AUTISM RESEARCH INSTITUTE

Autism is Treatable

HEALTHY PREGNANCY

PRECONCEPTION THRU POST-NATAL STRATEGIES

Improving Conception, Pregnancy, Birthing and Long Term Health of the Developing Child

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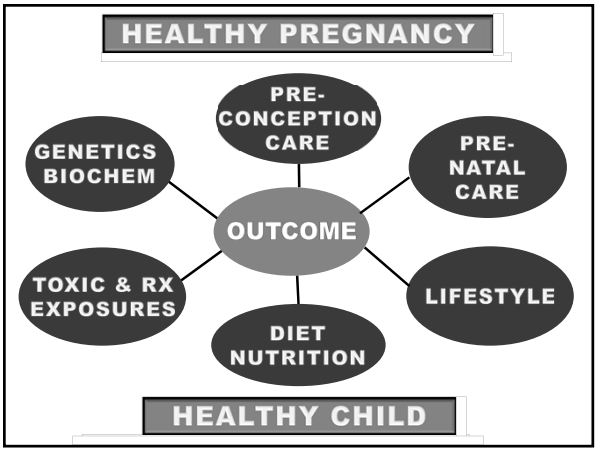
EPIGENETICS

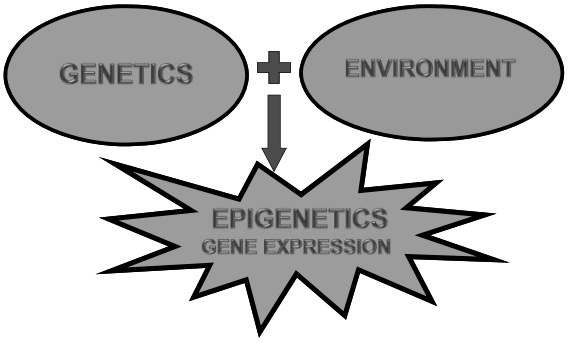
- Prior to the discovery of epigenetics, it was thought that genes were stable and not subject to change with the exception of rare mutations.
- We now have a greater understanding::
  - The genes can be turned on or off to express themselves. The expression or lack of expression can be beneficial or damaging.
  - The environment (lifestyle, diet, toxic exposures, stressors, infections) has a profound effect on how the genes express themselves.
  - "The genetic sequence is the hard drive. Epigenetics is the software that determines how and when the sequence will be read." *S. Jill James, PhD*
  - The effects of gene expression are passed on to generations.
  - Gene variants are different forms of gene that vary according to their DNA sequencing. They are heritable and may or may not be damaging, depending upon the variant and the influence on the variant.
  - There are some heritable disorders that now appear to be epigenetic, rather than genetic: Schizoaffective disorder, OCD, ODD, Bipolar, Autism, Cancer and others.

HEALTHY PREGNANCY HEALTHY CHILD START EARLY

- ❖ Epigenetics
- ❖ Infertility Risk Factors
- ❖ Autism Risk Factors
- ❖ Evaluation
- ❖ Nutrition Factors
- ❖ Dietary Factors



ENVIRONMENTAL MODIFICATION OF GENE EXPRESSION



PLANNING AND PREVENTION

FERTILITY PREGNANCY FETAL

- Multiple risk factors interact to cause problems in fertility, pregnancy, birthing and child development.
- Single risk factors alone are less potent.
- The more risk factors, the more potential for complications.
- Testing of potential parents focuses on identifying the applicable risk factors.
- Treatment is based upon:
  - Genetics and family history
  - Biochemical individuality
  - Laboratory and clinical findings
- Seek the guidance of a medical / nutritional practitioner skilled in prenatal health.

INFERTILITY RISK FACTORS

BOTH PARENTS

- Age: maternal >30 and/or paternal >35
- Genetic conditions
- Use of alcohol, tobacco, drugs, and toxin exposures
- Medications which interfere with fertility
- Nutrient deficiencies
- History of infertility
- Infections, inflammation
  - Paternal: testicular and/or prostate problems
  - Maternal: endometriosis, uterine fibroids

- Alter MD, et al. Autism and increased paternal age related changes in global levels of gene expression regulation. PLoS One. 2011 Feb 17;6(2):e16715.
- Sengupta. Environmental toxins. Hum Exp Toxicol:2014 Oct;33(10):1017-39.
- Purandhar et al. Male fertility, aging, apotosis. World J Mens health. 2014 Dec;32(3):123-32.

PATERNAL iNFERTILITY RISK FACTORS

Lead cadmium and mercury exposures increase the percent of immobile sperm

Mendiola J. Health. 2011 Jan 19;10(1):6.

Soy consumption decreases sperm count to 41 million fewer /ml of semen.

Cederroth CR, et al. Int Androl. 2010 Apr;33(2):304-16. Epub 2009 Nov 16.
Chavarro JE, et al.Hum Reprod. 2008Nov;23(11):2584.

Spermatogenesis inhibited by illness, infections, and inflammation - can be corrected with L-carnitine.

Abd-Allah A, et al. Oxid Med Cell Longev. 2009 Apr-Jun;2(2):73-81

PATERNAL INFERTILITY RISK FACTORS

- Undescended testicles
- Injury to the testicles
- Vas deferens blockage
- Spermatocord varicosities
- Varicocele
- Retrograde ejaculations
- Previous vasectomy
- Cystic fibrosis
- Spinal cord injury
- Prostatitis
- Hemochromatosis
- Sickle cell anemia
- Systemic disease
- Testicular cancer
- STD's
- Sperm antibodies

- Alter MD, et al. Autism and increased paternal age related changes in global levels of gene expression regulation. PLoS One. 2011 Feb 17;6(2):e16715.
- Sengupta. Environmental toxins. Hum Exp Toxicol:2014 Oct;33(10):1017-39.
- Purandhar et al. Male fertility, aging, apotosis. World J Mens health. 2014 Dec;32(3):123-32.

NUTRIENTS IN PATERNAL FERTILITY

- The following nutrients improve sperm motility, concentrations and morphology; and increase impregnation and live births 4 to 5 fold higher.

Vitamin D and E	Selenium
Vitamin C	Carotenoids
CoQ10	Folate (L-5MTHF or folinic)
Zinc	Glutathione (detox/sulfation)
Quercetin	L-Carnitine

- Showell MG, et al. Cochrane Database of Systematic Reviews 2011,
- Moslemi MK, et al. Int J Gen Med. 2011 Jan 23;4:99-104.
- Agarwal Q, et al. Hum Fertil (Camb).2010 Dec;13(4):217-25.
- Balercia G, et al. Fertil Steril. 2004 Jan;81(1):93-8.
- Abd-Allah AR, et al. Oxid Med Cell Longev. 2009 Apr;2(2):73.
- Ben Abdallah F, et al. Andrologia.2011 Aug;43(4):261-5. 2011 Feb 25.

