GOLISANO CHILDREN'S HOSPITAL

Feeding, Eating & Nutrition in Autism Spectrum Disorders

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Medicine of the Highest Order

University of Rochester Medical Center

Objectives

- Understand common feeding problems in children with ASD
- Review the literature on nutritional status of children with ASD
- Discuss dietary interventions frequently used by families of children with ASD and the evidence behind their use
- Discuss recommendations for improving nutritional status of children with ASD
- Learn about behavioral interventions frequently used to treat feeding issues in children with ASD

Common Feeding Problems in ASD

- Food selectivity by type and/or texture
- Food selectivity by brand and/or container
- Perseverative interests, obsessions, presentation and routines
- Food neophobia, anxiety
- Food refusal
- Oral motor delay/deficit
- Parent-child interactions

Food Selectivity

- Type
- Texture
- Brand
- Container
- Visual presentation

Perseverative Behaviors at Meals

- Bottles, cups
- Utensils, plates, bowls
- How food is presented on plate
- Food can't touch, only eat 1 food at a time
- Significant disruptive behaviors if food items are exactly the same

Food Refusal

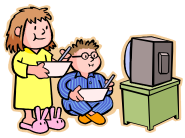
- Head turning
- Batting at the spoon
- Throwing food
- Spitting food out
- Holding food in the mouth (packing)
- Screaming
- Leaving the table – refusing to sit**

Oral Motor Delays

- Poor tongue lateralization
- Delayed chewing skills
- Hypersensitive gag reflex
- Poor endurance/weak muscles
- Difficulty biting/tearing food
- Tactile and oral defensiveness

Parent-Child Interactions

- Attention
- Follow-through
- Distractions
- Siblings



Current DSM Definition

- Persistent failure to eat adequately or gain weight, or significant weight loss over at least one month
- Not due to existing medical condition
- Not better accounted for by another mental health disorder or lack of food
- Onset before age 6
- Failure To Thrive

About 30 Years Ago…

- FTT kids were admitted and fed by nursing
- If they gained weight, they went into foster care
- Faulted the parent for poor weight gain
- Research conducted on parent variables related to feeding demonstrated they were not the cause of the feeding problem.

Origins of Feeding Disorders

- Not one that accounts for all problems
- Assume that an aversive event was paired with eating, usually a physical illness, disrupted eating
- Illness is treated, but the aversion of food remains
- Classical Conditioning Model

Origins of Feeding Disorders – Con't

- Treatment sought well after problem arises.
- Many parents report feeding concerns at the time they tried to introduce solids/table foods
- Disruptions in the developmental food continuum

Developmental Food Continuum

- 1-4 months: formula and/or breast milk
- 4-6 months: Liquids and smooth purees (infant cereal)
- 6-8 months: Liquids, thin purees (baby food fruits and veggies). Small pieces of soft finger foods
- 8-10 months: Liquids, thickened purees, soft mashed foods (mashed potatoes, mashed veggies, yogurt, applesauce)

Developmental Food Continuum

- 10-12 months: Table foods. chopped meats (soft), casseroles, bread. Start to see a rotary chew
- 4-6 months is first critical period for offering cereals
- 6-12 is second critical period for offering table foods

Components of a Feeding Problem

- Medical
- Developmental
- Behavioral
- Social and environmental
- Dietary

Common Nutrition Related Issues

- Medications
  - Increased appetite and weight (ex. atypical anti-psychotics)
  - Decreased appetite and weight (ex. stimulants and anti-epileptics)
  - Time of dosing – interaction with supplements and food
- Low Intake and Low Serum Vitamin D and/or Iron
  - Limited diet
  - Possible decreased absorption
  - Lack of outdoor play (indoor therapy)
- Weight Management
  - Underweight due to limited diet and/or medications
  - Overweight due to limited (energy dense) diet and/or medications and lack of physical activity

Common Nutrition Related Issues

- Gastrointestinal (constipation, diarrhea, delayed emptying, abdominal pain)
  - Medications
  - Supplementation
  - Low fiber intake
  - Withholding
- Dietary Interventions
  - Special Diets
  - Supplementation
- Feeding tube dependence
- Allergies

Dietary Interventions for ASD: Restricted Diets

- 23 -50% children with autism reportedly on special diets
- Few have been tested in a systematic controlled way
- Common Diets:
  - Gluten Free/Casein Free Diet (GFCF)
  - Specific Carbohydrate Diet™
  - Elimination Diet/Oligoantigenic Diet
  - Sugar Free Diet
  - Dye Free Diet

