

Building Pediatric Immune Resilience:

An Integrative Pediatric Approach
to Healthier, Happier Kids

ELISA SONG, MD
ALLINA HEALTH, NOVEMBER 14, 2024

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Objectives and overview

During this talk, you will learn evidence-based strategies to support your pediatric patients through seasonal respiratory viral illnesses. You will understand why their microbiome holds the key to immune resilience.

Objective #1: Identify the role of the gut microbiome in supporting immune health and protecting against viral respiratory illnesses.

Objective #2: Realize the implications for immune health when the gut microbiome becomes disrupted.

Objective #3: Identify practical, daily strategies to help your patients implement diet and lifestyle strategies that support immune resilience.



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WHO I AM

The 2 things I'm most proud of:

- ❖ Mom to 2 thriving kids! ☺
- ❖ Integrative pediatrician in the SF Bay Area



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Who I am



- ❖ Integrative pediatrician and pediatric functional medicine expert with over 20 years of experience
- ❖ Trained at Stanford, NYU School of Medicine, and UCSF Pediatrics Residency
- ❖ Additional training in functional medicine, homeopathy, acupuncture, herbal medicine, and essential oils
- ❖ Teach other practitioners pediatric functional medicine, pediatric acupuncture, and clinical homeopathy (A4M, IFM, CEDH, Academy for Pain Research, Center for Advanced Acupuncture Pediatrics)
- ❖ Created Healthy Kids Happy Kids to be a trusted online holistic pediatric resource for parents and practitioners
- ❖ Author of *Healthy Kids, Happy Kids: An Integrative Pediatrician's Guide to Whole Child Resilience*



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PATIENT MIX

- ❖ Well kids ~25%
- ❖ Consultations for autism/ADHD ~ 25%
- ❖ Consultations for other chronic conditions ~50%
 - ❖ Eczema, asthma, failure to thrive, GERD, chronic fatigue, autoimmune illness (IBD, rheumatoid arthritis, PANDAS/PANS), Down's syndrome, cerebral palsy, seizures, constipation, chronic ear infections, allergies, etc...



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My Integrative Practice

- ❖ Conventional Pediatrics
- ❖ Functional Medicine
- ❖ Nutritional Medicine
- ❖ Homeopathy
- ❖ Traditional Chinese Medicine – acupuncture and herbs
- ❖ Western Herbal Medicine
- ❖ Essential Oils/Aromatherapy



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What is Evidence-Based Medicine?

- ❖ Defined by Sackett in 1996:
 - ❖ *"Evidence-Based Medicine (EBM) is the conscientious, explicit, judicious and reasonable use of modern, best evidence in making decisions about the care of individual patients. EBM integrates clinical experience and patient values with the best available research information."*
- ❖ Evidence-Based Medicine is a TRIAD between research, clinical experience, and patient values – one is not more important than the other.
- ❖ I share the evidence-based tools and protocols I've used successfully with my patients and my own kids
 - ❖ Based on existing research and my 20+ years of clinical experience as a pediatrician



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Why an Integrative Approach?



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QUIZ



Approximately 27% of kids today have at least one chronic disease?

~1 in 2 kids today has at least 1 chronic health condition



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Our kids are sick, and getting sicker...

In 2015, ~27% of children in US had a chronic disease (CDC)

- https://www.cdc.gov/pcd/issues/2015/14_0397.htm


In 2021, over 40% of children had at least 1 chronic disease (CDC)

- <https://www.cdc.gov/healthyschools/chronicconditions.htm> (From: National Survey of Children's Health. NSCH 2018 19: Number of Current or Lifelong Health Conditions, Nationwide, Age in 3 Groups website. childhealthdata.org. Accessed February 24, 2021.)

(Do we know the real numbers?)

From 2007 National Survey of Children's Health (N = 91,642; children aged 0-17 years)

- 43% of US children had at least 1 of 20 chronic health conditions assessed
- Increasing to 54.1% when overweight, obesity, or being at risk for developmental delays are included
- <https://pubmed.ncbi.nlm.nih.gov/21570014/>



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Where we are now

Immune Disorders

- ❖ 1 in 5 has eczema
- ❖ 1 in 5 has obesity (1 in 4 among Hispanic and Black children)
- ❖ 1 in 10 has asthma
- ❖ 1 in 13 has anaphylactic food allergies
- ❖ 1 in 13 has autoimmunity

Neurodevelopmental & Neuropsychiatric Concerns

- ❖ 1 in 6 has a developmental disability
- ❖ 1 in 10 has ADHD
- ❖ 1 in 36 has autism
- ❖ 1 in 3 teens has anxiety
- ❖ 1 in 3 teen girls has seriously thought of suicide (and >1 in 10 have tried)



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Where we are now – The “New Normal”

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- ❖ <https://www.nimh.nih.gov/health/statistics/any-anxiety-disorder>
- ❖ https://www.cdc.gov/healthyouth/data/yrbs/yrbs_data_summary_and_trends.htm
- ❖ <https://www.cdc.gov/obesity/data/childhood.html>
- ❖ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5932324/>
- ❖ <https://publications.aap.org/aapnews/news/13763/Study-1-in-6-children-has-developmental-disability>
- ❖ <https://www.cdc.gov/asthma/nhis/2011/table4-1.htm>
- ❖ <https://www.cdc.gov/ncbddd/adhd/data.html>
- ❖ <https://publications.aap.org/aapnews/news/23904/CDC-Autism-rate-rises-to-1-in-36-children>



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Not so normal...

NEJM (2005) "A Potential Decline in Life Expectancy in the US in the 21st Century"

- ❖ There has been a slow steady *increase* in life expectancy over past thousand years
- ❖ Because of lifestyle changes and the rise in childhood obesity with resultant health problems, this could be the first time that children today live less healthy and have **shorter lifespans** than their parents!!!



