

# Probiotics and the GI System

## Navigating the World of Probiotics

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1. What are probiotics?

2. Do probiotics work?

3. Which probiotic is the best?

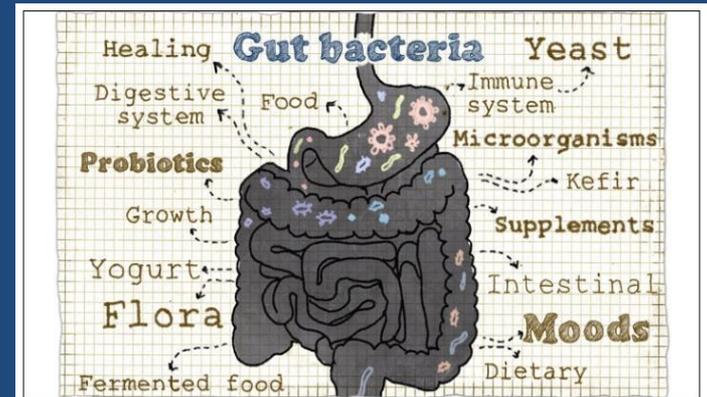
*“The “good bacteria” may help healthy people but aren't formally recommended”-[Harvard Health Letter](#)*

# → There is a need for public and health professional education about probiotics

## Agenda

1. Distinguish Probiotic vs Prebiotic vs Synbiotic vs Fermented foods
2. Key functions of the microbiome
3. Increase knowledge regarding the strain-specific properties of probiotics
4. Increase knowledge regarding the clinical evidence for benefits of probiotics
5. Bring awareness to various types of available probiotics
6. Tips/Recommendations of probiotics to your patients (supplements and foods)

# Probiotic IQ test



# 1. Probiotics are:

- A. Drugs that help your body make good bacteria
- B. Little organisms that could give your body a boost
- C. A type of vitamin

## 2. You can find probiotics in:

- A. Food
- B. Supplements
- C. Both

### 3. What health conditions do probiotics seem to help the most?

- A. Gastrointestinal problems
- B. Common colds
- C. Ear infections

4. On probiotic supplement labels, the number of bacteria is measured by:

- A. Bacteria level counts
- B. Colony-forming units
- C. Probiotic numerals

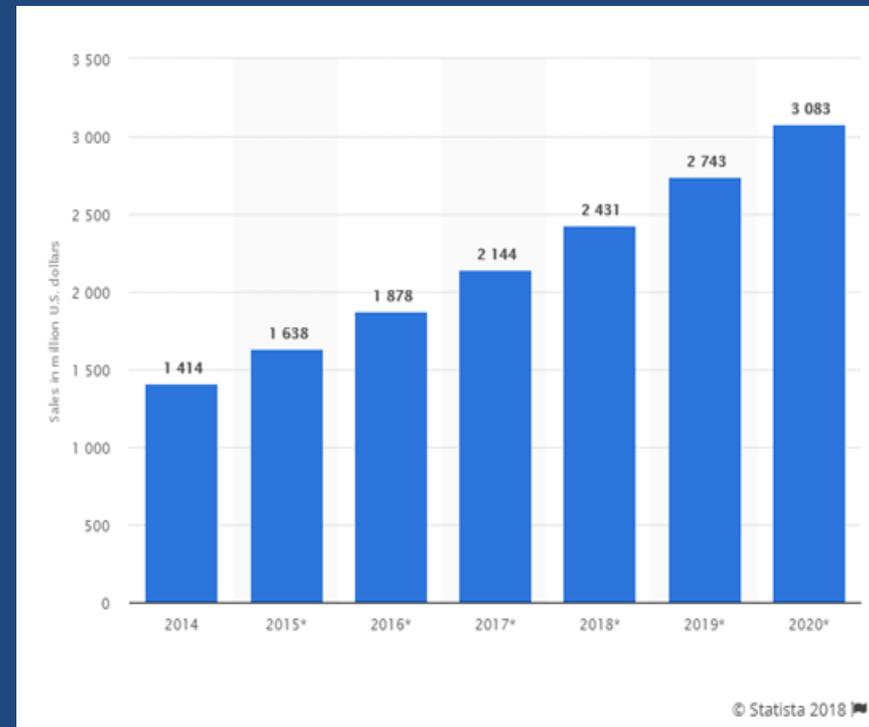
5. If you try a probiotic, wait this long to see if it helps:

- A. 1 week
- B. 2 weeks
- C. 1 month

# Why talk about probiotics?

- There is surging scientific and public interest in the human microbiome
- ~\$40 billion worldwide sales of probiotics in 2016 (up from \$30.4B in 2010)
  - Will exceed \$64 Billion by 2023
- Products- “supposed ” to treat everything from constipation to obesity to depression
- 1 in 5 Americans takes probiotic for digestive problems\*
- 3<sup>rd</sup> most commonly used dietary supplement other than vitamins and minerals^
- Skepticism: Do they work?

Dollar Sales of Probiotic supplements in the US from 2014 to 2020 (in million US Dollars)



