

YOUR BRAIN AND NUTRITION: Is there a connection?

Judith Pentz MD

February 25, 2016

Presentation via webinar UNM/IHS

Objectives

At the end of this presentation, participants will

- 1) have an increased awareness of the power of nutrition and when supplementation may be considered.
- 2) Review epidemiological studies regarding Western standard nutrition and impact on physical/mental health
- 3) Recommendations for simple, yet effective dietary changes that impact quality of mental health within days

Objectives

- 1) Review key nutrients in food for promoting and maintaining mental health
- 2) Case report: Focus will include when supplementation is needed due to significant mental health problems and dietary changes are not sufficient or maintained

6 realms of Ecological care-holistic care

- 1) Environment- quality of air, water, noise, toxins, crowding and economic stress
- 2) Physical-nutrition, sleep, exercise, gut
- 3) Mental-beliefs, attitudes, intellectual stimulation, creative expression
- 4) Emotional- parental support, trauma, conflict, self esteem,
- 5) Social-friendships, family, community
- 6) Spiritual-values, purpose, religious path

- **Growing evidence about how we live our daily lives and what foods we eat impact our immediate and long term health, including our mental health. (Averinos, 2005)**
- **One study in women suggested a greater incidence of depression in nutrient poor but energy dense food (processed food) in diets of women compared to those with whole food, nutrient dense diet (Jacka F et al, 2010)**

NUTRITION

- FOOD which nourishes the brain and body to achieve optimum health
- FOOD IS PRINCIPAL way to create optimum health
- **ONE part of the bigger story** for each human but becoming more significant due to the poor quality nutrition consumed more and more

New field in Psychiatry

Nutritional psychiatry which advocates for the need for

recognizing *diet and nutrition* being

CENTRAL DETERMINANTS for

BOTH

MENTAL and PHYSICAL health

International Society for Nutritional Psychiatry Research.org

Public health concerns and Lifestyle

• **Risk factors** for diabetes, heart disease and hypertension have these common issues:

POOR DIET

PHYSICAL INERTIA

SMOKING

• And NOW finding **SAME risk factors for DEPRESSION and ANXIETY**

• **KEY** to our mental health and physical health is to **address 'Habitual dietary intake'** . Changes need to happen here!

HABITUAL DIETARY INTAKE

IS

SHAPING

OUR

CHILDREN'S

MENTAL/PHYSICAL

HEALTH

HABITUAL DIETARY INTAKE

Food and drink we consume daily without thought of impact for the day or tomorrow.

Deep fried foods like french fries(with trans fats)

(Trans fats are a type of mostly man-made fat that the food industry loves, but our hearts and blood vessels don't) <http://www.hsph.harvard.edu>

Soda or diet soda/d (creates calcium depletion due to high phosphorus content and supplies empty calories along with excess sugar)

White bread (needing to be fortified due to all nutrients processed out during manufacturing)

Daily intake??



Transfats-FOOD industry darling

- Partially hydrogenated oil added to food since 1950s
- In early 1990s, trans fat intake in the United States averaged 4 to 7 percent of calories from fat. Prior to this, less 1% in our diet
- Very stable; does not spoil easily and has high heat point
- Transports easily
- partially hydrogenated vegetable oil” and “vegetable shortening” means trans fat

Labeling to be aware of....

January 1, 2006, the U.S. has required that trans fat must be listed on food labels along with other bad fats (saturated fats) and good ones (unsaturated fats).

(Government Publishing Office)

Health risks of trans fats

- 1) **INCREASES low-density lipoprotein (LDL, “bad” cholesterol)**, especially the small, dense LDL (more damaging to arteries).
- 2) **LOWERS high-density lipoprotein (HDL)** particles, which scour blood vessels for bad cholesterol and truck it to the liver for disposal. It also
- 3) **PROMOTES inflammation** -over activity of the immune system that has been implicated in heart disease, stroke, diabetes, and other chronic conditions.
- 4) **REDUCES** normal healthy responsiveness of endothelial cells, the cells that line all of our blood vessels.
- 5) In animal studies, **promotes obesity and resistance to insulin**, the precursor to diabetes.

<http://www.hsph.harvard.edu/>

Link with trans fats and mood

- Prospective Study in graduate students in Spain noted that consumption of trans fats was linked to a significant increased risk for depression, whereas monounsaturated fatty acids and polyunsaturated fatty acids lowered depression risk

BUYER BEWARE

- Institute of Medicine has stated “there are no known requirements for trans fatty acids for specific bodily functions,” and so trans fatty acid consumption should “be as low as possible.”
- **Look for products that don't contain any transfats**

What to do next....

- **Choose liquid vegetable oils**, or choose a soft tub margarine with little or no trans fats.
- **Avoid eating commercially prepared baked foods (cookies, pies, donuts, etc.), snack foods, processed foods, including fast foods.** To be on the safe side, assume that all such products contain trans fats unless they are labeled otherwise.

What to do next....

- IF foods containing partially hydrogenated oils can't be avoided, choose products that list these oils near end of ingredient list.
- **AVOIDING trans fats in restaurants.** One strategy is to avoid deep-fried foods (since many restaurants still use partially hydrogenated oils in fryers) and desserts. ASK to help change these cooking practices!! By asking server, know what chefs/managers in the establishment uses only trans-free oils and foods.

<http://www.hsph.harvard.edu/>

SODAS: NEW HEALTH RISK!