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Major Influences on Children's Health in the 21st Century

- ❖ Overconsumption & undernutrition
- ❖ Deficient immunologic education ("hygiene hypothesis")
- ❖ Overuse of antibiotics, antacid medications, mood regulators & other pharmaceuticals
- ❖ Environmental toxicity
- ❖ Psychological stress



At the Root Cause:
Disruption to our children's developing gut microbiomes

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What can we do?

TAKE A ROOT-CAUSE, INTEGRATIVE
PEDIATRIC APPROACH



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Functional Medicine & Kids

- ❖ Functional medicine is personalized medicine
- ❖ Addresses the *ROOT* causes and underlying biochemical imbalances
- ❖ "**Functional medicine** is anchored by an examination of the *core clinical imbalances* that underlie various disease conditions. Those imbalances arise as **environmental inputs** such as diet, nutrients (including air and water), exercise, and trauma **are processed** by one's body, mind, and spirit through a unique set of genetic predispositions, attitudes, and beliefs."

The future of pediatric medicine:
Anchored in compassion and connection;
Guided by the microbiome and epigenetics.



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ASSIMILATION –
 digestion, absorption, and barrier integrity

***The Cornerstone of Functional
 Medicine***

(especially for kids)

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QUIZ



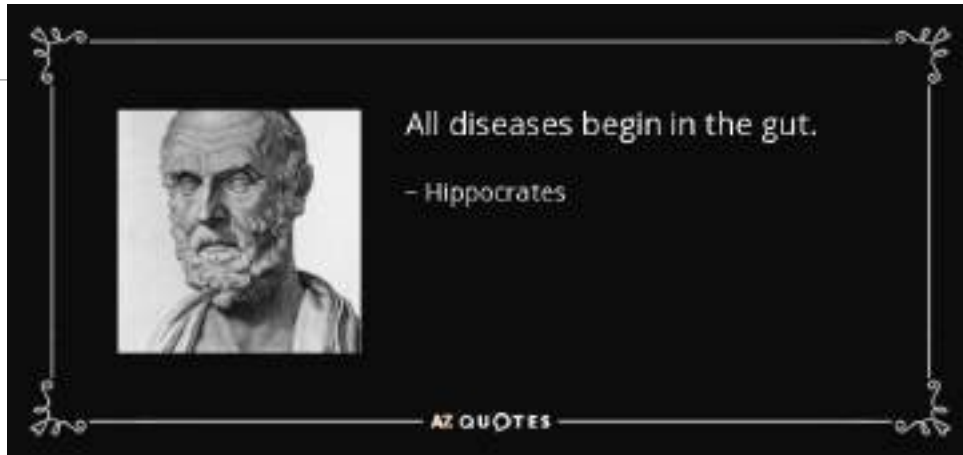
Who said "All diseases begin in the gut"?



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~400 B.C.



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Dr. Alessio Fasano, Chief of Pediatric Gastroenterology and Nutrition at Mass General for Children (MGfC)



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All Health Starts in the Gut

The gut-immune system connection

The gut-brain connection

- ❖ Our "second brain"

The gut-hormone connection

- ❖ Thyroid
- ❖ Adrenals

The gut-metabolism connection

- ❖ Obesity/overweight
- ❖ Metabolic syndrome



The Gut-WHOLE BODY Connection

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The Gut-Immune System Connection

70-80% of our immune cells are in our gut!

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8001875/>



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Your Child's Gut-Immune System Connection

Our gut microbiome is home to over 100 trillion microscopic organisms

- 10 bacteria for every 1 human cell in and on our body

Our gut is one of our **FIRST** and **LARGEST** interface with the outside world (foods, toxins, pathogens)

- Tonsil-like patches along our entire gut → Gut-associated lymphoid tissue (GALT)
- GALT decides who is friend or foe and how to respond
 - Too little → get sick frequently and stay sick longer
 - Too much → chronic inflammation
 - Wrong kind → autoimmune

Healthy, happy gut = Healthy, happy immune system



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The Gut-Immune System Connection

- ❖ Resilience against infections
 - ❖ Faster and better recovery from infections
 - ❖ Reduces fever/flu risk during winter
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/19651563/>
- ❖ Reduces antibiotic-induced diarrhea
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/37564180/>
- ❖ Healthy gut microbiome associated with fewer respiratory tract infections (RTIs) in babies and children
 - ❖ <https://www.mdpi.com/2072-6643/14/14/2992/htm>
- ❖ Gut microbiota regulate immune defense against influenza A
 - ❖ <https://www.pnas.org/doi/full/10.1073/pnas.1019378108>
- ❖ Healthy gut microbiome and probiotic supplements >>> may improve effectiveness of influenza, COVID-19 and other vaccines
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/28923425/>
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/29416317/>
 - ❖ <https://gut.bmj.com/content/71/6/1106>



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What happens when the gut microbiome becomes disrupted?

IMPLICATIONS FOR CHILDREN'S LIFELONG HEALTH



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Microbiome Disruption & Children's Immune Health

Early microbiome disruption and atopic disease

- ❖ Antibiotics or antacid medicines in the first 6 months of life increase risk of every allergic disease by 4 years of age, including (eczema, asthma, hayfever, anaphylactic food allergies)
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/29610864/>
- ❖ Probiotics given to mom during 3rd trimester and while nursing may reduce risk for atopic disease in their babies by 50%
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/11297958/>

Microbiome disruption and respiratory infections

- ❖ Gut microbiota composition influences response to common childhood respiratory viral infections, and vice versa
 - ❖ Gut dysbiosis influences the severity of respiratory infections
 - ❖ Viral infections can trigger/worsen gut dysbiosis
- ❖ Unhealthy gut microbiome (gut dysbiosis) associated with more frequent RTIs in babies and children
 - ❖ Gut dysbiosis associated with more severe RSV and non-RSV bronchiolitis in infants and children
 - ❖ <https://www.mdpi.com/2072-6643/14/14/2992/html>



