Nourish and Nurture

Understanding the Role of Food and Feeding in Healthy Development

A Mind, Mood, and Food Webinar

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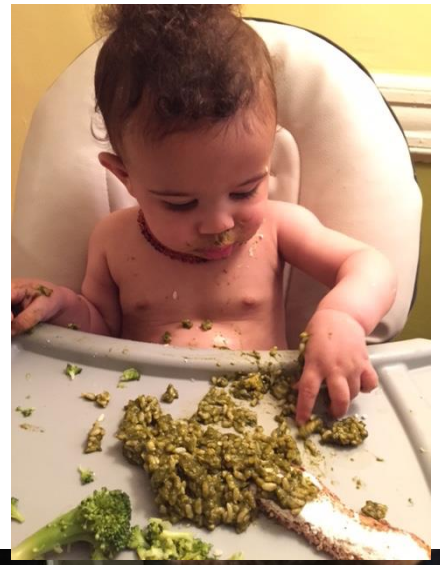
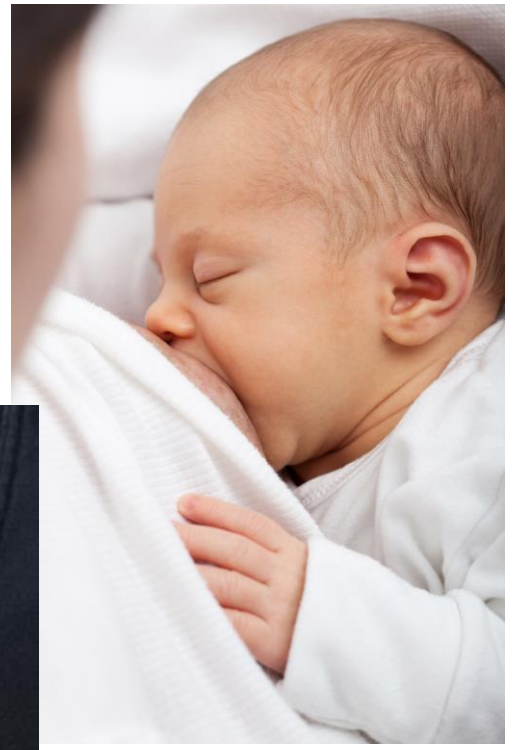
Learning Objectives

1. Describe the relationship between infant feeding and infant **physical and emotional** development.
2. Describe how parental and infant temperament influence feeding.
3. Identify foods and feeding activities that enhance or detract from **healthy brain development.**
4. Use 2 tools to support parents and care providers in helping children develop a healthy relationship to food **so they are able to continue to nourish their brains and bodies as they grow.**

The development of nourish and nurture





How does a pregnant Mom influence her infant?

- Diet
- Stress
- Toxins
- Microbes

Maternal Diet

- "A **maternal high-fat diet** is associated with distinct changes in the neonatal gut microbiome at birth which **persist through 4-6 weeks of age**."
- "Consistent evidence that **fish consumption during pregnancy** benefited the **neurocognitive development** of the child was also found. Two constituents of fish, n-3 polyunsaturated fatty acids and iodine, were associated with these benefits in children."
- **Phytoestrogens** may impact the **development of boys** and increase the incidence of hypospadius
- **Maternal obesity** may influence the microbiome and the ability of the child to use energy efficiently throughout life

Nutrition Reviews article on The Avon longitudinal Study of Parents and Children (The Avon Longitudinal Study of Parents and Children (ALSPAC)

Maternal/familial stress:

"Higher prenatal maternal depressive symptoms and lower social support predicted higher cortisol among infants with higher temperamental negativity."

Dev Psychobiol. 2015 Dec; 57(8): 961–973.Effects of Prenatal Factors and Temperament on Infant Cortisol Regulation in Low-Income Mexican American FamiliesLinda J. Luecken, David P. MacKinnon, Shannon L. Jewell, Keith A. Crnic, and Nancy A. Gonzales

Maternal/familial stress

- Genetics: “Regional prefrontal cortical thickness decreased with antenatal maternal anxiety among infants who were *met* homozygotes on the *COMT* gene but increased among those who were *val* homozygotes ”
- Behavior: Newborns with higher reactivity showed either the best or worst emotional regulatory skills 6 months later, conditional upon mothers' HPA reactivity during pregnancy.
  - biology is influencing individuals' responses to environmental stress;
  - biology may amplify sensitivity to environmental conditions, both positive and negative;
  - heritable, biological differences may fit some environments better than others; or
  - some biological characteristics may only become evident in particular environments.

