's role as a methyl donor is especially important when folate intake is low. In fact, it has been shown that the methionine and folic acid together might prevent neural tube defects such as spina bifida and anencephaly by supporting methyl group metabolism or by keeping homocysteine levels in check.

SOURCES OF CHOLINE

Excellent sources of choline must contain at least 110 mg of choline per serving (20% of the Daily Value for choline based on 550 mg reference)

Good sources of choline must contain at least 55 mg of choline per serving (10% of the Daily

Value for choline based on 550 mg reference)

Food	Choline Content (per serving)
Beef liver, 85 g (3 Oz)	453.2 mg
Egg, 50 g (1 large)	280.0 mg
Beef steak, 85 g (3 oz)	58.5 mg
Cauliflower, 99 g (1/6 medium head)	43.9 mg
Iceberg Lettuce, 89 g (1/6 medium head)	28.9 mg
Peanuts, 30 g (1oz)	28.3 mg
Peanut butter, 32 g (2 Tbsp)	26.1 mg
Converted from values given in Chapter 28 written by Steven H. Zeisel MD, PhD of: Shiels ME, Olson, JA, Shike, M. <i>Modern Nutrition in Health and Disease</i> , 8 th edition 1994	

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Pieces of the Puzzle: Fetal Nutrient Utilization

Leona Dang-Kilduff, RN, MSN, CDE

What are the main nutrients that a fetus uses? And, why do things go so wrong with diabetes during a pregnancy? The main nutrients are primarily glucose, amino acids and fatty acids/lipids. Glucose is needed for energy and stored as glycogen and adipose (fat). Amino acids are needed for protein synthesis and growth, but it can also be utilized for energy. Lastly, fatty acids are utilized for cell membranes (walls). The placenta contains transporters for each of these major nutrients. And the placenta utilizes these substrates also.

This article looks at the use of these macronutrients by the fetus, after a placenta has developed, in a pregnancy with abnormal glucose tolerance.

Glucose

So what happens with glucose? First, glucose moves across the placenta based on saturation kinetics. Higher levels mean more glucose and visa versa. This is usually seen with the GLUT1 transporter. There are other GLUT transporters but this is the main transporter in the placenta. The higher the glucose, the higher the utilization of glucose. The offshoot of this is increased glycogen, carbon dioxide and lactate production.

Low glucose

- Decreased insulin concentration
- Placental to fetal transport is reduced
- Breakdown of other substrates for energy

Acute mild to moderate glucose elevation

- Hyperglycemia
- Increased fetal insulin production
- Increased glucose utilization and oxygen consumption
- Mild arterial hypoxemia
- Increased placental lactate production, fetal lactate uptake and utilization

Acute severe glucose elevation

- Increased fetal oxygen consumption.
- Arterial hypoxemia and metabolic acidosis

- Decreased placental perfusion leading to potential demise

Chronic glucose elevation

- Decreased fetal insulin production when marked and constant
- Increased insulin secretion and/or production of intermittent hyperglycemia
- Increased placental glucose consumption to placental transfer
- Increased erythropoietin production (makes more red blood cells leading to polycythemia and hyperbilirubinemia)
- Decreased placental perfusion leading to potential demise

Amino Acids

Most amino acids move across the placenta via transporters. The amount of specific transporters varies for example some increase with gestation. The active transport of amino acids is reduced with hypoxia. Peptide uptake also occurs and can move across the placenta by pinocytosis. This process increases with gestation. Amino acids also stimulate fetal insulin secretion. So amino acid concentration as well as glucose stimulates insulin secretion in the fetus. Fetal protein synthesis and turnover are highest in the second trimester. Insulin and IGF-1 and many of the endocrine-paracrine hormones and factors also affect this turnover. High glucose/insulin concentrations appear to reduce the protein proteolysis and have less effect on protein synthesis. On the flip side of this, fetal gluconeogenesis can occur after even short periods of decreased glucose concentrations, 1-4 hours. Amino acids can act as a substrate.