- People who consume sugary drinks regularly (1 to 2 cans/d or more) have a 26% greater risk of developing type 2 diabetes than people who rarely have such drinks. (*Malik VS et al, 2010*)
- Study that followed 40,000 men for 20 years found that those who averaged one can of a sugary beverage per day had a 20% higher risk of having a heart attack or dying from a heart attack than men who rarely consumed sugary drinks. (*de Koning L et al, 2010*)
- Related study in women found a similar sugary beverage–heart disease link. (*Fung TT et al, 2009*)

<http://www.hsph.harvard.edu/>

<http://fit.webmd.com/teen/food/slideshow/slideshow-teens-sugar>

THE LEGAL DRUG ON THE STREET



SODA CONSUMPTION

- According to the USDA, 16% of calories in the typical American's diet come from refined sugars and half of those calories come from beverages with added sugar," "Sodas used to be an occasional treat, but now they are part of the culture." Michael F. Jacobson, Ph.D., Executive Director, Center for Science in the Public Interest.
- NYU prof of Nutrition/food studies Marion Nestle, PhD, says there is plenty of evidence that sodas contributed to America's growing girth, especially among children.
- Nestle says pediatricians who treat obese children tell her that many of their patients take in 1,000 to 2,000 calories a day from soft drinks alone.
- "Some children drink sodas all day long," she says. "They are getting all of the calories they need in a day from soft drinks, so it's no wonder they are fat."

Grains are stripped of their bran and germ to make white flour

Half of the beneficial unsaturated fatty acids	50 percent of the calcium	80 percent of the iron	50-80 percent of the B vitamins
Virtually all of the vitamin E	70 percent of the phosphorus	98 percent of the magnesium	And only some of these are replaced

WHITE BREAD



high-sugar, low-fiber

WESTERN DIET=SAD DIET

- Loren Cordain, in “Origins and evolution of the Western diet: health implications for the 21st century”, published in *The American Journal of Clinical Nutrition*, 2005. Author: *The Paleo Diet Revised* (2011)
- *Standard American diets high in sugar and processed grains are both void of necessary micronutrients and deplete micronutrients. Refined sugars such as those found in soft drinks do not contain any vitamins or minerals. Therefore consuming these beverages reduces the nutrients in the diet.”*

WHERE THE PROBLEMS START!

- $\frac{3}{4}$ of lifetime psychiatric disorders emerge in adolescence or early adulthood
- Recent national survey showed more than 22% of adolescents aged 13 to 18 years had already experienced a clinically significant mental health problem.

Prospective Study with teens

- In 2011, Felice Jacka, PhD, and colleagues from Deakin University and the University of Melbourne in Australia found that better diet quality was associated with better mental health in adolescents cross-sectionally and over time.

HEALTHY DIET

- A **healthy diet** was defined as one that included fruit and vegetables as "core food groups" and included both 2 or more servings of fruit per day and 4 or more servings of vegetables
- general avoidance of processed foods including chips, fried foods, chocolate, sweets, and ice cream.

UnHealthy Diet

High in snack and processed foods.



OUTCOME after 2 years...

- **Changes in diet quality** over the course of 2 years **were matched** by **changes in mental health** during the same time, so children whose **diets** got **worse** had a **worsening in their mental health**, and those whose **diet improved** had **improved mental health**. "This was independent of every variable I could think to adjust for," she added.



In this study we show that a good-quality diet at baseline predicts better mental health at follow-up, even after adjustments for diet quality at follow-up, sociodemographic variables, exercise, and most importantly, mental health at baseline," Dr. Jacka told *Medscape Medical News*.

PUBLIC HEALTH intervention

- **“Given that the majority of mental health problems start before age 25, and the enormous burden of illness of depression and anxiety in young people, and given that nutrition is so critical to adequate development, we think these data have enormous significant implications for public health” Dr Jacka**

Inadequate intake of essential vitamins and minerals

- Most of the world, including developed countries, have been lacking in about 30 essential vitamins and minerals (micronutrients)
- Key ingredients as cofactors to help with making neurotransmitters, aiding in the Krebs cycle and methylation cycle

Healthier eating is possible

- Awareness is key
- Willingness to CHANGE habits
- Starts in the FAMILY system
- Healthcare providers need to WALK their TALK
- BEST done in COMMUNITY with each other supporting the other

HEALTHY FOOD choices

- Best to walk the perimeter of the grocery store or go to local farmers market
- Look for fresh fruits and vegetables
- If packaged, frozen fruits and vegetables are preferred
- Read labels on packages; if you cannot pronounce the names of the ingredients, reconsider buying it

SIMPLE DIETARY CHANGES

- START cooking meals at home beyond the microwave
- ADD RAINBOW colored steamed or sautéed vegetables to lunch and dinner (easier to digest for most people)
- REDUCE OR ELIMINATE FOOD PRESERVATIVES/ADDITIVES!
- ORGANIC if possible by choosing top 3 vegetables or fruit you eat and know level of pesticide exposure for them (EWG.org)

SIMPLE DIETARY CHANGES

- ADD WHOLE GRAINS/PULSES



SIMPLE DIETARY CHANGES

- GRASS FED BEEF or WILD GAME

(as nature did not give them corn, we did thus altering the nutrient value)

EGGS AND MILK FREE OF ANTIBIOTIC EXPOSURE (as nature did not create these extreme living conditions requiring ATB)

In Defense of Food

- Michael Pollan addresses the industrial food complex and advertising
- Brings light to how we are bombarded by messages influencing our eating habits.
- AND recommends: “Eat food. Not too much. Mostly Plants.”

Nutrient dense foods are good sources for key vitamins and minerals



- Salmon
- Kale
- Garlic
- Seaweed
- Shellfish
- Potatoes
- Sardines
- Blueberries
- Eggs AND DARK CHOCOLATE

3-5 servings of
vegetables a day can
give the body and
brain key nutrients.

YET HOW MANY KIDS
CHOOSE OTHERWISE
!?

**AND so DO their
PARENTS!**



And yet, what if diet change is not enough?

There are integrative approaches to further support the mental health of the child/teen.

Micronutrients can be a part of the treatment plan for the added support that may be needed.