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Microbiome Disruption & Children's Immune Health

❖ Autoimmune connection

- ❖ Gut dysbiosis may predispose to autoimmunity
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/28556916/>

❖ COVID-19 infection

- ❖ Persistent gut dysbiosis seen in severe & long COVID
 - ❖ <https://www.frontiersin.org/articles/10.3389/fimmu.2023.1080043/full>
- ❖ Leaky gut (increased zonulin) found in children with MIS-C
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/34032635/>



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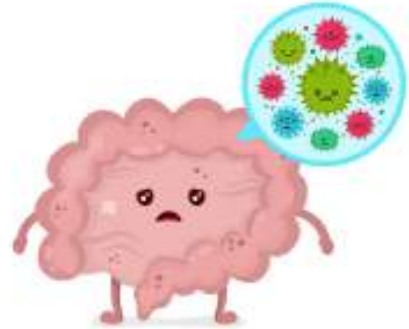
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Microbiome Disruption & Children's Overall Health

Gut dysbiosis during the critical development window increases the risk of developing **immune**, **metabolic**, and **neurological** conditions throughout the lifespan and may be related to:

- ❖ **Early on:** sleep issues, colic, atopic march (eczema, allergies), CMPA
- ❖ **Childhood:** Constipation, FPIEs, EoE, mood disorders, ADHD, autism, Crohn's, Juvenile idiopathic arthritis, type 1 diabetes
- ❖ **Adulthood:** UC, Celiac disease, mental illness, type 2 diabetes, obesity...

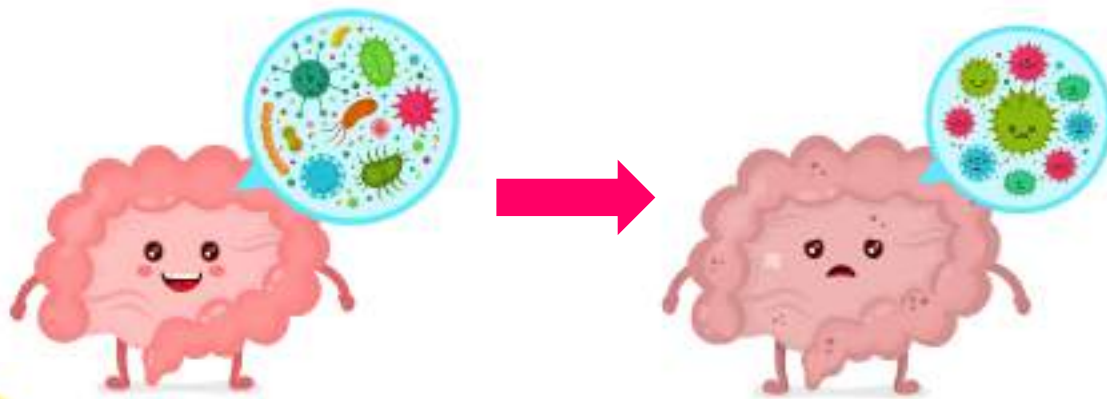
❖ <https://pubmed.ncbi.nlm.nih.gov/27074706/>



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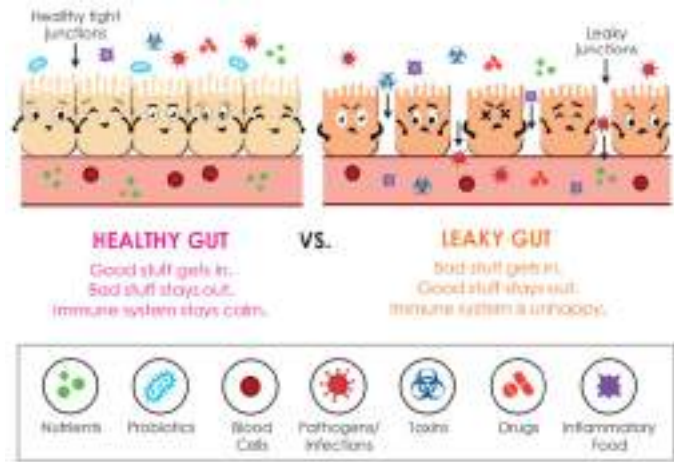
When the Gut Microbiome is Disrupted → Gut Dysbiosis, Leaky Gut, Metabolic Endotoxemia



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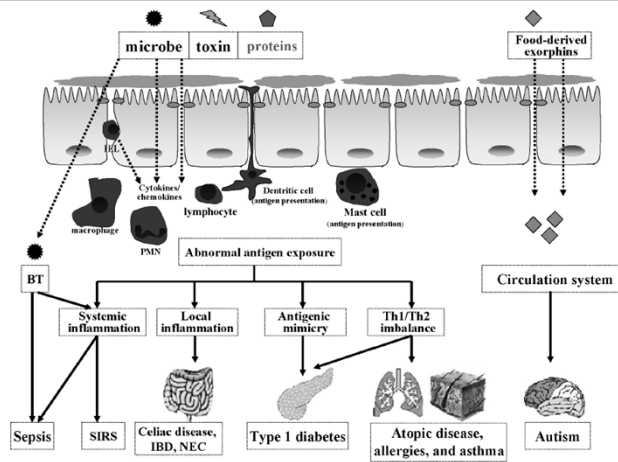
When the gut microbiome is disrupted ...



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Leaky Gut & Children's Health



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Leaky Gut & Kid's Health – How long have we known?