Fetal Lipids

Higher plasma levels of free fatty acids are associated with bigger human fetuses. Higher plasma insulin levels increase the lipid and fatty acid transport. This combination of Fatty acids

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ADEQUATE INTAKE OF CHOLINE DURING DIFFERENT LIFE STAGES

Life stage	Adequate Intake (mg/day)
Females	
9-13yrs.....	375
14-18 yrs.....	400
>19yrs.....	425
Pregnant	450
Lactating	550
Infants	
0-6 months.....	125
7-12 months.....	150

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Pieces of the Puzzle: Fetal Nutrient Utilization Continued from page 6

and lipids, with insulin, are thought to be a piece of the puzzle in large or macrosomic infants.

Each of these nutrients and the fetus's response to them and their environment only answer a piece of what can and does go wrong, but also what goes right. These fetuses are amazingly resilient and often do better then expected based on the environment we know they were exposed to.

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Gestational Diabetes and Multiple Fetus Pregnancies

Leona Dang-Kilduff, RN, MSN, CDE

Twin or higher multiple pregnancies in theory should have a higher incidence of Gestational Diabetes (GDM). There is more placental tissue (hyperplacentosis) and higher hormone levels. All of these factors work against the normal carbohydrate metabolism and tolerance. Studies have demonstrated higher levels of hormones such as human placental lactogen, which is a classic diabetogenic hormone are increased in these pregnancies. The alteration of the fasting to eating excursion is thought to be exaggerated in twin and higher pregnancies. More fetuses are also thought to increase the prevalence of GDM. So triplets would increase risk over twins. Newman and Luke compiled data from multiple studies that demonstrated this to be true. See chart below.

This increase held true even when pregnancies were reduced down. So if a woman reduced from triplets to twins, the rate of GDM was also reduced.

Conflicting data does appear in the literature. In several studies the researchers hypothesized that the rate of glucose disposal appears to be more rapid in multiple pregnancies resulting in equal, singleton to twin GDM rates. In some study populations this appears to be true.

Interestingly insulin needs were not higher in GDM pregnancies requiring insulin when compared to

singleton pregnancies requiring insulin.

Most of the studies looking at twin pregnancies are older and may not apply to our women now. After all we see more multiples now due to infertility treatments. Research in this area was limited except when looking at the utilization of Metformin. This is another choice .

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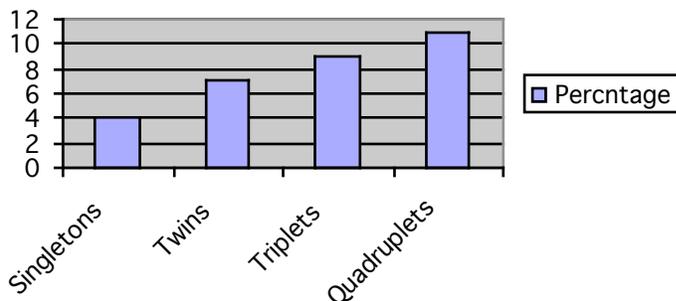
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GDM Incidence in Multiple Pregnancies.



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**CALIFORNIA
DIABETES AND
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PROGRAM**



Conferences

August 9-12, 2006. American Association of Diabetes Educators: 33rd Annual meeting. Los Angeles, CA. For information go to www.aadenet.org.

Diabetes & Pregnancy Training
September 19 and 20, 2006
Garden Grove Hospital
12601 Garden Grove Blvd.
Garden Grove, CA
For more information call (714) 456-6706

November 2-4, 2006. Sweet Success 2006: Diabetes and Pregnancy- Pathways for Progress. For more information please call 800-732-2387.

67th Scientific Sessions.
American Diabetes Association.
June 22-26, 2007 Chicago, IL

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UPDATES

Data Center Changes

The California Diabetes and Pregnancy data center is moving and changing. Lisa Bollman, RN C, CPQH remains the Data Consultant and is now the Data Coordinator. Her new address is:

Community Perinatal Network,
13601 East Whittier Blvd #208,
Whittier, CA 90605

Phone is: 562-945-6484
FAX: 562-945-6489

We will be receiving an update order form for data sheets. If you require data forms in the interim please contact your regional coordinator.

Data sheets are still submitted to your regional coordinators.

Data for 2005 is still being submitted and if you had not submitted all of your data from 2005 we will still accept them until August 1, 2006.



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