PATERNAL INFERTILITY RISK FACTORS

- Age 35 or older
- Over or under weight
- Alcohol
- Amphetamines
- Cocaine, heroin
- Marijuana
- PCP
- Steroids
- Tobacco
- Phytoestrogens (soy)
- Excessive heat
- Excessive caffeine
- Celiac disease
- Toxic metals: Pb, Cd, Hg
- Harmful chemicals
  - Organochlorine pesticides
  - Bisphenol A, thalates
  - Vinclozolin,dioxins
- Endocrine disrupters
- Medications for: cancer, cardiovascular, arthritis, gout

- Alter MD, et al. Autism and paternal gene expression regulation. PLoS One. 2011 Feb 17;6(2):
- Sengupta. Environmental toxins. Hum Exp Toxicol:2014 Oct;33(10):1017-39.
- Purandhar et al. Male fertility, aging, apotosis. World J Mens health. 2014 Dec;32(3):123-32.

IMPROVING MALE FERTILITY

- Multiple Vitamin Mineral
  - Vit A as B-carotene 5000 mg
  - B Complex 25 mg or more
    - L-5MTHF or folinic
    - Methyl B12
  - Vitamin C 200 mg +
  - Vitamin D3 1000 iu +
  - Vitamin E mixed 400 iu
  - Calcium 250 to 500 mg
  - Magnesium 400 mg +
  - Potassium 99 mg +
  - Zinc 15 mg or more
  - Copper 1 mg or less
  - Chromium 100 mcg
  - Selenium 50 mcg +
  - Iodine 200-300 mcg
- Probiotics 5 – 50 billion +
- Omega-3 total 1200 mg+
- L-carnitine 250 – 500 mg
- L-arginine 250 – 500 mg
- CoQ10 50 to 200 mg
- Pumpkins seeds, ground flax
- Herbs
  - Ginseng (*Panax ginseng*)
  - Astragalus
- Additional as needed
  - D3 >2000 iu + *(25 OH = 60 ng/ml)*
  - Glutathione *(sulfation)*

MATERNAL INFERTILITY RISK FACTORS

FERTILITY - PREGNANCY - FETAL OUTCOME

- Previous problems with a pregnancy.
- Eating disorders: increase miscarriage, prematurity.
- <18% body fat increases the risk for:
  Infertility and poor fetal outcome
  [Ideal BMI 20 to 25]
- Maternal obesity increases risk for
  Infertility, miscarriage, pre-eclampsia
- Infections including periodontal disease -
  which increases inflammatory prostaglandins
  leading to premature birth and low birth weight.

ASD MATERNAL NUTRIENT STATUS

MATERNAL METABOLISM AND NUTRITION

DYSFUNCTIONS	DEFICIENCIES
Methylation	Omega-3 fatty acids
Sulfation	Vitamin C and E
Oxidation	Vitamin D
Mitochondrial	Folate, B12, B6
Autoimmunity	Zinc
Inflammation	Magnesium
Toxic metals	Iron
Digestion / absorption	Iodine

- Pangborn J, Baker SM. Autism:Effective Biomedical Treatments. 2005,2007S
- Schmidt RJ et al. Epidemiology. 2011;Jul;22(4):476-85.

ASD RISK FACTORS

FAMILIAL – CONCEPTION - GENETIC

Familial

- Parental age:>35
- ASD, OCD
- Genetic conditions:
  Fragile X, Tourette's, Down Syndrome
- Seizure disorder
- Psychiatric conditions
- Gene variants
- Developmental delays
- Immune dysfunction

Conception

- ICSI invitro ART technique
  (Intracytoplasmic sperm injection)

Maternal

- Teratogen susceptibility
- MTHFR, CBS variants

Child In Utero

- Presence of multiples
- Genetic disorders
- DNA deletions, duplications
- COMT, MTHFR variants
- Congenital disorders
- Viral encephalitis

WOMB ENVIRONMENT RISK FACTORS

- Alcohol use
  The most potent teratogen
- Carrying Multiples
- Medications:
  Pregnancy category D, X
- Inflammation
- Toxic metals:Hg,Pb,As,Cd,Cu.?Fl
- Hypothyroidism
- Infections:
  - Coxsackie
  - Herpes
  - Parvovirus
  - Syphilis
  - Toxoplasmosis
  - CMV
  - HIV
  - Rubella
  - Varicella
- Diabetes
- Defects and Deficiencies
  - MTHFR deficiency
  - Sulfation defects
  - Increased cytokines:
    IFN-gamma, IL-4 and IL-5
  - Maternal antibodies
    against fetal brain proteins
  - Nutrient excess: vitamin
  - Nutrient deficiencies:
    B vitamins –folate, B12, B6
    Vitamins D3 and E,
    Iron, iodine
    Omega-3, magnesium
    Zinc, choline

ASD MATERNAL RISK FACTORS

FERTILITY PREGNANCY FETAL

- Recent oral contraceptive use
- History of infertility
- 2 or more spontaneous abortions
- Carrying multiples
- Higher prenatal stress at 21 to 32 weeks
- Defects in methylation (MTHFR and/or sulfation)
- Increase in ASD copy number variants (CNVs)
- Use of an SSRI anti-depressant during pregnancy
- Nutrient deficiencies: vitamin D, B vitamins, iron, iodine
- Less likely to take prenatal nutritional supplements

- Desachy et al. Female autosomal CNVs in ASD. Mol Psychiatry. 2015 Jan 13.
- Schmidt et al. Prenatal vitamins. Epidemiology. 2011 Jul;22(4):476-85
- Schmidt et al. Maternal iron intake and ASD. 2015 Am J Epidemiol. 2014 Nov1; 180.
- Schmidt et al. Maternal folic acid and ASD risk. Am J Clin Nutr. 2012 Jul;96(1)80-9

WOMB ENVIRONMENT RISK FACTORS

ALCOHOL: THE MOST POTENT TERATOGEN

- Fetus can not clear alcohol well
- Interferes with development in all three trimesters
- Increases risk for spina bifida (from folate depletion)
- Increases risk for prematurity (magnesium depletion)
- Causes Fetal Alcohol Spectrum Disorders (FASD)
  - Specific facial characteristics
  - Mental retardation, developmental delays
  - Defects: heart, lung, kidney, motor, sensory
  - Attention, behavior, reasoning, memory problems

ENVIRONMENTAL TOXICS

MANUFACTURED ENVIRONMENTAL CHEMICALS

84,000 manufactured chemicals in use in the US:

- Only 200 have been tested (according to the EPA)
- According to 1976 Toxic Substances Control Act
  - Testing by manufacturers is voluntary
  - 17,000 - kept secret from public, agencies, governments

287 toxics in newborn umbilical cord blood

- Carcinogens, neurotoxins, developmental toxins
- Organophosphate pesticides can cause neurotoxicity.