Treatment options beyond psychotropics for mood disorders

- Dietary/nutrition modifications
- Herbs, amino acids, essential fatty acids
- Mind Body medicine including meditation, biofeedback, CBT
- Specific nutrient therapies with micronutrients
 - Copper/zinc imbalances
 - Elevated histamine levels
- Global approach with micronutrients

Why consider micronutrients?

- 1. Medication options for mood disorders and ADHD have both their risks, limited efficacy and side effects**
- 2. Specifically, options for Bipolar disorder have included atypical antipsychotic medications**
- 3. Risk factors include metabolic syndrome, increased lipids, cardiovascular effects in all age groups including youths**

Why use MICRONUTRIENT supplements?

- Nutrient poor food consumption is a problem in emerging and developed countries including USA
- Changing dietary patterns for stressed populations is needed and yet, change is not easy to introduce.

WHY USE MICRONUTRIENTS?

Food desert (no grocery store with economical, healthy choices available-
inner urban and frontier areas)

(USDA economic report to Congress, 2009)

Cost of processed/fast food is CHEAPER for person to buy

Micronutrients are...

Needed in small quantities for normal and optimal function for the body and brain

- Vitamins

Vitamin C

all Vitamin Bs (water soluble and need daily replacement)

Vitamin E, A, D, K (fat soluble)

- Minerals (Ca, Mg, Zn, Se, Cr, Fe)

Micronutrients are...

Part of the critical infrastructure for the human body/brain aiding in homeostasis and balance.

We require a minimum of these substances to function and possibly to age less

Nutrient research focus

- **Early 1900s, there was a focus on single nutrients and the physical impact of deficiencies and to a lesser degree, on the brain/mental functions**
- **With advancing research, more awareness of key nutrients in combination needed for brain/body function did occur.**

Single nutrient research for mental/brain imbalances

Low levels of Iron, calcium and zinc have been associated with mental symptoms (Benton, Donohoe, 1999; Dubovsky et al, 1994, Maes et al. 1997)

Studies with supplementation indicate improved mood and mental function with selenium, B vitamins and iron. (Benton and Cook, 1991, Benton et al. 1997; Hoffer 1999)

Specific nutrients supporting mental health at RDA dosing ?

Challenges with metabolic imbalance with single nutrient dosing can create other nutrient imbalances

Ex: Vit B12 deficiency can worsen with folate only dosing

Specific nutrients supporting mental health at RDA dosing?

Challenges with metabolic imbalance with single nutrient dosing can create other nutrient imbalances

Ex: Vit B12 deficiency can worsen with folate only dosing

All LIVING BEINGS FLOURISH WITH OPTIMUM
levels of MICRONUTRIENTS



Multinutrient combinations

Since 2000, increased interest in combination of nutrient deficiencies rather than single nutrient deficiencies

Theory is that there may be multiple deficiencies; with the multinutrient, the body and brain are supported at multiple levels

And that there is an OPTIMUM level of nutrients for optimum Brain function/mental health

Proposed concepts to consider

- 1) **Mood dysregulation may result from innate metabolic malfunction/errors resulting in inefficient use of nutrients thus brain dysfunction such as the emerging field of mitochondrial disorders**
- 2) **Mood instability may be due to methylation errors leading to deficiencies of molecules responsible for DNA transcription, switching on of genes, regulating protein generation, activating enzymes, synthesis of neurotransmitters**

Proposed concepts

- 3) **Nutrition deficiencies may alter gene expression as is being discovered in the emerging field of epigenetics, leading to mood instability**

- 4) **Unstable mood may result from long-latency effects of nutrient deficiencies that alter brain development directly or by way of dysfunctional nutrient absorption in the gut noting importance of the microbiome**

Biochemical Conditions

- **Increased awareness of the impact of methylation on mental health has grown**
- **Certain conditions do best with less folate in the diet and supplements**
- **Other conditions may do better with less copper and more zinc in the diet/supplements**

Biochemical conditions

Use of the micronutrient formula is one approach to be reviewed today with appropriate screening for the conditions just mentioned.

Whole blood Histamine

Serum copper

Serum Zinc

Iron levels, serum ferritin

Pyrrole levels

3 IMPORTANT MINERALS

- ZINC, IRON AND MAGNESIUM

Are in foods depending on quality of diet.

Are key for ADHD and even mood.

Research has seen trend with kids diagnosed with ADHD have lower levels compared to controls.

ZINC (Zn)

- NO Double blind RCTs but several studies compare children with ADHD to controls
- 2 studies in Turkey found low Zn levels in kids with ADHD
- Arnold et al, 2005 noted kids with inattentive ADHD had even lower Zn compared to kids with ADHD/hyperactivity

LOW ZINC, Iron, Mg

- In 2011, Mahmoud et al noted in study with 58 kids with ADHD from ages 5-15 compared to 25 kids w/o ADHD followed for 2 yrs.
- Serum levels of minerals measured in both populations. Consistent trend with kids with ADHD having lower levels. Copper levels were normal

IRON Storage

- Serum ferritin is more telling of actual iron storage. Best if levels are above 40.
- LOW levels have been correlated with ADHD and learning problems.
- ROLE OF Iron goes beyond heme production; important in making dopamine and norepinephrine.

Iron (Fe) issues

- Konofal in 2004 studied Fe levels in 57 kids with ADHD and 27 kids w/o ADHD
- Levels in kids with ADHD were in the low 20s compared to other kids in the low 40s.
- SEVERITY of ADHD correlated with lowest serum ferritin levels

Fe issues

- In 2008, Konofal conducted smaller study with 23 kids with ADHD and Fe therapy if levels below 30 comparing them to 5 kids receiving placebo
- Clinical Global Impression scale indicated positive change for kids with Fe replacement compared to those who did not.