- ❖ 1981 Eczema
- ❖ 1982 Crohn's and Celiac disease
- ❖ 1985 Food allergies
- ❖ 1986 Pollen allergies
- ❖ 1989 Migraines
- ❖ 1990 Irritable Bowel Syndrome
- ❖ 2000 Juvenile arthritis
- ❖ 2003 Autism
- ❖ 2005 Type 1 diabetes
- ❖ 2018 ADHD
- ❖ 2020 Hashimoto's thyroiditis
- ❖ 2020 Childhood obesity
- ❖ 2020 OCD
- ❖ 2021 Multisystem Inflammatory Syndrome in Children (MIS-C)



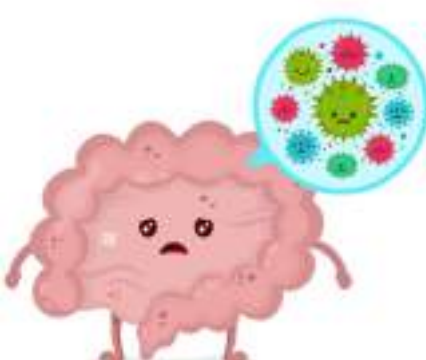
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How does the gut microbiome become disrupted?

MICROBIOME MISCHIEF MAKERS

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Modern Microbiome Mischief Makers

<ul style="list-style-type: none"> ❖ Medications <ul style="list-style-type: none"> ❖ Antibiotics ❖ NSAIDs (like ibuprofen) ❖ Reflux/antacid medications ❖ Antihistamines (Zyrtec, Claritin) ❖ Steroids ❖ Oral contraceptives ❖ SSRIs ❖ Environmental <ul style="list-style-type: none"> ❖ Glyphosate 	<ul style="list-style-type: none"> ❖ Ultraprocessed foods <ul style="list-style-type: none"> ❖ Too many sugars (fructose, sucrose, Ace-K, etc.) ❖ Food additives (emulsifiers) ❖ Electromagnetic Frequencies (EMF's)/Screen time ❖ Psychological stress ❖ Lifestyle stress – lack of exercise, lack of sleep, lack of hydration ❖ ???
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How many of our kids are exposed to all of these?

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References for Microbiome Mischief Makers

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- ❖ <https://gut.bmj.com/content/69/8/1510>
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- ❖ <https://pubmed.ncbi.nlm.nih.gov/34642755/>



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Antibiotics & the Gut Microbiome



Antibiotics are the single biggest ACUTE disruptor to the gut microbiome

1. Use antibiotics judiciously and appropriately – make sure they're really "necessary"
2. Work with patients restore their gut microbiome after antibiotics and other microbiome-disrupting meds

- <https://pubmed.ncbi.nlm.nih.gov/39235661/>



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Psychological Stress & the Gut Microbiome



Psychological stress is the single biggest **CHRONIC** disruptor to the gut microbiome

(Psychological stress increases zonulin within 1 hour)

<https://www.sciencedirect.com/science/article/abs/pii/S0301051118303302>



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Building immune resilience

FOR THIS WINTER AND BEYOND ...



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Common childhood viral illnesses

- ❖ What we've always had:
 - ❖ RSV
 - ❖ Influenza
 - ❖ Influenza-like illnesses (many different non-influenza viruses)
 - ❖ Common colds – caused by over 200 different viruses, including rhinoviruses, coronaviruses, adenoviruses
 - ❖ Stomach flu (viral gastroenteritis)
 - ❖ Pharyngitis (viral or bacterial)
- ❖ What we now also have:
 - ❖ COVID-19



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Crud Type	What causes it	How contagious?	Common symptoms	Risk for severe disease	Conventional treatment
RSV	Respiratory Syncytial Virus	RO ~3.0 (>42% of children are asymptomatic)	<ul style="list-style-type: none"> • Mild fever • Runny nose/congestion • Sneezes • Copious mucous • Cough • Wheeze/Difficulty breathing • Headache 	<ul style="list-style-type: none"> • Premature infants • Infants 6 months and younger • Children <2 years with chronic lung disease or congenital heart disease • Children with immunocompromise • Children with neuromuscular disorders 	<ul style="list-style-type: none"> • Supportive • +/- albuterol • Steroids no not help • Oxygen if needed • SYNAGIS (monoclonal antibody for prevention of RSV in high-risk babies)
The "flu"	<ul style="list-style-type: none"> • Influenza A virus – subtypes A(H1N1) and A(H3N2) • Influenza B virus – lineages B(Victoria) and B(Yamagata) <p>This year, Influenza A (H3N2) is most prevalent</p>	RO ~ 1.3-1.5 depending on season (>50% of children may be asymptomatic)	<ul style="list-style-type: none"> • Sudden onset • High fever • Body aches • Chills • Fatigue • Headache • Sore throat • Cough • Runny nose/congestion • Nausea/vomiting/diarrhea 	<ul style="list-style-type: none"> • Children <2 years, especially infants < 6 months • Adults > 65 years • Asthma and chronic lung disease • Neurologic or neurodevelopmental conditions • Obesity • Chronic conditions • Pregnant and immediately post-partum women • Certain racial/ethnic minority groups (Black persons, Hispanic or Latino persons, and American Indian or Alaska Native persons) 	<ul style="list-style-type: none"> • Supportive • Tamflu (will discuss shortly – not my preferred) • Xofluva (baloxavir)
Common Cold	Most often Rhinovirus (also coronavirus, adenovirus and 200+ others)	RO < 1.0 for most cold viruses (70% or more of children may be asymptomatic)	<ul style="list-style-type: none"> • Low-grade fever or none • Runny nose/congestion • Sneezes • Sore throat • Cough 	Severe disease uncommon	<ul style="list-style-type: none"> • Supportive
COVID-19	SARS-CoV-2 Virus	RO of BA.4/A.5 ~ 6-10 (up to 40-50% or more of children may be asymptomatic)	<ul style="list-style-type: none"> • Fever • Cough • Sore throat • Runny nose/Congestion • Headache • Abdominal pain • Fatigue • Body aches • Nausea/vomiting/diarrhea • Loss of taste or smell 	<ul style="list-style-type: none"> • Adults > 65 years • Chronic co-morbidities • Obesity • Immunocompromised • +/- Asthma • Certain racial/ethnic minority groups (Black persons, Hispanic or Latino persons, and American Indian or Alaska Native persons) 	<ul style="list-style-type: none"> • Supportive • Paxlovid (watch for rebound) • Molnupiravir (cancer and birth defect concerns) • Tocilizumab (IL-6 antagonist used to treat Rheumatoid Arthritis) for severe COVID • Evusheld for pre-exposure prophylaxis
Influenza-like illness	Many different non-influenza viruses		Same as influenza	Same as influenza	<ul style="list-style-type: none"> • Supportive
"Stomach flu"	Many different viruses		<ul style="list-style-type: none"> • Abdominal pain • Nausea/vomiting/diarrhea • Low-grade fever 	Young children (the biggest concern is dehydration)	<ul style="list-style-type: none"> • Supportive
Pharyngitis	Many different viruses, or Bacterial (usually group A strep)		<ul style="list-style-type: none"> • Sore throat • Headache (strep) • Abdominal pain (strep) • Fever • Very few upper respiratory symptoms 	Severe disease is uncommon	<ul style="list-style-type: none"> • Supportive if viral • Supportive + Antibiotics if Strep throat