FDA. EAFUS. Nov 2011. http://www.fda.gov/food/foodingredientspackaging/ucm115326.htm
EPA Summary of the TSCA. http://www.epa.gov/lawsregs/laws/tsca.html (accessed 2/15/2013)
EPA New Chemicals. http://www.epa.gov/oppt/newchems/pubs/invntory.htm
TSCA Section 8(e) www.epa.gov/opptintr/tsca8e/pubs/confidentialbusinessinformation.html
Layton L. Use of potentially harmful chemicals kept secret under law. Wa Post. 2010 Jan 4.
Body Burden — The Pollution in Newborns: *Environmental Working Group, July 14, 2005*

GENES + ENVIRONMENT = EPIGENETICS

THE STANFORD TWIN STUDY

Genetic Heritability and
Shared Environmental Factors
Among (192) Twin Pairs With Autism

- Susceptibility to ASD has
  - 38% genetic heritability
  - 62 % environmental component

Hallmayer J, Cleveland S et al. Arch Gen Psychiatry. July 4, 2011. .

THE WOMB ENVIRONMENT

FOOD ARTIFICIAL ADDITIVES & PRESERVATIVES

American Academy of Pediatrics Acknowledgement

- Meta analysis of 15 trials concluded that a wide variety of chemicals can result in neurobehavioral toxicity and some children may be more sensitive.
- A preservative-free, food coloring-free diet is a reasonable intervention.
- Editors note: …"we as skeptics, who long doubted parental claims ..admit we might have been wrong."

McCann et al. Lancet. 2007:370)9598):1560-1567
ADHD and Food Additives RevisitedSchonwald *AAP Grand Rounds.*2008;

GENES + ENVIRONMENT = EPIGENETICS

IDENTICAL TWINS – DIFFERENT ENVIRONMENTS

John

- Severe autism
- First six months:
  - Congenital heart defect
  - Surgery, anesthesia
  - Strong medications

Sam

- Aspergers – high function
- First six months:
  - Healthy

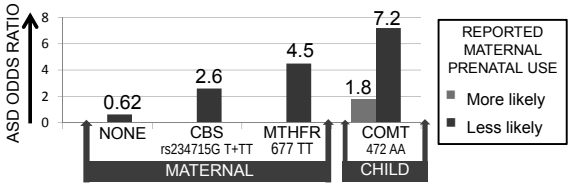
National Geographic, January 2012

RX WOMB ENVIRONMENT MEDICATIONS

MEDICATION	SIDE-EFFECTS
ANTACIDS (PPI) Prilosec, Pevacid, Nexium, AcipheX	Maldigestion / Malabsorption *Decreases:* Zinc, Iron, B12!! Vit C, Magnesium, Calcium, B Vitamins
HCTZ DIURETIC (for high blood pressure)	*Depletes*: Sodium, Zinc, B Vit Potassium & Magnesium *Increases:* Glucose, Uric Acid, Ca Cholesterol, LDL, Triglycerides
BETA BLOCKERS (for high blood pressure)	*Increases:* Fatigue, Triglycerides, Weight, Uric acid, Glucose
STATINS Crestor, Lipitor, Zocar (for high cholesterol)	CoQ10 Depletion (critical to heart)!! Risk for neuromuscular damage, heart muscle damage, weak muscles. Vytorin: increased risk for cancer Little impact on cardiovascular disease
SSRI anti-depressant use	Increased for autism

PRENATAL VITAMINS, GENE VARIANTS & ASD RISK

- The most significant timing for taking prenatal vitamins was 3 months before conception or the 1st month of pregnancy:
  - Mothers of TD children: more likely to report taking prenatals
  - Mothers of ASD children: less likely to report taking prenatals
- ASD risk increases if the mother or child have gene variants.



Schmidt et al. Epidemiology 2011;Jul:22(4).

ASD PERINATAL RISK FACTORS

THE PROCESS SURROUNDING BIRTHING

EVAULATION AND TESTING

6 MONTHS TO 1 YEAR IN ADVANCE

ASD INFANT STATUS RISK FACTORS

INFANT STATUS – INCREASED RISK FOR ASD

- Male
- Low birth weight
- Hyperbilirubinemia
- Low 5-minute Apgar
- Meconium aspiration
- Small for gestation age
- ABO/Rh incompatibility
- Mitochondrial disorders
- Congenital malformation

GENETIC DISORDERS
account for 5 – 20% of ASD

- PKU
- Fragile X
- Rett syndrome
- Neurofibromatosis
- Tuberous sclerosis
- Angelman syndrome

• Weissman et al. PLoS ONE 3(11)
• Giulivi et al. JAMA. 2010;304(21)

PRECONCEPTION

MEDICAL & GYNECOLOGICAL EVALUATION

- Medical history: family, ancestral, ethnic, genetic
- Review of risk factors, lifestyle and exposures
- Review use of
  - Prescribed and OTC medications
  - Nutritional supplements
  - Alcohol, tobacco, drugs
- Complete physical examination
- Menstrual history and status
- Reproductive history
- Complete gynecological examination
- Complete pre-pregnancy lab work

ASD PERINATAL RISK FACTORS

BIRTH CONDITIONS / COMPLICATIONS

- Abnormal birth presentations (breech)
- Multiple birth (twins, triplets or more)
- Fetal distress, birth injury / hypoxia
- Umbilical cord complications
- Obstetric complications
- Maternal hemorrhage
- <35 weeks gestation
- Summer birth

Gardener H, et al. Pediatrics. 2011;128(2): 344-55.
Kolevzon A et al. Arch Pediatr Adolesc Med. 2007;161(4):326

