

# Increasing Awareness of Potential Nutritional Calamities in Children with Autism

**RDs in Practice: Specialized Diets and Nutritional  
Management of Gastrointestinal Issues  
Children's Hospital Orange County  
5.13.15**

Carol Henderson, PhD, RD  
Medical Advisor, Autism  
Nutricia North America,  
Rockville, MD

# Objectives:

1. Understand diagnostic criteria for ASD and its prevalence.
2. Recognize the unusual manifestations of GI issues in hypo- or non-verbal children with autism and how they may be identified.
3. Recognize primary contributors to nutritional deficits in children with ASD including: Feeding problems, GI issues and food allergies.
4. Describe commonly occurring nutritional deficits that have been reported in children with ASD.

# Background: Autism diagnosis by DSM V

Must meet criteria A, B, C, and D: (ASD term eliminated)

- A. Persistent deficits in social communication and social interaction across contexts, not accounted for by general developmental delays
- B. Restricted, repetitive patterns of behavior, interests, or activities
- C. Symptoms must be present in early childhood (but may not become fully manifest until social demands exceed limited capacities)
- D. Symptoms together limit and impair everyday functioning

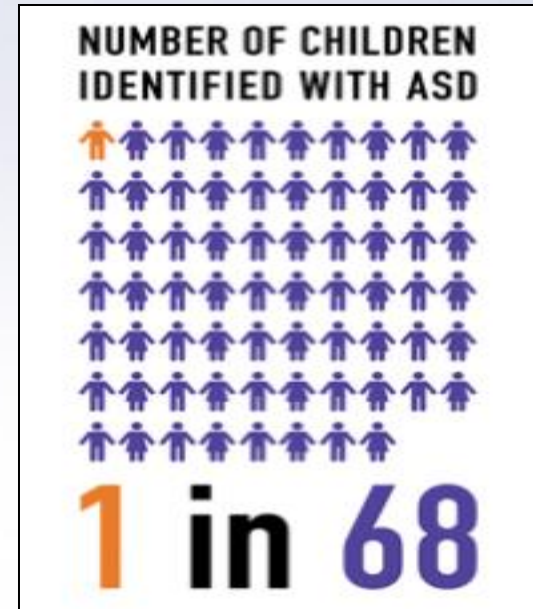
American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington, VA: American Psychiatric Association; 2013.

# What is the U.S. prevalence of autism in 2014?



CDC Press Release. March 27, 2014

<http://www.cdc.gov/media/releases/2014/p0327-autism-spectrum-disorder.html>. Accessed March 27, 2014.



1 in 42 boys  
have ASD

1 in 189 girls  
have ASD

- ASD is ~5 times more common among boys than girls

# Who is affected?

- Occurs in all racial, ethnic and SES groups
- Symptoms are often evident by age 2
- Median age for diagnosis = 4 years 5 months
- Diagnosis can be made as early as 18 months



# Autism is Heterogeneous

## ● Co-morbidity in Autism commonly discussed:

1. Genetic syndromes
2. Associated psychopathology
3. Medical conditions:
  - Epilepsy
  - GI Disorders
  - Food Allergy
  - Immune Dysregulation
  - Catatonia



# What are known causes/risk factors for Autism?

- ◆ Scientists aren't certain about what **causes** autism
- ◆ Likely many causes for the multiple types of autism

## Environmental, biologic and genetic risk factors:

1. Genes
2. Genetic or chromosomal conditions: Fragile X syndrome, tuberous sclerosis
3. Drugs during pregnancy: valproic acid and thalidomide
4. Greater risk of ASD if sib has been diagnosed with ASD
5. Children born to older parents
6. Critical age for developing ASD occurs before, during, and immediately after birth

<http://www.cdc.gov/ncbddd/autism/facts.html> . Accessed May 10, 2015.

# Can autism be managed?

- ◆ There is no cure for autism
- ◆ Therapies and behavioral interventions exist
  - Remedy symptoms
  - Can bring about substantial improvement
- ◆ Ideal treatment plan is coordinated and individualized
  - Educational therapies
  - Medications
  - Other management options: **Nutrition**
- ◆ The earlier the intervention, the better



**Each child's symptom profile is unique**



# Medication Use in ASD

- ◆ In U.S. 33,565 children with autism, 64% had prescription for 1 psychotropic medication, 35% had psychotropic polypharmacy

- Stimulants
- Antidepressants
- Antipsychotics
- Antianxiety agents
- Mood stabilizers

Spencer et al. *Pediatrics* 2013;132:833–840.