GFCF Studies

Author	Design	N	Measure	Outcome
Knivsberg et al. 1990,95	Case series 3 diets	15	DIPAB, ITPA C-Raven	ITPA, Raven better
Lucarelli et al. 1995	Case series Casein free	36	BSE	Improved in 8 wks
Whitely et al. 1999	Case series. Gluten elimination	22 31	Clinical impression, over 5 mo.	Slightly improved Parent rating
Knivsberg et al. 2002	Single blind, Peptide pattern	10 10	ITPA, DIPAB Over 1 yr	Improvements in autistic traits
Elder et al. 2005	Double blind, crossover	15	CARS, EOC	No change
Whitely et al. 2010	Single blind, delayed start to second group	26 29	ADOS, Gilliam, ATED	Improvement of scales in ADOS, Gilliam initially

Cochrane Review 2008

- Gluten and casein-free diets for autistic spectrum disorder (review) – Millward, et al.
  - Authors' Conclusion:

    "Can not recommend these exclusion diets as standard treatment."

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University of Rochester: GFCF Diet Study

- Double Blind, Placebo Controlled
- Funding:
  - Studies to Advance Autism Research and Treatment (STAART): Diet and Behavior in Young Children with Autism
    - Registered Dietitians
    - Diet Technician
    - Research Assistants
    - Behavior Specialists
    - Parents
    - Teachers
    - Physician

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STAART :Double Blind Placebo Controlled Challenge Study of the GFCF Diet

Recruited 22 children with ASD in Applied Behavioral Analysis programs

↓

14 were able to maintain a GFCF diet and data collection

↓

4 weeks minimum on GFCF diet

↓

Double Blind Placebo Controlled Challenges of wheat flour, milk, both, placebo (GFCF diet maintained)

↓

Follow up at 30 weeks from study entry

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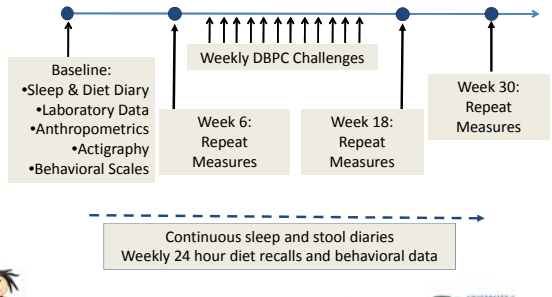
Study Design:



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Challenges

- 1: Gluten Free
- 2: Casein Free
- 3: Gluten & Casein Free
- 4: Placebo (regular)

Each challenge given to each subject 3 times

Results of Double Blind Placebo Controlled Challenge Study; n=14

- **No** effect on sleep
- **No** difference in stool frequency or consistency on the Bristol Stool Scale
- **No** difference in rating of attention or activity by parents, teachers, research team (all blinded to status)
- **No** difference on actigraphy
- **No** statistically significant differences in social approach, language, sensory motor behaviors

Nutritional Intake of Children with ASD

Raiten & Massaro 1986	40 ASD 34 TD	7 d diet; no difference between groups
Ho et al. 1997	54 ASD	3 d diet; 33% of un-supplemented low in Ca; 7.4% met Canadian RNI for food groups
Cornish 1998	17 ASD	3 d diet & FFQ; low RNI for 53% in one or more of Fe, niacin, B2, B6, Ca, Zn, vit D, & Vit C
Cornish 2002	8 ASD (on GFCF) 29 ASD (not on GFCF)	3 d diet, nondiet group 32% of children with <LNRI Zn, Ca, Fe, vit A, B12 & B2 50% in diet group <LNRI for Zn and Ca No sig difference in energy pro or micronutrients between groups
Lindsay et al. 2006	20 ASD	FFQ; Mean intake exceed DRI, but individual deficiencies in Ca, B5, vit D, vit K
Levy et al. 2007	52 ASD	3 d diet; met calorie CHO fat and exceeded pro requirements
Lockner et al. 2008	20 ASD 20 TD	3 d diet; similar nutrient intakes

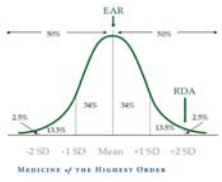
BS1

Nutritional Intake of Children with ASD

Herndon et al. 2008	46 ASD 31 TD	3 d diet; ASD higher vit B6 & E, lower Ca, excluding 14 GFCF - only B6 different
Johnson et al. 2008	19 ASD 15 TD	24 hr recall & FFQ; ASD lower percent met vitamin K; greater percent with Mg adequacy
Schmitt et al. 2008	20 ASD 18TD	3 d diet; No differences in nutrient intake Less variety in intake
Bandini et al. 2010	53 ASD 58 TD	3 d diet; Nutrient inadequacies in fiber, Vit D, E Ca: D and Ca more likely to be low in ASD More limited repertoire associated with nutrient adequacy
Xia et al. 2010	111 ASD	3 d diet; Did not meet DRI for vit A, B6, vit C, Folate, Ca, Zn & lower fat
Emond et al. 2010	79 ASD 12901 TD	FFQ; Less vit C and D but more iodine
Zimmer et al. 2011	22 ASD 22 TD	FFQ; Higher Mg lower pro, Ca, B12, vit D Ate fewer foods; selective eaters at greater risk