Magnesium

- Important mineral involved in 300 enzymatic reactions in body
- Assists in healthy immune system
- Supports muscle/nerve function
- Reduces excitability in body and brain

Magnesiumn(Mg)

- Studies done in Europe have shown correlation of lower Mg in kids with ADHD
- NO double blind RCTs to date
- One study conducted by Starobrat-Hermelin et al with 75 kids diagnosed with ADHD and Low Mg. 50 kids in one group treated with Mg for 6 mos and 25 kids not treated. Kids given Mg improved. Study NOT blinded

TREATMENT with single minerals

- Zinc piccolinate 15 mg/d with gradual increase to 30 mg/d is most supportive.
- Iron is best given in chelated form at about 30 mg. There is also herbal form of Iron replacement in Floradix
- Magnesium in chelated form(glycinate or citrate) is absorbed best and dosed 2-3 mg/pound.
- Levels can be monitored: RBC Zn or plasma Zn, serum Mg levels, Serum ferritin with CBC and other iron studies

Multinutrient trials on depressed mood in nonclinical samples

4 positive RCTs

1 RCT by Benton et al(1995) studied college students for 1 yr; 2 capsules with 10x RDA with both men and women more 'agreeable' with women having improved mood as well.

Another RCT by Hesker et al(1992) followed young adult males (n=498) for 8 wks with daily dosing of micronutrient formula with 7 vitamins and noted those with specific nutrient deficiency had less irritability.

- **3rd RCT by Harris et al(2011) followed older males (25 active, 25 placebo) on Swiss Men's Ultivite for 8 wks and compared to placebo, reduction in depression and anxiety, improved alertness but not in stress level.**
- **4th RCT by Nguyen et al (2009) followed 459 Guatemalan women (RCT with 4 arms) for 12 wks. Dosing was 1xwk(n=88) or 1xd (n=97), 1xd (n=100) of different doses of B9, Iron, Zinc, B12. All benefited but no placebo arm.**

Multinutrient studies in nonclinical samples

- **4 negative DBRCTs with 2 conducted in elderly(not reviewed here)**
- **1 RCT by Haskell et al (2008) studied children (8-14 yrs) for 12 wks with 40 active, 38 placebo. Taking Pharmaton Kiddi 2 chewables/d. No effect on mood but positive for attention span.**

- **2nd RCT by America and Milling (2008) studied nonclinical young psychology students (17-37 years) for 6 wks with 4 arms: Solgar multivitamin (n=27); Solgar B complex vitamin (n=31), placebo (n=28) no treatment (n=28) with 114 completing. No treatment benefit noted**

BROAD Spectrum micronutrients

Peer reviewed data for this micronutrient product includes over 20 studies.

One RCT to date with positive findings for adults with ADHD. Data in children and teens limited to case reports and other research that is to be reviewed.

Please NOTE: the product is now available by 2 companies and has been modified since 2002. Choice is available with EMP advanced, Q 96, DEN (Daily Essential Nutrients)

Multinutrient formula with most empirical data for mental health

- **Product name is EMPower+ and now available as Q68, DEN by different companies**
- **Has 36 ingredients that are NOT exotic (16 dietary minerals, 14 vitamins except Vitamin K, 3 amino acids, 3 antioxidants)**
- **Relatively large (but safe) doses with 4 nutrients**
- **Website: truehope.com for list of ingredients. Each bottle has information as well**

Micronutrient formula

- **In studies reviewed, the formula was donated to the centers for the duration of the study.**

Safety and tolerability of this complex micronutrient formula

- **No toxicity or clinical meaningful negative outcomes based on biological safety data based on 144 youth and adults in 1 research study. (Simpson et al, 2011)**
- **A review of 6 other research studies of 157 youth and adults noted adverse events to be minor, transient nausea and/or headache (Simpson et al, 2011)**

Formula has had revisions starting in 2002

- **Reducing the size of the minerals has reduced daily dosing to only up to 4/d at the maximum level for mood stability to be maintained**
- **Specific chelation of the minerals has allowed greater absorption**

Clinical research on Multinutrients since 2000

Much larger effect on mood than single nutrient interventions noted on a database analysis of children and teens taking the micronutrient formula

Includes 4 publications of open-label trials in adults, adolescents, and children with bipolar disorder

Database analysis

- **2 children with explosive rage and mood swings within subject cross-over design: on-off control of tantrums/rages with formula (Rucklidge et al. BMC Psychiatry, 2010, 10:74)**
- **358 adults with bipolar disorder, more than half were positive responders after 3 months on formula. And sustained at 6 months, thus less likely to be due to placebo or expectancy effects (D Gately, B Kaplan. Clinical Medicine: Psychiatry 2009:2 3-16)**

Database analysis

- Decrease in bipolar symptoms from baseline by 45% in study with n=120 children and adolescents with bipolar disorder. 46% had sustained improvement of 50% at 6 months (Rucklidge et al, 2010)

Clinical research since 2002

- **Case report of 18 yo male with OCD and limited impact of CBT; formula added in ABAB design, which allowed on-off control for anxiety and mood. Reduction in symptoms noted on formula**
- **Open label study of 14 adults with ADHD and mood dysregulation; reduction in symptoms over 8 wk period with 2 month F/U maintaining change on those who stayed on formula**

More research

- **Case control study of 44 children and teens with autism spectrum disorder who had irritability and mood symptoms treated with micronutrient formula; matched for age, sex and SES with 44 patients on conventional medications**
- **Both groups improved significantly but the micronutrient group improved even more in areas of mood and irritability**
- **1/6 as many adverse events, no wgt gain**

'Andrew'

- Middle child of 3; intact Calgary family, apparently eating well --- healthy
- Borderline IQ, moderately severe language problems
- Age 10: “stressed” and “overwhelmed”
- Disturbances in sleep, concentration, behavior
- Auditory hallucinations, paranoid ideation
- Symptoms of Obsessive Compulsive Disorder