Mandell et al. *Pediatrics*. 2008;121(3)

- ◆ Medication use is highest among older children
- ◆ Other drugs used can contribute to excessive weight gain (SSRI) or insufficient weight gain (stimulants)

Coury et al. *Pediatrics* 2012;130:S69–S76.

Spencer et al. *Pediatrics* 2013;132:833–840.

# Medication Use in ASD

Health Risk	Nutritional Risk	Associated Medications
<b>Osteoporosis/Bone Fracture</b>	Altered metabolism of Vitamins B <sub>12</sub> , B <sub>6</sub> , D, K, Calcium, magnesium	<b>Anticonvulsants</b>
<b>Bone demineralization</b>	Decreased absorption of calcium and magnesium	<b>Proton Pump Inhibitors (PPI)</b>
<b>Impaired eating / swallowing</b>	Altered facial and tongue musculature  Xerostomia Depressed oral awareness and voluntary muscle control  Gum hypertrophy	<b>Anti-psychotics</b> (Risperadone, Chlorpromazine, Olanzapine, Quetiapine, Lithium)  <b>Serotonin Selective Reuptake Inhibitors</b> <b>Anticonvulsants</b> (Clonazepam, Phenobarbital, Gabapentin, Valproic Acid)  <b>Anticonvulsants</b> (Phenytoin)
<b>Obesity, metabolic disorder</b>	Insulin resistance, excessive weight	<b>Antipsychotics</b> (Risperadone) <b>Anticonvulsants</b> (Gabapentine)
<b>Reduced appetite</b>	Poor weight gain, insufficient caloric or nutrient intake	<b>Anticonvulsants</b> (Topiramax) <b>Stimulants</b> (Methylphenidate, Atomoxetine, Amphetamines)

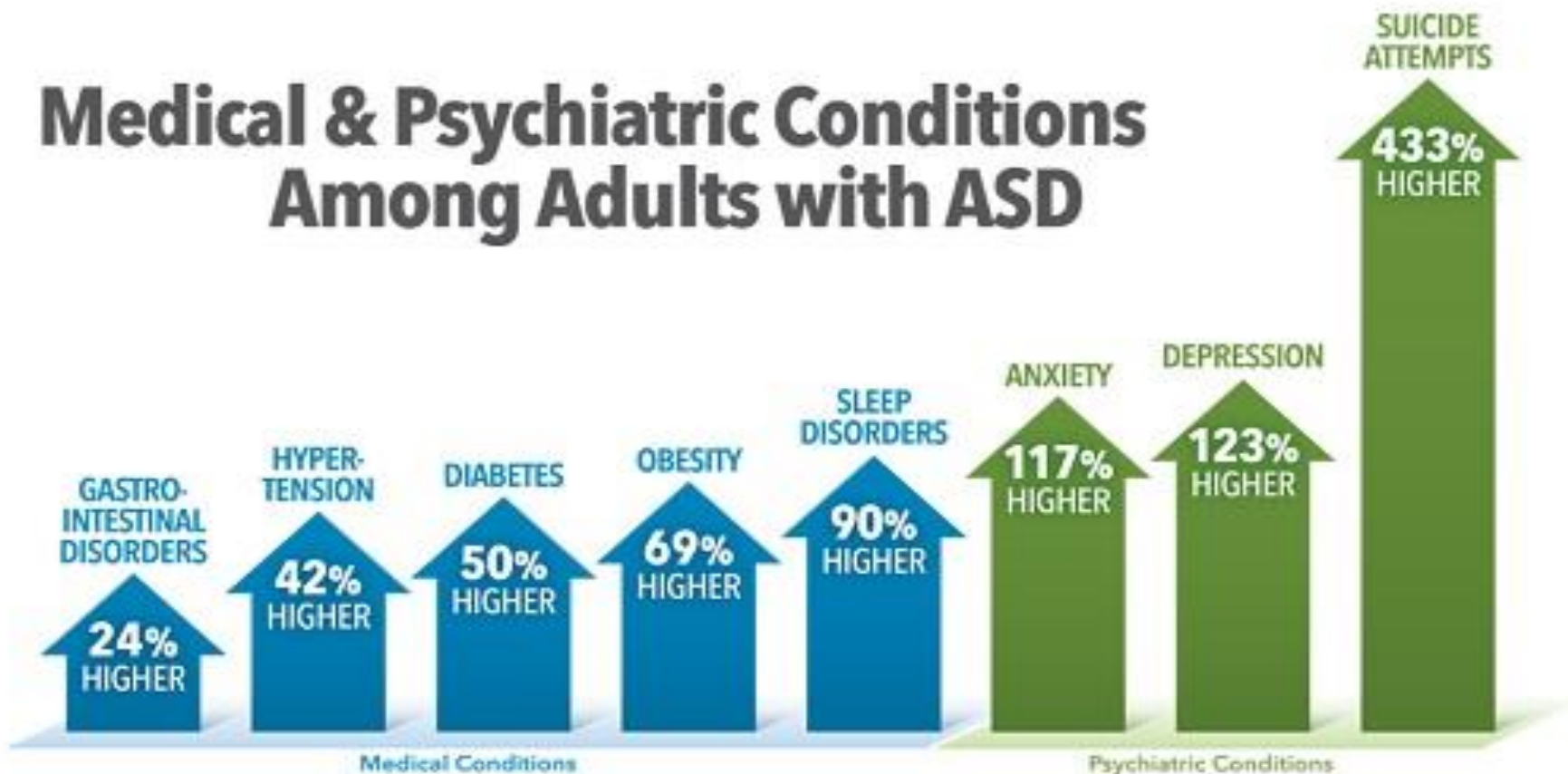
## Medical Comorbidities in Autism: Challenges to Diagnosis and Treatment