Limitations of Literature on Intake and ASD

- Tools/methods used to collect dietary intake data
- Accounting for variability of intake
- Nutrient software packages
- Comparison to DRI's (use of EAR vs. RDA)
- Comparison groups
- Sample sizes



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Autism Treatment Network

- Collaborative network of hospitals, physicians, researchers and families
- 17 sites across US and Canada
- Working together to develop the most effective approach to medical care for children and adolescents affected by autism
  - Clinical and Health Related Research
  - Outreach and Family Education
  - Dissemination and Training for Professionals

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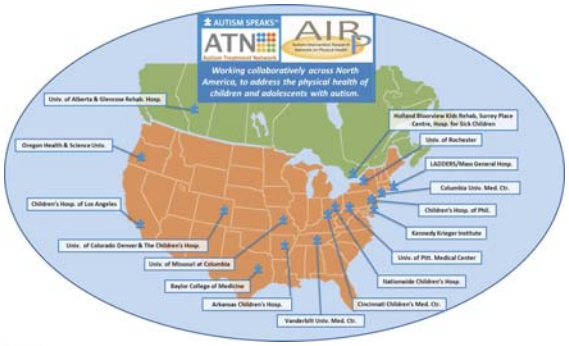

- University of Rochester
- University of Arkansas
- University of Colorado
- University of Pittsburgh
- Cincinnati Children's Hospital Medical Center

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Diet and Nutrition in Children with Autism: An Autism Treatment Network Study

- Data collected from 366 children with autism across 5 ATN sites
  - 3 day food records (including supplement intake)
  - Bowel habits (Bristol Stool Scale)
  - Behavioral data on feeding and other behaviors
  - Laboratory data (vitamin D, CBC and ferritin)
  - Feedback provided to each subject after individual analysis
- 252 food records analyzed to date
- Supplement data not yet analyzed

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Diet and Nutrition in Children with Autism:
An Autism Treatment Network Study

The majority of children with ASD were meeting their nutritional needs for <u>most</u> nutrients through dietary intake of foods and beverages

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Results

- Similar to other children in America (NHANES):
  - Low intake of potassium, fiber, vitamin D, vitamin E, calcium and excessive sodium
- A greater percentage of children with ASD met vitamin K and E requirements
- Approximately 30-40% aged 1-3 exceeded the UL for vitamin A, zinc, and manganese from food/beverages

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Interventions Used for ASD: Supplements

- Multivitamins
- Omega 3 fatty acids
- B_6/Mg
- Individual vitamins
  - (i.e. vitamin A, E, B_{12},C)
- Carnosine
- Carnitine
- Taurine
- Melatonin
- Probiotics
- Folate Cycle, Transmethylation and Transsulfation Pathway Supplements:
  - Dimethylglycine (DMG)
  - Trimethylglycine (TMG)
  - SAM
  - Methionine
  - Methylated B_{12}
  - Folinic acid

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Supplement Use

- 66% of children with ASD compared to:
  - 34% general pediatric population
  - 61% with chronic illness

Supplement Use

- Range:
  - 0-19 per day
  - Average: 2.5 per day
- Most Frequently Used:
  - Multivitamins
  - Individual Nutrients
  - Fatty Acids
  - Other
    - Melatonin, DMG, TMG, Co-Q10, etc.
  - Probiotics
  - Vitamin D

Evidence for Use:

- Omega 3 Fatty Acids

  Omega 3 Fatty Acids for ASD: A Systematic Review

  Bent, et al. J Aut Dev Disorder 2009

  – Few randomized, controlled trials

  – Insufficient evidence to determine if use is safe or effective for ASD

- B_6/Mg

  Combined B_6/Mg Treatment in ASD

  Nye and Brice *Cochrane Review 2009*

  – "Due to small number of studies, the methodological quality of studies and small sample sizes no recommendations can be advanced regarding the use of B_6/ Mg as treatment for autism."

