## Autism is ACTIONABLE: Integrated, Effective Approaches Can Make a HUGE DIFFERENCE NOW

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# NEW SCIENCE MEANS IT'S TIME FOR NEW POLICY

#### Changing Concepts and Findings on Autism Sir Michael Rutter, JADD, 2012

- "New research findings provide major challenges regarding our understanding of the concept of autism. ..... It is concluded that, although there have been major research advances.... there is a need for a reconceptualization and an avoidance of claims that go beyond the evidence."
- In fact, many of the things we have believed about autism have gone beyond the evidence. We were doing the best we could. Now we have a great opportunity to regroup!

### Autism: WHY and HOW ?



#### www.autismWHYandHOW.org

- A framework for reflective inquiry and civil discourse
- Review of many perspectives, each with value
- We need to take the best from each to respond effectively

#### Emerging Science Leading to Major Reconceptualizations of What Autism <u>Is</u>

- Not a broken brain
  - Many with autism are highly gifted
  - Issues are often expression and coordination, not capability
- Not purely genetic
  - Environment plays big role
  - Number actually going up
- Not just brain
  - Whole body, multi-system involvement
- Not life sentence
  - Variable, changeable, treatable, some who lose diagnosis
  - Great potential

### Beyond Genes

- Not a Static Prevalence: Numbers going up
- Not Just Genes: Environmental Contributors
- Not Just a Few High-Impact Genes: Hundreds of Mostly Lower-Impact Genes
- Not Just Inherited Genes: De Novo Mutations (that children have but their parents don't – where do they come from??)
- Not Even Mainly Genes: Substantial Environmental Contribution
- Not Just Mutations: Epigenetics and Physiology
- Not just Human Genes: Gut Microbiome Genes

### Where are the Growing Numbers Coming From?



- Conclusion of largest autism twin study to date: Susceptibility to ASD has moderate genetic heritability and a substantial shared twin environmental component.
  - Hallmayer et al, July 2011, Arch Gen Psych

 Growing body of associations of environmental exposures with autism risk and prevalence

## INCREASING COSTS ARE UNARGUABLE -- AND AVOIDABLE BY BETTER POLICY

#### Reclassification won't make it go away

- New York State in the US spends \$1 <u>Billion</u> every year or two just sending kids out of state for residential placement – NOT COUNTING all the other costs for kids still living at home, and for adults
- Autistic children are being abandoned in emergency rooms because their parents can't handle them
  - This is a failure of the SYSTEM, not the parents
- Autism has a huge spectrum, from highly articulate to severely impaired, non-verbal, aggressive and/or ill
- Policy needs to account for the full spectrum

### Canadian report title: Pay Now or Pay Later

- The costs will come back at us
- They are coming back at us right now
- It will only get worse unless we change course

Current policy is being driven by old assumptions about autism

- These old assumptions close off options
- They don't take advantage of all the actionable features of autism
- They don't have more truth value than newer models

• While we wait for many delicate scientific points to be clarified, we can choose to act in common sense scientifically rational ways that can improve the situation

## NOT JUST AUTISM

#### Drop in Infectious and Rise in Chronic Immune-related disorders



Figure 1. Inverse Relation between the Incidence of Prototypical Infectious Diseases (Panel A) and the Incidence of Immune Disorders (Panel B) from 1950 to 2000.

In Panel A, data concerning infectious diseases are derived from reports of the Centers for Disease Control and Prevention, except for the data on hepatitis A, which are derived from Joussemet et al.<sup>12</sup> In Panel B, data on immune dis-

#### Rise in Autism Prevalence v. Other Major Chronic Conditions in US

**Autism** 



Figure 1. Inverse Relation between the Incidence of Prototypical Infectious Diseases (Panel A) and the Incidence of Immune Disorders (Panel B) from 1950 to 2000.

In Panel A, data concerning infectious diseases are derived from reports of the Centers for Disease Control and Prevention, except for the data on hepatitis A, which are derived from Joussemet et al.<sup>10</sup> In Panel B, data on immune disorders are derived from Swarbrick et al.,<sup>10</sup> Dubois et al.,<sup>11</sup> Tuomilehto et al.,<sup>14</sup> and Pugliatti et al.<sup>16</sup>

### Autism Under the Skin – More than Meets the Eye

To the social eye you see a disconnected, disruptive child <u>Under the skin</u> you see cells and organ systems in trouble.