Margaret L. Bauman

*Department of Neurology, Department of Pediatrics, and Lurie Center LADDERS program, Massachusetts General Hospital, and Department of Neurology, Harvard Medical School, Boston, Massachusetts*

- “Individuals with ASD have the same medical disorders/diseases that affect neurotypical persons, although they may present differently.”
- Many “autistic behaviors,” such as aggression and self-injurious activity, have been attributed to be just “part of the autism.” As a result, the patient with ASD is frequently referred for behavioral management and/or psychopharmacological intervention because of failure to interpret these behaviors as indicators of pain and discomfort, suggesting an underlying medical condition.

# Medical & Psychiatric Conditions Among Adults with ASD



Health Care Providers



Social Services



Education



Employment



Community



Family / Care Givers

Figures as compared to adults without ASD.

DIVISION of RESEARCH  
AUTISM RESEARCH PROGRAM

Image courtesy Lisa Croen, Kaiser Permanente Division of Research

# Something wise to keep in mind when you see a patient with autism . . .



“Clinicians should expect individuals with autism to experience medical issues in the same frequency as their non-affected peers.”

*Pediatrics* 2010; 125;S1.

Timothy Buie, MD - Director of Pediatric Gastroenterology and Nutrition, Lurie Center for Autism; Massachusetts General Hospital for Children and Harvard Medical School

# Autism: Original disease description:

Kanner L. Autistic disturbances of affective contact. *Nervous Child* 1943; 2:217-250.

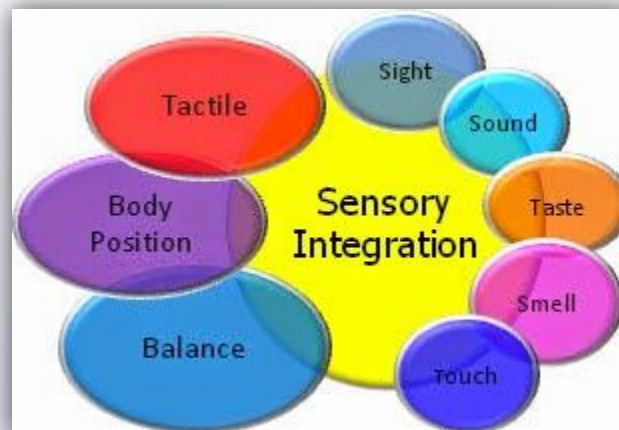
- 6/11 Cases described below have common issues . . .