\*Scoop of probiotics. Consum Rep Health.. 2015

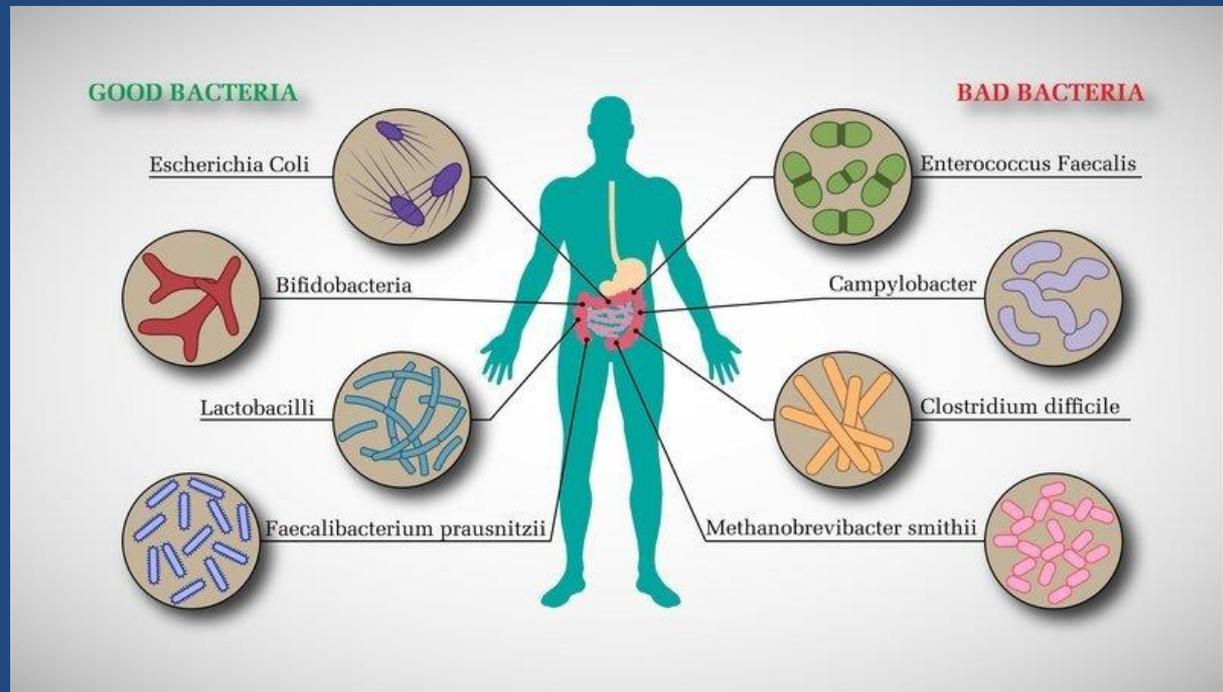
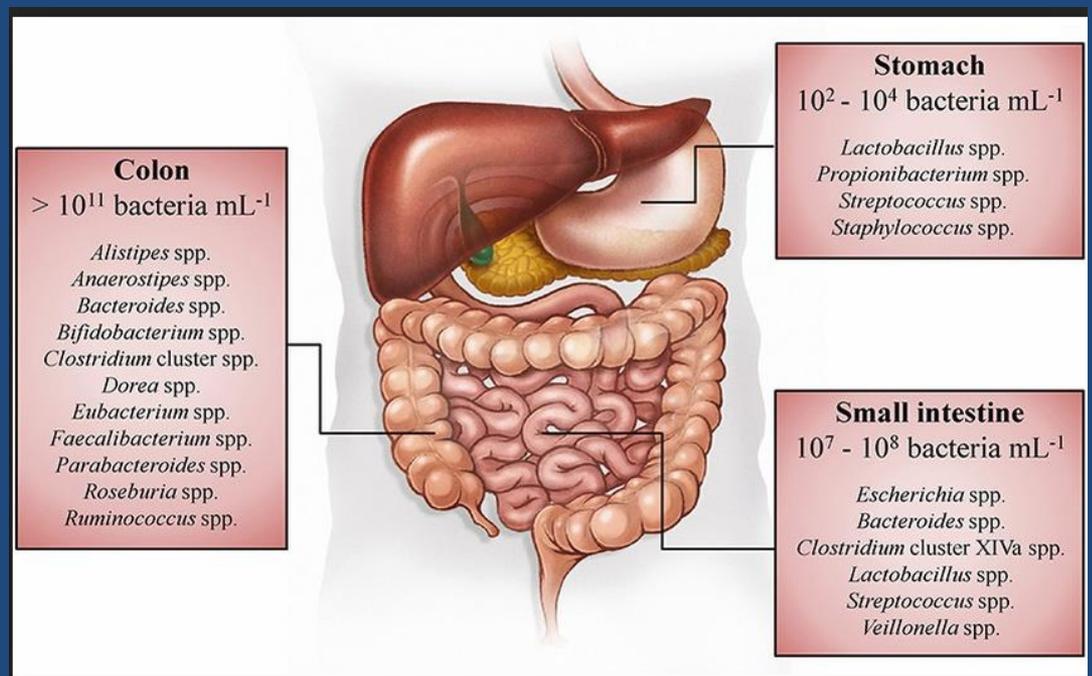
# Questions being raised?

1. What are probiotics, and why may we need them?
2. What is in probiotics?
3. Are all probiotics the same?
4. What is the evidence for use of probiotics in certain conditions?
5. What conditions may benefit from probiotic use?
6. How to choose a probiotic preparation?
7. How do I take probiotics?

# GI Tract

The human GI system contains ~39 trillion bacteria

We want a balance of good bacteria vs bad bacteria



# Key functions of the intestinal microbiome:

1. Digest food (i.e., via digestive enzyme activity)
2. Fight harmful bacteria
3. Regulate immune system
4. Also-
  1. Endocrine function
  2. Generate needed nutrients via microbial metabolic activities (i.e., synthesis of vitamins)
  3. Mediate brain-gut communication

## Intestinal Flora Affect Your Health

ASU BIODESIGN  
INSTITUTE  
ARIZONA STATE UNIVERSITY

The microbes that live inside your intestines influence your health in **beneficial** and **harmful** ways

### Immunity

Providing a physical barrier to invasive microbes, our gut flora enhances the functionality of the immune system



### Vitamins

Bacteria in the gut play a direct role in the synthesis of vitamins B and K as well as the absorption of calcium and iron



### Metabolism

Metabolic activity of the gut flora allows our body to utilize food that would otherwise not be digested



### Obesity

In 2009, Dr. Krajmalnic-Brown discovered gut bacteria of obese patients differ significantly from normal individuals



### Inflammation

Gut flora likely play a major role in the development of various inflammatory diseases including IBD and colitis