• Brain:

- Hypersensitivity, reduced coordination
- Immune system:
  - Many issues that may include allergy, autoimmunity, inflammation
- Gut:
  - Many issues that may include depleted microbiome, transport problems, reflux, constipation, diarrhea, inflammation
- Metabolism:
  - Mitochondrial dysfunction, methylation abnormalities, many other less common metabolic glitches

#### Multi-system from the start? Kanner 1943 on *body* symptoms

Case 1: "Eating has always been a problem ....." for him. He has never shown a normal appetite."

Case 2: "...large and ragged tonsils."

- Case 3: diarrhea and fever following smallpox vaccination .... healthy except for large tonsils and adenoids.
- Case 4: vomited a great deal during his first year... feeding formulas were changed frequently ... tonsils were removed...
- Case 5: nursed very poorly ... quit taking any kind of nourishment at three months... tube-fed five times daily up to one year of age...At camp she slid into avitaminosis and malnutrition but offered almost no verbal complaints."
- Case 7: vomited all food from birth through the third month....

Case 8: feeding formula caused ...concern. ... colds, bronchitis, streptococcus infection, impetigo...

Case 9: none of the usual children's diseases." [? Overactive immune system?]

Case 10: frequent hospitalizations because the feeding problem ... repeated colds and otitis media

Case 11: was given anterior pituitary and thyroid preparations for 18 months

Kanner's original paper, discussed in Jepson 2007

"The co-morbidity burden of children and young adults with autism spectrum disorders."

- The comorbidities of ASD encompass disease states that are significantly overrepresented in ASD with respect to even the patient populations of tertiary health centers.
- Significantly more: epilepsy, schizophrenia, inflammatory bowel disease, other bowel disorders, CNS/cranial anomalies, diabetes type 1, muscular dystrophy, sleep disorders

Kohane, I. S., A. McMurry, et al. (2012). <u>PLoS One 7(4): e33224.</u>

#### HARVARD STUDY

Large Burden of Comorbidities in ASD Requires Broad Multidisciplinary Management

In a study of co-morbidities for 14,000 ASD patients in the Harvard system under the age of 35, the authors concluded:

"The comorbidities of ASD encompass disease states that are significantly overrepresented in ASD with respect to even the patient populations of tertiary health centers. This burden of comorbidities goes well beyond those routinely managed in developmental medicine centers and requires broad multidisciplinary management that payors and providers will have to plan for." [emphasis added]

Source: Kohane IS et al., (2012), The Co-Morbidity Burden of Children and Young Adults with Autism Spectrum Disorders. PLoS ONE 2012 (open access)

### "Physiology" has been under-represented in autism literature Bibliometric grap

(% of literature indexed in PubMed with "Physiology" subheading 1980-2011)

Bibliometric graph from Mark Corrales, MPA, 2013

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If you believe it's just "psychological," you won't look for physiology.

# All the parts really influence each other



# KEEP THE BRILLIANCE, LOSE THE ILLNESSES

#### There is no virtue to being sick

- The special perceptual capabilities and insights of many with autism are not the problem
- We can overcome the gross whole-body dysregulation medically.
- This will allow full potential to be expressed

## ROLE OF ENVIRONMENT

### Where do these problems come from? For most of us, probably environment

- We all have genetic vulnerabilities but they are usually not that serious
- Most strongly influential mutations in autism are rare
- Environment brings them to the surface
  - ➤The heavier the environmental load,
  - > the less genetic vulnerability you need to get sick





# The system has many ways to repair itself – But it needs SUPPORT to do this

#### Electron microscopy of therapeutically activated glia turning into "brain garbage collectors and transporters"

CELLS PICK UP CELLULAR DEBRIS, SIDLE OVER TO BLOOD VESSEL, AND DUMP DEBRIS INTO BLOOD VESSEL They do this after receiving an intensive nutritional stimulation program RIGA, S. et al., Ann. N.Y. Acad. Sci. 1067: 383–387 (2006) RIGA, S. et al., Arch. Gerontol. Geriatr. suppl. 4 (1994) 227-234



## AUTISM: NOT BORN BUT MADE

### Problems that often precede the autism diagnosis (plenty of data on this)

- Parents with health problems
  - Health issues, particularly Metabolic Syndrome (diabesity, hypertension, etc)
  - Exposures (toxins, EMF/radiation, stress) leading to genotoxicity and metabolic dysfunction
- Pregnancy issues
  - Inadequate nutrition
  - Exposures (toxics, medications, EMF, stress, infections, allergens)
- Infancy issues
  - Infections, antibiotics that injure microbiome
  - Allergens, lack of microbiome support
  - Insufficiency of various nutrients for handling load of stressors

