Diabetes Education SERVICES

CELEBRATING 20 YEARS

Advancing Your Career in Diabetes Education

Getting to the Gut & Skin
Meet your Microbiome

Beverly Thomassian, RN, MPH, CDCES, BC-ADM

2021 DiabetesedEd.net

Diabetes Education SERVICES

Happy Diabetes Month

November Celebration Sales

Free Purple Tote + Medication Pocketcards with

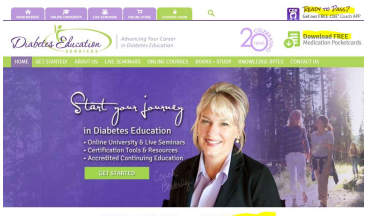
Happy 100th Birthday of the Discovery of Insulin!

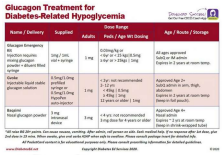
November 14th is World Diabetes Day
It is the birthday of Dr. Banting, who along with Best, discovered insulin in 1921.

Diabetes Education SERVICES

Med and Insulin PocketCards

NEW Accordion 2-sided PocketCards





Download on Website

DiabetesEd.net

Diabetes Education SERVICES

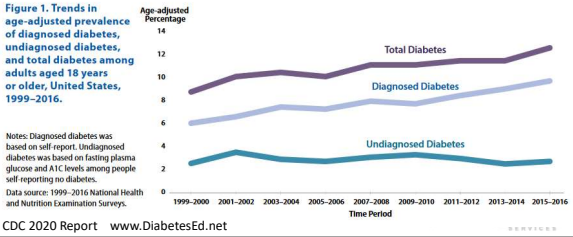
Meet Your Gut & Skin Bacteria

- Enjoy the state of wonder
- Discuss the role of gut and skin bacteria in relation to health.
- Explore Gut-Lung Axis in COVID
- Describe the impact of mom's nutrition on baby's microbiome
- State strategies to improve intestinal health.

State of Wonder

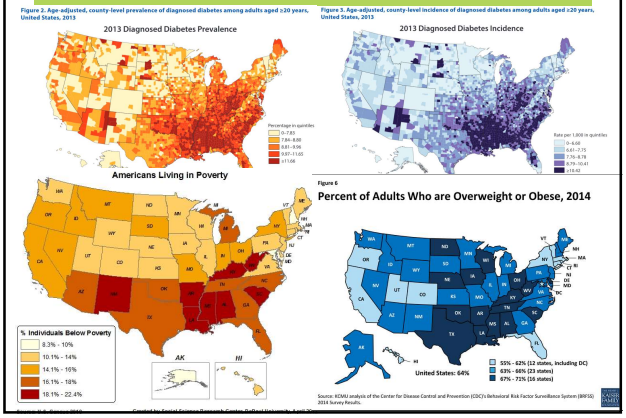
Diabetes in America 2021 - CDC

- 13% of adults have diabetes (34 mil)
  - 21% of those don't know they have diabetes
- 35% adults have pre diabetes (88 mil)
  - 85% of those don't know they have prediabetes

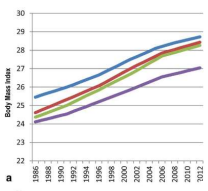


CDC 2020 Report www.DiabetesEd.net

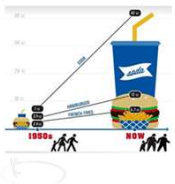
Diabetes in America

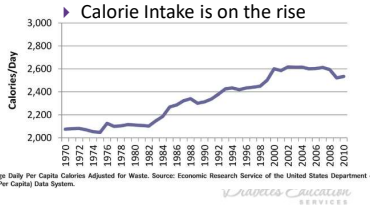


U.S. Weight - 68% experiencing overweight or BMI >30



- 34% BMI 25-29
- 34% BMI 30 +
- 1/3 of all people with extra weight don't get diabetes
- We burn 100 cals less a day at work
- Overall, food costs ~ 10-15% of income
- Calorie Intake is on the rise





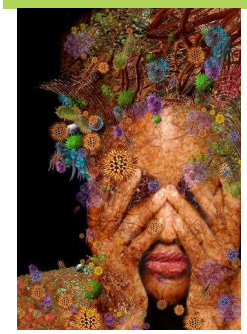
Average Daily Per Capita Calories Adjusted for Waste. Source: Economic Research Service of the United States Department ...ility (Per Capita) Data System.