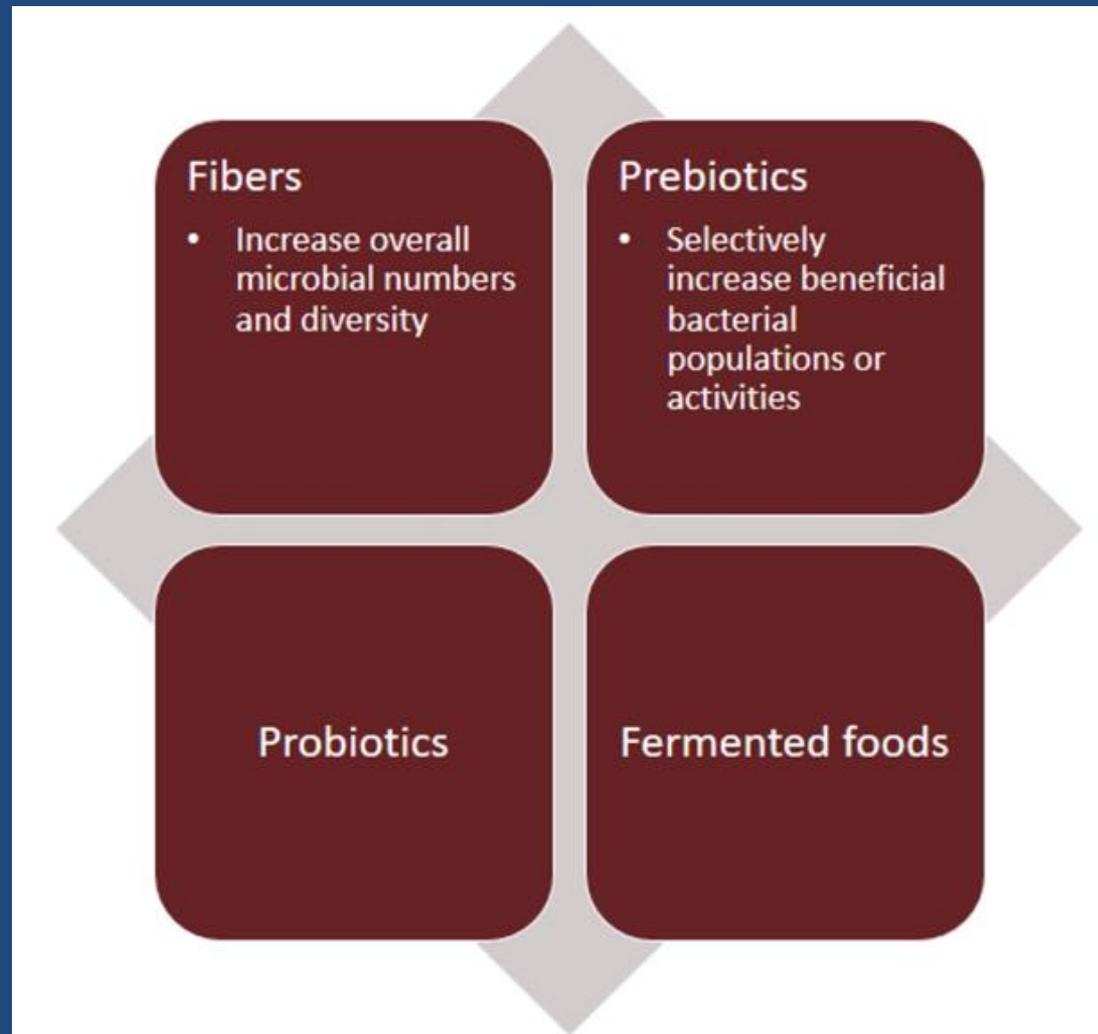


### Autism

New research by Dr. Krajmalnic-Brown suggests a link between autism and decreased gut bacterial diversity



# Strategies to support Gut Microflora



# What are probiotics?

	Probiotic	Prebiotic	Synbiotic	Fermented Food/Beverage
Definition	<p>Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.</p> <p>-Restore the balance of “good” <i>microorganisms</i></p>	<p>Non-living , non-digestible natural substances in some foods that encourage the growth of healthy bacteria in the gut</p>	<p>A product that contains both probiotics and prebiotics.</p>	<p>-A type of food made by live microbes.</p> <p>-May not be tested for health benefits</p> <p>-Live microbes may not survive after fermented foods are treated (i.e., sourdough bread is baked), and do not contain live microbes at the point of consumption</p>
Examples	<i>Bacteria and yeasts</i>	Inulin, Lactulose, others		
Availability	<p><b>Food:</b> yogurt, cultured milks, etc.</p> <p><b>Supplements:</b> Capsules, powders, tablets, and liquids,</p>	<p>Found in bananas, whole grains, honey, garlic, onions, leek, dandelion, chicory root, breast milk.</p>		<p>Kombucha, sauerkraut, Cheese, sourdough bread, . Kefir (fermented milk)</p>

# Probiotics

- Restore the balance of “good” *microorganisms*
- Probiotics **do not** reinoculate the gut microbiome
  - They are recoverable only in stool samples for one to two weeks
  - Everybody has a different gut microbiota
  - Not enough data to recommend any particular strains of bacteria
- To be effective, probiotic need to colonize the hosts' system
  - They should survive both gastric acid and bile to reach the small intestine and colon where they exert their effects
- The bacteria are usually freeze-dried -but remain alive
  - Bacteria warm up in your digestive system and become fully active.
- Probiotics are **dietary supplements**, not drugs.
  - Regulated by FDA’s Center for Food Safety and Applied Nutrition
  - FDA doesn't monitor their manufacturing
  - No legal requirement to demonstrate safety, purity or potency before marketing probiotics

# Why is there a need for probiotics?

Are we missing microbes?

## 1. Changes in:

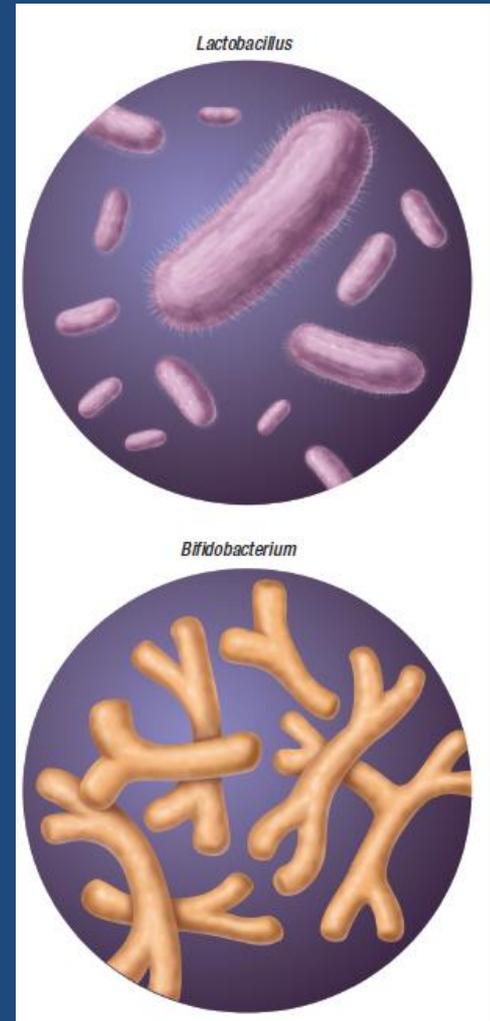
1. Diet –eat fewer foods with live microbes
2. Lifestyle
3. Exposure to toxins
4. Antibiotic use