ANDREW

- **Admitted to Alberta Children's Hospital inpatient mental health**
- **Every investigation imaginable...all within normal limits, long list of "working" diagnoses**
- **Delusions:**
 - **food poisoned**
 - **murderer and an adulterer**
 - **caused extreme guilt and remorse, leading to excessive *obsessive* prayer**
- **Stuttering, tremors**

➤ **6 months inpatient at ACH**

➤ **Various medication trials**

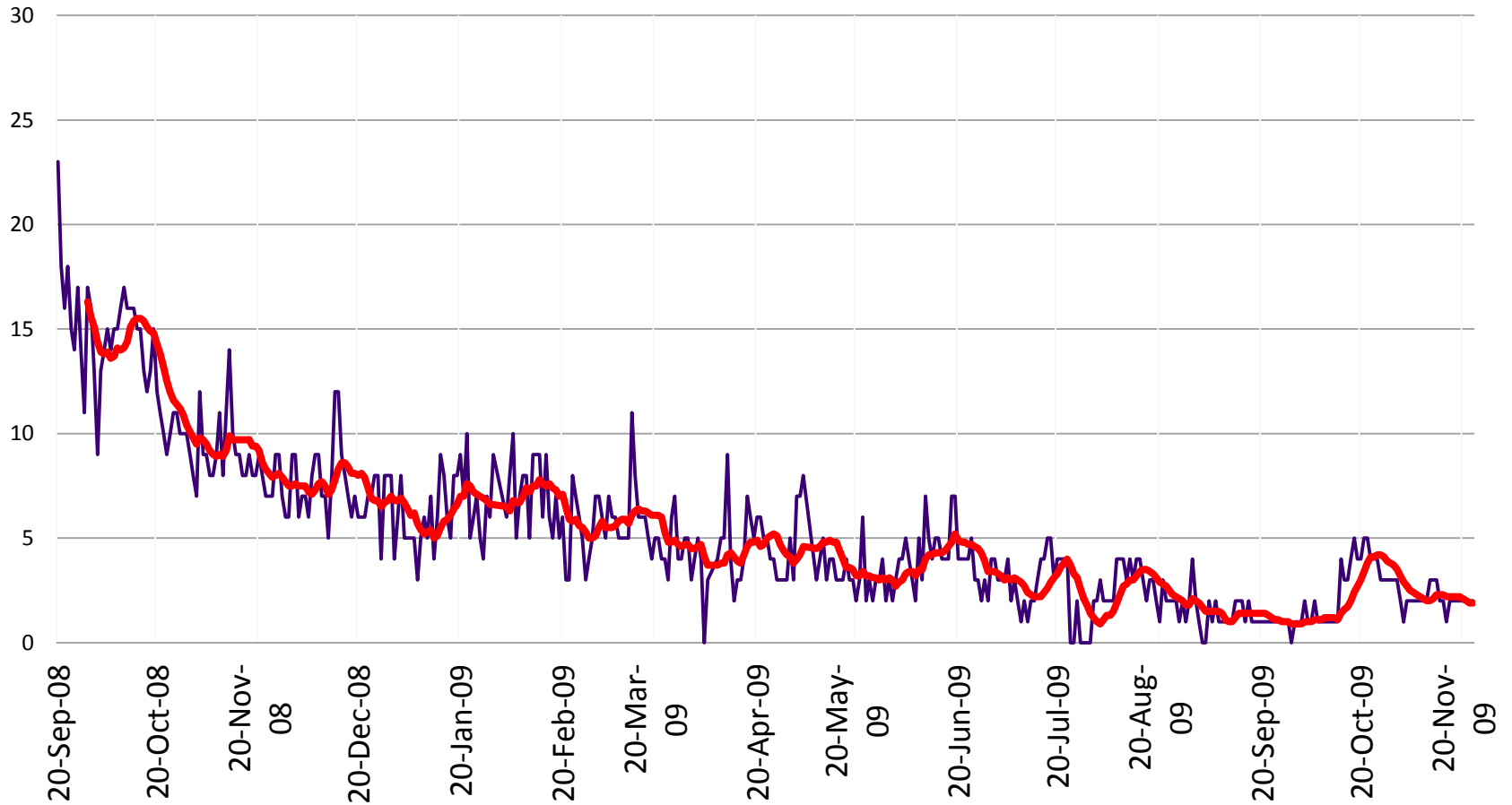
➤ **Discharge CGAS* = 35: unchanged after 6 mos!**

*Children's Global Assessment Scale

- **Returned to outpt care (Mood & Anxiety Disorders clinic; Dr. Megan Rodway)**
- **Parents suggested trying a broad spectrum micronutrient formula (EMP)**
- **Dr. Rodway – “This is snake oil, but I don’t have anything better to offer!”**