Neuropsychopharmacology. 2016 Jan; 41(1): 142–162. **Differential Susceptibility of the Developing Brain to Contextual Adversity and Stress** W Thomas Boyce1,*

Maternal toxin exposure

- Alcohol, tobacco, marijuana, opioids, psychostimulants
- Air pollution, when combined with maternal stress associated with impaired memory and learning
- Lead exposure exacerbates impact of maternal depression on temperament
- Prenatal exposure to mercury, a known neurotoxic metal, is associated with lower cognitive performance during childhood…The observed persistent epigenetic disruption of the *PON1* gene may modulate mercury toxicity in humans and might serve as a biomarker of exposure and disease susceptibility.
- Exposure to toxins during pregnancy may constitute an important but relatively unacknowledged cause of child psychiatric morbidity.

European Child & Adolescent Psychiatry
June 2007, Volume 16, Issue 4, pp 243-253 | Cite as
Consequences of prenatal toxin exposure for mental health in children and adolescents

Microbes

- Arizona-based Children's Respiratory Study, has shown how exposures to microbial products early in life, such as that occurring in rural farming communities, confer protection against atopic diseases such as asthma (ie, the so-called hygiene hypothesis that poorer hygienic conditions may be protective against certain immune-mediated disease processes).
- Protection and risk occur, however, in a genotype-specific manner. Specifically, the T allele diminishes sensitization under conditions of high endotoxin exposure and amplifies in conditions of low exposure, whereas carriers of the C-allele show much less dramatic effects of varying endotoxin loads

Microbes

- Transmission of bacteria from the mother to the neonate through direct contact with maternal microbiota during birth and through breast milk during lactation also seems to influence the infant's gut colonization, with potential health consequences.

Nourish and Nurture

It’s Not Simple

- “Feeding a hungry baby can seem like one of the most basic tasks of parenthood, but right from the beginning, **the way an individual baby eats, gains weight and grows is a complicated parent-child mix of behavior and biology.**” Perri Klass, MD, NYT 6/19/17

Feeding is Complicated

- **The Early Feeding Skills Assessment for Preterm Infants**
  Suzanne M. Thoyre, RN, PhD, Catherine S. Shaker, MS/CCC-SLP, BRS-S, and Karen F. Pridham, RN, PhD, FAAN

TABLE 2

Examples of EFS Items within Each Section

Oral Feeding Readiness				
Able to hold body in a flexed position with arms/hands toward midline			Yes	No
Demonstrates energy for feeding—maintains muscle tone and body flexion through assessment period			Yes	No
Oral Feeding Skill				
Ability to Remain Engaged in Feeding				
Predominant muscle tone (Energy infant [illegible] for feeding)	Maintains flexed body position with arms [illegible]	Inconsistent tone, variable muscle [illegible]	Some tone consistently felt, but [illegible]	Little or no tone felt; flaccid, limp [illegible]

What the infant brings to the table

- Skill: Feeding Positions
- Skill: Food Quantity
- Skill: Food Types Eaten
- Skill: Sucking Liquids from the Bottle or Breast
- Skill: Sucking Liquids from the Cup
- Skill: Sucking Soft Solid or Pureed Foods from the Spoon
- Skill: Swallowing Liquids
- Skill: Swallowing Semi-Solids
- Skill: Swallowing Solids
- Skill: Coordination of Sucking, Swallowing, and Breathing
- Skill: Control of Drooling
- Skill: Jaw Movements in Biting
- Skill: Jaw Movements in Chewing
- Skill: Tongue Movements in Chewing
- Skill: Lip Movements in Chewing

What the parent/caregiver brings to the table

- Breast or bottle
- Breastmilk or formula (and which one)
- Feeding style
- Temperament
- Environment
- Physical/emotional health

How relationship affects physiology

- “Feeding efficacy was predicted by mother–child touch, reduced maternal depression and intrusiveness, easy infant temperament, and less child withdrawal…”

  Journal of the American Academy of Child and Adolescent Psychiatry, Mother–Child Touch Patterns in Infant Feeding Disorders: Relation to Maternal, Child, and Environmental Factors. RUTHFELDMANPH.D., MIRIKERENM.D., ORNAGROSS-ROZVALM.A., SAMTYANOM.D.