BMI – Review Literature

BS3

Curtin et al. 2005	42 ASD	Prevalence similar to general pediatric population
Mouridsen et al. 2001	198 PDD	15% of males below 5th percentile
Hendy et al. 2010	50 ASD	12% under 10th percentile for BMI
Ho et al. 1997	54 ASD	42.6% obese (120% IBW)
Lindsay et al. 2006	20 ASD	Higher BMI compared to national means
Emond et al. 2010	79 ASD 12901 TD	No difference in BMI

Diet and Nutrition in Children with Autism: An Autism Treatment Network Study

BMI:

	ASD	NHANES Matched *	ASD	NHANES Matched *
Age (years)	2-5		6-11	
N	213	302	149	257
BMI Category	(%)			
Underweight (<5th %)	7	6	7	2+
Healthy weight (5th – 85th %)	63	78+	66	64
Overweight (>85th – 95th %)	16	7	11	14
Obese (>95th %)	14	10+	16	21++

*NHANES 2007-2008 Matched for SES, Age, Gender, Race

+ P<0.0001

++P<0.04

Diet and Nutrition in ASD Study Summary:

- Low intake of:
  - Potassium
  - Fiber
  - Vitamin D
  - Vitamin E
  - Calcium
- Excess intake of:
  - Sodium
  - Vitamin A
  - Zinc
  - Manganese

Ages 1-3

- 66% of children were on supplements
- BMI - Children with ASD:
  - **ages 2-5** are more likely to be **obese** compared to NHANES data
  - **ages 6-11** are more likely to be **underweight** compared to NHANES data

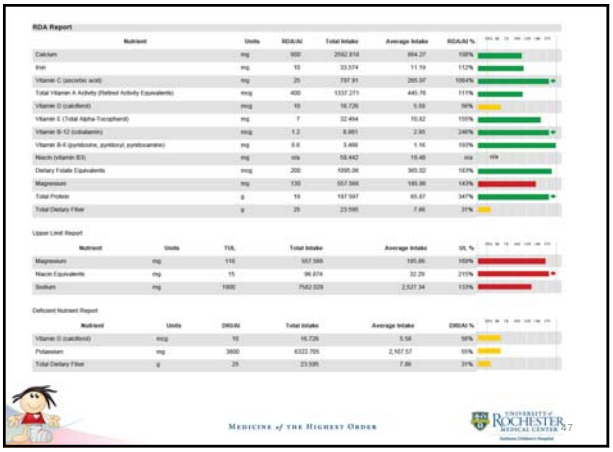
Clinical Visit

- Complete a food record mailed in prior to visit
- Analyzed using Nutrition Data Systems for Research (NDSR)
- Uploaded using web based comparison tool (SNAC) to compare to age appropriate DRI's
  - add supplement data
- Height, Weight and BMI
- Labs – (i.e.. Vitamin D and Iron Status)
  - Social Story

Case Study

- 6 year old male with ASD
- Height – 116.2cm Weight – 36.9 kg
- BMI – 99.9%ile (Obese)
- Labs:
  - Vitamin D – 22ng/mL (low)
  - Ferritin – 18ng/mL (low) (Hgb & Hct – normal)
- Currently on children's gummy MVI
- Medical team wants to start an atypical antipsychotic for aggression and SIB

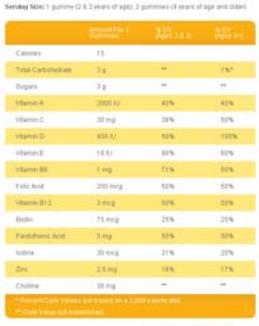
Time*	Food Item	Description of Food/Beverage (Brand name, cooking method used, type i.e. low fat or low carbohydrate, fortification, and any other additional information)	Amount	Unit
6:45am	Pop tart	Kellogg's Frosted Cherry Pop Tart	1	
	Milk	Tops 2% milk	10	oz
9:00am	Donut	Walmart Bakery yeast made chocolate frosted donut	1	
	Juice	Capri-sun 100% juice "Fruit Dive"	6	oz
11:40am	Chick	Kirkwood (Aldi's) Safari Adventure breaded chicken nuggets -microwaved	4	
	Chips	Doritos –Cool Ranch	18	chips
	soda	Tops- Orange Soda	8	oz
	fruit	Sun Maid –Vanilla Yogurt Raisins	1 box	1oz
12:45pm	Chips	Doritos-cool ranch	12	chips
	juice	Capri-sun 100% juice "Fruit Dive"	6	oz
	candy	Star burst- red yellow and orange	5	
3:00pm	candy	Gum balls from gum ball machine at Wal-mart	2	
6:00pm	chick	Banquet – Chicken Nuggets (microwaved)	9	
	chips	Pringles-cheddar cheese flavored	7	chips
6:00pm	Juice	Great Value (Walmart) 100% Apple Juice mixed with Vitamin Water -low cal-orange-orange flavor 1 oz	9	oz
7:30pm	Milk	Tops- 2% milk	6	oz
	snack	Kellogg's Assorted fruit snacks-Phineas and Ferb	2	packs