## 2. Other risk factors:

1. More C-section births
2. Fewer breastfed children
3. Better sanitation
4. Fewer animals living in our homes

# What kinds of microorganisms are in probiotics?

- Most studied and common probiotics:
  - **Bacteria groups** (Gram-positive anaerobes):
    1. *Lactobacillus*
    2. *Bifidobacterium*
  - **Yeast**: *Saccharomyces boulardii*.
- Probiotics contain a variety of microorganisms
- Most commonly used prebiotic is inulin, an extract of chicory root.



# Are all probiotics the same?

- No, not all probiotics are the same
- Effectiveness can be species-, dose-, and disease-specific
- Probiotics are identified by genus, species, and an alphanumeric designation
- It is best to find a product containing the exact strain (or strains) that have demonstrated the best evidence for the benefit you are seeking

Same species, different function

For probiotics:

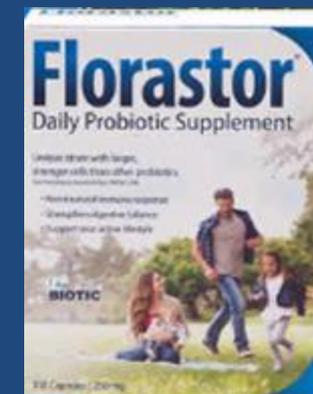
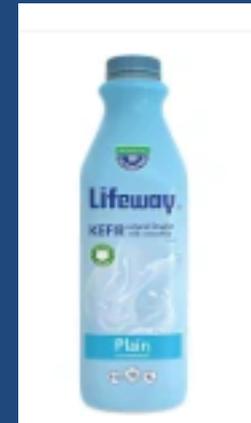
Lactobacillus acidophilus NCFM  
genus            species            strain

# LACTOBACILLUS

strain:		best for:
<b>L. Acidophilus</b>		Vaginal health, Diarrhea, Acne
<b>L. Rhamnosus</b>		GI support, Eczema
<b>L. Plantarum</b>		Inflammation
<b>L. Casei</b>		Brain function, Diarrhea

## Table. Some Probiotic Products

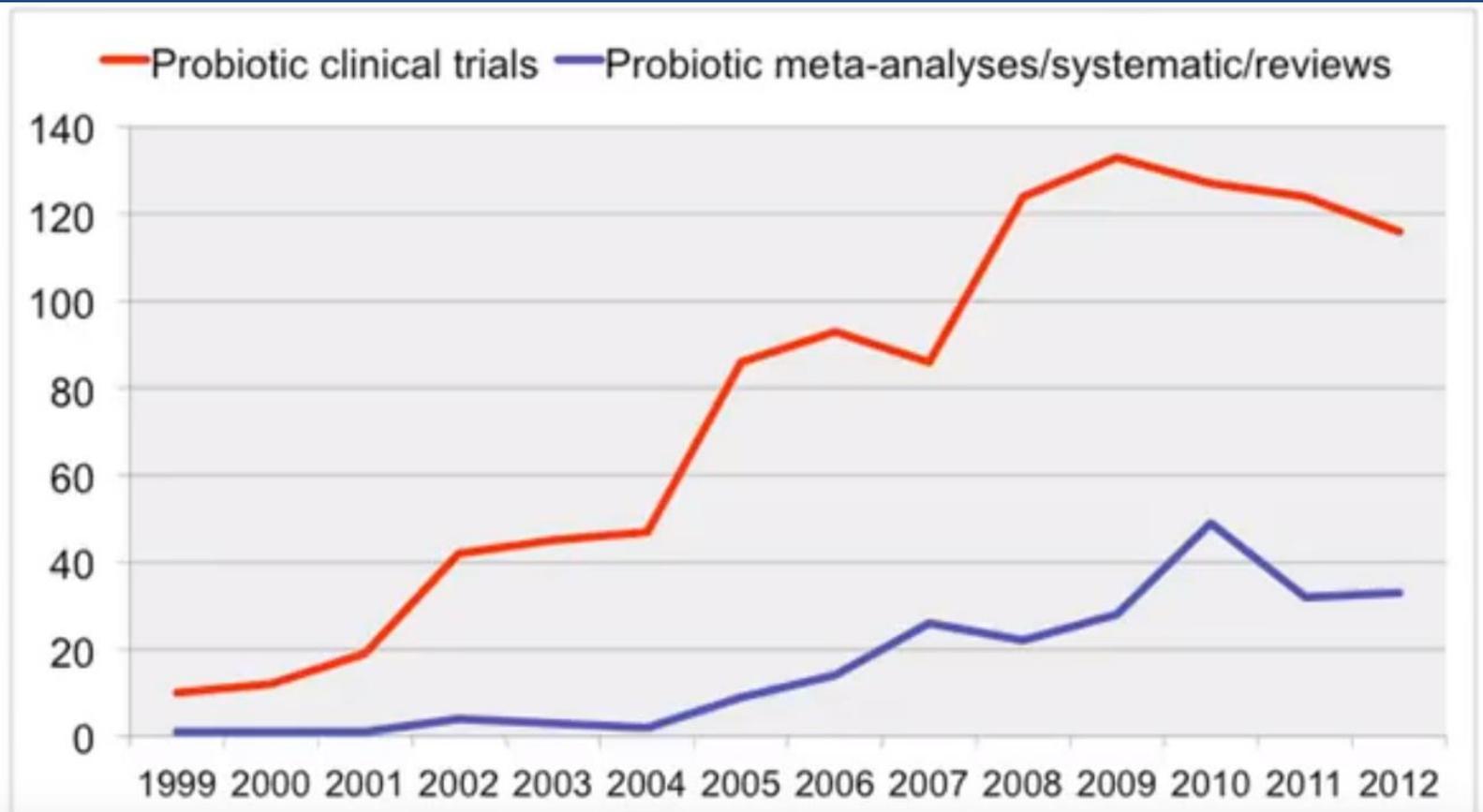
Brand Name	Bacterial Species
<b>Foods</b>	
Activia yogurt (Dannon)	<i>Bifidobacterium lactis</i> DN-173010 (plus <i>Lactobacillus bulgaricus</i> , <i>Lactobacillus lactis</i> , <i>Streptococcus thermophilus</i> )
DanActive yogurt (Dannon)	<i>L. bulgaricus</i> , <i>S. thermophilus</i> , <i>Lactobacillus casei</i> DN-114001
Original Kefir cultured milk (Lifeway)	<i>L. lactis</i> , <i>Lactobacillus rhamnosus</i> , <i>Streptococcus diacetylactis</i> , <i>Lactobacillus plantarum</i> , <i>L. casei</i> , <i>Streptococcus florentinus</i> , <i>Leuconostoc cremoris</i> , <i>Bifidobacterium longum</i> , <i>Bifidobacterium breve</i> , <i>Lactobacillus acidophilus</i> , <i>B. lactis</i> , <i>Lactobacillus reuteri</i>
<b>Dietary Supplements</b>	
Phillips' Colon Health Probiotic Caps (Bayer)	<i>Lactobacillus gasseri</i> , <i>Bifidobacterium bifidum</i> , <i>B. longum</i>
Align capsules (P&G)	<i>Bifidobacterium infantis</i> 35624
Culturelle Digestive Health tablet or capsule (i-Health)	<i>Lactobacillus GG</i>
Florastor capsules (Biocodex)	<i>Saccharomyces boulardii</i> lyo
VSL #3 capsules (Sigma-Tau/VSL)	<i>B. breve</i> , <i>B. longum</i> , <i>B. infantis</i> , <i>L. acidophilus</i> , <i>L. plantarum</i> , <i>Lactobacillus paracasei</i> , <i>L. bulgaricus</i> , <i>S. thermophilus</i>
Florajen capsules (American Lifeline)	<i>L. acidophilus</i>