### The ALLOSTATIC LOAD (or Total Load) Theory of Autism

#### TOO MANY NOXIOUS EXPOSURES → INCREASED FRAGILITY

- Toxicants, Radiation, Noise
- Infections
- Stress

#### POOR DEFENSES → NOT ENOUGH RESILIENCE

- Dietary insufficiencies
- Weak social supports
- Poor lifestyle
- Damaged microbiome

### Commentary on next slide for pdf

- There are many environmental influences.
- They all converge upon an ancient set of physiological systems that have not caught up with new-to-nature exposures human scientific cleverness has generated.
- The body reacts to the overload with oxidative stress, inflammation and mitochondrial dysfunction.
- Specific further problems may be associated with the chemical or other features of agents to which one is exposed
- The age, state of health and other factors also contribute to the ways the problems are expressed
- But the general picture is one of overload, overflowing the levees



#### Autism REGRESSION as a TIPPING POINT

- The system's ability to regulate itself deteriorates and you see problems with:
  - Sleep, sensory perception, digestion, hormones, coordination
- Depending on how far this deterioration goes, and which systems are more vulnerable, you may get
  - Sensory processing and motor coordination disorders
  - ADHD
  - Allergies, asthma, diabetes
  - Language delays and/or social awkwardness
  - Autism

# HOW WHOLE BODY PROBLEMS AFFECT THE BRAIN

# Problems in each area make trouble for the other areas

This is consistent with emerging SYSTEMS **BIOLOGY** 



Whole Body Systems Model: Symptoms Emerge from Problems with Underlying Functions

**VISIBLE Social** & Behavioral **SYMPTOMS** are <u>OUTPUT</u> **DISTURBANCE OF** CORE UNDERLYING **BODY FUNCTIONS** are **GENERATORS** 

Ziggarut model: http://www.texasautism.com/

#### Commentary on inflammation/brain slide for pdf

- Peripheral inflammation (shown as yellow blur in the blood vessel)can breach the blood brain barrier.
- It can activate microglial cells (blue) and astroglial cells (light green) which then change their function, producing excitotoxic biochemical and immune substances, and neglecting regular housekeeping functions.
- One housekeeping function neglected is mopping up glutamate in the synapse after the signal fires. If the glutamate hangs out it prolongs excitation.
- This all creates cellular noise, but the brain is not equipped to distinguish internally generated noise from noise that comes from events in the outside world.
- STORY: An 8 year old boy on a gluten/casein free diet talked his parents into letting him have cake at a party. After cheating on his diet, he felt awful for several days. He kept saying to his parents, <u>"My brain is roaring."</u>
- This self-report is consistent with a flare-up of internal noise from aggravating his brain inflammation .

# Inflammation in the brain creates cellular noise that interferes with information processing



- Excitatory chemicals created by activated glial cells
- Normal housekeeping functions of glial cells get neglected
- Chronic inflammation is irritating and promotes excitotoxicity
- Chronic inflammation can cause damage

Inflammation and Its Discontents: The Role of Cytokines in the Pathophysiology of Major Depression. Miller et al., BIOL PSYCHIATRY 2009;65:732–741

### Mitochondrial Dysfunction and Synapses

(neuronal signaling through synapses is hugely energy demanding and requires huge energy input from mitochondria)



 Neurons impacted by metabolic dysfunction have the energy to stay alive,
but not always enough energy to fire electric signals

Efrati et al., PLoS One, 2013

• This likely contributes to poor brain connectivity but needs to be studied

#### A FINAL COMMON PATHWAY Model of autism: Increased ratio of excitation / inhibition in key neural systems

Rubenstein & Merzenich, Genes, Brain and Behavior (2003) 2: 255-267



### Commentary on next slide for pdf

- We performed EEG studies on children, and analyzed them for power and coherence.
- Across the power spectrum (brain waves from delta, theta, alpha and beta to gamma) we assessed that there was more power in autism than controls.
- However, we found that across the same power spectrum the children with autism had less phase synchrony and coherence (indicators of coordination of signaling in the brain)
- This suggests that <u>although there is greater power</u> in signals generated in the brains of children with autism, <u>it is not generating</u> <u>more information because it is not well-coordinated</u>.

### "Inefficiency" in brain signaling in autism

J.R. Isler, K.M. Martien, P.G. Grieve, R.I. Stark, M.R. Herbert Clinical Neurophysiology 121 (2010) 2035–2043



ASD has <u>more power</u> than controls... but <u>less coherence</u> <u>POOR Signal-to-Noise Ratio – Sound and Fury, signifying nothing</u> Metaphor: Tissue pathophysiology REDUCES BRAIN <u>BANDWIDTH</u>



Differences and More Spontaneous Learning

Improving Whole-Body BANDWIDTH makes therapies more effective

• Trying to make behavioral gains in a child with untreated medical problems is like trying to do your job with a migraine, diarrhea, an itchy rash and a bad sinus infection.