PRECONCEPTION / PRENATAL

TESTING

- CBC with differential
- Chemscreen with full lipid panel
- Serum iron, IBC, %saturation, ferritin
- Thyroid: T3, T4, TSH
- Vitamin D3 25 hydroxy
- Blood ABO/Rh (both parents)
- Hep B, Syphilis, HIV (both parents)
- If diabetes risk: HbA1C, GTT
- Vaccine titers: Rubella, Varicella
- PAP
- GBS (Group B Strep)
- STDs
- Genetic work-up if indicated (both parents)

PRECONCEPTION / PRENATAL TESTING

PRIORITY NUTRITIONAL & TOXIN TESTING

Homocysteine Fasting Total Plasma	Ideal: <9 <µmol/L (fasting) Prior to conception and in each trimester. Consider MTHFR if indicated.
Vitamin D3 25 hydroxy	Ideal: 60 – 80 ng/ml Critical for fetal development.
Organic Acid Test (OAT – urine)	Nutrient functions, methylation, sulfation, neurotransmitters, antioxidants, toxic exposures, bowel pathogen markers
RBC Mineral Panel	Intracellular measures of minerals *Measure of tissue levels*
Hair analysis for minerals & toxics	It is a permanent chronological record and cost-effective screening tool.

NUTRITIENTS & SUPPLEMENTS

6 MONTHS TO 1 YEAR IN ADVANCE

PRECONCEPTION / PRENATAL TESTING

NUTRITIONAL & TOXIN TESTING AS INDICATED

Celiac blood testing	For family history of Celiac, or digestive problems. Untreated Celiac is a risk factor for poor fetal development.
Opiate peptide urine testing for gluten & casein	If there is a family history or symptoms: craving gluten and/or casein, mental "fog", GI problems.
Adrenal profile	Signs of weak adrenal function: low blood pressure, dizzy upon standing, low body temps, pregnancy nausea.
Digestive stool analysis	Measures: good flora, pathogens, parasites, immunity, inflammation, digestive enzymes, pH, blood
Porphyrin Urine	If evidence of toxic metals is present.

NUTRITION TERMINOLOGY

RDA Recommendations:

- Are "sufficient to meet the nutritional requirements of 97% to 98% of healthy individuals .." (IOM / NAS / FNB)
- Do not apply to more than 70% of the population who have chronic conditions and to those with developmental delays, gene variants, and biochemical individuality.

Elemental: nutrient amount available for absorption

- $CaCO_3$ is a compound which is 40% elemental Ca

Nutrient Absorption: amount which crosses the GI tract

- Depends upon nutrient form, antagonists, agonists, digestive status and level of deficiency

Nutrient Bioavailability: what is available for function

Nutrient Function: physiologic utilization

PRECONCEPTION

DENTAL EVALUATION

Remove Mercury Amalgams

- ❖ Not within 6 months of conception!
- ❖ Not while pregnant
- ❖ Consult with a biological dentist for:
  - Safe mercury amalgam removal
  - Safe, mercury-free, BpA-free restorations

Maintain Periodontal Health

- ❖ Routine dental prophylaxis (cleaning)
- ❖ Excellent brushing, flossing
- ❖ Periodontal disease – increases risk of early delivery & low birth weight

NUTRIENT FORMS & SOURCES

Natural forms are naturally occurring nutrients which:

- Are food based and can be extracted from food sources;
- Usually require taking more substance; and
- Can cause reactions depending upon food sources.

Synthetic forms are synthesized in the lab and:

- Contain active sites identical to the natural forms;
- Are used when therapeutic / high doses are required; and
- Usually require less substance and are less expensive.

Artificial refers to non-natural nutrient forms which are:

- Not the forms best used by the body; and
- May be much less effective and, in some cases, harmful.

Physiological activity will vary among the different forms

PROBIOTICS AND PREGNANCY

- 10 trillion human cells to 100 trillion bacteria
- Gut flora support systemic and digestive immunity
  - 70% of human immunity is in digestive tract
- Probiotics in pregnancy: 10 – 50 billion
  - Improve nutrient absorption
  - Reduce inflammation and intestinal and vaginal infections
  - Reduce gestational diabetes
  - Prevent asthma, allergies and eczema in child for 2 years
- In infants, probiotics: 5 – 10 billion
  - Reduce sepsis, allergies, asthma and eczema
  - Reduce / resolve colic, diarrhea, diaper rash, thrush
- Fermented foods: coconut kefir, sauerkraut, kambucha
  - Provide 100 to 700 billion probiotic count / serving

For high or UL doses – seek advice from a medical/nutritional practitioner.

OMEGA-3 EPA & DHA SUPPLEMENTATION

Test: RBC Membrane FA

Dose depends upon:

- History & symptoms
- Age, gender & stage
- Tests and diagnoses

EPA, DHA

- Fish or Krill oils
  Molecular distillation
- Algae DHA – Neuromins
  Vegetarian source

Age & Stage	20–60 mg/Kg	Comments
Typical Child	500 – 1500 mg	EPA:DHA 1:1 to 3:2
ASD Child / Adult	1000 – 3000 mg	EPA:DHA 1:2
Adult	1000 – 3000 mg	EPA:DHA 1:1 to 3:2
Pregnant > nursing	1000 – 3000 mg	EPA:DHA 1:1 to 2:1

BIOTIN

MATERNAL DEFICIENCY

- Dermatitis, eczema, seborrhea
- Intestinal yeast overgrowth
- Depression
- Hair: dull, fly-a-way, color loss
- Paresthesias

FETAL / INFANT DEFICIENCY

- Fatty acid defects
- Developmental delays
- Dermatitis, eczema, seborrhea
- Thrush, yeast infection
- Seizures, acidosis
- Hair: dull, fly-a-way, poor growth

SUPPLEMENTS

- Produced in GI by flora
- Antagonists: antibiotics
- 500 mcg – 20 mg.
- Non toxic

For high or UL doses – seek advice from a medical/nutritional practitioner.