# JUST BECAUSE IT SAYS 'PROBIOTIC' DOESN'T MEAN IT IS A PROBIOTIC

- We are only beginning to understand how probiotics may promote health
- Some products labeled 'probiotic' do not contain strains shown to be effective or may not deliver adequate levels of live probiotic through the end of shelf life.

# Is there evidence for health benefits of probiotics?



9

Data from PubMed 8/30/2013 (excludes 2013) – published trials – 1064, meta-analyses - 225

# What are the health benefits associated with probiotics?

## ❖ GOOD Evidence (Evidence rating A):

1. Reducing risk of antibiotic-associated diarrhea in children and adults (NNT=10-12)
2. Manage digestive symptoms (i.e., IBS, Ulcerative Colitis) (NNT=4-5)
  - Increasing remission rates in adults with ulcerative colitis
3. Reducing incidence of necrotizing enterocolitis and mortality in preterm infants (NNT=30)

## ❖ Compelling evidence (Evidence rating B):

1. Reduce the incidence of Clostridium difficile-associated diarrhea (NNT=29-42)

## ❖ May reduce the duration of acute diarrhea in infants and children by about 1 day

## Other benefits include:

1. Improving the ability to fight off colds
2. Promoting healthy vaginal tracts
3. Improving digestion of lactose; Treating infectious diarrhea
4. Reducing the risk of eczema in infants
5. Glycemic and weight control and brain function

**\*\*Don't recommend probiotics for: patients with weak immune systems, asthma, Crohn's disease, Celiac disease. \*\***

# Conditions that may benefit from Probiotic use

Clinical Condition	Studies Probiotic Species	Studies Products	Comments
Antibiotic-associated diarrhea	<p><b>Bacillus</b> <i>clausii</i>, <i>coagulans</i></p> <p><b>Bifidobacterium</b> <i>animalis</i> subsp <i>lactis</i>, <i>bifidum</i>, <i>breve</i>, <i>longum</i>, <i>longum</i> subsp <i>infantis</i></p> <p><b>Clostridium</b> <i>butyricum</i></p> <p><b>Enterococcus</b> <i>faecium</i></p> <p><b>Lactobacillus</b> <i>acidophilus</i>, <i>casei</i>, <i>casei</i> subsp <i>immunitas</i>, <i>delbrueckii</i> subsp <i>bulgaricus</i>, <i>paracasei</i>, <i>plantarum</i>, <i>reuteri</i>, <b>rhamnosus</b>, <i>rhamnosus</i> GG, <i>sporogenes</i></p> <p><b>Lactococcus</b> <i>lactis</i> subsp <i>diacetylactis</i></p> <p><i>Leuconostoc</i> <i>cremoris</i></p> <p><b>Saccharomyces</b> <i>boulardii</i>, <i>florentinus</i></p> <p><b>Streptococcus</b> <i>thermophilus</i></p>	<p>Align</p> <p>Bio-K+</p> <p><b>Culturelle</b></p> <p>DanActive</p> <p>Florastor</p> <p>HOWARU</p> <p>Restore</p> <p>MIYAIRI 588+</p> <p>VSL#3</p>	<p>-Broad-spectrum combination products are likely to have the most benefit; consider 10 billion CFUs per day of each organism</p> <p>-Start probiotics on the 1<sup>st</sup> day of antibiotic treatment and continue for 1-2 weeks following completion of antibiotic therapy.</p> <p>-<i>S boulardii</i> and <i>L rhamnosus</i> GG are best supported by the available evidence</p>
<i>Clostridium difficile</i> –associated diarrhea	<p>-<b>Bifidobacterium</b> <i>animalis</i> subsp <i>lactis</i>, <i>breve</i>, <i>longum</i>, <i>longum</i> subsp <i>infantis</i></p> <p>-<b>Clostridium</b> <i>butyricum</i></p> <p>-<b>Lactobacillus</b> <i>acidophilus</i>, <i>casei</i>, <i>delbrueckii</i> subsp <i>bulgaricus</i>, <i>paracasei</i>, <i>plantarum</i>, <i>rhamnosus</i> GG</p> <p><b>Saccharomyces</b> <i>boulardii</i></p> <p><b>Streptococcus</b> <i>thermophilus</i></p>	<p><b>Align</b></p> <p><b>Culturelle</b></p> <p>DanActive</p> <p><b>Florastor</b></p> <p>MIYAIRI 588+</p> <p>VSL#3</p>	<p>Patients interested in trying a probiotic should consider one with preliminary evidence, such as <i>Saccharomyces boulardii</i> (Florastor, others) or <i>Lactobacillus</i> (Culturelle, Bio-K+, others)</p>