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Vulnerability vs. resilience

We're all vulnerable ...
What would make us resilient?



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Immune Resilience

- ❖ Immune resilience ≠ never getting sick
- ❖ Immune resilience = ability of cells to cope with stress and recover rapidly and completely
 - ❖ EVEN IF we get sick
 - ❖ The ability to bounce back and be even stronger for the next "hit"
 - ❖ → Cellular hormesis (from the Greek *hórmēsis* "rapid motion, eagerness")
 - ❖ → Cellular memory of how to do it even better the next time!
- ❖ Cells differ less in the "vulnerability," than in their "resilience"
 - ❖ Smirnova L et al. Food for Thought... Cellular Resilience. <https://www.ncbi.nlm.nih.gov/pubmed/26536287>

"It is not important whether you fall, but whether you get up again."



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The #1 way to support your child's immune resilience ...

CREATE MICROBIOME MAGIC EVERY DAY!



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“5 Things” for Microbiome Magic

Nourish: Nurture your microbiome

Breathe: The Vagus Nerve to optimize the gut-brain connection

Move: Daily movement

Hydrate: Healing hydration

Sleep: Restorative sleep for the gut and brain



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Nourish Part 1:

GET YOUR MICROBIOME CHAMPIONS IN




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The Whole Gut Rainbow

Microbiome Champions = The 3 “F’s”

- Fiber
- Phytonutrients
- Fermented foods



(Found in *Healthy Kids, Happy Kids* resources)

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The 3 F's: Fiber

Our "Fiber Gap"

- ❖ **95% DO NOT** meet recommended intake
- ❖ Most US adults and kids get **LESS THAN HALF** the recommended daily fiber intake

Age/Gender	Recommended daily fiber intake
Adult males > 50 years	30 grams
Adult females > 50 years	21 grams
Adult males <50 years	38 grams
Adult females <50 years	25 grams
Teen males 14-18 years	38 grams
Teen females 14-18 years	26 grams
Boys 9-13 years	31 grams
Girls 9-13 years	26 grams
Children 4-8 years	25 grams
Children 1-3 years	19 grams



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Fiber in Foods – Make It Concrete

- ❖ 1 cup of raspberries – 9 grams
- ❖ 1 cup of blueberries – 3.5 grams
- ❖ 1 medium apple w/skin – 4-5 grams
- ❖ 1 cup of broccoli – 5 grams
- ❖ ½ medium avocado – 5 grams
- ❖ 1 cup cooked carrots – 5 grams
- ❖ 1 cup raw carrots – 3.5 grams

- ❖ ½ cup of brown rice – 2 grams
- ❖ ½ cup of white rice – 0.5 grams
- ❖ 1 tablespoon of chia seeds – 5 grams
- ❖ 2 tablespoons of peanut butter – 2 grams
- ❖ 1 cup of lentils – 16 grams
- ❖ 1 cup of edamame – 8 grams

TABLE: Fiber Content of Foods
p. 45 of *Healthy Kids, Happy Kids*



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The Colors of Fiber

Red	guava, raspberries, strawberries, apples (with skin on), beets, red bell pepper
Orange/Yellow	sweet potatoes, pumpkin, carrots, apricots, persimmon, grapefruit, orange, nectarine
Green	artichoke, avocado, broccoli, kale, collard beans, spinach, cabbage, brussels sprouts, squash (crookneck, summer, zucchini, acorn), okra, green beans, peas, asparagus, kiwifruit
Blue/Purple	blackberries, blueberries, prunes, raisins, passionfruit
Tan/Brown	seeds (pumpkin, chia, sunflower, flax), nuts (coconut, almonds, chestnuts, pinenuts, pistachios, hazelnuts), legumes (lentil, navy, lima, adzuki, pinto, black, garbanzo, kidney), whole grains (whole wheat, barley, bran, quinoa, oat, popcorn, brown rice, bulgur, spelt, teff), potato (with skin), mushrooms
White	parsnips, jicama, cauliflower, kohlrabi, Asian pear, bananas, pears

Tan/Brown packs the biggest fiber punch per bite!



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The 3 F's: Phytonutrients (Phytonutrients = Color)

Get in a variety of **COLOR** – each color has different Phytonutrient Power

The Phytonutrient Gap

- 8 in 10 Americans has a phytonutrient gap – in EVERY color
 - 83% don't get enough White
 - 80% don't get enough Orange/Yellow
 - 76% don't get enough Blue/Purple
 - 74% don't get enough Red
 - 69% don't get enough Green
- <https://boletin.inmegen.gob.mx/boletin2/images/AmericaPhytonutrientReport.pdf>



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Herbs & spices count, too!