MAKING SAFER SEAFOOD CHOICES

AVOID / LIMIT		SAFER CHOICES
Bass (largemouth)*	Marlin*	Blue crab (mid-Atlantic)
Bluefish	Monkfish	Croaker fish sticks
Blue crab (gulf)	Oysters (gulf)*	Flounder (summer)
Croaker (white)*	Pike*	Haddock
Flounder	Sea bass	Mussels
Halibut*	Shark*	Salmon (wild Pacific)
King mackerel*	Sole	Sardines
Lake whitefish	Swordfish*	Shrimp
Largemouth bass	Tilefish*	Trout
Mahi mahi	Tuna albacore*	Tuna (light)

* Avoid these choices if pregnant

www.epa.gov/waterscience/fish/ www.EWG.org

OMEGA-3 EPA & DHA DEFICIENCIES

GENERAL SYMPTOMS

- Skin: eczema, dermatitis
- Poor cognition & vision
- Mood disorders
- Immune dysfunction
- Frequent urine & thirst

MATERNAL

- Infertility
- Pre-eclampsia
- Postpartum depression

IN FETUS / INFANT

- Fetal growth delays
- Developmental delays
- Cognitive impairment
- Vision dysfunction
- Poor eye contact
- Eczema, allergies
- Attention disorder

DHA IMPORTANCE

- Brain & retina structure

FISH CONSUMPTION – PREGNANCY

- Women who consumed more than 340 grams (12 ounces) of seafood per week had more intelligent children who had fewer behavioral problems. (1)
- The mothers who ate no fish were 50 % more likely to have a child with a low verbal IQ score. (1)
- Dose range: based on lab tests and status
  DHA 500 – 1000 mg
  EPA 500 – 2000 mg

1. Hibbeln J, et al. Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. Lancet, 2007 Feb;Vol 369 (9561) 578- 585.

For high or UL doses – seek advice from a medical/nutritional practitioner.

ZINC FUNCTIONS

>300 ZINC DEPENDENT ENZYMES

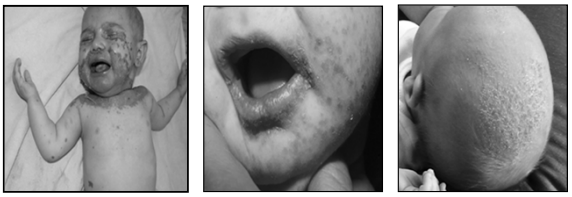
- Gene expression
- Cell membrane structure, function, stability
- Epithelial integrity: skin, mucosal membranes
- Retinal binding protein RPB (carrier for vit A)
- Growth and development
- Brain pruning & toxic metal metabolism
- Sensory development & function
- Spermatogenesis

Vision Auditory Smell Taste Touch Processing

ZINC DEFICIENCY – CLINICAL CLUES

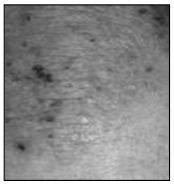
ACRODERMATITIS ENTEROPATHICA

- Occurs after weaning from breast milk
- Breast milk zinc is well absorbed – formula zinc is not
- Leads to immune disorders, developmental delays
- Biotin deficiency contributes!

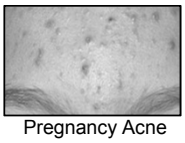


ZINC DEFICIENCY – CLINICAL CLUES

- Impaired epithelial integrity = susceptible tissues
- Zinc is synergistic with vitamin A, D and omega-3s



Eczema Dermatitis



Pregnancy Acne

Infant Acne

Nails White Lines

VITAMIN A & BETA CAROTENE

VITAMIN A EXCESS	β CAROTENE EXCESS
Depletes vitamin E, D,K	Depletes vitamin E
Increases bone loss	Skin fatty areas - yellow
Toxicity: Yes	**Toxicity**: No
Nausea, dizzy, headache	Builds up in fatty tissues
Blurred vision	*If vitamin A is adequate*
Skin desquamation	*carotene will not convert*
TEST Serum vitamin A	TEST Serum β carotene

Diabetics do not convert β carotene efficiently to A

ZINC: FROM FERTILITY TO INFANT HEALTH

DEFICIENCY – ADULT

- Vitamin A deficiency
- Infertility (both parents)
- Gestational diabetes
- Impaired folate function
- Poor gene expression
- Toxic metal excess
- Inflammation
- Immune disorders
- Gene expression dysfunction

DEFICIENCY – INFANT

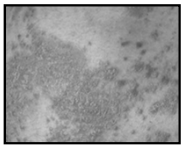
- Fetal death
- Teratogenesis
- Prematurity, low weight
- Fetal growth delays
- Infant acne /eczema
- Immune dysfunction
- Impaired brain pruning
- Sensory dysfunction
- Low tone
- Gene expression dysfunction

Preconception to post-natal zinc Supplement: 20 to 40mg

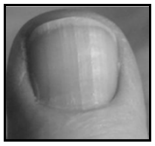
VITAMIN A DEFICIENCY - CLINICAL CLUES

Zinc deficiency is a primary cause of vitamin A deficiency
Zinc is responsible for retinol binding protein (RBP)

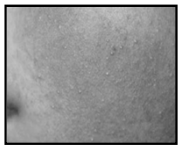
Acne



Eczema, Dermatitis



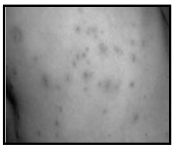
Ridged Nails



Keratosis Pilaris
Chicken Skin

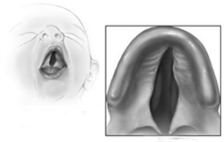
Face

Arm



PRENATAL VITAMIN A

DEFICIENCY



- Cleft palate
- Vision impairment
- Blindness
- Keratomalacia

EXCESS

- Small head size
- Small jaw
- Small eyes
- Mental retardation
- Facial dysmorphia
- Missing ear lobes
- Vision impairment
- Hearing impairment

Preconception to post-natal Vitamin A supplement: 2500 IU

VITAMIN D IN PREGNANCY

Vitamin D
is equal to folate
in importance to
fetal development
and outcome

VITAMIN D IN PREGNANCY & FETAL HEALTH

PREGNANCY
- Maternal bone health
- Maternal immunity
- Pregnancy health

DEFICIENCY
- Pre-eclampsia
- Gestational diabetes
- Increased risk C section
- Vulvovaginal infections
- Depression, SAD
- Postpartum depression

FETAL HEALTH
- Skeletal development
- Brain development
- Immune development

DEFICIENCY
- Newborn infections
- Newborn seizures
- Mental retardation
- Infant asthma
- Developmental delays
- Increased risk for ASD

CALCIUM DEFICIENCIES

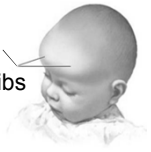
MOTHER
- Pre-eclampsia
- Seizures
- Muscle cramps
- Palpitations
- Hypertension
- Tremors
- Bone loss
- Brittle nails
- Insomnia
- Anxiety

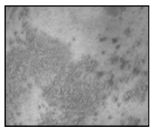
FETUS / INFANT
- Shortened gestation
- Low birth weight

- ➢Calcium: 800 mg or more based on diet.
- ➢High dose Ca w/o Mg increases inflammation
- ➢Mg deficiency precedes Ca deficiency
- ➢Mg and D3 are critical to Ca utilization.