Quick Question

- What do you think is contributing to increasing prevalence of type 2 diabetes?
  - A. Processed foods
  - B. Increased sugar intake
  - C. Lack of exercise
  - D. Changes in gut bacteria
  - E. Environment
  - F. All of the above

Diabetes Education SERVICES

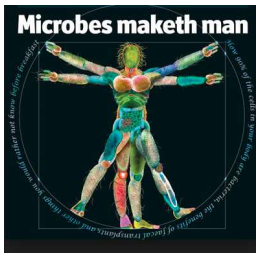
Bacterial Cells Outnumber Human Cells 10 to 1



Diabetes Education SERVICES

Gut Microbiome

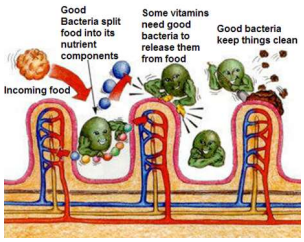
- Part of endocrine axis
- Stabilized by 3 years of age
- Influenced by:
  - Birth method
  - Breast fed
  - Early Antibiotic use
  - Environment
  - Travel
- Help us
  - utilize energy
  - fight off invaders



Diabetes Education SERVICES

How do our bacteria help us?

- Maintain physiological homeostasis and metabolism.
- Other benefits
  - pathogen displacement
  - immune system development
  - barrier fortification
  - vitamin production
  - nutrient absorption
- Forgotten organ



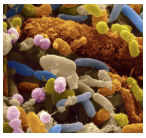
Quick Question

- How much does your gut bacteria weigh?
  - A. 24 ounces
  - B. 3 pounds
  - C. Less than 1 pound
  - D. 1.5 pounds

- How much does your brain weigh?

Diabetes Education SERVICES

3 lbs of Microbes in our Gut



- Community of bacteria extra 'organ' "microbiome".
- Evolved together with our microbiome over millions of years.
- Ratios of these communities has changed over the past 30 years
- Mirrors global spikes in obesity, diabetes, allergic and inflammatory diseases

Diabetes Education SERVICES

Bacterial Taxis?

Standard American Diet is SAD

- What are we doing to change these bacteria?
- 70% of food consumed is processed
- Low fiber, high sugar
- Intake of fruit and veggies decreasing
- We are starving our good bacteria.

Quick Question

- In general, how does immigrating to the U.S. impact individual's gut microbiota?

A. Increased diversity due to new food exposure.
B. A generational decline in bacterial diversity
C. They experience a sudden increase in Akkermansia muciniphila
D. Decrease in helicobacter pylori.

HEALTH

Just Months of American Life Change the Microbiome

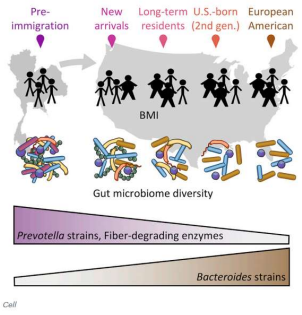
Immigrants' gut bacteria "westernize" soon after they move to the U.S., which might influence obesity in immigrants and Americans alike.

OLGA KHAZAN NOV 1, 2018 Atlantic.com Nov 2018

A Hmong woman carries grass in Vietnam. (NGUYEN HUY KHAM / REUTERS)

Diabetes Education SERVICES

Moving to America isn't good for your health



Researchers don't know if eating a less-healthy diet increases the rate of obesity *and* changes the microbiome, or if a less healthy diet changes the microbiome *so* it makes people experience higher BMI.

Atlantic.com Nov 2018

Diabetes Education SERVICES

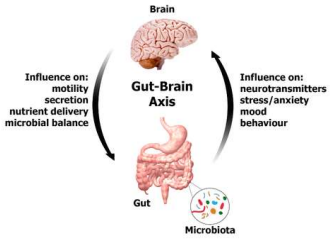
Keeping our Microbiome Healthy

- Use antibiotics wisely.
- Reduce the number of the unnecessary Cesarean sections.
- Promote breastfeeding.
- Reduce antimicrobial products in our environment.
- Improve nutrition by increasing the amount of fiber and diversity of foods to promote microbial diversity and benefit health.
- Adding functional foods containing prebiotics, probiotics to diets.

