Gut microbes and their connections with CNS

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Gut Brain Axis

Biochemical signaling that takes place between the gastrointestinal tract and the central nervous system



ENS presents many similarities with the brain in terms of neuronal components, neurotransmitters, and functional independence

Microbial organ : 90–95% microorganisms

Gut and gut microbiota work together to perform the tasks of digestion, immune and endocrine functions, and neurotransmission

Bidirectional communication between central and enteric nervous system, linking emotional and cognitive centers of the brain with peripheral intestinal functions

Interaction between microbiota and GBA - bidirectional through signaling

Evidence of microbiota-GBA interactions comes from the association of dysbiosis with central nervous disorders (i.e. autism, anxiety-depressive behaviors) and functional gastrointestinal disorders(IBS)





Microbiota & Microbiomes



to trillions of microbe

Ibacteria, virus, these are

useful, and some are

The human body is

Microbiomes

nicrobion humans me relation for live with is vital

Human beings live in a bacterial world, and lifestyle factors such as environment and habit determine the species and the number of bacteria that one carries

Microorganisms mostly inhabit the skin surface and digestive, respiratory, urinary, and reproductive tracts.

Microorganisms amounting to more than 1 kg inhabit the digestive tract

The microbiota contains 300–3,000 different species

Micro organisms with Interdependent and mutualistic relationships with humans - commensal microbiota

Growth and development of human beings influenced by commensal microbiota



The microflora(Bacteria and other organisms that live inside the intestines) of the gut.

Help digest food

Drives our immune system and its response – particularly inflammation

Provides resistance to colonization by exogenous pathogenic microorganisms

How they live in Gut

Sticks to the walls of intestines

Acts as a gatekeeper and a trainer to T-cells to distinguish foreign entities from our own tissue.

Microbial-mediated gut hormone release

- Within the gut lumen, bacteria produce a number of metabolites
- Metabolites contain structural components that act as signaling molecules to a number of cell types within the mucosa
- Entero endocrine cells responds to these signals to produces various hormones

How these microbiota develops

Gut microbiota develops almost simultaneously with the brain and psychology

Regulates the structure and function of the gut-brain

Influences the development of the brain and behavior

Development	Prenatal	Postnatal (year	.)			
		0 3	1	8	65	
Mental disorders		Alzheimer's disease / Parkinson's disease Bipolar Disorder / Schizophrenia Eating Disorder / Drug Abuse Depression / Anxiety ASD / ADHD				
Mind		Cognition Self Control Social Interaction Language				
Brain Myelination Synapse						
Gut Intestinal Length Brain Gut Microbiota	3° .					
Diet	Prenatal Diet	Breast Milk Formula Milk Powder Solid Foods	Home / School Foods Snacks	Individual Diet Snacks	Individual Diet Special Diet	
Delivery Mode & Feeding Pattern						
Influential Factors		Chronic Stress Infection / Antibiotics Life Style Life Environment				
		0 3	18	8	65	
Subject	Maternal	Self (year)				

What alters these microbiota

The circadian rhythm

Sleep duration

Day and night inversion of activities

The changes in delivery mode & feeding patterns

Physical activity

Dietary pattern

Medicines – eg. Antibiotics

etc

Is really a diet matters



Diet shapes the gut microbiota, and different foods prompt the proliferation of different microorganism

Even short-term dietary changes alter the human microbiota

Refined carbohydrates , the intake of meat, fat, artificial sugar, and salt – definitely harmful

Dietary fibers are non-digestible polysaccharides (whole grains) - microbiotaaccessible carbohydrates (MACs) Long term low MAC diet destroys the microbiota

The number of times people eat at home has reduced significantly

The number of times people eat out and eat snacks has increased rapidly.

In food processing, the proportion of fresh food and traditional fermented food has decreased significantly

The proportion of processed food and industrially produced food has increased rapidly

Food additives, pesticide residues, artificial colors and drug residues in the food – destroys microbiota



LET'S GET STARTED!

How microbiota works



Short chain fatty acids



SCFA - Important to prevent Irritable bowel syndrome

Bile acid metabolism

Deconjugation and dihydroxylation of bile acids by microbial-derived bile salt hydrolases (BSH)

Gives rise to secondary bile acids - more hydrophobic Firmicutes and Actinobacteria capable of metabolizing all conjugated bile salts and Bacteroidetes BSH activity

Activation of G-protein coupled receptor TGR5 and the nuclear receptor FXR



Metabolism Via Gut Hormone Release

Serotonin GLP CCK GIP All are secreted in Enteroendocrine cells with the influence of microbiomes

Also they stimulate neurotransmitters



The Saviour

Four dominant microbial Phyla seen in the gut – Firmicutes, Bacteroidetes, Actinobacteria & Proteoacteria

Prevotella sp. – carbohydrates

Bacteriodes – aminoacids, animal proteins, saturated fats

Bacteriodes, Enterobacter, Enterococcus - Vit k synthesis

Clostridium – bile salt hydrolase – formation of secondary bile acids

Bacteroides, Firmicutes – inflammation, immunity

Citrobacter- anti microbial defense

Lactobacillus – produces lactic acid, prevents harmful bacteria colonization, ensures intestinal epithelium intact

Saccharomyces – diarrhoea prevention, antibiotic damage

Streptococcus & Enterococcus- helps in nutrients absorption, anti microbial

Dysbiosis

Impaired nutrients absorption

Inflammatary bowel diseases

Irritable bowel syndrome

Acid peptic Disease

Allergy

Autism, ADHD

Depression

Bipolar disorder,

Parkinsonism

Alzheimer's Disease

Stress

Prone to infection

Constipation

Sleep disorders			
Bloating			
Skin Diseases			
Weight gain or Weight Loss			
Diarrhoea			
And			

How to maintain gut flora

Say yes

Whole grains

Yoghurt

Fermented foods

Bananas

Green peas

Curd

Ginger

Garlic



Say Yes

Breast milk

Fruits

Onions

Blueberries

Brocolli

Beans

Turmeric



Say no

Meat Fat rich food High salted foods Beverages Artificial sugars Artificial Colors



Say no

Sodas

Fast foods

Alcohol

Processed foods



New Corner Stone of preventive medicine

Probiotics - Prebiotics

Thank you