Gut-Brain-Immune Axis

- Evidence has mounted that **gut-brain communication primarily occurs via interactions between the gut microbes and established psychoneuroimmunologic (PNI) pathways,** including immunological (cytokines), endocrine (hypothalamic-pituitary-adrenal [HPA]), and neural (vagus) pathways (Grenham et al., 2011).
- **Early life dysbiosis of the microbiome may impact the developing immune system—perhaps increasing an infant's tendency toward developing an inflammatory disease.** Once stimulated, systemic inflammatory cytokines then exert effects on the central nervous system (CNS), shaping mood, stress response, and behavior via the initiation of what is often referred to as "sickness behaviors" (e.g., fatigue, insomnia, lack of appetite and depression) (Dantzer & Kelley, 2007; Elenkov & Chrousos, 2002; Raison, Capuron, & Miller, 2006).
- **The vagus nerve (the parasympathetic nerve of the autonomic nervous system) innervates and regulates the gut, maintains systemic homeostasis, promotes anti-inflammatory activity, and influences the CNS and behavior directly, and via interaction with the HPA axis and inflammatory mediators** (Bailey et al., 2011).

Development of the infant immune system

- Lymphocytes of the B series develop in the liver by 9 weeks' gestation and are present in the blood and spleen by 12 weeks.
- T lymphocytes start to leave the thymus from about 14 weeks' gestation and subsequently cells with helper and suppressor phenotypes are present in the spleen.
- Newborn plasma contains adult levels of IgG which is acquired across the placenta from the mother. The small amounts of IgM (less than 20 mg/dL) which are normally present in healthy newborns have been reported to include antibody with specificity for maternal lymphocytes.
- IgA synthesis normally starts in the secretory immune system, about 2-3 weeks after birth.

How food impacts immune health

- Breastfeeding is **strictly associated with a lower risk of gastrointestinal infections and of acute otitis media.**
- Breastfeeding **is associated with a reduction in the risk of childhood inflammatory bowel disease and of celiac disease** of 31% and 52%, respectively, in infants who were exclusively breastfed at the time of gluten exposure; this may be due to the presence of microRNAs.
- Human milk **provides the infant with a rich microbial consortium and a variety of oligosaccharides, prebiotics ensuring gut colonization by microbes** beneficial for metabolism and immune development (Jeurink et al., 2013).
- **Clostridial species more predominant in the gut of the formula fed infant predispose the infant to atopic symptoms, including eczema, recurrent wheeze, allergic sensitization, and diagnosis of atopic dermatitis**

How food influences the development of the brain

- **“Beginning around midway through gestation and continuing until about two years after birth, the brain’s growth is highly sensitive to the quantity and quality of nutrition it receives.** This sensitive period coincides with the great spurt in synapse development, dendritic growth, and myelination, which together wire up the brain and also greatly increase its total weight. **The quality of nutrition during this period has a profound impact on a child’s future cognitive, emotional, and neurological function.”**
  Whats Going On In there? How the Brain and Mind Develop During the First Five Years of Life” by Lise Eliot, PhD; October 2000; pages 48 – 49:
- Maternal stress increases corticosterone levels in the foetal brain, decreases foetal testosterone and brain aromatase activity in males, and alters brain catecholamine activity to that in females. Learning deficits, reductions in hippocampal neurogenesis, LTP and dendritic spine density in the prefrontal cortex are more readily seen in prenatally-stressed males, while anxiety, depression and increased response of the HPA axis to stress are more prevalent in females. Neurochemical Research, October 2007, Volume 32, Issue 10, pp 1730-1740 | Gender Differences in the Effects of Prenatal Stress on Brain Development and Behaviour, Marta Weinstock

How food influences mood and cognition

- …the gut microbiome may be viewed as a key mediator between exposures to internal and external environmental factors, including diet and stress (Sudo, 2014), and health and developmental outcomes (Grenham, Clarke, Cryan, & Dinan, 2011).
- …growing evidence suggests the gut microbiome exerts influence over a range of developmental indices, from cognition to anxiety, mood, and sociability (Borre et al., 2014; Moloney, Desbonnet, Clarke, Dinan, & Cryan, 2014).
  Nurs Res. 2016 Jan-Feb; 65(1): 76–88. **The Infant Microbiome: Implications for Infant Health and Neurocognitive Development** Irene Yang, PhD, RN, Postdoctoral Fellow, et al.
- Diet influences the microbiome and "When mothers ate fruits or vegetables, infants experienced the flavors in amniotic fluid and then mother's milk, which, in turn, increased the palatability of these foods by their infants…this continuity in flavor helps the infant transition to solid foods."
  Adv Nutr January 2016 Adv Nutr vol. 7: 211S-219S, 2016

Attributes of breast milk

- Human milk (breastmilk) is a complex fluid consisting of a number of diverse components, including microbes, oligosaccharides and other prebiotics, which are biologically optimized for the human infant[1].
- Lipid content of breastmilk is known to change both during and after breastfeeding and pumping.
- Preterm birth influences breastmilk lipid, carbohydrate and energy contents[7].
- Protein content decreases over the course of lactation in both term and preterm milk.
- Human milk provides appropriate nutrition, immunological support and developmental programming.