Gut Health affects our overall health.

Diabetes Education SERVICES

Gut Neurons Direct Messaging



- Enteric Nervous System = Nervous System of Gut
- Sometimes referred to as "second brain".
- Critical part of Gut-Brain Axis

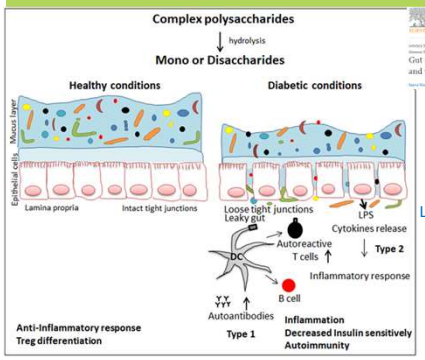
New way for gut neurons to communicate with brain. Medical News Today Aug 2020

Gut's Messaging Brain

- Gut has its very own nervous system
- Functions independently of brain or spinal cord
- Neurons in gut wall can activate spinal cord neurons
- Powerful mechanism to transmit info from gut to brain
- Viscerofugal neurons relay info from gut to sympathetic nervous system
- Brain can "sense" what is going in gut.
- Influences our decision, mood, general well being.
- Most serotonin, a chemical mood messenger, is found in gut
- Understanding how gut messaging controls other organs can lead to treatment breakthroughs

New way for gut neurons to communicate with brain. Medical News Today Aug 2020

Gut Microbiome and Diabetes

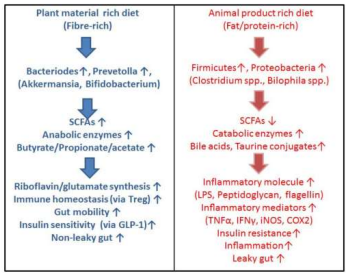


https://www.sciencedirect.com/science/article/pii/S0955286318303073

LPS - lipopolysaccharide

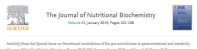
Fig. 1. Interplay between diet and the gut microbiome. Regulatory role of diet and microbiota in healthy (left) and diabetic conditions (right) has different mechanisms. In T1D, the bacterial population in gut modulates gut permeability and signaling mechanisms, thereby initiating an autoimmune response. In T2D, dysbiosis due to carbohydrate hydrolysis causes low-grade inflammation and decrease in insulin sensitivity.

Plant & Fiber Diet = Less inflammation



Download : Download high-res image (294KB) Download : Download full-size image

Fig. 2. Flowcharts representing the effect of diet pattern on bacterial population in the human gut. The flowchart on the left panel (blue) indicates fiber-rich diet and the right panel (red) indicates fat/protein-rich diet.



SCFA – short chain fatty acids

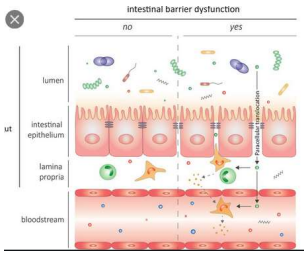
https://www.sciencedirect.com/science/article/pii/S0955286318303073

Metformin helps gut microbiota in diabetes

- Induces GLP-1 secretion
- Changes in *Bacteroidetes/Firmicutes* ratio
- Capacity to induce mucin expression similar to *Akkermansia* muciniphila
- Improves the metabolic profile by lowering tissue inflammation in the presence of extra weight

Especially increases Akkermansia and Bifidobacterium.

Akkermansia Muciniphila



A. muciniphila in our mucus lining is inversely correlated with obesity and diabetes in both mice and humans.

Mucus lining protector and increases presence of short chain fatty acids.

High levels of A. muciniphila is associated with improved health.

"AKK" is associated with enhanced intestinal barrier function and incretin secretion from intestinal endocrine cells. Together, these actions suppress obesity, insulin resistance, and intestinal inflammation.

Depommier C, Everard A, Druart C, et al. Supplementation with *Akkermansia muciniphila* in overweight and obese human volunteers: a proof-of-concept exploratory study. *Nat Med.* 2019. doi: 10.1038/s41591-019-0495-2.