Sources: Am Fam Physician. 2017 Aug 1;96(3):170-178. Chart excludes *Third-party tested products* .  
**POWERPAK: Are Probiotics Right for This Patient? Individualizing Recommendations for Disease Management and Health Maintenance, 2017**

# Conditions that may benefit from Probiotic use

Clinical Condition	Studies Probiotic Species	Studies Products	Comments
Ulcerative colitis	Various (esp E. coli Nissle, and a mixture of the strains of Lactobacillus, Bifidobacterium and Streptococcus)	Activia <b>Align</b> Bacid <b>Culturelle</b> Mutaflor <b>VSL#3</b>	-VSL#3 and similar high-dose multispecies products with several <i>Bifidobacterium species</i> are preferred -Start at the onset of an exacerbation of UC, and continue for 1-2 weeks following resolution of symptoms.
Irritable bowel syndrome	Various (esp. Bifidobacterium infantis, Sacchromyces boulardii, Lactobacillus plantarum )	Activia <b>Align</b> Bacid <b>Culturelle</b> USANA <b>VSL#3</b> YoPlus	Start probiotics at the onset of symptoms and continue as needed for persistent symptoms

Sources: Am Fam Physician. 2017 Aug 1;96(3):170-178. Chart excludes *Third-party tested products* ; American Gastroenterological Association (<https://www.gastro.org/practice-guidance/gi-patient-center/topic/probiotics>)

# Conditions that may benefit from Probiotic use

Clinical Condition	Studies Probiotic Species	Studies Products	Comments
Necrotizing enterocolitis		Bacid <b>Culturelle</b> Florajen <b>Florastor</b>	Products containing a variety of <i>Bifidobacterium species</i> are most <i>beneficial</i> Dose approximately 3 billion CFUs per day of each organism for the first seven days of life; adult powdered products may be given at one-fourth dose in breast milk or formula  Start in those at risk of the condition and continue as long as the increased risk persists.

## Conditions for Which Patients Use Probiotics

<b>Diagnosis</b>	<b>(%) Among All Physicians</b>	<b>(%) Patients of Private Practitioners</b>	<b>(%) Patients of Academic Practitioners</b>
IBS	98	96	100
<i>C. difficile-associated diarrhea</i>	74	89	55*
Pouchitis	38	43	32
Crohn's disease	34	39	27
Ulcerative colitis	30	29	32
General wellness	26	25	27
Radiation enteritis	10	14	5

<b>Brand Name</b>	<b>Bacterial Species</b>	<b>Clinical Condition</b>	<b>Effectiveness</b>	<b>Practice Guidelines</b>	<b>Bacteria Count/Dosing</b>	<b>Cost/Quantity</b>
<b>Activia</b>	<i>B. lactis</i> DN-173 010, (plus yogurt starters <i>L. bulgaricus</i> , <i>L. lactis</i> and <i>Streptococcus thermophilus</i> )	IBS	C	<a href="#"><u>1b**</u></a>	4 oz/cup, 1–4 QD	\$10–18/24 count
<b>Danactive</b>	<i>Lactobacillus casei</i> DN-114001	<b>AAD Prevention</b>	A	<a href="#"><u>1b**</u></a>	3.1 oz/cup	\$5.00/8 count
		Infectious Diarrhea Prevention		<a href="#"><u>1b*</u></a>	10 billion/cup	
		CDAD Prevention		<a href="#"><u>1b**</u></a>		

**Effectiveness** based on expert panel recommendations where: A=strong, positive, well-conducted, controlled studies in the primary literature, B=some positive, controlled studies but presence of some negative studies or inadequate amount of work to establish the certainty; C=some positive studies but clearly inadequate amount of work to establish the certainty.

**Practice Guidelines** include those of 1) World Gastroenterology Organisation’s global guidelines evidence level assignment based on the Centre for Evidence Based Medicine system:

\*pediatrics

\*\*adults

<b>Brand Name</b>	<b>Bacterial Species</b>	<b>Clinical Condition</b>	<b>Effectiveness</b>	<b>Practice Guidelines</b>	<b>Bacteria Count/Dosing</b>	<b>Cost/Quantity</b>
<b>Align</b>	<i>Bifidobacterium infantis</i> 35624	<b>IBS</b>	B	<a href="#">1b**</a>	1 billion/1 QD	\$29.99/28 count
<b>BioGaia</b>	<i>L. reuteri protectis</i> SD2112 (ATCC 55730 or DSM 17928)	Infectious Diarrhea Treatment	A	<a href="#">1a*</a>	100 million QD	\$29.99
		IBS	C	<a href="#">1b*</a>		
<b>Bio-K+</b>	<i>L. acidophilus</i> CL1285 and <i>L. casei</i> LBC80R	AAD Prevention	NS	<a href="#">1b**</a>	50 billion/capsule	\$29.99/15 count
		CDAD Prevention		<a href="#">1b**</a>	BID	
<b>Culturelle</b>	<i>L. rhamnosus</i> GG (LGG) (LGG also included in Danimals yogurt, Dannon)	<b>AAD Prevention</b>	A	AAP, 1b ,1b <sup>*</sup>	10 billion/1 QD	\$18–25/30 count
		<b>Infectious Diarrhea Treatment</b>	A	AAP, 1a , 2b <sup>*</sup>		
		Infectious Diarrhea Prevention	B	1b , 1b <sup>**</sup>		
		CDAD Prevention	B/C			
		CDAD Prevention of Recurrence	B/C			
		Crohn's Disease	C			
		IBS	B/C (children)	1a ,1b <sup>***+</sup>		
<b>Florastor</b>	<i>Saccharomyces Boulardii</i>	<b>AAD Prevention</b>	A	AAP, 1a , 1b <sup>**</sup>	250 mg/1 BID	\$19.99/20 count
		<b>Infectious Diarrhea Treatment</b>	A	1a ,1b <sup>**</sup>		
		Infectious Diarrhea Prevention	B			
		CDAD Prevention	B/C			
		<b>CDAD Prevention of Recurrence</b>	B/C	<a href="#">1b**</a>		
		Crohns	C			
<b>VSL*3</b>	Combination Probiotic Product ( <i>Streptococcus thermophilus</i> , <i>B. breve</i> , <i>B. longum</i> , <i>B infantis</i> , <i>L. acidophilus</i> , <i>L. plantarum</i> , <i>L. paracasei</i> , <i>L. delbreuckii/bulgaricus</i> )	IBS	B/C		122.5 billion/capsule	\$86/30 Sachets
		UC Induction	B	<a href="#">1b**</a>	450 billion/sachet	\$52/60 count
		<b>UC Maintenance</b>	A		IBS: ½–1 sachet/day	
		<b>Pouchitis: Prevention and Maintaining Remission</b>	A	<a href="#">1b**</a> , BSG "B"	Pouchitis: 2–4 sachets/day	
					UC: 1–8 sachets/day	