The epigenetics of breastfeeding/cow's milk feeding

- Overall, milk-feeding type in conjunction with HLA-DQ genotype play a role in establishing infants' gut microbiota; moreover, **breast-feeding reduced the genotype-related differences in microbiota composition**, which could partly explain the protective role attributed to breast milk in this disorder (celiac disease). Influence of Milk-Feeding Type and Genetic Risk of Developing Coeliac Disease on Intestinal Microbiota of Infants: The PROFICEL Study. Giada De Palma,
- Extended breastfeeding promoted a preference for happy faces, **but only in infants with a specific genetic variation.**
- "These data indicate that early exposure to cow's milk and solid foods may be associated with increased risk of IDDM. The inclusion of HLA-encoded risk in the analyses demonstrates the combined effect of genetic and environmental factors." Diabetes 1993 Feb; 42(2): 288-295. https://doi.org/10.2337/diab.42.2.288 September 20, 2011

Primary Prevention

- Obesity
- Diabetes
- Eating disorders
- Food allergies
- Mental health issues
- Digestive Disorders

Primary Prevention (cont.)

- Healthy gut microbiome
- Food allergies – recognizing and honoring
- Altering responses to prenatal influences and early compensation – metals, dysbiosis, stressors, epigenetics
- Development of appropriate hunger and satiety cues
- Development of autonomy/self-efficacy over food intake
- Learning to separate nourishment from nurture

Timeline

- Birth to 4-6 months – suckling on breast and/or bottle
- 4- 6 months – introduction of solids
- 9-10 months – self feeding
- 2-3 years – self-efficacy

Stages of Development

Birth to 3 months Homeostasis - figuring out the world	3-6 months Attachment - interacting with the world	6-36 months Separation and Individuation - owning the world
▪ Cues for feeding: arousal, crying, rooting, sucking ▪ Infant quiets to voice ▪ Hunger-satiety pattern develops ▪ Infant smile promotes interaction ▪ Pleasurable feeding experience promotes healthy social development	▪ Infant falls in love ▪ Consistent cues – parent and child understand hunger and satiety cues better ▪ Infant exhibits preferences	▪ Understands cause and effect ▪ Imitates others ▪ Follows simple directions ▪ Independent feeding emerges ▪ Infant insists on preferences ▪ Speech/language development

Overview of Infant Feeding

- Sucking and swallowing are observed in fetuses in the womb as early as 14 - 15 weeks gestation. The smooth co-ordination of sucking, breathing and swallowing develops in most infants over the first few days of life.
- The newborn infant can turn the head, root for the nipple and cry when hungry.
- Infants can signal to parents that they no longer want milk; parents need to learn to interpret these signals.
- **Caregiver response to cues leads to self regulation.**
- **Feeding infants is an intense and emotional experience for both parent and child.**

Newborn skills

- Root
- Suck
- Swallow
- Breathe
- Coordinate
- Communicate

Feeding Difficulties

- Medical/physical
  - Ankyloglossia
  - Immature suck-swallow-breathe
  - Latching difficulties
  - GI reflux/motility
- Neurodevelopmental
  - Oral motor dysfunction
  - Sensory integration issues
  - Colic
- Behavioral
  - ASD
  - Disorganization
- Interactional
  - Mismatched temperaments
  - Inadequate touch/eye contact
- Environmental
  - Lack of appropriate equipment
  - Inappropriate food choices
  - Distracting environment
  - Delayed oral feedings
- Psychosocial
  - Postpartum depression
  - Maternal eating disorder
  - Parental anxiety

Controversy: Breast vs bottle

- No credible research stating that formula is better than breastmilk
- There is credible research that infant formula can be a viable substitute or adjunct to breast milk when needed
- **Parent-child relationship is at least as important as the content of what the infant is fed**
- Breastmilk has a positive impact on the microbiome
- Positive social interaction has a positive impact on the microbiome

Infant Formula

- https://www.babble.com/baby/formula-feeding-vs-breastfeeding-my-pros-and-cons-2/ - one woman's story
- The best that industry can do to mimic breastmilk and it has improved immensely over the years
- Does not have the variability and adaptability of breast milk so requires more parental attention to quantity and timing
- Requires a parental decision to use feeding time for nurture as there are other options
- There are choices for starting out and if you are not happy with the one you're using
- There are concerns about the forms of the vitamins and minerals in the infant formula