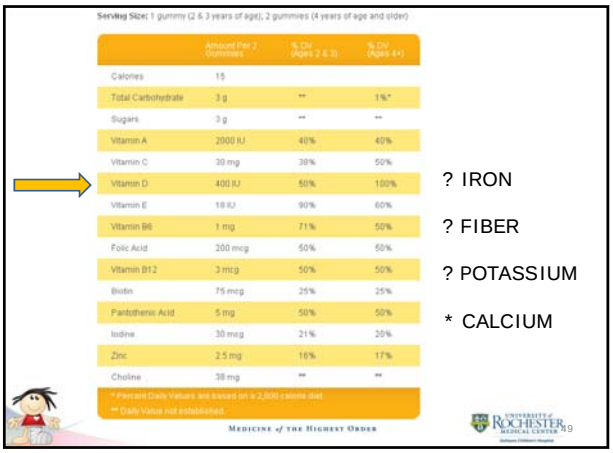


Case Study (con't)

Analysis of 3 Day Food Record:

- ↓ Ferritin (lab) ∨ Iron (many non-heme sources)
- ↓ Fiber
- ↓ Vitamin D (labs and intake)
- ↓ Potassium
- ∨ Calcium sources (from milk and juice)
- ∨ B Vitamins
- ↑kcal intake high compared to EER (Obese)





Serving Size: 1 gummy (2 & 3 years of age); 2 gummies (4 years of age and older)

	Amount Per 2 Gummies	% DV (Ages 2 & 3)	% DV (Ages 4+)
Calories	15		
Total Carbohydrate	3 g	**	1%*
Sugars	3 g	**	**
Vitamin A	2000 IU	40%	40%
Vitamin C	30 mg	33%	50%
Vitamin D	400 IU	50%	100%
Vitamin E	10 IU	90%	60%
Vitamin B6	1 mg	71%	50%
Folic Acid	200 mcg	50%	50%
Vitamin B12	3 mcg	50%	50%
Biotin	75 mcg	25%	25%
Pantothenic Acid	5 mg	50%	50%
Iodine	30 mcg	21%	20%
Zinc	2.5 mg	16%	17%
Choline	38 mg	**	**

* Percent Daily Values are based on a 2,000 calorie diet
** Daily Value not established.

? IRON

? FIBER

? POTASSIUM

* CALCIUM

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Treatment: Increasing Dietary Iron

- Heme:
  - Meat (beef, turkey, chicken, fish, chicken nuggets, tuna and pork)
- Non-Heme:
  - Breakfast Cereal
  - Beans
  - Molasses
  - Tofu
  - Oatmeal
  - Raisins
  - Whole Grain Crackers
  - Granola Bars

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Treatment: Supplementation

ID <u>without</u> Anemia:

- No real consensus on cut off point or treatment. Many treat a ferritin levels below 20ng/mL
  - Common recommendations:
    - Increase dietary iron
    - MVI with iron (caution with TUL)
    - follow up labs in 6 months

ID <u>with</u> Anemia:

- 3-6 mg/kg elemental iron, given once or twice daily for 3 months
  - (max 60 mg elemental Fe/day)
- Recheck the complete blood count in 3 months

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During Supplementation:

- Give supplement with orange juice or another source of vitamin C to help absorption
- Do not give with milk or other source of calcium which inhibit absorption
- Best to give between meals for best absorption
- Encourage high fiber foods and fluids to prevent constipation

During Supplementation:

- Use age appropriate supplements (if using MVI)
  - Gummy MVI's typically DO NOT contain iron
- Give orange juice or brush teeth right after a dose of liquid iron to prevent staining of teeth
- Ensure that parent is keeping iron supplement out of reach to prevent overdose which could be fatal

ROUTINE FOLLOW UP WITH DOCTOR FOR LABS

Vitamin D

- Fat soluble hormone that is made by the skin when exposed to sunlight (UVB)
- Increases the absorption of calcium, which is require to build strong bones
- Supports healthy immune function including inflammation reduction as well as healthy muscle and nerve function
- Recent research indicates that vitamin D deficiency is wide spread
- Requirement for dietary vitamin D has recently increased

DRI Age Group	RDA (IU)	UL (IU)
1–3 years old	600	2,500
4-8 years old	600	3,000
9-13 years old	600	4,000

(25-OH) Vitamin D Serum Levels

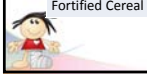
	Range (ng/ml)	Risk/Benefit
Adequate	30-50	Maximum Ca & Phos absorption
Insufficiency	20-29	Maintains bone health / low risk
Deficiency	< 20	High risk for bone-related diseases
Excess	> 50	Increase in all-cause mortality