VITAMIN D DEFICIENCY – CLINICAL CLUES

- Late-closing fontanels
- Deformed skull (bossing)
- Enlarged knees, wrists, ribs
- Eczema, dermatitis
- Chronic chapped lips
- Bowing legs, low tone
- Developmental delays
- Learning disabilities
- Delayed tooth eruption
- Profuse sweating





TESTS: Vit D3 25 hydroxy Supplement: 2000 to 4000 IU

MAGNESIUM DEFICIENCY

PREGNANCY
- Pregnancy nausea
- Preterm labor
- Hypertension
- Pre-eclampsia
- Miscarriage
- Premature birth
- Deficiencies: Ca, potassium

INFANT
- Apnea, SIDS
- Irritability
- Prolonged startle reflex
- Poor sleep quality
- Infant seizures
- Febrile seizures
- Night terrors

Pregnancy: 400 to 800 mg
Test: RBC Mg, OAT results

For high or UL doses – seek advice from a medical/nutritional practitioner.

SELENIUM

FUNCTIONS
- Glutathione peroxidase
- Sulfation & antioxidant
- Substitute for sulfur
- Thyroid function
- Synergistic with vit E
- Mercury antagonist
- Pancreatic enzymes
- Cardiac health

TESTS EGPx, RBC Se
Hair, GSH:GSSG ratio

PREGNANCY
- Infertility (male)
- Recurrent miscarriages
- Thyroid dysfunction

FETUS / INFANT
- Growth delay
- Low RBC GSH P-x
- Immune dysfunction
- Toxin accumulation

SUPPLEMENTS
- Child: 15 – 50 mcg
- Adult: 50 – 200 mcg

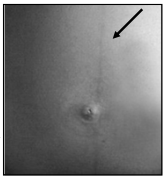
PREGNANCY B VITAMIN DEFICIENCIES

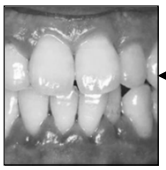
FOLATE & B6

Pregnancy Hyperpigmentation

Melasma

Linea Nigra

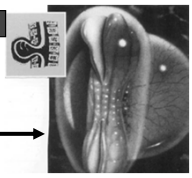




FOLATE

Pregnancy Gingivitis

Neural Tube Defect



VITAMIN E DEFICIENCY

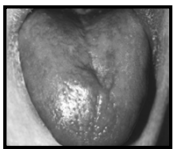
PARENT SYMPTOMS
- Infertility (male)
- Miscarriage

CHILD SYMPTOMS
- Fetal growth delays
- Hyperbilirubinemia
- Developmental delays
- Apraxia
- Low tone
- Loss of reflexes
- Anemia

SUPPLEMENTS
- Gamma or mixed natural
- Bilirubinemia: 50 IU only once
- Infant: 20-50 IU
- Ch: 50-100 IU
- Preg: 100 - 200 IU

For high or UL doses – seek advice from a medical/nutritional practitioner.

PREGNANCY B VITAMIN DEFICIENCIES



B12 Deficiency
- Glossitis, loss of papillae
- Macrocytic anemia
- Fatigue, depression
- Neurological symptoms
- Maldigestion / malabsorption

Prenatal Dose: 500 - 1000 mcg

Geographic Tongue (Migrans)
- B vitamin deficiencies
- Hormonal & genetic component
- Common in pregnancy
- Common in autoimmunity
- Dysbiosis especially yeast

B Complex 50 mg & Methylation support

For high or UL doses – seek advice from a medical/nutritional practitioner.

FOLATE DEFECTS AND DEFICIENCIES

PREGNANCY
- Macrocytic anemia
- Fatigue, depression
- Homocysteinemia
- Memory problems
- Glossitis, gingivitis
- Neuropathy
- Cervical dysplasia
- Melasma & linea nigra

PRENATAL SUPPLEMENT
L-5-MTHF or Folinic acid
1 - 3 mg (Not folic acid)

FETUS / CHILD
- Failure to thrive
- Developmental delays
- Neural tube defects
- Macrocytic anemia
- Risk for ASD

ASD CHILD SUPPLEMENT
Folinic acid 0.5 - 3 mg

DOSE BASED ON
- FIGLU & RBC Folate
- MTHFR Gene SNP test

VITAMIN C - ASCORBATE

FUNCTIONS
- Oxidation - Reduction
- Anti-histamine
- Anti-inflammatory
- Neurotransmission
- Immune & adrenal health
- Toxin metabolism
- Vascular integrity

DEFICIENCY
- Fetal & child growth delays
- Petechiae
- Bruising
- Iron deficiency
- Immune dysfunction
- Inflammation, oxidation
- Low WBC
- Depression, anxiety

	DRI / RDA	THERAPY	TOXICITY
Children	25 – 55 mg	100 – 1000 mg	Non-toxic
Adult	55 – 70 mg	500 – 3000 mg	Non-toxic

SUPPLEMENTATION PRINCIPLES

Supplementation is customized to the patient's individual needs - the "patient-specific DRI / RDA."

- Introduce the best tolerated supplement first
- Start "low and go slow"
- Introduce one new supplement at a time
  - Start with a lower dose
- Increase as tolerated, stop if there are problems
- Add another supplement in 1 to 5 days
- Continue the supplement if well tolerated

PRECONCEPTION, PRENATAL & POSTNATAL

- Prenatal Multiple Vitamin Mineral
  To provide sufficient Ca & Mg requires 3 – 6 tabs/caps
  If folinic or IL-5-MTHF is not 1 mg or more- add separately
  If magnesium is not 400 mg – must add more
- Folinic total: 1 to 2.5 mg (Rx Leucovorin)
  Based on FIGLU and homocysteine testing
- Probiotics: 10 to 50 billion
  Based on dysbiosis. Reduced risk for infant allergy, eczema
- Omega-3 total: 1000 to 3000 mg or more
  DHA 500 mg – fetal brain & retinal development
  EPA 500 mg – immunity, skin, hormones
- D3 total: 1000 to 4000 IU (6000 if breastfeeding)
  Based on 25 hydroxy vitamin D3 goal: 60-80 ng/ml

PROBLEMS WITH RX PRENATALS

- One "pill" does not "fit all" & can not include needed nutrients.
- Folic acid at 800 – 1000 mcg. Other B vitamins are low or absent, resulting in imbalances. L-5-MTHF or Folinic acid is preferred. Folic acid is damaging in methylation defects.
- Vitamin E at 10 iu is too low to protect against bilirubinemia. Most contain dl-alpha which is a 50% less effective form. Ideal is mixed natural tocopherols especially gamma.
- Iron (sulfate) causes constipation and is antagonistic to vit E. Fumarate, chelate & bisglycinate are better tolerated.
- Calcium is 100 to 200 mg. 800 mg or more is recommended.
- Magnesium (required for calcium utilization) - is low or absent. Low Mg increases risk for toxemia, early labor and SIDS.
- Chromium is absent. Cr reduces risk for gestational diabetes.