Helpful additions for the formula fed baby

- Infant probiotics/prebiotics to enhance microbial diversity – now added to some formulas
- DHA – related to brain development - also now added to some formulas
- Learning to bottle the baby as if nursing – skin contact when possible (Dad's and other caregivers, too), eye contact, talking, singing – a bottle fed baby can be as nurtured as a breastfed baby
- Feeding on demand and learning to understand infant's cues; using a pacifier when baby needs non-nutritive sucking (sometimes necessary with breastfed babies do, too)
- **The most important thing for an infant is to be fed with love and understanding**

So, a bottle of breastmilk or formula is sometimes the answer

- Paternal involvement
- Maternal health needs
- Social emotional environment
- Prematurity
- Cleft palate
- Weak suck
- Maternal or infant illness
- Adoption
- Maternal drug use – prescription and non-prescription

It does not have to be all or nothing

- Pumping to offer breast later; providing breast milk for the infant who cannot nurse
- Supplementing formula with low milk supply/slow growth – sometimes continues and sometimes reverts to all breast
- Nursing early before other life demands kick in
- Need for a prolonged maternal absence – may use pumped milk or formula

Controversy: Demand versus Schedule

- Dr. Julie Lumeng, a professor of pediatrics at the University of Michigan. “Many researchers believed that childhood obesity could be prevented by breast-feeding, or by changing strategies for introducing solid foods, but that has not been borne out in studies.”
- Dr. Ian Paul, a professor of pediatrics and public health sciences at Penn State College of Medicine, is one of the leaders of the Insight Study, an intervention which started in 2011 to look at the effects of helping parents learn “responsive parenting” strategies that help them read their babies’ signals. “Many people tell mothers to feed on demand, but they never define what ‘on demand’ is,” he said.
- Baby Eating Behavior Questionnaire developed to encourage parents to observe their babies - asking parents about four different aspects of infant appetite, the baby’s responsiveness to milk when it’s offered, the baby’s enjoyment of food, the baby’s satiety responsiveness (that is, how easily the baby fills up), and the baby’s slowness in feeding.

Controversy – Demand vs Scheduled Feeding

- Non-nutritive suckling at the breast as a healthy way of nurturing that does not overfeed
- Pacifier use – does it help or hinder breastfeeding?
- A baby who is distressed but not particularly hungry will calm down if given a sweet liquid, which Dr. Paul said could lead to problems later on. **"Their normal ability to regulate their emotions becomes overridden with a food reward to soothe them and that then projects later into life — when they are upset or depressed, food becomes the mechanism to soothe these emotions."**

The Research

- “We found that differences between babies in their appetite have a really important genetic component to them” For slowness of feeding, for example, genetics explained 84% of the variation from baby to baby; for enjoyment of food, it was 53%. And, among nonidentical same-sex twin pairs, babies with heartier appetites (higher food responsiveness or lower satiety responsiveness) gained weight faster than their twins.” Dr. Clare Llewellyn, lecturer in behavioral obesity research at University College London

Conclusion

- “We will see that the feeding practices that evolved across human history as **effective parental responses to the threat of food scarcity**, can, when combined with infants' unlearned preferences and predispositions, **actually promote overeating and overweight in our current eating environments**”
  J Law Med Ethics. 2007; 35(1): 22–34.Parental Influence on Eating Behavior. Conception to Adolescence; Jennifer S. Savage, Jennifer Orlet Fisher, and Leann L. Birch

- The development of healthy eating is based on a combination of genetics and environment and **the best way to support this is to help parents effectively read infant cues and give them tools for modulating infant feeding behaviors when indicated**

Tools

Appetite 57 (2011) 388–396

Research report
Development and factor structure of the Baby Eating Behaviour Questionnaire in the Gemini birth cohort§

Clare H. Llewellyn, Cornelia H.M. van Jaarsveld, Laura Johnson 1, Susan Carnell 2, Jane Wardle * Cancer Research UK Health Behavior Research Centre, Department of Epidemiology and Public Health, University College London, London WC1E 6BT, United Kingdom

Suzanne Evans Morris - http://questionnaire.feedingmatters.org/questionnaire - a self-help tool for parents to assess their child's eating behavior

Nourish

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Introduction of solids

- Based on infant's development
- It is all about learning: communication, hand to mouth, pincer grip, hand-eye, chew/swallow to replace suck/swallow, experiencing food with all your senses
- Parental acceptance of mess – plastic table cloths, naked feeding before bath