#1		What do these cases have in common?
#4		What underlying medical issues or conditions come to mind?
#5		GER
#7		Food allergies
#8		Feeding problems
#10		

# Sensory processing deficits (SPDs) in autism that may affect feeding

- ◆ A person with SPD finds it difficult to process and act upon information received through the senses and turn them into appropriate motor and behavioral responses.
  - Neurological “traffic jam”
  - Creates challenges in performing everyday tasks
  - Motor clumsiness, behavioral problems, anxiety, depression, school failure, and feeding difficulties

<http://www.spdfoundation.net/about-sensory-processing-disorder/> . Accessed May 10, 2015.





# What **additional problem** is more likely to occur in children with autism compared to typically developing children?

## ◆ 5.1-fold increase in odds of having feeding problems:

Sharp et al. *J Autism Dev Disord.* 2013 43:2159–2173.

- Food selectivity-beyond “picky”
- Food refusal
- Oral sensory defensiveness
- Behavioral rigidity

## ◆ Children with ASD have more feeding problems and food selectivity compared to their peers

Bandini LG et al. *Pediatr.* 2010 Aug;157(2):259-64.





# Have you considered the child's motor skills?

- ◆ Are often overlooked
- ◆ **“Look beyond the mouth”**
  - Assess motor skills – low skills more difficult to self-feed
- ◆ A reason for food refusal may be because the food is too difficult to manage
- ◆ Restricted diet limits opportunity to progress motor skills
  - Eg., if you only eat purees, you might not have the experience to have learned how to chew food with a greater texture

# Motor skill assessment and intervention

- ◆ **Assessment:** look at child's food choices
  - What are the preferred vs. most effective food textures?
  - Monotonous, limited diet
    - **Color**, shape, integrity, textures, temperature etc.
  - Environment: location-specific eating; noise, smell, visual
- ◆ **Intervention:**
  - Collaboration: RDs working with OT/SLP - align their recommendations so child receives the most effective textures
  - Evaluate the whole body posture and positioning
  - Recommendations need to adapt to child's individual profile

# Odyssey of GI issues and Autism

**PEDIATRICS**<sup>®</sup>  
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

**Evaluation, Diagnosis, and Treatment of Gastrointestinal Disorders in Individuals With ASDs: A Consensus Report**  
Timothy Buie, Daniel B. Campbell, George J. Fuchs III, Glenn T. Furuta, Joseph Levy, Judy VandeWater, Agnes H. Whitaker, Dan Atkins, Margaret L. Bauman, Arthur L. Beaudet, Edward G. Carr, Michael D. Gershon, Susan L. Hyman, Pipop Jirapinyo, Harumi Jyonouchi, Koorosh Kooros, Rafail Kushak, Pat Levitt, Susan E. Levy, Jeffery D. Lewis, Katherine F. Murray, Marvin R. Natowicz, Aderbal Sabra, Barry K. Wershil, Sharon C. Weston, Lonnie Zeltzer and Harland Winter  
*Pediatrics* 2010;125:S1  
DOI: 10.1542/peds.2009-1878C

The online version of this article, along with updated information and services, is located on the World Wide Web at:  
[http://pediatrics.aappublications.org/content/125/Supplement\\_1/S1.full.html](http://pediatrics.aappublications.org/content/125/Supplement_1/S1.full.html)

**PEDIATRICS**<sup>®</sup>  
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

**Recommendations for Evaluation and Treatment of Common Gastrointestinal Problems in Children With ASDs**  
Timothy Buie, George J. Fuchs, III, Glenn T. Furuta, Koorosh Kooros, Joseph Levy, Jeffery D. Lewis, Barry K. Wershil and Harland Winter  
*Pediatrics* 2010;125:S19-S29  
DOI: 10.1542/peds.2009-1878D

The online version of this article, along with updated information and services, is located on the World Wide Web at:  
[http://www.pediatrics.org/cgi/content/full/125/Supplement\\_1/S19](http://www.pediatrics.org/cgi/content/full/125/Supplement_1/S19)

What problems are more likely to occur in children with autism compared to typically developing children?