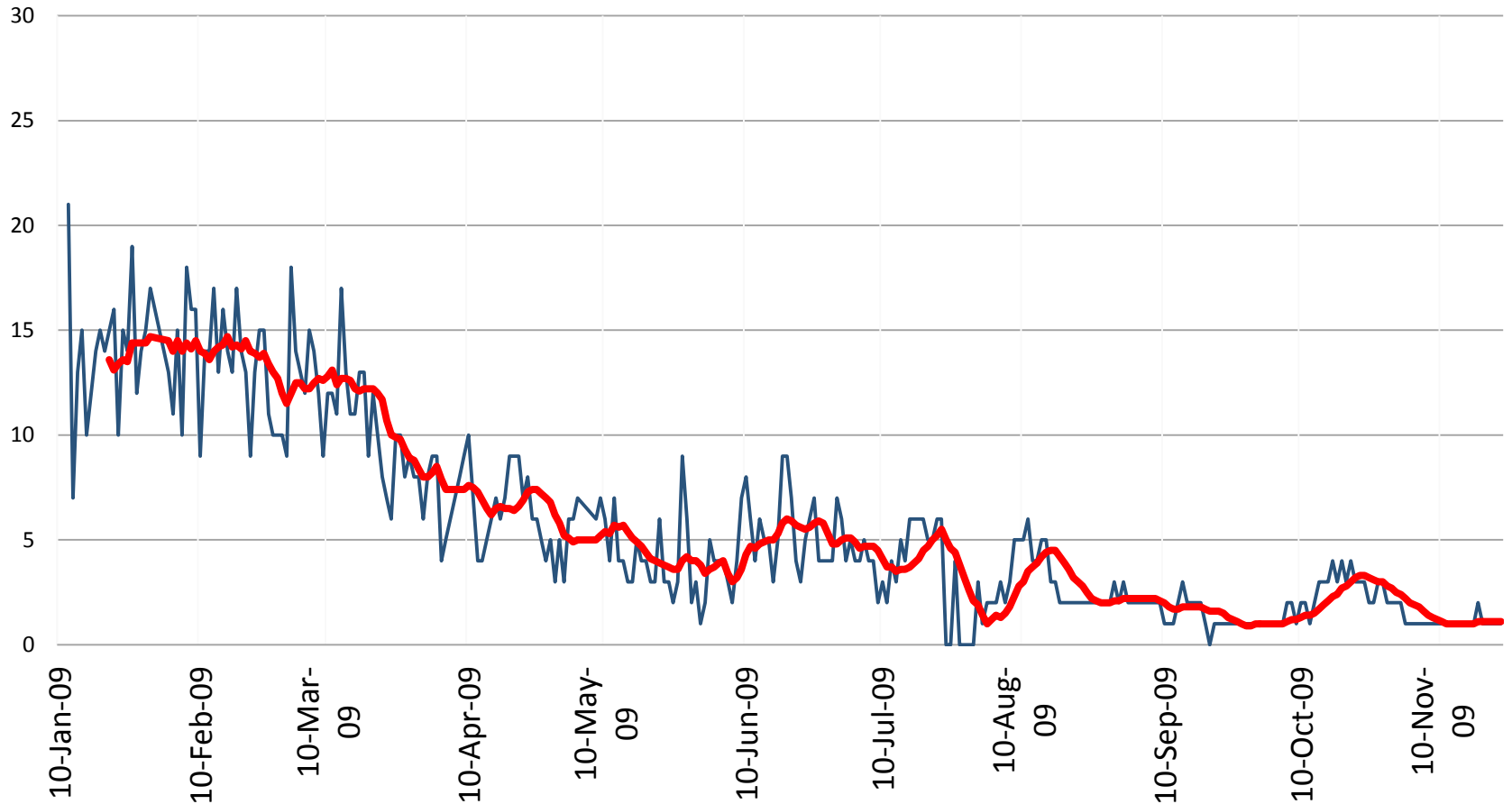
- **What happened to Andrew on the snake oil??**

Daily Obsessive Compulsive Symptom score



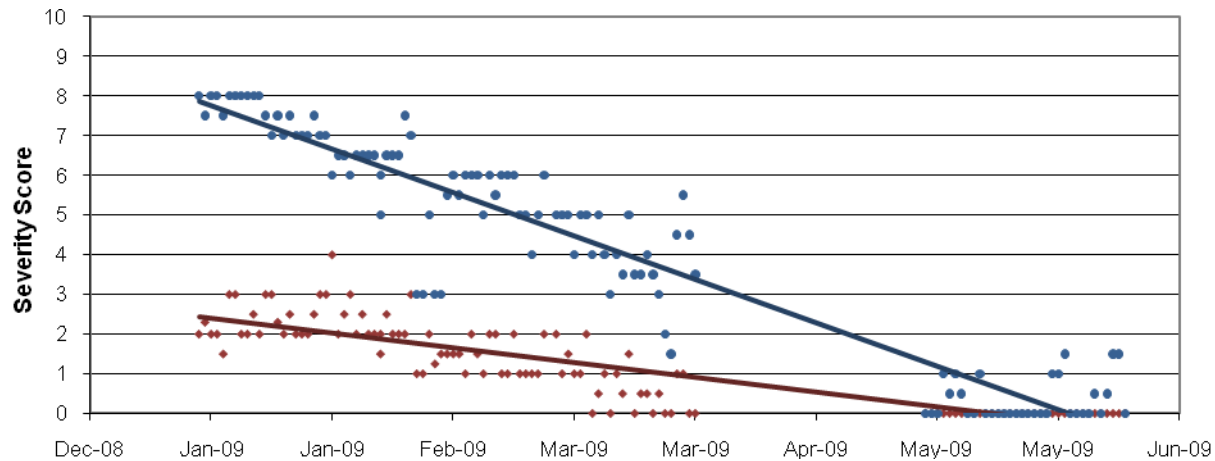
red line is 10 day moving average

Daily psychosis symptom score



redline is 10 day moving average

Self-reported account of hallucinations(blue/VH, red/AH)



Blue circles are visual hallucinations; red diamonds are auditory hallucinations

Andrew in 2010 (and in 2014)

- **No clinically significant anxiety**
- **No psychotic symptoms**
- **Enjoys school, has friends**
- **Normal relationship with sibs**
- **But...still borderline intelligence with mixed expressive/receptive language struggles**

Andrew in 2015

- **Graduated high school**
- **Due to quantity of pills, he requested to stop yet many symptoms returned.**
- **Restarted protocol and is once again able to be in the community and at home**

(via Personal communication with Bonnie Kaplan July, 2015)