AAP Guidelines

Age 4 to 6 Months

- **Continue approximately 28 to 32 oz formula or human milk given as 4 to 6 bottles/day of 5 to 8 oz each or 4 to 6 breastfeedings/day lasting about 10 minutes**
- **Begin iron-fortified rice cereal 1 time/day (1 tbsp to 4 oz)**
- **Several weeks later, offer pureed vegetables and fruits**
- **Several weeks later, offer pureed meat**
- Introduce only 1 new food every 3 days to make it easier to determine if something causes difficulties; refrigerate leftover food and discard after 48 hours
- Avoid high-sugar or high-salt foods
- No **cow's milk** or honey for the first year

Age 7 to 8 Months

- Offer a cup
- **Allow small lumps of pasta or vegetables to remain in pureed foods**
- 1 feeding/day should include 2 to 4 oz vitamin C-rich foods, such as **diluted apple or orange juice (not fruit drinks)**
- Avoid whole grapes, nuts, raw carrots, and round candies (choking risk)

Age 9 to 12 Months

- **Transition entirely to a cup**
- Offer small pieces of adult food
- Allow self-feeding with dry crackers and cereal
- ***Family enjoyment of the meal is more important than the amount the infant eats***

Vs. Born to Eat

- Infant feeding in response to infant ability
- All self feeding
- No purees

AAP Peanut Guidelines – January 2017

- **Guideline #1** recommends that the **highest risk infants — those with severe eczema and/or egg allergy (see definitions below) — be introduced to peanut as early as 4-6 months of age, following successful feeding of other solid food(s) to ensure the infant is developmentally ready.**
- **Guideline #2** suggests that infants with mild to moderate eczema, a group also at increased risk of peanut allergy, should be introduced to peanut "around 6 months of age, in accordance with family preferences and cultural practices, to reduce the risk of peanut allergy." These infants may have peanut introduced at home following successful ingestion of other solid food(s) without an in-office evaluation, although an evaluation can be considered.
- **Guideline #3** addresses infants without eczema or food allergy who are not at increased risk, suggesting that peanut be introduced "freely" into the diet together with other solid foods and in accordance with family preferences and cultural practices.

AAAI Guidelines

- *Solid foods are introduced early, no later than 4 to 6 months.*
- ***Common allergenic foods such as milk, eggs, wheat, peanuts, tree nuts, fish and shellfish can be introduced anytime** once a few other less allergenic solid foods like whole grain cereal, bananas, avocados or puréed meats have been tolerated.*
- *Highly allergenic foods should be introduced for the first time at home, rather than at day care or a restaurant. These first tastes should be separated by a few days, so if an allergic reaction does occur, it will be easier to identify the trigger. During these trials, parents may want to keep some liquid diphenhydramine (Benadryl) in the medicine cabinet. If rash, swelling or vomiting occur after the introduction of a new food, families should call their pediatric provider immediately to be advised of the appropriate steps to take.*

How table food impacts development

- The **transition from a milk-based to a solids-based diet** exposes infants to novel non-digestible plant carbohydrates, animal protein, and fats providing **new substrates for the survival and dominance of bacterial species not supported by breastmilk and/or formula** (Parrett and Edwards, 1997
- Because of extensive physiological influence, **infant microbial colonization patterns have the potential to impact physical and neurocognitive development** and life course disease risk.
- **Diet-induced differences in the gut microbiota may contribute to host metabolism and immune function** by regulating genes involved in lipid and carbohydrate metabolism, altering endocrine functions, increasing inflammatory responses, and influencing energy balance and body weight (Gill et al., 2006; Greiner and Backhed, 2011; Nauta et al., 2013).
- **Microbiome - does not like hormones, antibiotics, pesticides, alcohol, refined, manufactured, GMO; when in inflammatory mode, it disrupts gene expression**

Eating Disorder Prevention

- Satter described an ideal feeding dynamics environment as one in which the caregiver decides “what” food is offered, “where” food is eaten, and “when” food is eaten and allows the child to decide “whether to eat” as well as “what” and “how much” to eat of the food offered [7, 8]. She originally proposed this feeding dynamics approach as the “trust model.” Satter posits **that children learn to trust and develop a healthy relationship with food when they and their caregivers each have an appropriate level of control and autonomy in the feeding relationship.**

J Obes. 2015; 2015: 964249.
Published online 2015 Jun 23. doi: 10.1155/2015/964249
PMCID: PMC4493292

Targeting Feeding and Eating Behaviors: Development of the Feeding Dynamic Intervention for Caregivers of 2- to 5-Year-Old Children

Ihuoma U. Eneli, 1 , 2 , * Tracy L. Tylka, 3 Rosanna P. Watowicz, 1 Jessica Hummel, 1 Jan Ritter, 4 and Julie C. Lumeng 5 , 6 , 7
Author information ► Article notes ► Copyright and License information ►

"Targeting feeding dynamics, a concept centered on the roles and interaction of the caregiver and child in a feeding relationship, may have significant potential for obesity intervention."