Herbs & Spices that support your microbiome

- ❖ Turmeric
- ❖ Ginger
- ❖ Cumin
- ❖ Rosemary
- ❖ Fennel
- ❖ Garlic
- ❖ Parsley
- ❖ Cardamon
- ❖ Coriander
- ❖ Cinnamon
- ❖ Oregano
- ❖ Cayenne
- ❖ Black pepper
- ❖ Clove
- ❖ Green tea



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QUIZ



Why are fermented foods good for you?



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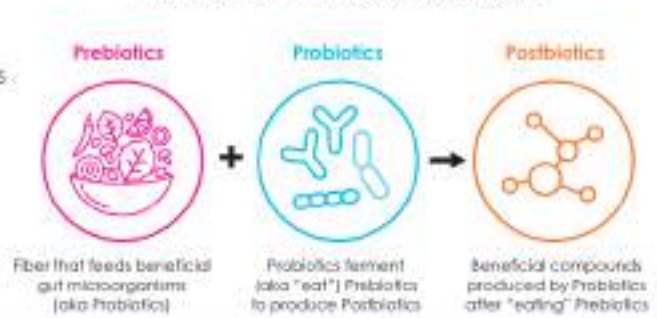
54

The 3 F's: Fermented Foods

Fermented Foods: Probiotics with a Postbiotic Punch!

- ❖ Yogurt (caveat: avoid dairy if "phlegmy")
- ❖ Options – almond, coconut, cashew
- ❖ Kefir (dairy, coconut, water)
- ❖ Kombucha
- ❖ Kvass
- ❖ Sauerkraut
- ❖ **Real** pickles & fermented vegetables
- ❖ Raw unfiltered apple cider vinegar
- ❖ Miso
- ❖ Natto
- ❖ Tempeh
- ❖ Kimchi
- ❖ Idli
- ❖ Oso

Prebiotic vs. Probiotic vs. Postbiotic



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Postbiotic examples

Vitamins

- ❖ Vitamin K
- ❖ Vitamin B12 (cobalamin)
- ❖ Vitamin B9 (folate)
- ❖ Vitamin B1 (thiamin)
- ❖ Vitamin B2 (riboflavin)
- ❖ Vitamin B3 (niacin)
- ❖ Vitamin B6 (pyridoxine)

Enzymes

Immune chemicals

- ❖ Infection-fighting proteins
- ❖ Histamine
- ❖ Beta-glucans
- ❖ Organic acids

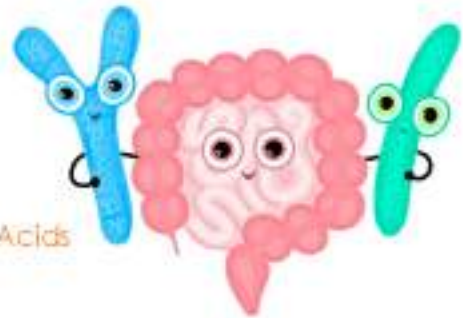
Neurotransmitters

- ❖ Serotonin
- ❖ Dopamine
- ❖ GABA
- ❖ Acetylcholine
- ❖ Melatonin
- ❖ Histamine

Short-Chain Fatty Acids

- ❖ Butyrate
- ❖ Propionate
- ❖ Acetate

And more!



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Think beyond sauerkraut

RECIPES FROM HEALTHY KIDS, HAPPY KIDS
FERMENTED BLACKBERRY LEMONADE



INGREDIENTS

- 1/2 cup organic blackberries (or berries of your choice)
- 1 tablespoon organic sugar
- 1/2 to 1 cup fresh lemon juice (from 2 to 4 large organic lemons)
- 1 probiotic capsule (containing 5 billion to 25 billion CFU per capsule)

DIRECTIONS

1. Wash the blackberries and sugar in a 22-ounce (1-quart) wide-mouth glass mason jar. Use the rest of a washed apple as gently scrubby fine sandpaper and dry lemon juice.
2. Add the lemon juice to the jar. Add 1/2 to 1 cup lemon juice, depending on how tart you like your lemonade.
3. Place in 2 tablespoons of filtered water in a small bowl or glass. Open the probiotic capsule. Add the probiotic powder to the water and stir gently to dissolve. Dissolve the probiotic powder.

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QUIZ



Which is better for your gut microbiome?

Fiber or Fermented foods

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Fermented Foods vs. Fiber

Fermented foods may win over fiber

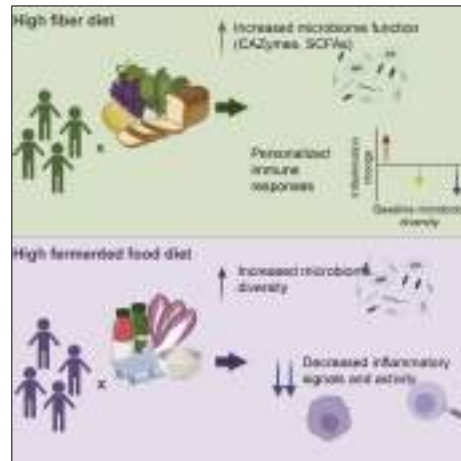
17-week randomized prospective study of plant-based fiber vs. fermented foods

High-fiber diet increased microbiome-function despite stable microbial community diversity

High-fermented-food diet steadily increased microbiota diversity and decreased inflammatory markers

CONCLUSION: "Fermented foods may be valuable in countering the decreased microbiome diversity and increased inflammation pervasive in industrialized society."

[https://www.cell.com/cell/fulltext/S0092-8674\(21\)00754-6](https://www.cell.com/cell/fulltext/S0092-8674(21)00754-6)



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Nourish Part 2:

KEEP MICROBIOME MISCHIEF MAKERS OUT



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The Standard American Diet (SAD for our Gut Microbiome ☹️)



I'll have fries and a milkshake with that...