◆ 3.2-fold increase in odds of having **GI issues**

4 most common symptoms:

1. Diarrhea
2. Constipation
3. Reflux
4. Abdominal pain

McElhanon et al. *Pediatrics* 2014 May;133(5):872-83.



## GI Disorders in Children with ASD – Overall Prevalence: 9 – 91%

Horvath K et al. *Curr Gastroenterol Rep* 2002 Jun; 4(3):251-8.

Objective Signs/Symptoms	Prevalence
Constipation	6-45%
Diarrhea	3-77%
Belching/Vomiting	5-30%
Flatulence	2-41%
<b>Reported-suspected Signs/Symptoms</b>	
Abdominal pain or discomfort	?
Enteric infections (dysbiosis)	?
Gastritis (requires EGD)	?
Gastroesophageal reflux (requires an EGD)	?
Lactose intolerance	?
Leaky gut	?
Maldigestion	?
Malabsorption	?

**GI issues in ASD are common and parent-reported concerns correlate well with physician assessment.**

Gorrindo P et al. *Autism Res.* 2012 Apr; 5(2):101-8.

# Medical Issues: GI and Autism

Findings	References
Inflammation	<ul style="list-style-type: none"><li>▪ Horvath K et al. <i>Curr Gastroenterol Rep</i> 2002 Jun; 4(3): 251-8.</li></ul>
Increased intestinal permeability	<ul style="list-style-type: none"><li>▪ D'Eufemia P et al. <i>Acta Paediatr</i> 1996 Sep;85(9):1076-9.</li></ul>
Impaired digestion of carbohydrates	<ul style="list-style-type: none"><li>▪ Horvath K et al. <i>Curr Gastroenterol Rep</i> 2002 Jun;4(3): 251-8.</li><li>▪ Kushak RI et al. <i>Autism</i>. 2011 May;15(3):285-94.</li><li>▪ Williams BL. <i>PLoS ONE</i> 2011 6(9): e24585.</li></ul>
Disruption of typical microbiota	<ul style="list-style-type: none"><li>▪ Finegold SM et al. <i>Anaerobe</i>. 2010 Aug;16(4):444-53.</li><li>▪ Williams BL. <i>PLoS ONE</i> 2011 6(9): e24585.</li><li>▪ Kang DW, et al. <i>PLoS One</i>. 2013 Jul 3;8(7):e68322.</li></ul>
Altered immune response to inflammation	<ul style="list-style-type: none"><li>▪ Ashwood P et al. <i>Clin Dev Immunol</i>. 2004 Jun;11(2):165-74</li></ul>

# Traditional vs. unconventional symptom recognition

Typical Child	Autism/Non-Verbal Child
Hurts to swallow	Intermittent or continuous tantrum, feeding refusal
Hard to swallow	Banging on chest, textural preferences
Something stuck in throat	Pointing to throat, tapping site of distress
Have heartburn Stomach hurts after eating	Irritability after meals or at bedtime; poor sleep patterns
Reports pain	Self-injury, aggression

# New symptom development think medical/GI issues





# Evaluation, Diagnosis and Treatment of GI Disorder in Individuals with ASDs: A Consensus Report Buie et al. *Pediatrics* 2010| 125; S1.

**TABLE 6** Key Take-Away Messages

Individuals with ASDs whose families report gastrointestinal symptoms warrant a thorough gastrointestinal evaluation.

All of the common gastrointestinal conditions encountered by individuals with typical neurologic development are also present in individuals with ASDs.

The communication impairments characteristic of ASDs may lead to unusual presentations of gastrointestinal disorders, including sleep disturbances and problem behaviors.

Caregivers and health care professionals should be alert to the presentation of atypical signs of common gastrointestinal disorders in patients with ASDs.

If a person with an ASD is on a restricted diet, professional supervision can help to identify and treat nutritional inadequacy.



What problems are more likely to occur in children with autism compared to typically developing children?

◆ 2.2-fold increase in odds of having **food allergies**

Lyall et al. *Autism Research*. 2015 Feb 26. doi: 10.1002/aur.1471.