PRECONCEPTION, PRENATAL & POSTNATAL

- Magnesium total/day: 400 to 800 mg in divided doses
  Mg is self-limiting, excess causes diarrhea and loss of Mg
- B complex total/day: 25 to 50 mg
- B6 total/day: 5 to 20 mg
  Based on kynurenate and total homocysteine
- Biotin total/day: 500 mcg to 20 mg
  Based on dysbiosis and OAT markers
- Zinc total/day: 20 to 40 mg (based on RBC Zn)
- Vitamin E mixed tocopherols or gamma total: 200 IU
- Vitamin C total/day: 500 to 1000 mg
  Important in fetal growth and development

PRENATAL MULTIPLE

Vit A 5000 IU total β carotene & preformed A (≤ 2500 IU)
B Complex 25 to 50 mg +
Folinic or 5-MTHF 1 to 2.5 mg
Methyl B12 500 mcg to 1 mg
Biotin 500 mcg to 10 mg
Vitamin C 200 mg +
Vitamin D3 1000 to 4000 IU +
Vitamin E mixed natural gamma 100 to 200 IU
Calcium 800 mg +
Magnesium 400 mg +
Potassium 99 mg +
Zinc 20 to 40 mg
Copper 2 mg or less
Chromium 200 to 400 mcg
Selenium 50 to 100 mcg
Iron (not sulfate) 30 mg
Iodine 200 to 300 mcg
Vitamin K2 100 to 200 mcg

HERBS & PREGNANCY

AVOID		SAFE	BENEFIT
Aloe	Kava	Ginger	Anti-nausea
Arnica	Licorice	Dandelion	Anti-nausea
Camphor	Pau D'Arco	Oat & Oat straw	Calming
Cascara	Pennyroyal	Peppermint leaf	Anti-nausea, GI
Cohosh	Red clover	Red raspberry leaf	Uterine support
Comfrey	Rosemary	Slippery elm bark	Anti-nausea, GI
DongQuai	Senna	LACTATION	BENEFIT
Feverfew	Turmeric	Fenugreek	Milk production
Ginseng	Yohimbe	Fennel seed	Milk production

PRENATAL, PERINATAL & POSTNATAL

EDEMA / TOXEMIA
- Protein, water and salt
- Magnesium, B6, vitamin D

PREGNANCY NAUSEA
- Acupuncture!!
- Ginger, peppermint leaf
- Magnesium, B6
- Amino acid supplements
- Protein frequently

INDIGESTION
- Probiotics and biotin
- Peppermint, slippery elm
- Soup purees & small meals
- Acupuncture

DELIVERY
- **Prior to delivery**
  Stop 1 week before
  - Omega 3 *reduces clotting*
  - Vitamin E *reduces clotting*
  - Magnesium *relaxes muscles*
  Continue and increase
  - Vitamin C
  - B complex
  - Zinc & calcium
- **Within 1 week - return to**
  - Prenatal supplements
  - + Fenugreek for nursing

INFANT BILIRUBINEMIA
- Vitamin E 50 iu for 1 day

POST PARTUM DEPRESSION

- Affects 1 out of 7 (15-20%) postpartum women
- Signs: Depression for more than 3 weeks postpartum
  - Loss of pleasure, joy, self-confidence
  - Difficulty sleeping at night & daytime lethargy
  - Appetite loss and/or craving for sweets
  - Anxiety or chronic worry
- Prevention and treatment strategies
  - Glycemic control and excellent hydration (water)
  - Frequent meal-snacks and always w/ protein
  - Excellent sleep
  - Take breaks from the baby – get help from others
  - Exercise
  - Higher nutrient intakes!
    Omega 3, Mg, B vitamins, vitamin D3 and E

Magnesium sulfate is the anticonvulsant of choice for treating eclampsia.
It is more effective than diazepam, phenytoin, or lytic cocktail.

The global impact of pre-eclampsia and eclampsia. Duly L. Semin Perinatol. 2009 Jun;33(3):130-7.

CHOLESTEROL - IN FERTILITY AND PREGNANCY

- Cholesterol is produced by the liver (>1000 mg / day) for:
  - Reproductive hormones and vitamin D production
  - Brain and nerve development and structure
  - Serotonin metabolism and antioxidant functions
- Cholesterol should increase in pregnancy and breast feeding 200 to 325 mg/dl in 2nd and 3rd trimesters.
- If triglycerides and LDL are elevated - it is not a fat problem. It is a sugar problem: excess glucose converts to triglycerides.
- Statins should not be used if improving fertility and attempting to become pregnant. They reduce the production of cholesterol which is necessary in fetal development. Statins are teratogenic.

BREAST FEEDING BENEFITS

MOTHER
- Releases Oxytocin which
  - Promotes nurturing
  - Reduces stress
  - Improves uterine health
- Protects against:
  - Breast cancer
  - Ovarian cancer
  - Osteoporosis
  - Weight gain
  - Diabetes

INFANT
Provides
- Beneficial flora
- Antibodies
- Omega-3 fatty acids
- Oral motor development

Protects against
- SIDS
- Digestive problems
- Infections and allergies
- Malocclusion
- Tongue thrusting
- Obesity

Breast milk production adapts to the infant growth changes.

IMPORTANCE OF SALT IN PREGNANCY

- Blood volume expands over 40% as pregnancy progresses.
- Salt & protein maintain the osmolality of this volume.

PREGNANCY SALT RESTRICTION RESULTS IN
- Reduced blood flow to kidneys and placenta.
- High blood pressure and tissue edema:
  - As blood volume increases and salt intake decreases: blood osmolality becomes too dilute because of insufficient concentration of particles in the fluid.
  - The fluid moves to the tissue to improve osmolality. This causes tissue edema and reduced blood volume.
  - The vessels constrict to compensate for low blood volume. The constriction causes high blood pressure.
- Pre-eclampsia (HTN, weight gain, edema, proteinuria)

Animal studies:
Perinatal salt restriction leads to insulin resistance and obesity in offspring

Life Sci. 2008 Mar 26;82(13-14):728-32.