The Trust Model: A Different Feeding Paradigm for Managing Childhood obesity

Ihuoma U. Eneli1,2, Peggy A. Crum3 and Tracy L. Tylka4

Obesity (2008) **16,** 2197–2204. doi:10.1038/oby.2008.378

"The trust model emphasizes the division of feeding responsibility between caregivers and children and trust in the child's ability to self-regulate food intake by recognizing hunger, appetite, and satiety cues within the context of regular eating patterns (i.e., pleasant and structured meals and snacks)"

Genetics – how they influence feeding

- Two common haplotypes of *TAS2R38* have been shown to influence perception of bitter taste and are significantly related to differences in bitter taste sensitivity, 32 preference for sucrose and sweet tasting foods and beverages, and to modestly lower risk of type 2 diabetes among participants of the British Women's Heart and Health Study.
- This study suggests that genetic variation in genes encoding CCK and leptin may **contribute to obesity risk by influencing satiety**, and may have independent effects. [de Krom M, van der Schouw YT, Hendriks J, et al. Common genetic variations in CCK, leptin, and leptin receptor genes are associated with specific human eating patterns. Diabetes. 2007;56(1):276–280.]

Nutr Rev. 2011 Jan; 69(1): 52–60.Genetics of Eating Behavior: Established and Emerging Concepts; Eleanor R. Grimm and Nanette I. Steinle

Genetics – how they are influenced by food

- Different vitamins and foods can affect the regulation of genes, particularly in the areas of hypermethylation and inflammation
- The most common role of methylation is related to the development of neural tube defects in utero from folate deficiency- folate impacts expression of the gene associated with neural tube defects in those who are genetically susceptible
- “A healthy diet shouldn't be made up of more than one-third carbohydrates (up to 40 per cent of calories) in each meal, otherwise we stimulate our genes to initiate the activity that creates inflammation in the body.” [*Source:*The Norwegian University of Science and Technology (NTNU)]
- Rosemary, green tea and other spices upregulate the genes that support detoxification, making us less vulnerable to cancer-inducing toxins

Conclusions:

- Every child develops differently
- Food allergy is not as common as people think and should not be the sole basis for feeding decisions
- The right way to introduce solids is the way the child accepts them best, within the limits of safety
- We have tools for helping to support healthy eating that we can use based on a child's behavior
- We understand the role of genetics but do not test and therefore do not have enough experience to rely solely on these to determine how we feed
- As with liquid feedings, introduction of solids is an interactive process that works best when the parent can interpret and respond effectively to infant cues
- A healthy relationship with food supports good health

Important!

- Real food is what our genetics, immune system and microbiome understand
- It is more important that a child eat real food than that they eat a measured quantity
- During this introductory phase of 4-10 months, the experience of eating is more important than quantity or nutrient balance as long as all the food is nutritious.

Nourish

Nurture

Development of Self-efficacy

- By 10 months, infants should have been spending some time in an appropriate chair, handling food with their hands, and playing with utensils. They should have some experience drinking from a cup.
- By 10 months, parents should be using the language that helps them to differentiate hunger from nurturing needs
- This is when limit-setting starts – infants develop a sense of cause and effect around 9 months old (you see it when they drop something on the floor and look to see what you are doing to do as opposed to dropping something and no longer knowing it exists)

Development of Separation and Individuation

- It is the job of the parent to offer a variety of nutritious foods, in a developmentally appropriate form, in a pleasant environment.
- It is the job of the child to take what she or he needs.

Switching gears

- In the newborn, we always respond to their distress with food
- When we introduce solids, we still respond to distress with breast or bottle
- When the infant becomes mobile and more food dependent, we sometimes forget that the crankiness may simply be due to hunger, and, if it is not, that we need to find other ways to soothe the child and teach them to self-soothe.

Epigenetics

- "The **presence of differences in genetic material** due to a single nucleotide may explain not only the onset of certain pathological conditions, but also **the different responses to nutrients/foods in the diet**" J Nutrigenet Nutrigenomics. 2011 Jul; 4(2): 69–89. Nutrigenetics and Nutrigenomics: Viewpoints on the Current Status and Applications in Nutrition Research and Practice Michael Fenech,a,* et.al.

