NUTRITION TO KEEP GUT MICROBIOME HEALTHY
Objectives

- Probiotics and Prebiotics
- Human milk oligosaccharides (HMO)
- Factors derailing HMO
- Symbiosis vs Dysbiosis
- Researches focusing on effects of missing Gut microbiome
Some facts revised

- Gut microbiota’s weight can reach up to 1 to 2 Kg.
- The GI tract surface is as big as 2 tennis courts: 400 m².
- 95% of our bacteria are located in the gastrointestinal (GI) tract.
- In our body, microbes outnumber human cells by 10:1.
- Laid end to end, our body’s bacteria would circle the Earth 2.5 times.
Gut microbiome impacts whole body
Difference between Probiotics and Prebiotics

**Probiotic**: The term was defined by Parker (1974) as “organisms and substances which contribute to intestinal microbial balance.”

**Prebiotics**
are nondigestible substances that feed the probiotics, helping them to thrive in the GI tract.

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HUMAN MILK Oligosaccharides

- A family of structurally diverse unconjugated glycans

- Recent studies show that HMO—a prebiotic found naturally in human milk—can serve as food for beneficial bacteria in the infant gut.
Early immune development

Of immune system is in gut, prebiotics supports colonization of gut which helps in immune system development

Prebiotics and more functions

https://anhi.org/conferences/50-espghan-hmo-pediatric-nutrition/hmo-mechanisms
The Early Gut Microbiome

Cultivating Healthy Growth and Nutrition through the Gut Microbiota

Sathish Subramanian, Laura Y. Blanton, Steven A. Frese, Mark Charbonneau, David A. Mills, and Jeffrey I. Gordon
But...humans have changed almost everything
Gut microbiome described 100 years ago

“In four of the others, the results were nearly identical. The films showed the punctate form of B. bifidus in nearly pure culture... in the flora of breastfed infants (the ideal), the acid-tolerant group is immeasurably predominant and is of the strictly anaerobic type called B. bifidus.”

—Logan, in 1913, echoing the findings of his contemporaries, Tissier and Moro
Bifidobacterium longum infantis and HMO.

4 enzymes needed to break HMO.
Its still diverse for some parts of world

Some countries like Bangladesh still have high levels of bifido among breast feeding infants.

While developed countries have much lower abundance

*Huda et al 2014; Davis et al 2017; Vatanen et al 2016; Yatsunenko et al 2012; Frese et al 2017; Subramanian et al 2014; Lewis et al 2014*
Factors that derail the healthy Gut microbiome

- Formula feeding
- Mode of delivery
- Antibiotics
- In absence of Bifidobacterium dysbiosis sets in
Dysbiosis is opposite of Symbiosis

- **Symbiosis**: to live together with our microbes in a relationship where we are useful to each other
Dysbiosis

- Is a term for a microbial imbalance or maladaptation inside the body, such as an impaired microbiota.
What happens in dysbiosis in infancy

- Colic
- Infections
- Contipation
- Excessive weight gain
What happens in dysbiosis in adulthood

Some microorganisms go missing resulting in chaos in gut, leading to diseases
Gut microbiome in hospitalized infants

- 12 subspecies found in rooms and infants
- Most common were *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*
- Authors concluded that room habitats contained bacterial groups that often colonize infants housed in the NICU
Reintroduction of a symbiont

Symbiont: an organism living in symbiosis with another.

• 66 mothers were recruited, all were term infants exclusively breast fed, born vaginally or C-section.

• One group received B infantis 18 billion CFU/day for 21 days, starting 7 days after birth.

• Both group received lactation support for first 60 days. Fecal samples were collected throughout 60 days.
Key finding of the research

Blue area shows the bifidobacteria

The supplementation increased the bifido population and sustained over time
40%
Higher bifido bacteria in vaginal delivered infants

25%
Lesser bifido in C-section delivery
Antibiotics reduces good bacteria
Breast feeding had a significant impact on microbiome
Probiotics for infants and children

- Probiotics are promoted for
- Diarrhea.
- Infant colic
- Allergy
- Eczema symptoms

However, the evidence is mixed on whether probiotics are actually effective for a range of infant conditions.
Safety of Probiotics

- Safe and well tolerated in normal, healthy infants and children.
- Good tolerance has also been observed in premature infants.
- Very low birth weight babies
- HIV-infected children and adults.
- Late pregnancy.
- Some cases of probiotic septicaemia in immunocompromised adults and children.

Probiotics with antibiotics

Probiotics must be prescribed with start of antibiotics and continue for at least one week after the end of the course.
Commercially available probiotics in Pakistan

- Biflor- (Saccharomyces boulardii)
- Enflor
Ecotec

- Lactobacillus acidophilus LA-5,
- Bifidobacterium BB-12,
- Lactobacillus delbrueckii ssp.bulgacus LBY-27,
- Streptococcus thermophilus STY-31.
Gutcare

- Ingredients: Bifidobacterium 420mg, Clostridium Butyricum 500mg
Ezegut and Imutec

Drops for infants **Ingredients:** Lactobacillus

**Ingredients:** Bifidobacterium
Foods containing natural probiotics

- Yogurt
- Cottage cheese
- Buttermilk
- Kefir
- Soy sauce
- Miso (fermented soyabean)
- Tempeh (fermented soyabean)
- Fresh sauerkraut
Prebiotics

Foods containing Prebiotics

- Wheat
- Barley
- Rye
- Flax
- Oatmeal
- Onion
- Garlic
- Leeks
- Legumes
- Asparagus
- Leafy greens
- Berries
- Bananas
- Honey
Researches on effects of missing Gut Microbiome
The microbial environment in the intestines, not only may affect an individual's risk of developing and surviving colorectal cancer but may also have a dramatic impact on the efficacy of anticancer immunotherapies.
People with multiple sclerosis (MS) show differences in gut bacteria composition compared with those without the disease.

Researchers evaluated 42 stool samples from patients who had relapsing-remitting MS or secondary progressive MS with relapses and compared them with samples from 28 healthy donors.
Scientists found that if mice were treated with antibiotics certain bacteria in gut were depleted which resulted in change in composition of immune cells, leading to tumor growth in liver.

*National Cancer Institute, USA recently published a paper on May 24th, 2018*
Probiotics effective in prevention of C- diff

What is Clostridium Difficile infection

is a bacterium that can cause symptoms ranging from diarrhea to life-threatening inflammation of the colon.
Organism can spread from contaminated objects & surfaces especially in hospitals.
Mild infection can lead to diarrhea while severe one can lead to sepsis.
evidence suggests that probiotic prophylaxis is a useful and safe Clostridium difficile infection prevention strategy.
Institute of Cancer Research (ICR) in London, United Kingdom, presents strong evidence that the disease is caused through a "two-step process" of genetic mutation and exposure to infection.

Acute leukemia is the most common childhood cancer in developed countries and accounts for about one third of all pediatric malignancies.

A lack of microbial exposure in early life could increase the risk of developing leukemia.

The paper was published on May 21, 2018 in Nature Reviews Cancer.
The U.S. Food and Drug Administration issued a final rule establishing that over-the-counter (OTC) consumer antiseptic wash products containing certain active ingredients can no longer be marketed.

Companies will no longer be able to market antibacterial washes with these ingredients because manufacturers did not demonstrate that the ingredients are both safe for long-term daily use and more effective than plain soap and water in preventing illness and the spread of certain infections.
Make sure to avoid unnecessary antibiotics

Probiotics must be taken as soon as you start the antibiotics and continue for at least one week after the end of the course.

Normal soaps are good enough to clean

Promote weaning with natural foods