# Food Allergies

- ◆ “Food allergy” refers to adverse immunologic reactions to food
- ◆ Usually IgE-mediated
- ◆ Both acute reactions (hives and anaphylaxis) and chronic disease (asthma, atopic dermatitis) and gastrointestinal disorders like Eosinophilic Esophagitis (EoE) may be caused or exacerbated by food allergy

Sicherer et al. *Am Fam Physician*. 1999 Jan 15;59(2):415-424.

TABLE 2

**Food Allergy: Target Organs and Disorders**

<i>TARGET ORGAN</i>	<i>IGE-MEDIATED DISORDER</i>	<i>NON-IGE-MEDIATED DISORDER</i>
Skin	Urticaria and angioedema	Atopic dermatitis
	Atopic dermatitis	Dermatitis herpetiformis
Gastrointestinal tract	Oral allergy syndrome	Proctocolitis
	Gastrointestinal “anaphylaxis”	Enterocolitis
	Allergic eosinophilic gastroenteritis	Allergic eosinophilic gastroenteritis
		Enteropathy syndrome
		Celiac disease
Respiratory tract	Asthma	Heiner syndrome
	Allergic rhinitis	
Multisystem	Food-induced anaphylaxis	
	Food-associated, exercise-induced anaphylaxis	

# Allergy Testing



“Children with ASD can be difficult to examine, often due to poor cooperation and difficult office behavior. In addition, many ASD individuals are nonverbal or hypo-verbal, and many of these patients have deficits in sensory processing, which are features that prevent them from reporting pain or accurately localizing discomfort.”

Bauman, M. *Neurotherapeutics*. 2010 Jul;7(3):320-327.

# Restricted diets are common in children with autism, especially in those with Gastrointestinal Issues and Food Allergies

## Three reasons why restricted diets are common in autism:

### 1. Parent directed

- Parents often initiate unproven biological-based therapies—herbs, vitamins, and supplements<sup>1-3</sup>
- Most frequent parent-initiated diet is the gluten-free, casein-free diet<sup>3-6</sup>

### 2. Child self restricts

- Children with autism often exhibit idiosyncratic food choices/food selectivity and rigid behaviors and have a 5.1 greater odds of feeding problems compared to typically developing peers<sup>7-9</sup>

### 3. Healthcare Professional initiated

Specific antigen removal is a recommended management strategy for:

- GI conditions (E.g., EoE, GERD)<sup>10, 11</sup>
- Food allergies<sup>12,13</sup>

1. Hanson E et al. *J Autism Dev Disord.* 2007 Apr;37(4):628-636.

2. Huffman LC et al. *J Dev Behav Pediatr.* 2011 32:56 –68.

3. Wong HH et al. *Autism Dev Disord.* 2006 Oct;36(7):901-909.

4. Elder JH. *Nutr Clin Pract.* 2008 Dec-2009 Jan;23(6):583-588.

5. Goin-Kochel RP et al. *Res Autism Spectr Disord.* 2009. 3(2):528- 537.

6. Pennesi CM et al. *Nutr Neurosci.* 2012 Mar;15(2):85-91.

7. Sharp WG et al. *J Autism Dev Disor* 2013. 43:2159-2

8. Bandini LG et al. *J Pediatr.* 2010 Aug;157(2):259-264.

9. Zimmer MH et al. *J Autism Dev Disor* 2012. 42:549-556.

10. Henderson CJ et al. *J Allergy Clin Immunol.* 2012 un;129(6):1570-1578.

11. Wechsler JB et al. *J Asthma Allergy.* 2014 May 24;7:85-94.

12. Groetch M et al. *Pediatr Allergy Immunol.* 2013 May;24(3):212-221.

13. Meyer R et al. *Clin Transl Allergy.* 2014 Oct 3;4(1):31.



# What may occur if diet is restricted?

- ◆ Restrictions may lead to **nutritional deficiencies** and **malnutrition**
  - Macro- and micro-nutrient deficiencies:
  - Protein, iron, vitamins A, B<sub>12</sub>, D, niacin, calcium, folate, zinc

Nylund et al. *J Parenter Enteral Nutr* Feb 2015 39: 231-256 (abstract 2076768).

Graf-Myles J et al. *J Dev Behav Pediatr*. 2013 Sep;34(7):449-59.