➤ **No Adverse Events**

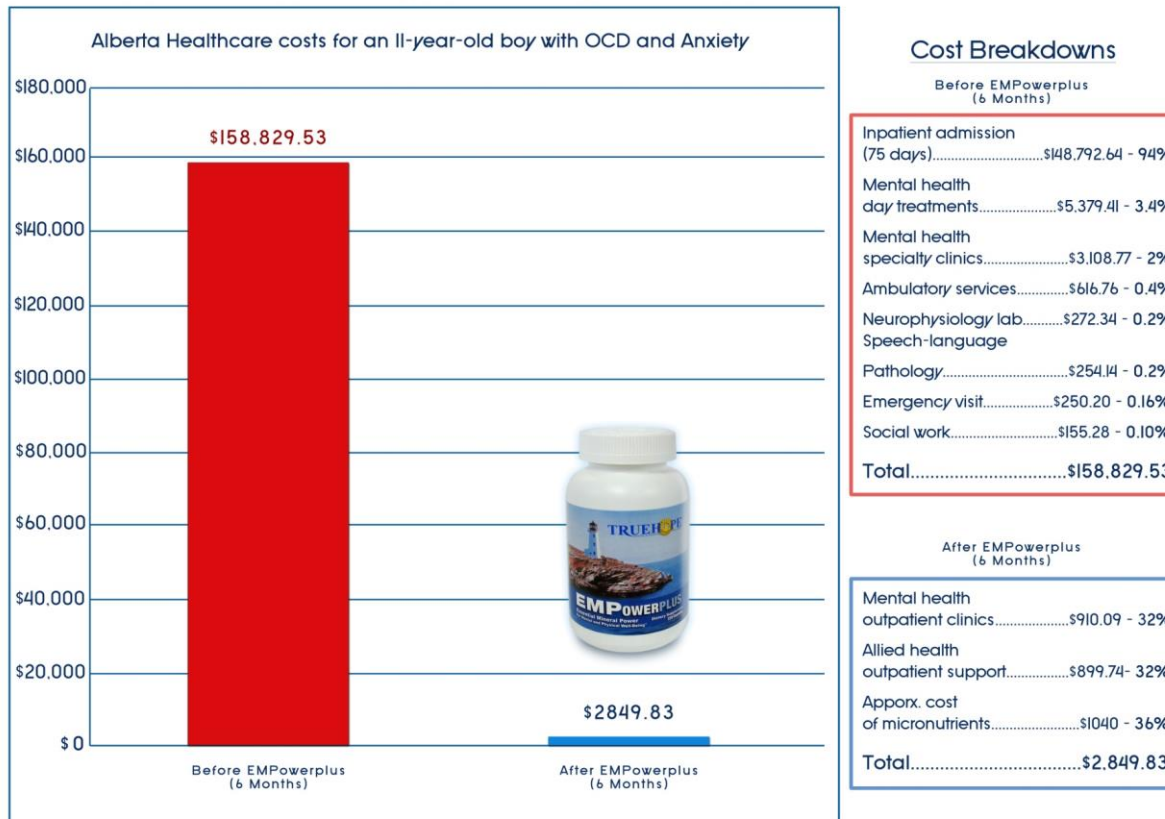
➤ **No safety concerns**

M Rodway, A Vance, A Watters, H Lee, E Bos, B Kaplan, Efficacy of micronutrient treatment of childhood psychosis,

BMJ Case Reports, Nov 9, 2012

Cost analysis

Costs of 6 months of conventional inpatient treatment compared to 6 months of outpatient follow-up with micronutrient treatment



Limitations with current research and ongoing concerns

- 1) only one RCT to date but important to note that Julia Rucklidge has published 1 year follow up data; more clinical trials are needed**
- 2) Adherence to regimen and quantity of pills remains a challenge in all age groups**
- 3) Impact on individuals on pharmaceuticals taking formula needs further study to fully understand mechanisms of action but has become less of an issue with reformulations**

Conclusions

Growing body of evidence nudges us to have an **accessible, healthy nutritional approach to preventing and treating common mental illnesses**, including depression and anxiety.

Single nutrients can have positive effect on certain conditions such ADHD

Conclusions

- **Quality of nutrition and our daily dietary habits impact our overall health, including our mental health**
- **Individual nutrition needs and genetic vulnerabilities impact state of mental and physical health**
- **Nutrition changes may not be sufficient in sustaining mental health thus micronutrient supplementation can be considered**

Conclusions

- **Data with multiple or broad spectrum micronutrients is more robust for mood support than with single nutrient support**
- **Power is in the combination; further study is needed to understand mechanisms of action**
- **Effective for ADHD/mood disorders in all age groups studied**
- **Low side effect profile**

REFERENCES

- **Integrative Approaches to Pediatric Mood Disorders. Shannon, S. Alternative Therapies, Sept/Oct. Vol. 15. No 5.**
- **Access to Affordable and Nutritious Food-Measuring and Understanding Food Deserts and Their Consequences: Report to Congress. Michele Ver Ploeg, Breneman, Farrigan, Karen Hamrick, David Hopkins, Phillip Kaufman, Lin, Mark Nord, Travis A. Smith, Williams, Kelly Kinnison, Carol Olander, Anita Singh, and Elizabeth Tuckermanty. Administrative Publication No. (AP-036) 160 pp, June 2009**

REFERENCES

- **Social and lifestyle determinants of depression, anxiety, sleeping disorders and self-evaluated quality of life in Russia-a population-based study in Arkhangels. Averina M, Nilssen O, Brenn T, Brox J, Arkhipovsky, V. Soc Psychiatry Psychiatr Epidemiol. 2005; 40(7):511-518.**

REFERENCES

- **Optimal micronutrients delay mitochondrial decay and age-associated diseases. Mechanisms of Ageing and Development. Bruce Ames.
Doi:10.1016/j.mad.2010.04.005**