Pregnant Moms diet impacts baby's gut bacteria

What you eat while pregnant may affect your baby's gut microbiota and growth – Oct 21, 2020 Gut Microbiota for Health

- Mother's diet shapes gut microbiota during pregnancy, in birth and when breastfeeding
- Impact babies' gut microbial community and infant growth during first 18 months
- Disruption in gut colonization can lead to obesity, allergies and CV diseases later in life
- Diet is one of most powerful factors driving gut microbiota diversity

The Study – 86 Baby Mom Pairs

- Pregnant women's diet was based on a high amount of dietary fiber, omega-3 fatty acids and polyphenols.
- Pregnant women's diet with significantly higher intake of carbohydrates, saturated fatty acids and animal protein.

Results after 18 mo's of Study

High fiber diet & other nutrients

- Greater presence of *Ruminococcus,*
  - a type of bacteria that produce butyrate
  - Butyrate is a biomarker of gut health and is associated with anti-inflammatory properties.

Less healthy diet

- Diet mainly composed of carbohydrates, saturated fatty acids and animal proteins, showed a greater presence of *Prevotella*
  - an oral bacteria linked to an increased risk of disease and complications in pregnancy.
  - Infants had a higher risk of becoming overweight in the first 18 months.

Study Implications

- A maternal diet high in fiber, vegetable protein and omega-3 acids has a significant effect on the baby's microbiome and contributes to a child's development and a health during the first months of life.

What you eat while pregnant may affect your baby's gut microbiota and growth – Oct 21, 2020 Gut Microbiota for Health

One of the best gifts a mother can give her newborn is a balanced, healthy and diverse gut microbiota, and the most efficient way to achieve that is through diet during pregnancy.

Diabetes Education Services

Stretch Break

Diabetes Education Services

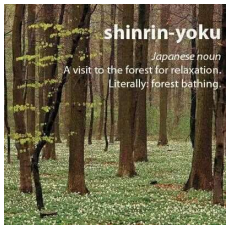
In the Beginning

- Earth
- Human
- Spirit

Diabetes Education Services

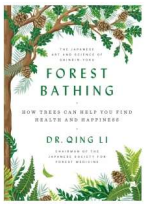
Humans Benefit from Nature

- Quiet: think tank of soul
- Trips to forest, enhance bodies immune system by increasing the number and activity of lymphocytes –
  2008 Nippon Med School Tokyo
- Tranquility lowers BP, reduces muscle tension, decreases stress related illness and improves sleep.



Shinrin in Japanese means "forest," and *yoku* means "bath." *Shinrin-yoku* means bathing in forest atmosphere, or taking in the forest through our senses.

Forest Bathing Steps



The key to unlocking the power of the forest is in the five senses.

- Let nature enter through your ears, eyes, nose, mouth, hands and feet.
- Listen to the birds singing and the breeze rustling in the leaves of the trees.
- Look at the different greens of the trees and the sunlight filtering through the branches.
- Smell the fragrance of the forest and breathe in the natural aromatherapy of phytoncides.
- Taste the freshness of the air as you take deep breaths.
- Place your hands on the trunk of a tree. Dip your fingers or toes in a stream. Lie on the ground. Drink

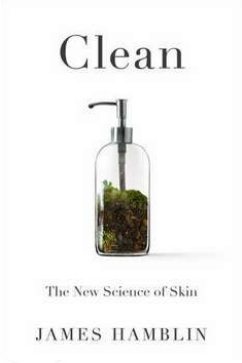
This is your sixth sense, a state of mind.
Now you have connected with nature. You have crossed the bridge to happiness.

Phytoncides – Immune Boosters

- Exposure to forests boosts our immune system.
- We breathe in phytoncides
  - airborne chemicals that plants give off to protect themselves from insects.
  - Phytoncides have antibacterial and antifungal qualities which help plants fight disease.
  - When people breathe in these chemicals, our bodies respond by increasing the number and activity of a type of white blood cell called natural killer cells or NK.
  - These cells kill tumor- and virus-infected cells in our bodies.
  - In one study, increased NK activity from a 3-day, 2-night forest bathing trip lasted for more than 30 days.
  - Japanese researchers are currently exploring whether exposure to forests can help prevent certain kinds of cancer.

https://www.dec.ny.gov/lands/90720.html

Are we over doing it?



How often did people bathe in the 18th century?

- As time went on, the rising middle class was particularly attentive to both personal and household cleanliness because the status of "being able to be clean" was significant to people for whom it was important to rise socially.