Herndon AC et al. *J Autism Dev Disord*. 2009 Feb;39(2):212-22.

Hyman SL et al.. *Pediatrics*. 2012 Nov;130 Suppl 2:S145-53.

Shmaya Y et al. *Res Dev Disabil*. 2015 Mar;38:1-6.



# Although normal growth is important, it may *not* equate to adequate nutritional intake in autism

Sharp et al. *J Autism Dev Disor* 2013. 43:2159-2173

Shmaya Y et al. *Res Dev Disabil*. 2015 Mar;38:1-6.



**LOOK BEYOND THE GROWTH CHART**



# RDs need to wear many hats . . .

## **“Extra” assessment considerations:**

1. Detailed histories: GI issues, feeding patterns, food allergy/intolerances, family (medical history, caregivers)
2. Detailed physical assessment: Bowel habits and patterns, skin, sleep habits, pain/discomfort (aggressive or self-injury)
3. Behavioral pattern (including feeding behaviors)
4. Detailed diet history: nutritional adequacy; Establish a baseline for determining effectiveness of dietary change
5. Inquire as to who is involved in the child’s care
  - Therapists, school personnel, WIC RDs, physicians (all disciplines)

**CONSULT AS NECESSARY AND COLLABORATE ALWAYS**

# Nutritional maladies in ASD

## **Permanent Visual Loss Due to Dietary Vitamin A Deficiency in an Autistic Adolescent**

*J Child Neurol.* 2009 Oct;24(10):1288-9.

Gary N. McAbee, DO, JD, Debra M. Prieto, MD, Janet Kirby, RD, MBA, Ann Marie Santilli, BS, and Rajendra Setty, MD

## **Ophthalmic Manifestations of Vitamin A and D Deficiency in Two Autistic Teenagers: Case Reports and a Review of the Literature**

*Case Rep Ophthalmol.* 2015 Jan 24;6(1):24-29.

Emma Duignan<sup>a</sup> Paul Kenna<sup>a</sup> Rosemarie Watson<sup>b</sup> Susan Fitzsimon<sup>c</sup>  
Donal Brosnahan<sup>a, b</sup>

*JPEN J Parenter Enteral Nutr.* 2012 Nov;36(6):753-5. doi: 10.1177/0148607111436280. Epub 2012 Feb 7.

## **Fried-potato diet causes vitamin A deficiency in an autistic child.**

Tanoue K<sup>1</sup>, Matsui K, Takamasu T.

*Pediatrics.* 2010 Oct;126(4):e967-70. doi: 10.1542/peds.2009-2975. Epub 2010 Sep 20.

## **Vitamin B12 optic neuropathy in autism.**

Pineles SL<sup>1</sup>, Avery RA, Liu GT.

*Pediatr Radiol.* 2013 Oct;43(10):1396-9. doi: 10.1007/s00247-013-2688-z. Epub 2013 Apr 19.

## **Scurvy in an autistic child: MRI findings.**

Gongqidi P<sup>1</sup>, Johnson C, Dinan D.

*BMJ Case Rep.* 2014 Mar 20;2014. pii: bcr2013202581. doi: 10.1136/bcr-2013-202581.

## **Nutritional implications of selective eating in a child with autism spectrum disorder.**

Keown K<sup>1</sup>, Bothwell J, Jain S. >2.5 L Carrot Jc/day; elevated serum carotene and Vit D deficiency

*Nutr Clin Pract.* 2015 Feb;30(1):100-3. doi: 10.1177/0884533614541483. Epub 2014 Aug 11.

## **Vitamin B deficiencies in a critically ill autistic child with a restricted diet.**

Baird JS<sup>1</sup>, Ravindranath TM<sup>2</sup>.

Fast food fried chicken; Deficiencies B vitamins, thiamine, pyridoxine

*Child Care Health Dev.* 2008 Mar;34(2):276-8. doi: 10.1111/j.1365-2214.2007.00806.x.

## **Symptomatic nutritional rickets in a teenager with autistic spectrum disorder.**

Stewart C<sup>1</sup>, Latif A.

*Child Care Health Dev.* 2006 Sep;32(5):601-2.