IOM vs. Endocrine Society Recommendations

DRI Age Group	IOM Recommendations		Committee Recommendations (patients at risk for Vit D Def.)	
	RDA (IU)	UL (IU)	Daily Requirement (IU)	UL(IU)
1–3 years old	600	2,500	600-1,000	4,000
4-8 years old	600	3,000	600-1,000	4,000
9-13 years old	600	4,000	600-1,000	4,000
14-18 years old	600	4,000	600-1,000	4,000

Vitamin D Sources

Food	Serving Size	Vit. D (IU)
Sockeye Salmon	3 oz	794
Canned Tuna	3 oz	154-229
Ovaltine – Malt	¼ cup	200
Fortified Milk	1 cup	100
Fortified O.J.	1 cup	100
Fortified Milk Alt.	1 cup	80-120
Fortified Marg.	1 TBSP	60-80
Fortified Yogurt	½ cup	50
Shiitake Mushrooms	1 cup	45 IU
Fortified Cereal	¾ cup	40



Increasing Dietary Fiber Intake

- Change to Whole Grain Products
  - White Whole Grain Bread
  - Whole Grain Crackers
- Bake with whole wheat flour
- Use a healthy cereal as a snack
- Increase Fruits & Vegetables
  - Smoothies
  - Veggies and Fruit with Dips
  - Kabobs


Weight Management: Overweight or Obese

- Increase physical activity (non-food reward)
- Use smaller plates
- Serve away from table
- Monitor "seconds"
- Drink low-calorie beverage between bits (put down fork – encourages slower eating)
- Provide healthy snacks ("snack drawer"
- Minimize fast food consumption
- Use small plastic bags for portion control
- Increase fiber intake
- Switch to 1% or skim milk
- Monitor juice intake
- Reduce soda intake (try adding soda water to 100% juice)
- Meal time and snack schedule

Weight Management: Underweight:

- Structured meals and snacks
- Increase % fat milk
- Peanut butter on crackers or with apples
- Add butter to bread, sandwiches, pasta, muffins
- Use oils in cooking
- Top food with cream sauces and dressing
- Add cheese to potatoes, salads, vegetables, etc.
- Use trail mix with dried fruit, nuts and candy as a snack
- Have healthy high-energy snack available

Implications for Practice

- Encourage families to initiate one intervention at a time
  - Identify clear outcomes and timeline
  - Weigh pros and cons (cost, burden on family, etc.)
- Focus on nutrients of greatest concern
  - Vitamin D, calcium, iron (source), fiber and potassium
  - These nutrients may not come from traditional food sources –
  - **Be Creative!**
- Increasing variety is KEY
  - If consuming < 20 foods, less likely to meet nutritional needs
- Supplements – Do Ask, Do Tell
  - Ask patients to bring in supplements
  - Compare to age appropriate DRI's
  - Counsel on efficacy, potential adverse effects and interactions
- Multi-disciplinary care is essential

Eating Disorders

- Main focus is body image distortion
- Anorexia - Adolescents consciously restrict food intake to keep from getting fat, while already very thin – delusional thinking
- Bulimia – Eat large quantities of food and then purge
- Cognitive processes that are not apparent in children with feeding disorders

Hunger and Satiety

- Many parents report that children with feeding disorders do not appear hungry.
- Children do not show interest in other people's food
- Do not typically request food
- Do not eat when they do request food
- Eat a few bites and then are done

Regulatory System

- Hunger is a regulatory system, as is our sleep-wake cycles.
- They are physiological clocks that need environmental regulation.
- If we do not impose restrictions on when we sleep and eat, all of our functioning would become out-of-sync.
- Sometimes, children are left to try and regulate their own systems.

Hunger–Satiety Cycles

- Our Hunger-Satiety cycle runs about every 4 hours.
- We recognize our hunger and satiety cues by pains in our stomach – growling for hunger, low throb for fullness.
- Scheduling meals helps establish hunger.

Grazing and Hunger

- Adults eat small frequent meals throughout the day to lose weight.
- It takes the edge off our hunger so we never feel really hungry or full.
- Affects children in the same way.
- Milk alone can curb hunger and keep a child from eating their meal.
- Kids can hold out for preferred foods.

Feeding Myths

- Myth 1: Leaving food out all day will increase the amount of food a child eats
- Myth 2: Restrict preferred foods and the child will get hungry enough to eat what you serve the family
- Myth 3: Use preferred foods as rewards for eating nonpreferred foods

Positive Mealtime Routine

- Meals and snacks happen at roughly the same time every day
- No food or drink (except water) between meals and snacks - "No grazing"
- Appropriate seating
- Eat meals together
- Time limits
- Limit distractions

Make meals fun!

- We want meals to be a positive and fun experience.
- Provide lots of praise for all appropriate eating.
- Encourage your child to smell, taste and describe the foods s/he is eating.
- Schedule game time after the meal if s/he cleaned the plate, tasted all of the foods, etc.

