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Editorial

Gut barrier and probiotics

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The Human body is separated from outside and saved from outside influences by various barriers:

1. Skin barrier
2. Genito-urinary tract barrier
3. Acid-ph barrier and
4. Gut barrier.

Gut barrier is the most complex as it performs various functions other than just the barrier function and most important of that is the digestion and absorption of food. Gut performs so many important functions in the body that it is also called "second brain." In the gut, there exists an intricate symbiotic relationship of host and gut microbiota. This microbiota is formed by billions of bacteria weighing 850-1000 gms. Collective genome of gut microbiota (microbiome) has more than 3 million genes while the number of genes in the human body (human genome) is about 1/10 of this.

Gut is sterile when baby is born and colonization starts soon thereafter. Factors that influence this act are the kind of delivery (vaginal or caesarean) and maternal microbiota of vagina, feces and skin. Skin microbiota of father, siblings, grandparents, nanny and even pet dog also determine and educate the native core microbiota. In 1-3 years, everyone develops his own core microbiota. About 90% of this is contributed by mother. Under normal conditions, this core microbiota remains the same, all throughout the life. Gut microbial species differ among individuals. Many factors can influence the composition of gut flora. These are diet, age, medications, illnesses, stress, and life style.

Functions of gut microbiota for the host's benefit:

1. Barrier effect: It has a profound effect in controlling pathogenic bacteria, virus or yeast affecting the host.
2. Synthesis.
3. Drug Metabolism.
4. Immunostimulation: Gut microbiota educates the immune system during first 4-5 years of life and it has bearing on immune responses of human throughout life, whether it is fighting infections, risk of developing auto-immune disorders or metabolic functions.
5. Metabolic functions.
6. Behavioral conditioning.

Functions of gut-micro flora are so many that it is sometimes called 6th organ for digestion.

OVERGROWTH OF MICROBIOTA

Various mechanisms exist to control the population and composition of gut microbes as overgrowth may have detrimental effects on host. These are:

1. Secretions: Gastric acid, biliary salts, mucus and mucosal Ig.
2. Mucosal ph.
3. Mucosal barrier integrity.
4. Intestinal motility.
5. Local mucosal and systemic immunity.
6. Interactions among different bacterial species.

On many occasions, gut equilibrium is disturbed to develop dysbiosis. Factors causing dysbiosis are dietary changes, use of antibiotic and steroids and use of proton pump inhibitors (PPI) or antacids for long time. Dysbiosis is usually linked to leaky gut that is dysfunctioning of gut barrier with increase in gut permeability. Dysbiosis is also associated with various GI and Liver diseases like:

1. Gastrointestinal (GI) infections.
2. Inflammatory bowel disease.
3. GI cancer.
4. Irritable bowel syndrome.
5. Food intolerance and allergy.
6. Obesity and metabolic syndromes.
7. Small intestinal bacterial overgrowth.
8. Liver diseases.

Gut microbiota is implicated in:

1. Obesity
2. Diabetes
3. Metabolic syndromes
4. Rheumatoid disorders
5. Alcoholic fatty liver disease

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6. Heart disease
7. Periodontitis
8. Behavior and motor activities
9. Schizophrenia
10. Dyslexia
11. Autism
12. Many mood disorders.

SECRET OF MAINTAINING HEALTHY GUT BARRIER

Best method to have good gut microbiota is diet. Plant based diet with little of animal food is the best option. Composition of food taken is so important that ancient Hindu scriptures say that “man is what he eats.” Diet and Dietetics are considered major regulators of life style.

VARIOUS INTERVENTIONS CAN BE TRIED TO CORRECT THE IMBALANCE (DYSBIOSIS)

Avoiding all predisposing factors like inadvertent use of antibiotics and steroids and minimizing use of antacids or PPI are the ways to build and maintain a healthy gut microflora.

Antibiotics can be used for this correction but have inherent risk of damaging the normal flora too. In such situation, pathogens like clostridium difficile may overtake.

Another intervention can be ”biotherapy” and targeted probiotic use. Lot of research is going on in the area of “targeted probiotic use.” Using “fecal microbiota transplant” has become the first-line therapy for vancomycin resistant clostridium difficile infection. Here good microbiota displaces the bad one and shows results within hours. Studies are of overcoming insulin resistance with such biotherapy. Finding “super doner (of feces)” has become business in USA.

USES OF PROBIOTICS (MICROBIAL THERAPY)

Concerns throughout the scientific literature with probiotics are:

1. Viability and reproducibility on a large scale. Making probiotic preparation by any pharmaceutical company is much more difficult than making a drug as drug is a fixed chemical formula while probiotic is a live culture where contaminant or mutation may destroy the whole batch. For this vary reason, it becomes difficult to rely on small, non-descript manufacturers for quality.
2. Viability and stability during use and storage. Packaging is, therefore, important. Heat sensitivity of the product may kill all the living cells before they reach the consumer.
3. Ability to survive in the intestinal ecosystem. If they do not survive, purpose of giving is lost.
4. Probiotics must have undergone controlled evaluation to document health benefits in the target host. (To repeat: Only products containing live organisms shown in reproducible human studies to confer a health benefit can actually claim to be a probiotic).
5. The probiotic candidate must be a taxonomically defined microbe or combination of microbes (genus, species, and strain level). It is commonly admitted that most effects of probiotic are strain-specific and cannot be extended to other probiotics of the same genus or species. This calls for a precise identification of the strain, i.e. genotypic and phenotypic characterization of the tested microorganism. It is also to be decided which strain or multiple strains to use?.
6. Dose and duration of treatment.
7. Safety: Important points to consider as these are living bacteria and are antibiotic resistant.

Challenge is to identify good bacteria and the conditions where they can be best utilized.

To find an answer to these issues we must focus on following:

1. Biological characteristics
2. Immunological benefits
3. Mechanism of action
4. Do they activate local macrophage?
5. Do they modulate cytokine profile?
6. Is that probiotic aTh1 or Th2 activator?
7. Does that probiotic has other immunological benefits?
8. Is it able to produce an enzyme?
9. Is it able to stimulate epithelial mucin production?
10. Is it able to digest food?
11. Does it compete for addition of pathogens?.

Scientifically proven probiotics so far are:

1. Sachromyces boulardie.
2. Sachromyces GG.
3. Bacillus clausie.

When given in proper dosage and for the proper duration. Sacharomyces GG is costly and is not available in Indian market.

In other words, it means that various preparations in the market having different combinations in different strength are not yet backed by scientific approvals. Their effectiveness is not proven, safety not established and quality not guaranteed and should, therefore, be avoided.

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