Deborah Truscott, Researcher and writer on 18th century topics. (Author of the Out of Time series)

Just for Fun – Poll Question

- How many times a week do you take a shower or bath?
- 1-2 a day
- Daily
- Every other day
- A few times a week
- Once a week or less

Skin Microbiome

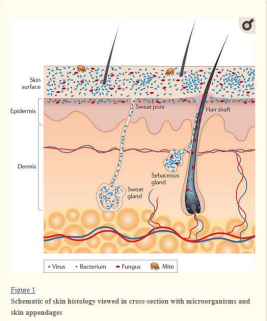
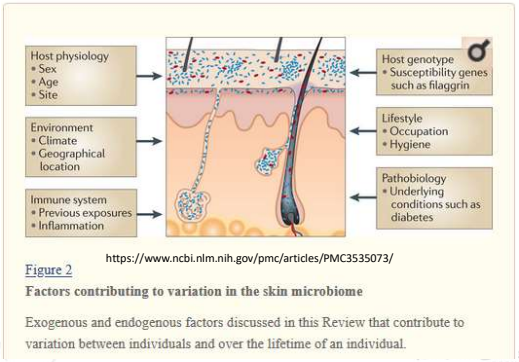


Figure 1
Schematic of skin histology viewed in cross-section with microorganisms and skin appendages

- The skin is largest organ
- Colonized by a diverse milieu of microorganisms, most of which are harmless or even beneficial to their host.
- Colonization is driven by the ecology of the skin surface, which is highly variable depending:
  - on topographical location,
  - endogenous host factors and
  - exogenous environmental factors
- The cutaneous innate and adaptive immune responses can modulate the skin microbiota, but the microbiota also functions in education of the immune system

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3535073/

Factors the Affect Skin Microbiome



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3535073/

Figure 2
Factors contributing to variation in the skin microbiome

Exogenous and endogenous factors discussed in this Review that contribute to variation between individuals and over the lifetime of an individual.

Original Article

Beyond the gut: Skin microbiome compositional changes are associated with BMI

Michael Brandwein [a], Idan Katz [a], Ariel Katz [a], Ron Kohen [a, b]

Show more

https://doi.org/10.1016/j.humic.2019.100063

Get rights and content

"skin microbiome may therefore be used as a biomarker for disease manifestations"

https://www.sciencedirect.com/science/article/pii/S2452231719300120

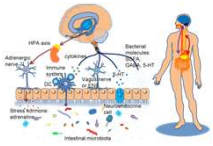
Gut and skin microbial diversity associated with BMI.

- Gut-Skin microbiome axis – two interconnected systems
- Diet affects skin physiology and microbiology
- Western individuals have less skin microbial diversity
- BMI of 25+ have less microbial diversity

More studies needed

- Statistical correlation between individuals BMI and skin microbiome.
- Corynebacterium is significantly correlated with BMI, and can be used as a weight marker.
- Further studies needed to investigate link between metabolic syndrome and skin microbiome

https://www.sciencedirect.com/science/article/pii/S2452231719300120



Questions

- **Does what we eat affect our skin microbiome?**
- **Does our skin microbiome affect our gut microbiome?**

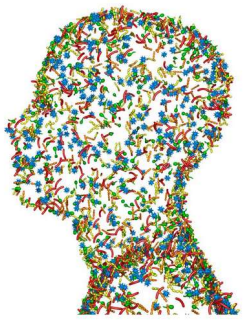
Skin Microbiome and Cleansers

- Should we suds up less?
  - Showering uses lots of water takes time
  - Do we need all these cleaning solutions, plastics?
  - We have been sold on importance of "getting clean"
- Is this daily wipe-out of our envelope of bacteria
  - Unnecessary
  - Harming us?

https://www.pinterest.com/pin/548173204496676 94/

What is the Ideal Balance?