# Which probiotic do I pick?

- ✓ What is your health need?
- ✓ Visit “Clinical guide to probiotic products”
  - [http://usprobioticguide.com/PBCPediatricHealth.html?utm\\_source=pediatric\\_ind&utm\\_medium=civ&utm\\_campaign=USA\\_CHART](http://usprobioticguide.com/PBCPediatricHealth.html?utm_source=pediatric_ind&utm_medium=civ&utm_campaign=USA_CHART)
- ✓ Choose companies that have been around for years
  - Attune Foods; Bifidex; BioGaia; Culturelle; Dannon; General Mills; Kraft; Nestle; Procter & Gamble; VSL Pharmaceuticals; Yakult
- ✓ Top Pharmacist recommendations\*:
  - Culturelle (35%); Florastor (22%); Florajen (14%); Align (12%)
- ✓ Check a third-party certifier (like ConsumerLab or the USP)
- ✓ Call the company
- ✓ Most are available over the counter
- ✓ Prescription
  - VSL#3 DS, requires a prescription: the prescription requirement was established by the manufacturer and is not a requirement of the FDA

\*According to the 2018 U.S. News & World Report <https://health.usnews.com/health-products/top-rec-probiotic-dietary-supplements-109>

# What to look for on the product label?

- ❑ **Microbe.** What probiotic microbe is inside? The genus, species and strain should be specified, such as *Bifidobacterium lactis Bb-12*.
- ❑ **CFU (Colony Forming Units).** How many live microorganisms are in each serving or dose through the expiration date (not at time of manufacture)?
- ❑ **Suggested serving size.** How much do I take?
- ❑ **Health benefits.** What health benefits are claimed for this probiotic? If claims seem too good to be true, they most likely are.
- ❑ **Proper storage conditions.** Where do I keep it to ensure maximum survival of the probiotic? (Although in general refrigeration in a dry environment promotes stability, not all probiotics need to be refrigerated to remain stable.)
- ❑ **Inactive ingredients** – For possible food allergies/lactose intolerance
  - Examples - fish oil, lactose, vitamin C, gluten. Calcium
- ❑ **Expiration** or “Sell-by” date

# What is the effective minimum dose?

- Different probiotics have been shown to be effective at various levels.
- A product with a larger dose is **not** always better.
- The “dosage” of bacteria probiotics is measured in CFUs, or colony-forming units.  
Common daily dosages for probiotics :
  - 5 to 10 billion CFUs for a child
  - 10 to 20 billion CFUs for an adult.
- The dose should match studies demonstrating their benefit(s)
- To help prevent antibiotic-associated diarrhea- take probiotic during treatment...and for up to 2 weeks afterward.
- If a prescribed product isn't working **after 3 to 4 weeks**, then try to move the patient to a different strain.
- Probiotic yogurt products and fermented milks contain varying amounts of bacteria, depending on the brand and ounces consumed.
  - Patients will need to eat ~8 oz twice daily to see benefit from probiotics found in yogurt
- **Yeast probiotic *S. boulardii*** - *Most studied dosage is 250 to 500 mg per day.*
  - **For diarrhea in people taking antibiotics:** 250-500 mg, taken 2-4 times daily for up to 2 weeks
  - **For diarrhea caused by *Clostridium difficile*:** For preventing recurrence, 500 mg twice daily for 4 weeks along with antibiotic treatment

# How do I take probiotics?

- ✓ Take with very light meal (i.e., snack).
  - Increased gastric pH is more favorable for the probiotics
- ✓ Do not add to warm or hot foods or beverages
- ✓ Separate taking probiotics within 2 hours of consuming other drugs and supplements
  - ✓ Examples: antibiotics, herbs, garlic, or prescription drugs or any other supplements known to have anti-bacterial properties as certain foods and medications can destroy probiotics
- ✓ The most common side effects reported are temporary bloating, gas, and mild stomach upset (temporary)

# Probiotic Containing Foods

Food	How it is made	Benefit
<b>Kefir</b>	Fermented by adding kefir grains (cultures of lactic acid bacteria and yeast) to milk	A better source of probiotics than yogurt, and people with lactose intolerance can often drink kefir with no problems.
<b>Yogurt</b>	Made from milk fermented by lactic acid bacteria and bifidobacteria	Is linked to a number of health benefits and may be suitable for people with lactose intolerance. Make sure to choose yogurt that has active or live cultures.
<b>Cheeses</b>	Most are made by fermentation, but it does not mean that all of them contain probiotics.	Check the label for live and active cultures. Typically, raw cheese is the only kind that has active probiotics in it. Note: Cheddar, mozzarella and gouda — contain probiotics
<b>Buttermilk</b>	2 types: traditional and cultured. <b>Traditional buttermilk</b> is the only this version contains probiotics, and it is sometimes called “grandma's probiotic.” It leftover liquid from making butter.	Cultured buttermilk, commonly found in American supermarkets, generally does not have any probiotic benefits