Behavior Rules

- Put a "No thank you" helping (1 tsp- 1 tbsp) of a new food on his/her plate, even if they are not going to eat it.
- "Taste with our tongue, not with our eyes."
- Ignore minor whining and complaining.
- Stay seated until the family is finished eating.
- Assist with preparation and clean-up.

Shaping

- Treat as food phobias - Neophobia
- Slowly introduce foods at least-intrusive levels before having to eat it
- Like successive approximations when getting over a fear of snakes or heights.
- Sometimes we can pinpoint a specific event paired with eating to create the phobia.
- We may see some foods as easy, but it's the child's perception that determines the phobia

Steps to Eating

- Increase tolerance to foods
  - On the table, near or on child's plate
- Increase interaction with foods
  - Stab, stir, touch with hands, serving others
- Increase nearness of food to mouth
  - Smell, touch to lips
- Increase tasting of food with tongue
  - Licking, touching food to tongue
- Take a small bite

Shaping - Case Example

- Rosie – 6/y girl, with autism, verbal
- Selectivity – brand
- Refusal – Visual level, severe behaviors
- Repeated exposures to tolerate foods in her presence
- Food chaining (fading) + Steps to eating (Shaping) with chicken nuggets.
- Paired each new food with a preferred
- Shaping was needed more in the beginning
- Was able to compare and contrast the items

Shaping - Case Example Ct'd

- OP lasted 12 months, (1/mo)
- Some follow-through at home
- She had more tantrums at home than in therapy
- Her terminal goal was chicken strips
- Also added all previous foods into diet – now had a variety of chicken she could eat, and could go out to eat with her family

Fading

- Slow introduction of volume of food presented, changing cups or plates, to different seating
- Helps with kids who are rigid and have set preferences
- Similar to shaping in that both involve a slow progression to move towards appropriate eating
- With shaping, you change the response
- With fading, you change the stimulus

Food Chaining

- Food chaining uses fading to introduce new foods.
- Pair preferred foods with similar, but different foods (e.g. plain cheerios with honey nut cheerios)
- Continue to pair different flavors, or different brands to expand the repertoire of a preferred food.

Chicken Nuggets Food Chain

- Chicken Nuggets - McDonald's
  - Wendy's
  - Burger King
  - White meat Tyson nuggets
  - Pop corn chicken
  - Chicken tenders or strips
  - Fried Chicken (skin only, no bone)
  - Baked chicken
  - Grilled chicken

French Fry Food Chain

- French Fries – McDonald's
  - Burger King
  - Wendy's
  - Frozen
  - Crinkle cut
  - Steak Fries
  - Potato wedges (like KFC)
  - Fried potato slices
  - Tater tots
  - Hash browns
  - Home fries
  - Baked potatoes
  - Mashed potatoes

Cooperation with Chaining

- 15-20 presentations at each level
- Pair a preferred food with a new version and discuss same and different.
- Do the Touch-smell-kiss-lick- bite procedure to assist with trying new foods. You may have to stay at one level for a while before you move forward.
- Do a consistent amount of trials at each step, so s/he becomes comfortable with that food.
- When offering the next food in the chain, you can pair it with the original preferred food or the most recent food s/he ate.
- Once a food is acquired it can go into a rotation, alternating with the original preferred food.
- If you get a lot of resistance, drop back to the previous step and regain compliance
- Practice at a snack time Offer rewards immediately for participating.

Fading – Case Example

- Edward -7 y/o boy, Moderate autism, non verbal
- Severe refusal including aggression
- Texture specific – crunchy, carbs mainly
- 2nd admission to Day treatment
- 8 week program

Fading - Case Example, Ct'd

- Used crunchy veggies (carrots, raw peppers, lettuce)
- 3 trials a session, one step per session. 1 food at a time
- Had to touch the food five times in a row, then got a one minute break with preferred toys.
- Used HOH as necessary
- Moved to next step when successful across 4 trials
- When offered peppers, he did the kiss step on his own
- Each food took less time to acquire than the 1 before.

Positive Reinforcement

- Very powerful tool, difficult to manage
- Anything that follows behavior and the behavior increases over time as a result.
- Hard to identify what items or activities will work as reinforcers.
- Kids preferences change quickly, even moment to moment
- We have to change with them.

Characteristics of Reinforcement

- Contingent – applied just to target behavior
- Specific – child should know exactly what behaviors to emit and what will happen
- Reasonable – relatively easy to complete
- Immediate – as soon as behavior occurs
- Value – must be worth the effort to earn
- Each time – reward each instance of behavior
- Use reminders – Charts, PECS, etc

Identifying Reinforcers

- Watch them play or ask others
- Reinforcer Survey
- Reinforcer assessment
  - Ranked order
  - Put 4-6 toys in front of the child and ask to pick one
  - List each one chosen in order from first to last
  - May do a few times to make sure s/he chooses the same thing
  - Relatively easy and quick

Common Questions?