- From occasionally jumping in the river to daily shower.
- *Skin immunity* is achieved through interaction between the external and internal skin layers and compartments, which operate in balance with the skin colonizing microbes.



https://www.origimm.com/skin-microbiome/

Cultural Norms and Hygiene

- Cleaning rituals associated with class and wealth signaling
  - Whitening teeth, wearing deodorant
  - enormous industry-complex of self-care, skin care, hygiene and cosmetics — which is barely regulated
- Hygiene
  - more scientific public health term
  - Avoidance or disease prevention behaviors
  - Brushing teeth, hand washing, cleaning open wounds, mask wearing

Quote from Clean – Dr. Hamblin

- A steady barrage of exposure to microbes trains our immunes systems on how and when to react
- Yet, our indoor lifestyle has the altered the function and role of our primary immune system – the skin
- If we carry dirt, dust, mud it is considered that we are "unclean".

Diabetes Education SERVICES

Stop Killing All the Bacteria The Hygiene Hypothesis

- In studies, mouse raised in clean environment is higher risk for DM than one raised in dirty one
- "Clean living" may increase risk for autoimmune diseases
- Diabetes risk is higher in urban than rural settings
- Daycare, other early exposures, lower risk for DM
- Children exposed to dirt, farm animals, and other kids have less reactive immune systems

Diabetes Education SERVICES

Over washing harms the skin?

- Hot water and body soaps strips away natural oils and healthy bacteria and dries skin and makes it more porous
- This makes the body more vulnerable to irritants and allergens
- Increases risk of autoimmune and other conditions:
  - Can lead to the atopic march - Progression from Atopic Dermatitis to Allergic Rhinitis and Asthma

Diabetes Education SERVICES

Complex Interplay

- If acne, eczema and psoriasis are the result of an interplay between your immune system and the microbes on your skin
- Can we shift or protect the microbiome and help people through their flares or outbreaks?
- Use of "cleansing products, could make things worse by shifting your microbiome

JAMES HAMBLIN

Connect

James Hamblin, M.D., is a staff writer at *The Atlantic*. He is also a lecturer at Yale School of Public Health, co-host of Social Distance, and author of *Clean: The New Science of Skin*.

Dr. James Hamblin on NPR interview 9/2020

Diabetes Education Services

Just wash your "Bits"

- Armpits, genitals, feet, hands
- What do you think?

Diabetes Education Services

COVID and Lung – Gut Axis

COVID-19 and the Gut Microbiome: More than a Gut Feeling
Daniel van der Lelie,a Safiyh Taghavia
Citation van der Lelie D, Taghavi S. 2020. COVID-19 and the gut microbiome: more than a gut feeling. mSystems 5:e00453-20. https://doi.org/10.1128/mSystems.00453-20.
Editor Ileana M. Cristea, Princeton University

Review

Gut microbiota and Covid-19- possible link and implications

Debojyoti Dhar[a,*], Abhishek Mohanty[b,*]

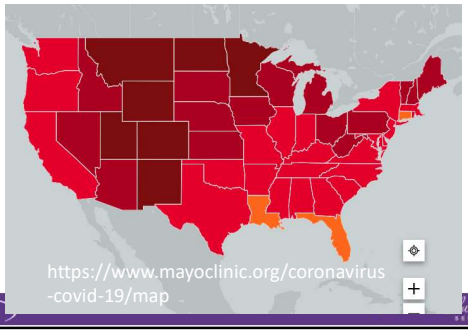
[a] *Leucine Rich Bio Pvt Ltd., Bengaluru, India*
[b] *Rajiv Gandhi Cancer Institute and Research Centre, New Delhi, India*

https://doi.org/10.1016/j.virusres.2020.198018
Received 24 April 2020; Received in revised form 8 May 2020; Accepted 8 May 2020
* Corresponding authors.
E-mail addresses: ddhar@leucinerichbio.com (D. Dhar), pro@rgcirc.org (A. Mohanty).
Virus Research 285 (2020) 198018
Available online 13 May 2020