# Probiotic Containing Foods (Cont)

Food	How it is made	Benefit
<b>Sauerkraut</b>	shredded cabbage that has been fermented by lactic acid bacteria	Is rich in vitamins, minerals and antioxidants. Make sure to choose unpasteurized brands that contain live bacteria
<b>Kimchi</b>	Made from fermented cabbage. Contains the lactic acid bacteria <i>Lactobacillus kimchii</i> , and other lactic acid bacteria that may benefit digestive health	Spicy Korean side dish, usually made from fermented cabbage. Its lactic acid bacteria may benefit digestive health.
<b>Tempeh, Natto, , Miso</b>	fermented soybean products. Natto contains <i>Bacillus subtilis</i> . Miso is made by fermenting soybeans with salt and fungus (koji).	Tempeh - popular, high-protein substitute for meat. It contains a decent amount of vitamin B12. Great choice for vegetarians Miso-Rich in several nutrients and may reduce the risk of cancer and stroke, especially in women
<b>Pickles</b>	pickled in salt +water. As ferment using their own naturally present lactic acid bacteria	Buy pickled made in salt +water Pickles made using vinegar <u>do not</u> have probiotic effects
<b>Kombucha</b>	Black or green tea drink fermented with bacteria and yeast	High-quality evidence on kombucha is lacking
<b>Apple Cider Vinegar</b>	Is <u>NOT</u> a probiotic	Buy raw, unfiltered apple cider vinegar – made from fermented apples (which contain pectin that promotes healthy digestion ) Example: Bragg Organic Apple Cider Vinegar

# Common Q&A

## **Q: I'm hearing a lot about probiotics lately. Are they good for everyone?**

A: There is some evidence that probiotics may help prevent or treat several different conditions (i.e., IBD, antibiotic-related diarrhea (including a severe form called C. difficile colitis), IBS). The best we can say right now is they won't hurt and may help. They are safe to use for most healthy people, but that doesn't mean they are always effective.

## **Q: Is it better to take probiotics via food or supplements?**

A: The most important consideration is that the product -- food or supplement -- deliver adequate numbers of efficacious probiotics for your needs.

## **Q: Are probiotic products regulated?**

A: Most probiotic products in the US are marketed as foods or dietary supplements, so they are not regulated in the same way as drugs are.

## **Q: Do probiotics need to be refrigerated?**

A: No, not unless indicated by the label.

## **Q: Are refrigerated products better than non-refrigerated products?**

A: Not true. Many products do NOT need to be in the refrigerator

## **Q: Does a higher dose and more strains mean the probiotic is better?**

A: Not necessarily. Take the strain that has been studied/tested to be effective for the respective disease or condition.

## **Q: Is a product with many different strains better than one with fewer strains?**

A: More strains are not necessarily better. The product formulation should match the studies demonstrating the benefit.

## **Q: Should I continue taking probiotics?**

A: If the probiotic is helping (i.e. improving the regularity of their bowel movements), we know of no reason not to take them.

# Summary

1. Probiotic use has increased at least 4-fold in recent years
2. Probiotics help balance the gut microbiota and normalize bodily functions
3. Not all probiotics are created equal.
  - Activities and efficacies of probiotics vary according to bacterial strains and differences have been confirmed in studies conducted on individual products
4. There is no clear guideline on when to use probiotics and the most effective probiotic for different conditions
5. Probiotics are safe in infants, children, adults and older patients. CAUTION with patients who have weak immune system
6. Recommend specific brands known to be of reasonable quality or encourage patients to research brands before purchasing a specific product
7. Pharmacists are ideally positioned to educate patients and follow-up on physician suggestions to help provide patients with evidence-based recommendations for probiotic use.
8. It will be beneficial to take probiotics with prebiotics
9. Further research is necessary to clearly define the optimal probiotic species, dose, formulation, and duration of treatment



# Appendix

# Strains of Bacteria

- UC:
  - *Bifidobacterium animalis subsp lactis, breve, longum, longum subsp infantis*
  - *Escherichia coli (Nissle)*
  - *Lactobacillus acidophilus, delbrueckii subsp bulgaricus, johnsonii, paracasei, plantarum, rhamnosus, rhamnosus GG*
  - *Streptococcus thermophilus*
- IBS:
  - *Bifidobacterium animalis subsp lactis, bifidum, breve, longum*
  - *Enterococcus faecalis*
  - *Escherichia coli (Nissle)*
  - *Lactobacillus acidophilus, delbrueckii subsp bulgaricus, lactis, paracasei, plantarum, rhamnosus, rhamnosus GG*
  - *Propionibacterium freudenreichii subsp shermanii*
  - *Streptococcus thermophilus*

# Strains of Bacteria

- Necrotizing enterocolitis
  - *Bacillus cereus, subtilis*
  - *Bifidobacterium adolescentis, animalis subsp lactis, bifidum, breve, longum, longum subsp infantis*
  - *Enterococcus faecalis, faecium*
  - *Lactobacillus acidophilus, casei, delbrueckii subsp bulgaricus, plantarum, reuteri, rhamnosus, rhamnosus GG, sporogenes*
  - *Saccharomyces boulardii*
  - *Streptococcus thermophilus*
- Colic
  - *Lactobacillus reuteri ATCC 55730/DSM 17938*

# Potential Advantages and Disadvantages of Probiotics

Advantages	Disadvantages
<ol style="list-style-type: none"><li>1. Have multiple mechanisms of action</li><li>2. Resistance is Infrequent</li><li>3. Use May Reduce Exposure to Antibiotics</li><li>4. Delivery of Microbial Enzymes</li><li>5. Well Tolerated</li><li>6. Benefit to Risk Ratio is Favorable</li></ol>	<ol style="list-style-type: none"><li>1. Few Controlled Trials</li><li>2. Persistence Possible</li><li>3. Translocation Possible</li><li>4. Transfer of Resistance Plasmids?</li><li>5. Infection Possible</li><li>6. Quality Control Issues</li><li>7. Regulatory Issues in USA</li></ol>