- IT DOESN'T MAKE SENSE.
- Treat the medical problems, and the behavioral and learning issues will be come MUCH EASIER.

Calling a person's condition "psychiatric" is not an appropriate rationale for denying medical assessment and treatment

- Behavioral features may be triggered by underlying medical problems
  - Pain
  - Allergy
  - Seizures
  - Sleep disturbances
  - Autoimmunity
  - Metabolic imbalances
  - Food malabsorption
  - Stool impaction
  - Gastroesophageal reflux
  - Dental abscess

People with autism do not always report these well so we need to be detectives to locate and understand these issues, So we can treat these medical problems MEDICALLY.

## WHAT DO WE NEED TO DO?

We need a Public Health and Clinician Training Program to Build Resiliency and Reduce Total Load

### Build Resiliency and Reduce Allostatic or "Total Load"

#### RESILIENCY

- High nutrient density food
- Vigorous Activity
- Skilled individualized teaching
- Family and social supports

#### "TOTAL LOAD"

- Avoid unnecessary exposures to chemicals, radiation, infection
- Reduce stress/time management
- Support the body's immune and detox biochemistry

#### Building RESILIENCY protects brain and body from being degraded by LOAD.

# Why is there too much load and not enough resilience?

#### TOO MUCH BAD STUFF

- Toxicants, other noxious exposures and stressors
- Molecular debris from cellular stress and inflammation

#### NOT ENOUGH GOOD STUFF

- Not enough nutrients needed to run clean-up operations
- Blood flow that is less than it should be due to sickness or poor nutrition

#### NUTRITION IS CRITICAL: The brain needs energy and nutrition supplies

- Abundant supplies allow the brain to
  - work at its best
  - protect it from being dragged down by inflammation and other health problems.
  - TAKE OUT THE GARBAGE!
- Better brain health will help restore the brain's full powers.
- We can support brain health through "nutrient flooding" high nutrient density diet

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#### Autism and Dietary Therapy: Case Report and Review of the Literature

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Author Contributions: MRH and JAB contributed equally to this work.

Abstract

We report the history of a child with autism and epilepsy who, after limited response to other interventions following her regression into autism, was placed on a gluten-free, casein-free diet, after which she showed marked improvement in autistic and medical symptoms. Subsequently, following pubertal onset of seizures and after failing to achieve full seizure control pharmacologically she was advanced to a ketogenic diet that was customized to continue the glutenfree, casein-free regimen. On this diet, while still continuing on anticonvulsants, she showed significant improvement in seizure activity. This gluten-free casein-free ketogenic diet used medium-chain triglycerides rather than butter and cream as its primary source of fat. Medium-chain triglycerides are known to be highly ketogenic, and this allowed the use of a lower ratio (1.5:1) leaving more calories available for consumption of vegetables with their associated health benefits. Secondary benefits included resolution of morbid obesity and improvement of cognitive and behavioral features. Over the course of several years following her initial diagnosis, the child's Childhood Autism Rating Scale score decreased from 49 to 17, representing a change from severe autism to nonautistic, and her intelligence quotient increased 70 points. The initial electroencephalogram after seizure onset showed lengthy 3 Hz spike-wave activity; 14 months after the initiation of the diet the child was essentially seizure free and the electroencephalogram showed only occasional 1-1.5 second spike-wave activity without clinical accompaniments. Diet appears to improve brain function: We need to support this kind of brain research, not just measure "what's broken"

THIS IS YOUR BRAIN ON GLUTEN, DAIRY, SUGAR and PROCESSED (JUNK) FOOD THIS IS YOUR BRAIN ON A WHOLE FOOD ALLERGEN-FREE HIGH NUTRIENT DENSITY DIET







The Center for Discovery: Whole Body SENSITIVE treatment of neurodevelopmental disabilities based on Biodynamic Farm PROPOSITION / ASSERTION: We know enough <u>now</u> to promote health and hunt for and remove contributors to harm

# We need clinicians trained to hunt for and treat ROOT CAUSES, not just symptoms

#### ENVIRONMENTALLY VULNERABLE PHYSIOLOGY

#### Current Opinion in Neurology, April, 2010

#### Contributions of the environment and environmentally vulnerable physiology to autism spectrum disorders

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Current Opinion in Neurology 2010, 23:000-000

#### Purpose of review

To present a rationale and evidence for contributions of environmental influences and environmentally vulnerable physiology to autism spectrum disorders (ASDs).