REFERENCES

- Akhondzadeh S, Mohammadi MR, Khademi M. Zinc sulfate as an adjunct to methylphenidate for the treatment of attention deficit hyperactivity disorder in children: a double blind and randomized control. (2004) *BMC Psychiatry*, 4(1):9
- Arnold L, Bozzolo H, Holloway J, Cook A, DiSilvestro R, Bozzolo D et al. Serum zinc correlates with parent-and teacher-rated inattention in children with attention-deficit/hyperactivity disorder. (2005) *J Child Adolesc Psychopharmacol*, 15(4):628-36

REFERENCES

Association of western and traditional diets with depression and anxiety in women. Jacka F, Pasco J, Mykletum A, Williams I, Hodge A, O'Reilly S et al. Am J Psychiatry 2010:167 (March)

REFERENCES

- A Prospective Study of Diet Quality and Mental Health in Adolescents.
Jacka F, Kremer P, Berk M, de Silva-Sanigorski A, Moodie M, Leslie E, Pasco J, Swinburn B. September 21, 2011
DOI: [10.1371/journal.pone.0024805](https://doi.org/10.1371/journal.pone.0024805)

REFERENCES

Database analysis of children and adolescents with Bipolar disorder consuming a micronutrient formula. Rucklidge et al. BMC Psychiatry, 2010, 10:74

Database Analysis of Adults with Bipolar disorder consuming a Micronutrient Formula. D Gately, B Kaplan. Clinical Medicine: Psychiatry 2009:2 3-16

REFERENCES

- Dietary Fat Intake and the Risk of Depression: The SUN Project. Sanchez-Villegas A, Verberne L, De Irala J , Ruíz-Canela M, 'a Toledo E , Lluís Serra-Majem L, Angel Martínez-González M. January 26, 2011
DOI: [10.1371/journal.pone.0016268](https://doi.org/10.1371/journal.pone.0016268)

REFERENCES

- Konofal E, Lecendreux M, Arnulf I, Mouren M. Iron deficiency in children with attention-deficit/hyperactivity disorder.(2004) *Archives of Pediatrics and Adolescent Medicine*, 158(12):1113-1115.
- Konofal E, Lecendreux M, Deron J, Marchand M, Cortese S, Zaim M, Mouren M, Arnulf I. Effects of Iron supplementation on attention deficit hyperactivity disorder in children. (2008) *Pediatr Neurol*, 38:20-26

REFERENCES

- Mahmoud et al. Zinc, ferritin, magnesium and copper in a group of Egyptian children with attention deficit hyperactivity disorder. *Italian Journal of Pediatrics* 2011, 37:60

<http://www.ijponline.net/content/37/1/60>

REFERENCES

- Simpson et al. Systemic review of safety and tolerability of complex micronutrient formula used in mental health. *BMC Psychiatry* 2011, 11:62
- Starobrat-Hermelin B, Kozielec T. The effects of magnesium physiological supplementation on hyperactivity in children with attention deficit/hyperactivity disorder (ADHD). *Magnes Res*, 10:149-156

References

**Efficacy and cost of micronutrient treatment of childhood psychosis.
Rodway et al. BMJ Case Reports 2012**

Improved Mood and Behavior during treatment with a Mineral-Vitamin Supplement: An open-label case series of children. Bonnie Kaplan et al. Journal of Child and Adolescent Psychopharmacology. Vol. 14, No. 1, 2004, 115-122

References

Multinutrient Supplement as Treatment: Literature review and case report of 12 yo boy with bipolar disorder. E Frazier et al. Journal of child and adolescent Psychopharmacology. Volume 19, no.4, 2009, 453-460.

Nutritional and Safety Outcomes from an Open-Label Micronutrient Intervention for Pediatric Bipolar Spectrum Disorders. Frazier et al. J of Child and Adolescent Psychopharmacology, Vol. 23, No. 8, 2013

References

Vitamins, minerals and Mood. Bonnie Kaplan et al. Psychological Bulletin, 2007. Volume 133, No. 5, 747-760.

Vitamin-mineral treatment of attention-deficit hyperactivity disorder in adults: double-blind randomised placebo-controlled trial. J Rucklidge et al. BJPsych (2014) 204, 306-315.

References

- Nutritional medicine as mainstream in psychiatry. Sarris, Jerome et al. The Lancet Psychiatry , Volume 2 , Issue 3 , 271 – 274
- Access to Affordable and Nutritious Food-Measuring and Understanding
- Food Deserts and Their Consequences: Report to Congress. Michele Ver Ploeg, Breneman, Farrigan, Karen Hamrick, David Hopkins, Phillip Kaufman, Lin, Mark Nord, Travis A. Smith, Williams, Kelly Kinnison, Carol Olander, Anita Singh, and Elizabeth Tuckermanty. Administrative Publication No. (AP-036) 160 pp, June 2009

Integrative mental health resources/literature

- The Healing Nutrients Within: How to use amino acids to achieve optimum health and fight cancer, Alzheimer's, depression, heart disease. E Braverman. Basic Health Publications, 2003.
- Textbook of Integrative Mental Health Care. J Lakes. Thieme, 2007.
- Nutrient Power. W Walsh. Skyhorse Publishing, 2012.
- Nutritional Medicine. A Gaby. Fritz Perlberg Publishing, 2011

Integrative mental health resources/literature

- INIMH.org International Network of Integrative Mental Health is a website created by researchers and clinicians in the mental health field. Is a member only website with over 1000 evidence based articles in all areas of integrative mental health. Forums are available for discussion of clinical relevant topics. A newsletter is published biannually.
- How to use Herbs, Nutrients, and Yoga in Mental Health Care. R Brown, P Gerbarg, P Muskin. Norton Publishing, 2009.
- Depression-Free, Naturally: 7 weeks to Eliminating anxiety, despair, fatigue and anger from your life. Joan Larson, PH.D. Random House Publishing, 1999.