And don't forget the Diet Coke!

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Microbiome Mischief Makers

Move from an ultra-processed SAD diet to a gut-happy one!

- ❖ Reduce FDA-approved food additives (especially emulsifiers)
- ❖ Reduce added sugars and artificial sweeteners
- ❖ Reduce glyphosate exposure



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FDA-Approved Food Additives & the Gut Microbiome

Cause direct harm to gut microbiome and cause gut dysbiosis and leaky gut

Food additives (esp emulsifiers) directly correlated with increased with of autoimmune disease

- **Emulsifiers (surfactants)** disrupt tight junctions and **directly cause leaky gut**
- Harmful effects of sucrose fatty acid esters found at 50 mg/L
 - FDA allows infant formula to have levels up to 120 mg/L!
- **Mono- and di-glycerides, Polysorbate 80, Sodium carboxymethyl cellulose (CMC), Carageenan**



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7117642/>
[https://www.gastrojournal.org/article/S0016-5085\(21\)03728-8/fulltext](https://www.gastrojournal.org/article/S0016-5085(21)03728-8/fulltext)
<https://pubmed.ncbi.nlm.nih.gov/25676324/>
<https://pubmed.ncbi.nlm.nih.gov/21300443/>

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Added Sugar & the Gut Microbiome

- ❖ Reduces macrophage activity against viruses by up to 50% for at least 5 hours
 - ❖ <https://www.sciencedirect.com/science/article/abs/pii/S0002916523334178?via%3Dihub>
- ❖ High-sugar, high-fat Western diets induces intestinal Paneth cell dysfunction leading to **gut dysbiosis and gut inflammation**
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/34010595/>
- ❖ Sugar and yeast dysbiosis
- ❖ Sugar compromises cognitive abilities (learning and memory) → ADHD
- ❖ Sugar linked with depression & schizophrenia
- ❖ Sugar worsens anxiety and body's ability to cope with stress
- ❖ Sugar and glucose/insulin dysregulation
- ❖ Sugar is as **ADDICTIVE**, or more, than cocaine
- ❖ Added sugar is found EVERYWHERE



There is NO nutritional benefit to eating added sugar

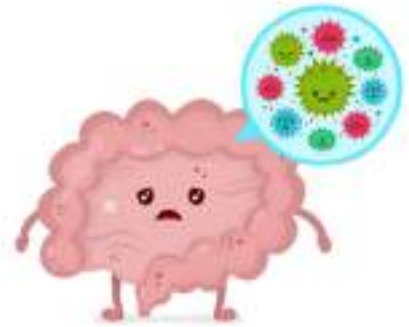
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“Sugar-Free” Isn’t Better

FDA-approved artificial “high-intensity sweeteners”

- ❖ Just as addictive as refined sugar and cocaine
- ❖ Rats already addicted to cocaine **chose saccharin** over cocaine
- ❖ **Can disrupt the gut microbiome** (esp saccharin and sucralose)
- ❖ Acesulfame potassium affects brain in mice and decreases memory and cognitive function
 - ❖ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9029443/>



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“Fake sugar” to avoid

- ❖ Saccharin
- ❖ Aspartame (NutraSweet, Equal)
- ❖ Acesulfame potassium (Ace-K)
- ❖ Sucralose (Splenda)
- ❖ Neotame
- ❖ Advantame



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QUIZ



Glyphosate was initially patented as a **XXX**.



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Glyphosate & the gut microbiome

Glyphosate initially patented by Monsanto in 2010 as an **antibiotic**

- ❖ Broad activity against a variety of bacteria and fungi
- ❖ Implicated in increasing problem of antibiotic resistance and multi-drug resistant bacteria

Directly causes gut dysbiosis

- ❖ Kills beneficial Lactobacillus and Bifidobacter species
- ❖ Preserves pathogenic Clostridia and Salmonella species
- ❖ Directly injures tight junctions, triggers zonulin release, and causes leaky gut
- ❖ Tight junctions also present in linings of upper respiratory tract, kidneys and blood-brain barrier
- ❖ Glyphosate may cause similar damage to BBB

- <https://academic.oup.com/jac/article/76/7/1655/6248211>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5972442/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6024569/>
- <https://clinical-nutrition.imedpub.com/protective-effects-of-lignite-extract-supplement-on-intestinal-barrier-function-in-glyphosatemediated-tight-junction-injury.php?aid=18161>
- <https://pubmed.ncbi.nlm.nih.gov/30605748/>



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Eat real food


SIMPLE, RIGHT?



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QUIZ



1 in **XXX** kids doesn't eat any vegetables any given day.


1 in 2



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QUIZ



1 in **XXX** kids doesn't eat any fruit on any given day.

1 in 3



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QUIZ



What % of US kids and adults meet their recommended fiber intake?

< 5%



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QUIZ



What percentage of their calories do Kids/Teens consume as at least 2/3rd of their calories as ultraprocessed foods?

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QUIZ



What is the MAXIMUM grams of added sugar children (2-18 years old) should have in one day?

25 grams

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How much added sugar is "too" much?

HEALTHY KIDS ARE SWEET ENOUGH

Kids age 2-18 should have **LESS THAN 25 GRAMS** or **SIX TEASPOONS** of **ADDED SUGARS DAILY** for a healthy heart.

4 grams of sugar = 1 teaspoon

1 teaspoon = 1 sugar cube = 1 sugar packet

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QUIZ



How many teaspoons of added sugar does the average teen have each day?



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34 teaspoons = 143 grams
Almost 6X the amount of added sugar they should have!





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QUIZ



Where do ~half of these added sugars come from?