#### Recent findings

Recent studies suggest a substantial increase in ASD prevalence above earlier Centers for Disease Control figures of one in 150 only partly explicable by data artifacts, underscoring the possibility of environmental contributors to increased prevalence. Some gene variants in ASD confer altered vulnerability to environmental stressors and exposures. De-novo mutations and advanced parental age as a risk factor for ASD also suggest a role for environment. Systemic and central nervous system pathophysiology, including oxidative stress, neuroinflammation, and mitochondrial dysfunction can be consistent with a role for environmental influence (e.g. from air pollution, organophosphates, heavy metals) in ASD, and some of the underlying biochemical disturbances (such as abnormalities in glutathione, a critical antioxidant and detoxifier) can be reversed by targeted nutritional interventions. Dietary factors and food contaminants may contribute risk. Improvement and loss of diagnosis in some with ASD suggest brain circuitry amenable to environmental modulation.

#### Summary

Prevalence, genetic, exposure, and pathophysiological evidence all suggest a role for environmental factors in the inception and lifelong modulation of ASD. This supports the need for seeking targets for early and ongoing medical prevention and treatment of ASD.

#### www.marthaherbert.org

### Autism and Environment

- We've made a mess of the planet the world outside
- We're also making a mess of the world inside
- Especially of people with autism
- We can dial it all back if we get a grip

### The Gut Microbiome Hits the Big Time

This, it seems to me, is pretty much where we stand today with respect to our microbiomes — our teeming, quasi-wilderness. We don't know a lot, but we probably know enough to begin taking better care of it. We have a pretty good idea of what it likes to eat, and what strong chemicals do to it. We know all we need to know, in other words, to begin, with modesty, to tend the unruly garden within.

> Michael Pollan, New York Times Magazine May 15, 2013



# The most effective treatments will deal with the root causes.



#### Dialing back the problems and Moving Toward Whole Body-Brain Health



### **RECIPE for improvement**



#### POOR BANDWIDTH, LOTS OF CHAOS

- Poor food: few nutrients, many allergens
- Lots of toxins and infectious issues
- Lots of stress, pressure, too much too fast



#### GOOD BANDWIDTH, RICH ORGANIZATION

- Excellent food: high nutrient density, minimal allergens
- Minimal toxic and infectious burden
- Love, learning, respect, sensitive sensory input, savor each moment

#### **Autism Revolution: Ten Tips**

- 1. Go for the extraordinary.
- 2. Know what you can't control and what you can.
- 3. Repair and support cells and cycles.
- 4. Get gut and immune systems on your side.
- 5. Build better brain health.
- 6. Calm brain chaos
- 7. Join your child's world.
- 8. Love, rejoice, and make breakthroughs.
- 9. Lead the revolution!

10. Do it for yourself, your next baby, your family, and your world.

www.AutismRevolution.org

#### Sources detailing these arguments

CONTED BY SHEEDON KRIMSKY & JEREMY GRUBER

#### GENETIC

Sense and Nonsense



THE AUTISM REVOLUTION: Whole-Body Strategies for Making Life All It Can Be Random House/ Harvard Health Publications By Martha Herbert with Karen Weintraub www.AutismRevolution.org Now in paperback

GENETIC EXPLANATIONS: Sense and Nonsense S Krimsky and J Gruber, Eds Chapter 10, on autism, by Martha Herbert

# THESE SCIENTIFIC ADVANCES SHOW THAT AUTISM IS <u>ACTIONABLE</u>

That is,

The idea that "there is nothing we can do but help people cope"

is now

OUT OF DATE

because

THERE IS A <u>LOT</u> WE CAN DO TO REDUCE SUFFERING AND INCREASE ACCESS TO HUMAN POTENTIAL.

### SUMMARY

- A significant portion of the increases in autism are real
- We cannot hide from the high costs
- Science is fundamentally shifting what we think autism "is"
- Autism has major similarities with other chronic conditions on the rise
- Environmental overload plays a major role
- Behaviors are the tip of the iceberg of a compromised whole system
- We can dial this back by BUILDING RESILIENCE and REDUCING TOTAL LOAD
- We are capable RIGHT NOW of a public health program and clinician training that will make a MAJOR DIFFERENCE in improving the lives of all those affected by autism and MAKING LIFE ALL IT CAN BE.