- "Cellular metabolism plays a far more dynamic role in the cells than we previously thought," explains Dr Ralser. "Nearly all of a **cell's genes are influenced by changes to the nutrients** they have access to. In fact, in many cases **the effects were so strong, that changing a cell's metabolic profile could make some of its genes behave in a completely different manner."** **Could the food we eat affect our genes? Study in yeast suggests this may be the case** February 11, 2016; Nature Publishing Group, http://www.nature.com/nmicrobiol/

Environmental Toxins and Genetic Expression

- In-vitro, animal, and human investigations have identified several classes of environmental chemicals that modify epigenetic marks, including metals (cadmium, arsenic, nickel, chromium, methylmercury), peroxisome proliferators (trichloroethylene, dichloroacetic acid, trichloroacetic acid), air pollutants (particulate matter, black carbon, benzene), and endocrine-disrupting/reproductive toxicants (diethylstilbestrol, bisphenol A, persistent organic pollutants, dioxin).
- There is compelling evidence that epigenetic dysregulation underlies the observed associations between adult disease and adverse environmental/nutritional conditions early in development.

Environment and Disease

- Among the toxins most frequently linked to the rising incidence of these cancers are those found in pesticides and industrial chemicals.
- Heavy metals, including lead and cadmium have been linked with learning disabilities
- **Enzyme deficiencies (**from genetics or inadequate nutrients) **that inhibit the ability to break down pesticides can lead to decreased intellectual function in exposed children**
- **Children are more exposed to chemicals (pound-by-pound),** their organs are still developing, and their bodies are less able to detoxify. Children are also more vulnerable to toxins because they lack a fully developed blood-brain barrier, the structure in the central nervous system that prevents the passage of chemicals between the bloodstream and the neural tissue.

Controversy: Dirty or Clean

- Newborns exposed to household germs, pet and rodent dander and roach allergens during their **first year of life** appear to have lower risk of developing asthma and allergies.
- Children who grow up on farms have lower allergy and asthma rates, a phenomenon attributed to their regular exposure to microorganisms present in farm soil.
- Infants may have more trouble fighting off an infection than older children or adults
- High fevers in infants can be dangerous

Tools for Navigating the Environment

- www.ewg.org
- “Eat food, mostly plants, not too much.” Michael Pollan
- Research the vaccines and vaccine schedule recommended by your physician and make decisions based on what you know about your child
- Minimize intake of processed foods to optimize nutrient intake and minimize chemical intake
- Do not heat foods in plastic or store in plastic for long periods of time at room temperature or warmer
- Filter your water
- Buy organic, grass-fed, pastured, local, when possible

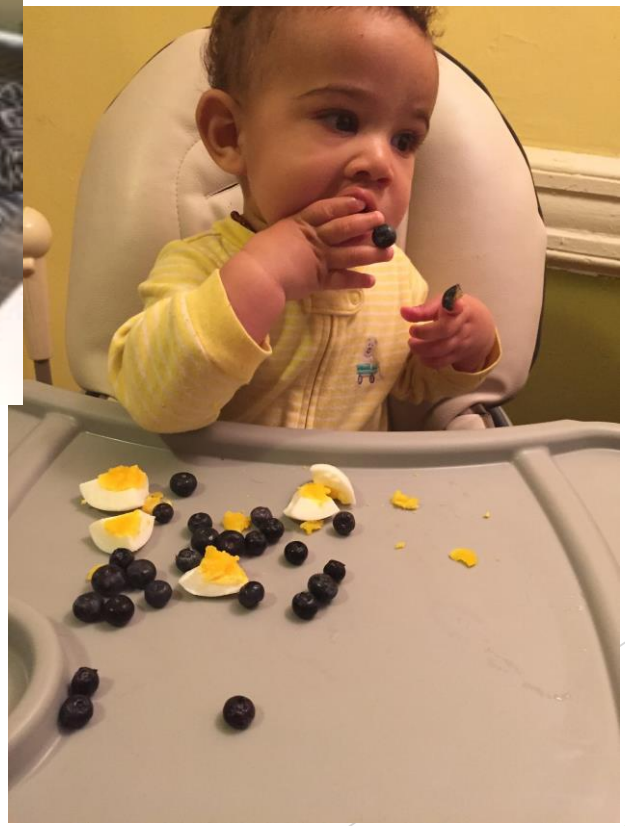
Tools to help children develop healthy eating habits

- Choices – a way of managing appetite
- Minimizing conflict
- Trust Model
- Modeling appropriate behavior
- Parenting inside the box

Parenting Inside the Box

Resources

- How to Get Your Child to Eat… But not too much – Ellyn Satter
- Preventing Childhood Eating Problems – Jane Hirschman
- Born to Eat – Leslie Schilling and Wendy Jo Peterson
- Healing the New Childhood Epidemics – Kenneth Bock, MD



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- Self-care practices to dramatically reduce stress and improve quality of life
- How to repair the traumatized, injured, and aging brain