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Sugar-Sweetened Beverages



Starbucks Grande Mocha Cookie Crumble Frappuccino – **55 grams (13 tsp)**



Boba Guys Strawberry Jasmine Fresca – **44 grams (11 tsp)**



Starbucks Grande Oatmilk Matcha Latte – **28 grams (7 tsp)**

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The sugar adds up



27 oz

2 slices = 8g of added sugar



By lunchtime, your child could have had 29 grams of added sugar or ~ 7 teaspoons of sugar

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The how:

EDUCATE. EMPOWER. HAVE FUN.

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Counting Plants 

Make every meal POP with Plants On Purpose!

BREAKFAST: Count Your Plants

Total Plants _____

Make it POP! _____

LUNCH: Count Your Plants

Total Plants _____

Make it POP! _____

DINNER: Count Your Plants

Total Plants _____

Make it POP! _____

SNACK: Count Your Plants

Total Plants _____

Make it POP! _____

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Teach them the HOW (to eat more plants)

Step 2: Count your plants!
(Know where you're starting from)

Step 3: Make every meal POP!
(Eat **P**lants **O**n **P**urpose!)

Homework: Count your plants at every meal/snack and then think about how you can make each meal/snack POP with "just one more" plant!

(Found in *Healthy Kids, Happy Kids* resources)

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Your Child's Daily Added Sugar Inventory

Breakfast:	Added sugar (in grams)
Lunch:	Added sugar (in grams)
Dinner:	Added sugar (in grams)
Snack/Event:	Added sugar (in grams)
TOTAL GRAMS OF DAILY ADDED SUGAR	
TOTAL TEASPOONS OF DAILY ADDED SUGAR (1 teaspoon = 4 grams)	

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Teach them the HOW (to reduce added sugars)

Step 2: Take your daily added sugar inventory!
(Know where you're starting from)

Step 3: Make Gut Hero swaps!

Homework: Take an inventory of the added sugars in what your kids are eating already.

Think about Gut Hero Swaps you can make!

p. 128 in *Healthy Kids, Happy Kids*

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There are 4 other “Things” for Microbiome Magic!

Nourish: Nurture your microbiome

Breathe: The Vagus Nerve to optimize the gut

Move: Daily movement

Hydrate: Healing hydration

Sleep: Restorative sleep

Your Kids Get to Choose Where to Start!



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Top supplements for immune resilience



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Food as medicine first!



Vitamin C,
Vitamin A,
Vitamin D,
Zinc,
Glutathione,
Omega-3's,
Probiotics

<https://healthykidshappykids.com/food-as-medicine/>



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Top supplements for immune resilience

- ❖ Vitamin D
- ❖ Omega-3 fatty acids (fish oil)
- ❖ Probiotics

❖ Zoe app data from COVID-19 of >400,000 users, reduced COVID risk in women:
<https://nutrition.bmi.com/content/4/1/149>



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Omega-3 EFAs may protect against COVID-19

- ❖ The Omega-3 Index (O3I) was measured in banked blood from 100 COVID-19 patients
 - ❖ Risk for death was analyzed as a function of quartiles (Q) of the O3I
 - ❖ Patients in Q4 (O3I \geq 5.7%) vs. Q1–3 were 75% LESS likely to die ($p = 0.07$).
 - ❖ These pilot data suggest that a higher O3I may lower risk for death from COVID-19
 - ❖ **Nutrition-based interventions to reduce COVID-19 morbidity/mortality are needed.**
- ❖ [https://www.plefa.com/article/S0952-3278\(21\)00013-2/fulltext](https://www.plefa.com/article/S0952-3278(21)00013-2/fulltext)



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Probiotics & viral illnesses

- ❖ Probiotics optimize gut microbiome, improve host immunity and reduce risk of viral RTIs
- ❖ 2015 Cochrane review
 - ❖ Probiotics better than placebo at:
 - ❖ Reducing duration of acute RTI illness
 - ❖ Reducing antibiotic prescription rate
 - ❖ Reducing cold-related school absences
 - ❖ **Probiotic use could achieve >54 million fewer days of infection, >2 million averted antibiotic courses, and >4 million avoided missed work days" each year!**
 - ❖ <https://link.springer.com/article/10.1007/s00394-021-02519-x>
 - ❖ <https://www.frontiersin.org/articles/10.3389/fcimb.2020.596166/full>
- ❖ Probiotics protect against RSV infection and RSV-induced lung
 - ❖ <https://pubmed.ncbi.nlm.nih.gov/33495515/>
- ❖ Probiotics reduce risk of influenza infection, reduce lung inflammation and speed up influenza viral clearance
 - ❖ <https://www.frontiersin.org/articles/10.3389/fcimb.2020.596166/full>



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Which probiotics?

(look for strain-specific probiotics for pediatric viral illnesses)

- ❖ Lactobacillus acidophilus NCFM
- ❖ Bifidobacterium lactis Bi-07
- ❖ Lactobacillus rhamnosus GG
- ❖ Bifidobacterium lactis BB-12
- ❖ B. coagulans GardenBC30
- ❖ B. subtilis DE111



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When Kids get sick ...

LEARN HOW TO USE YOUR EVIDENCE-BASED INTEGRATIVE PEDIATRIC TOOLKIT



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What is evidence-based medicine?

- ❖ Defined by Sackett in 1996:
 - ❖ "Evidence-Based Medicine (EBM) is the conscientious, explicit, judicious and reasonable use of modern, best evidence in making decisions about the care of individual patients. EBM integrates clinical experience and patient values with the best available research information."
- ❖ Evidence-Based Medicine is a TRIAD between research, clinical experience, and patient values – one is not more important than the other.
- ❖ I share the evidence-based tools and protocols I've used successfully with my patients and my own kids
 - ❖ Based on existing research and my 20+ years of clinical experience as a pediatrician



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If Microbiome Mischief-Making Medications are Necessary ...

Work with patients to restore their gut microbiome to help your children thrive for a lifetime!



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Everyone can be a Gut Hero!



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