HEALTHY EATING

- Avoid foods that cause reactions!!
- The first food or drink of the day sets the glucose standard for the day. Have protein first!
- Protein & fiber benefit: blood glucose control, mood, attention and endurance.
- Increase fiber: vegetables, fruits, nuts, seeds, whole grains: real oatmeal, brown rice, tabulleh Add Clear Fiber (guar g): 1 Tbs = 4 g of fiber.
- Organic is more nutritious and reduces the load of harmful additives, pesticides and chemicals.
- Low fat and "lite" foods are usually glycemic and can increase hunger, triglycerides and weight.

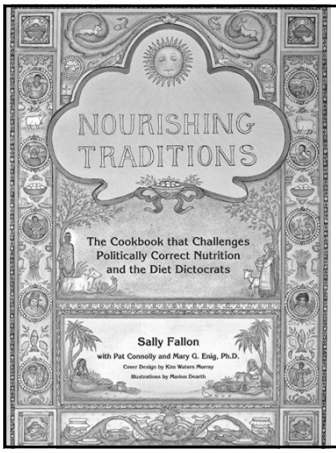
PREGNANCY DIET AVOIDS

- Alcohol Drugs Tobacco
- Artificial sweeteners & additives
- High Fructose Corn Syrup HFCS
- Sodas: diet and regular
- Hydrogenated oils / trans fats
- Raw: meat, seafood, eggs
- Soft cheeses
- Quinine
- Sugar and caffeine
- Refined grains & processed foods
- Deep fried foods
- Reaction provoking foods

HEALTHY ORGANIC NUTRIENT-DENSE DIET

Protein	Fat	Carbohydrate
ANIMAL SOURCE	***SATURATED***	*High in fiber:*
Seafood	***UNSATURATED***	Vegetables
Meats	**Monounsaturated**	Fruits
Poultry	❑ Omega-9	Grains* Gluten-free
Eggs	olive, avocado, almond	Beans
*Milk casein-free	**Polyunsaturated**	Nuts
PLANT SOURCE	❑ Omega-3 *Essential*	Seeds
Beans*****Soy-free	fish, beans, nuts, seeds	
Nuts	❑ Omega-6 *Essential*	
Seeds	vegetables and their oils	

* If tolerated. **Avoid** if **GFCFSF:** Gluten-Free, Casein-Free, Soy-Free



BASICS FIRST

ORGANIC ECO-FRIENDLY
WHOLE FOODS
NUTRIENT DENSE
BENEFICIAL FATS
BEANS NUTS SEEDS
SEAFOOD MEAT EGGS
HOMEMADE BROTHS
VEGETABLES & FRUITS
FERMENTED FOODS
WHOLE GRAINS

If it does not grow……
do not eat it!

HEALTHY ORGANIC NUTRIENT-DENSE DIET DURING PREGNANCY

	Daily to Start	Add Each Trimester	Total by 3rd Trimester
CALORIES	2000 to 2500	150 to 200 calories /day	2500 to 3000 calories / day
PROTEIN	90 grams/day	10 grams/day	120 grams /day
VEGETABLES	3 to 4 cups / day	1/3 cup / day	4 to 5 cups / day
FRUIT	1 to 2 cups / day	1/3 cup / day	2 to 3 cups / day
GRAINS	0 to 7 ounces / day	0 to 1 ounce	0 to 10 ounces
WATER	60 to 75 ounces/day	5 ounces / day	75 to 90 ounces / day

High Fiber Vegetables
Eat with other food or on empty stomach
1 to 3 cups/day or more
Eat More: green, orange, red, purple

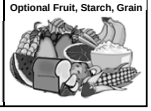
AVOID
Artificial additives
Artificial sweeteners
Preservatives, coloring
Sodas: diet and regular
HFCS – corn syrup
Hydrogenated oils
Refined foods
Fried foods
Deli Meat
Caffeine
Sugar

More Vegetables

Choose a wide variety of color, textures and flavors

Protein at Every Meal/Snack

Optional Fruit, Starch, Grain



Protein
8 grams protein =
1 oz meat, fish, poultry, cheese
1 large egg
1/3 C Greek yogurt
1/3 C cottage cheese
1/2 cup beans
¼ cup nuts, seeds
2 Tbs nut butters

Fruit, Starch, Grains
Not on an empty stomach
Eat Less Breads, Pasta
Bagels, Cold Cereals
Starches, Juices
Eat
Whole Grains 0 to 8 oz
Fermented Foods
Fruit 1 to 2.5 /day

Drink: water, green and herb teas, seltzer with juice.
Sweeteners: juice, maple syrup, honey, stevia
Oils: flaxseeds ground, olive, avocado, coconut, almond

SUMMARY OF GOALS

3 to 6 MONTHS BEFORE THROUGH NURSING

- Optimum nutritional supplements for age and stage
- Healthy weight and body fat %
- Nutritious, organic diet that is glycemically stable
- Optimum water and salt intake
- Regular exercise and reduced stress
- Medical and nutritional evaluation
- Avoidance of toxins, drugs, alcohol, pollutants
- Optimum restful sleep
- Acupuncture to improve fertility, energy and outcome
- Excellent preconception, prenatal and post-natal care

AUTISM360™ LETTING THE DATA TALK

www.Autism360.org

Autism 360 is a site that …

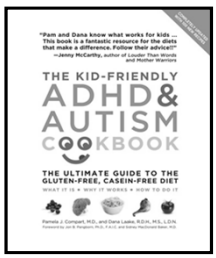
- Allows you to have a password protected record
- Provides the ability to track symptoms & progress
- Manages complex data on ASD patients
- Can be used to compare with others (anonymously)
- Gives the option to share data with your providers
- And….the service is free!

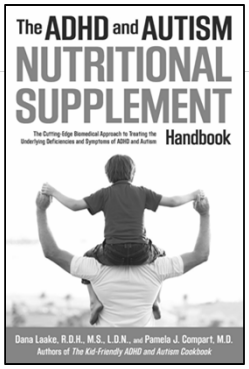
Moody's in the community

THE MOODY'S FOUNDATION

1500AM FEDERAL NEWS RADIO

www.FederalNewsRadio.com





These books are dedicated to the courageous children, and to all who love and serve them. We are humbled in your presence