Diabetes Education Services

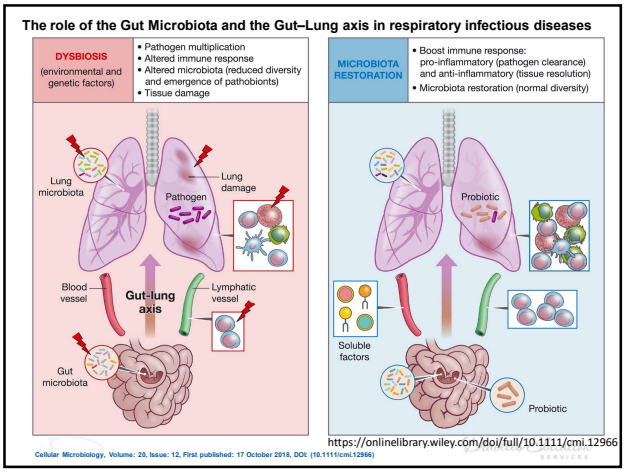
COVID Stats in United States

- 755,000 deaths.
- 70,000 new cases a day. 5,000 in hospital



COVID AND GUT MICROBIOTA

- Gut microbiota and immunity
- Diarrhea an expression of COVID
- Intense investigation on how gut microbiota regulates innate and adaptive immune system.
- We know our gut microbiota helps release signal that activate or trigger pro or anti inflammatory responses to diseases.
- Does gut health impact lung health?



Emerging new theory Gut – Lung Axis

- Gut microbiota potentially affects pulmonary health
- Gut-Lung cross talk between 2 mucosal sites in body
- Bi-Directional conversation
- Significant GUT-LUNG Axis dysfunction in the elderly population with COVID infections?
- Elderly population have less diverse gut microbiota
  - Most vulnerable for COVID
  - Loss of Gut bacterial diversity (dysbiosis)

Gut-Lung Axis and COVID

- Role of the gut microbiota in influencing lung diseases well articulated.
- Respiratory virus infection causes perturbations in the gut microbiota.
- Diet, environmental factors and genetics play an important role in shaping gut microbiota which can influence immunity.
- Gut microbiota diversity is decreased in old age
- Elderly have high COVID fatality rate – is dysbiosis contributing?

Improving Gut Microbiota May Save Lives

- Personalized nutrition and supplementation known to improve immunity
  - One strategy to reduce mortality and morbidity and improve outcomes in older people and those who are immune-compromised

Personalized Nutrition Strategies

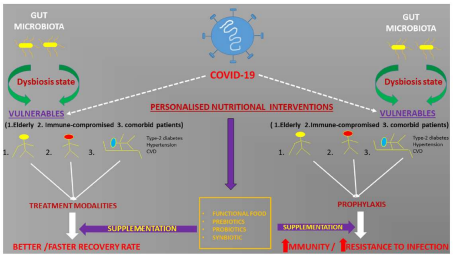


Fig. 2. Personalized nutritional strategies as prophylaxis and in treatment supplementation.
Personalized nutritional strategies may be adopted for the Covid-19 vulnerable sections both as prophylaxis and supplementation to current treatment modalities.

Review

Gut microbiota and Covid-19- possible link and implications

Debojyoti Dhar[a,c], Abhishek Mohanty[b,c]

Gut Nutrition – Important factor protect elderly in long term care facilities

- *There is no greater* vulnerable population than Elderly in Long Term Care facilities.
- Opportunity to evaluate and improve nutrition

Take Home Messages

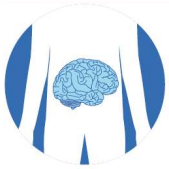
- What can we pass on to people and our communities to promote healthy microbiomes?

Reunite with “Old Friends”

But while your inherited genes are more or less fixed, it may be possible to reshape, even cultivate, your “second genome”

Diabetes Education SERVICES

GUT MICROBIOME AND SLEEP



All of the microbes that live in our intestines are known as the gut microbiome. Some even call it our “second brain.”

Taking special care of your gut health can have great effects on the quality of your sleep. This is true even if you are going through a stressful period which would normally disrupt your sleep length and quality.

HOW ARE SLEEP AND MICROBIOME CONNECTED?

Elderly get better sleep with better microbial composition

Better sleep showed a increase in Verrucomicrobia strain which is believed to be linked with better cognitive function.

Study authors hope that improving gut microbiome could lead to a new way of cognitive decline treatment in older adults.

www.sleepline.com

Diabetes Education SERVICES

Diversity matters for health

Find out how to maintain a diverse microbiota through diet.

GUT MICROBIOTA FOR HEALTH by ISNM

Although gut microbiota has a genetic component **diet, lifestyle, environment and antibiotics influence gut microbiota composition the most.**

What you eat can impact the gut microbiota within 24 hours of a dietary change.

The more diverse the diet, the more diverse the microbiota.

How do you eat your way to a diverse microbiota?

Include dietary fibers that can be metabolically used by gut microbes
Cooked and cooled potatoes, legumes and root vegetables, onions, garlic, bananas, chicory root, and artichokes.