## **Food faddism causing vision loss in an autistic child.**

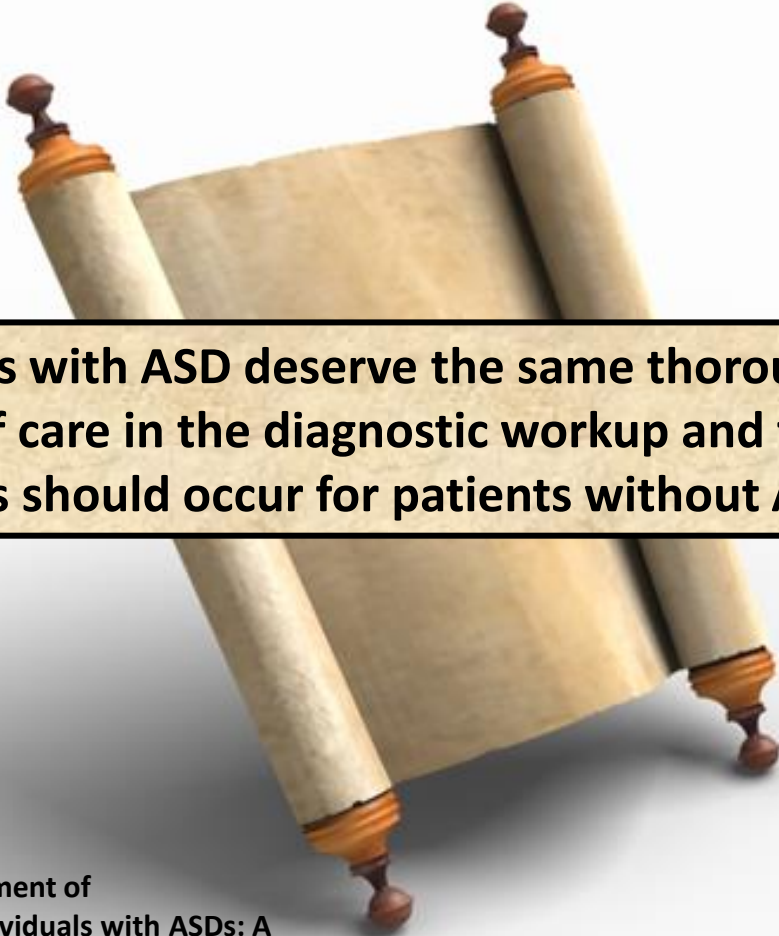
Uyanik O<sup>1</sup>, Doqanqun B, Kayaalp L, Korkmaz B, Dervent A.

*J Drugs Dermatol.* 2002 Jul;1(1):67-9.

## **A case of scurvy in an autistic boy.**

Monks G<sup>1</sup>, Juracek L, Weigand D, Magro C, Cornelison R, Crowson AN.

# Bill of Rights for Individuals with Autism



**“Individuals with ASD deserve the same thoroughness and standard of care in the diagnostic workup and treatment of GI concerns as should occur for patients without ASD.”**

**Evaluation, Diagnosis, and Treatment of  
Gastrointestinal Disorders in Individuals with ASDs: A  
Consensus Report**

*Buie T et al. Pediatrics 2010;125;S1*

# Summary: Key recommendations for HCPs caring for children with ASD

## **In clinical settings, healthcare providers should:**

- 1. Include assessment of feeding problems and nutrient intake as part of early routine medical evaluations.**
- 2. Not rely exclusively on typical anthropometrics (HT, WT, BMI) to assess overall health status.**
- 3. Educate parents/caregivers regarding potential empirical, detrimental non-proven interventions.**
- 4. Refer to a Registered Dietitian/Nutritionist to guide dietary intervention strategies.**
- 5. Assess for potential under/over supplementation.**
- 6. Foster interdisciplinary collaboration and communication to help improve the level of care provided.**
- 7. Consider increased risk for diet-related chronic diseases that may develop in adulthood.**

# Summary:

1. Understand diagnostic criteria for ASD and its prevalence.
2. Recognize the unusual manifestations of GI issues in hypo- or non-verbal children with autism and how they may be identified.
3. Recognize primary contributors to nutritional deficits in children with ASD including: Feeding problems, GI issues and food allergies.
4. Describe commonly occurring nutritional deficits that have been reported in children with ASD.