- Why don't sticker charts work?
- Rewards work for a little while and then stop.
- Child never consistently plays with the same thing.
- How do I chose a reinforcer if my child doesn't like to "play?"
- Why do I have to buy prizes for my child just to take a few bites?

Implications for Behavioral Strategies

- Address one goal at a time – volume, variety, sitting, cooperation
- Give each strategy time to work – Persist
- Don't give up on reinforcement – Change with it
- Practice! The best chance of success is to make sure you practice at home every day using the strategies you learned in therapy.

Research

- Research on feeding in ASD has increased over last 10 year.
- Applied Behavior Analysis (ABA) techniques
- Mostly done on day treatment or inpatient settings
- Involve extinction, punishment and reinforcement
- Successful with severe behavior disorders

Outpatient Research

- Minimal research conducted with shaping and food chaining techniques.
- Need to show there are other alternatives to intensive behavior problems.
- We are currently researching the effect that shaping has on increasing variety of foods.
- In conjunction with a school for young kids with disabilities.

Kirch Developmental Center - Feeding Program

- In the initial assessment the parent and child meet with a psychologist and a registered dietitian.
- Families will complete a 3 day food diary, which will be analyzed to make sure your child is getting all the nutrients they need. Information from this analysis will be used to guide food choices during treatment.
- May start with 4-6 sessions of therapy depending on needs of the child and family.
- Families would bring their child, preferred foods, and new/novel foods to try.

Kirch Developmental Center - Feeding Program

- Strategies such as positive reinforcement, shaping and fading will be used to increase acceptance of new foods.
- Ongoing nutritional analysis to determine the foods your child need to improve their nutritional status.
- Provide homework so families can practice these strategies at home.
- Cost:
  - Feeding therapy may be covered by insurance, self-pay, or grant funding.
  - Family should talk with their insurance company to determine what services are covered.

Summary

- Every child with ASD is unique and the characteristics of ASD can greatly impact feeding and nutrition
  - Feeding Disorders are complex and cannot be attributed to one cause
- Address medical and neurodevelopmental concerns first before behavioral
- It is important to be aware of the current dietary and behavioral trends used by patients and families and support them with evidence based practice

Summary

- Be supportive and empathetic with families – work collaboratively to seek the best outcomes and improve the quality of life
- Multi-disciplinary care is essential
- Establish appropriate structure and rules for mealtimes - Make meals fun!

In the Works:

- Additional analysis and publication of data from ATN Diet and Nutrition Study
- Tool-Kits for physicians and families on:
  - Constipation
  - Fiber
  - PICA
  - Toileting
- Nutrition education materials specifically for families of children with ASD
- Behavioral Feeding and Nutrition Studies

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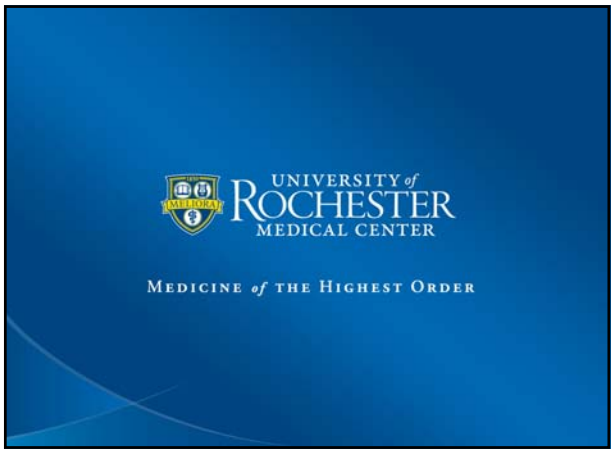
Resources

- Academy of Nutrition and Dietetics
  - http://www.eatright.org/
- Autism Speaks Toolkits
  - http://www.autismspeaks.org/site-wide/tool-kit
- DRI Books – Institute of Medicine
  - http://www.nap.edu/catalog.php?record_id=9956
- DRI Tables (United States Department of Agriculture
  - http://fnic.nal.usda.gov/dietary-guidance/dietary-reference-intakes/dri-tables
- Feeding Books
  - Food Chaining - Cheri Fraker et al 2007
  - Treating Eating Problems of Children with ASD and Developmental Disabilities - Keith Williams and Richard Foxx, 2007
- Office of Dietary Supplements (NIH)
  - http://ods.od.nih.gov/
- National Center for Complementary and Alternative Medicine (NIH)
  - http://nccam.nih.gov/

Thank You!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