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Keynote Lecture:
“Nutrients in the Perinatal Environment: Lessons Learned”

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Disclosure Statement
Dr. Allan Walker has disclosed the information listed below. Any real or apparent conflict of interest related to the content of the presentation has been resolved.

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Perinatal Nutrition

Lecture outline:
- New “hygiene hypothesis”
- Diet and disease “burden”
- Diet and microbiota
- Microbiota and disease
- Preconception and intrauterine nutrition
- Neonatal nutrition
- Clinical consequences
- Summary and conclusions
Perinatal Nutrition

Lecture outline:
• New “hygiene hypothesis”

The “Hygiene Hypothesis” has Evolved Into A New Paradigm

“Western Society Nutrition and the effects it has on gut colonization and immune responses are an increasingly likely explanation for the greater incidence of inflammatory diseases such as asthma and type-1 diabetes in developed countries”

Nature Immunology 12:5-9, 2011

Perinatal nutritional programming: A convergence of the “hygiene” and “fetal programming” hypotheses

“Accumulating evidence suggests that nutrition during pregnancy and early postnatal life is one of the most important environmental cues that programs microbiological, metabolic and immunologic development which in turn influences long-term health”

from Utrecht, Netherlands Symposium “Bringing Science to Early Life Nutrition”

Perinatal Nutrition

Lecture outline:
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• Diet and disease “burden”

Does Diet Affect “Disease Burden”? 

Acquired “Western Lifestyle” (Nutrition) Affects Disease Expression In Immigrants
Perinatal Nutrition

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Trialogue Between Commensals, Gut Associated Immune Tissue And Intestinal Epithelium

Trialogue

Metabolic Effect

Immunological Effect

Dybiosis in Clinical Disease

Pediatrics. 2012;129:950-60
Perinatal Nutrition

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What Is The Impact Of Maternal Pre-conception BMI On Childhood Obesity?


Gut Microbiota In Pregnant Women: Role Of Weight Gain and BMI

Role Of High Fat Obesogenic Diet On Placental Hemodynamics And Stillbirth

- Placental Volume Blood Flow
- Inflammatory Mediator TLR-4
- MCP-1
- IL-1β

Endocrinology. 2011;152:2456-64

Metabolic Syndrome In Childhood: Role of Birth Weight and Gestational Diabetes

- Prevalence of MS

LGA – Large For Gestational Age
AGA – Appropriate For Gestational Age
MS – Metabolic Syndrome
GDM – Gestational Diabetes Mellitus

Pediatrics. 2005;115:e290-6

Diet-Induced Obesity During Pregnancy Results In Offspring Obesity And Hypertension

- Offspring Obesity
- Offspring Hypertension

Hypertension. 2008;51:381-92
Intrauterine Nutrition: Immunoprogramming effect

- Vitamin D
- Omega 3 FA
- Probiotics
- Farm animal exposure and unpasteurized cow’s milk ingestion

Intrauterine Nutrition: Immunoprogramming

Intrauterine nutrition: immunoprogramming

- n-3FA and allergy

References:

Polyunsaturated Fatty Acid (W6/W3 Ratio) Effect During Pregnancy And Lactation On Immune Responses

Intrauterine Nutrition: Immunoprogramming

Prenatal Animal Contact And Non-pasteurized Cow Milk Ingestion On Innate Immune Function And Atopic Dermatitis (AT)
Convergence Of The Hygiene And Fetal Programming Hypothesis

Asthma Expression in Animal Model After Intrauterine Probiotic Exposure

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Breast Milk and Initial Colonization

sIgA Expression

Number of Bifidobacterium species at 1 month

sIgA at 6 months (ug/mL)

Genomic Analysis

Bacteroides Bifidobacterium LPS-induced IL-6

Bacteroides fragilis at 1 month (relative %)

IL-6 (pg/mL)

r = -0.79, p = 0.002

r = 0.58, p = 0.02
Breast Milk and Initial Colonization

What Is The Molecular Effect Of HMO’s On Bacterial Gene Expression?

Microbial Metabolites, SCFA, stimulates Treg Cells
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Clinical Disease Protection (longterm health effects)

- Obesity
- Type II diabetes
- Allergy
- Autoimmune disease
- Cardiovascular health

Breastfeeding and Obesity

1. Initial weight gain

2. Longterm single effect on weight
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**Summary and Conclusions**

- A “new” hygiene hypothesis has evolved implicating perinatal diet in disease states
- Diet affects intestinal colonization which is associated with metabolic and immune-mediated disease
- Inflammation links obesity and metabolic disease
- There is a convergence of the hygiene and fetal programming hypothesis
- A healthy diet during the perinatal period may prevent disease in later life