Add probiotic foods
such as fermented milk, yogurt and kefir.

Choose a balanced amount of animal and plant-based proteins
plant-based (legumes, nuts and seeds) and animal-based (meat, fish, shellfish, eggs and dairy products).

Include foods rich in omega-3 and omega-6 fatty acids
omega-3: walnuts, flax seeds, algae and oily fish; omega-6: avocado, nuts, seeds and vegetable oils (except for palm and coconut oil).

Eat plenty of vitamins and minerals
found in a variety of animal foods, in fruits and vegetables, wholegrain cereals, nuts and legumes, such as beans or lentils.

Diversity matters on the plate and in the gut!

GutMicrobiotaWW www.gutmicrobiotaforhealth.com Food4Gut_Health

https://www.gutmicrobiotaforhealth.com/how-to-eat-for-a-diverse-microbiota/

Diabetes Education SERVICES

Getting to Better Gut Bacterial Health

Eat more PREbiotics

- Foods with indigestible fibers that nourish the good bacteria:
  - High fiber foods like, whole grains, fruits, veggies, nuts
  - High in prebiotic fibers include: Jerusalem artichokes, onions, kale, Brussels sprouts, bananas, dandelion greens & more

PRObiotics

- These foods contain healthy bacteria like *Bifidobacterium* and *lactobacillus.*
  - Yogurt, Kefir – look for "live or active cultures"
  - Fermented foods like: Sauerkraut, Kimchi, Miso soup, kombucha

Diabetes Education Services

12 Super Foods to Enjoy

- Beans
- Dark Green Leafy Vegs
- Citrus Fruit
- Sweet Potatoes
- Berries
- Garlic

- Tomatoes
- Onions
- Fish High in Omega-3 Fatty Acids
- Whole Grains
- Nuts
- Fat-Free Milk and Yogurt

Kefir – Fermented Milk

From the Turkish word *keyif*, which means "feeling good" after eating

Diabetes Education Services

GET Lots of Diverse Fiber Foods
Goal is 25 – 30 gms day

American Food Project **Full Plate Diet**

- Helps increase fiber in usual meals

Fiber is suddenly hip. Grandma, it turns out, was just ahead of her time.

—*Health & Nutrition Letter*
Tufts University
February 2009

Diabetes Education SERVICES

Join US on Social Media / Blogs

Don't Miss Out – Join us

- https://www.facebook.com/DiabetesEducationalServices
- https://twitter.com/CDECoach
- https://www.instagram.com/cdcescoach/
- https://www.linkedin.com/in/beverlythomassian/

Sign up for Blog Bytes – Question of Week

- https://diabetesed.net/diabetes-blog-bytes-sign-up/

Sign Up | Diabetes Blog Bytes

Diabetes Education SERVICES | diabetes blog bytes

100 Trillion Friends to Call Your Own

From way back when, to current time
man and bacteria have been intertwined.

Start with your head, it's a happening place,
there's staphylococcus all over your face.

Next up is gums, teeth and mouth,
You'll find streptococcus inside and out!

Now to your stomach, to keep the pH,
H. pylori is on the case!

Inside the intestines, 30 feet of tube,
3 pounds of bacteria digesting your food.

From Bacteroidetes to keep you lean,
to Firmicutes, a junk food digesting machine!

Prevotella another bug on the scene,
breaks down fiber, veggies and beans!

Lactobacillus is a newborn's friend,
lining birth canal from tip to end.
Down to your feet, in-between the toes,
that's where lots of pseudomonas grows!

Short chain fatty acids, you wanna keep them around
Protects gut mucous lining from breakin' down

So here's my message, always nourish your gut
With fresh fruit, grains, veggies, beans and nuts

More kefir, miso, sauerkraut, kimchi
Less sugar and fast foods to keep away disease

Breast feed, get dirty, limit antibiotic use
Let newborns come out through the natural shoot

Be reassured that you're never alone
You've got 100 trillion friends to call your own!

100 Trillion Friends to Call Your Own by Beverly Thomassian, RN, MPH, CDE, BC-ADM to the tune "Yeah" in the style of Usher.

Thank You

- Email
  bev@diabetesed.net
- Web
  www.diabetesed.net

Diabetes Education SERVICES