The Forgotten Organ: Why Our Guts Biome is Reversing the ‘Germ Theory’ Domination of Medicine, and Why its Relevant For NCDs.

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Are we organisms or living ecosystems?

Disorders of ‘supraorganism’ function underlie the aetiology of many modern non-communicable diseases
“the only good bug is a dead bug”
A more holistic understanding of what constitutes gut health will ultimately guide future approaches to correcting gut dysbiosis and the answer surely lies in the consideration of the entire microbial ecosystem rather than its individual components.

"a relationship of non-acute non-infectious host-microorganism interaction that adversely affects the human host."

...A. Vasquez
The Knowledge SHIFT
..much of the research on infectious diseases continues to be dominated by reductionist approaches; one variable is altered while all others are assumed to hold constant.

Microbiologists tend to view the microbe as the key variable in disease and treat the host as a constant. Immunologists generally see the microbe as a constant and the host response as the variable.
This term should take in not just microbes, but the wider 'exposome' and recent discoveries in infection and immunity research.

A term is needed that encompasses sequences from the environment — intrinsic or extrinsic — that impart pathogenic or benign information to eukaryotic immune receptors.

‘PERCEPTOGEN’ (microbial or environmental) to cover protein sequences that affect the body's range of reactions after perception by its immune receptors.
Louis Pasteur 1861

Robert Koch Postulates 1875

Infectious medicine 1% of Bacteria cause human disease millions a year still die from them

Carl Bensussan

Immune Maturation

Inflammation

Tolerance & Health

Pathobionts

Commensals

1667 Antoni van Leeuwenhoek Motile microorganisms

Elie Metchnikoff 1908 LAB

Turnbaugh 2007 Metagenomics 16S rDNA

Pro biotics Pre biotics

Faecal Transplants

Germ Theory

1% of Bacteria cause human disease millions a year still die from them

> 75% Die from NCD

Infectious medicine
The healthy IM cannot be defined as an absolute entity anymore, but it needs to be reconsidered as a dynamic factor, with its own degree of ability to change over time preserving the individual homeostasis through the human lifespan and in response to a changing environment.
Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fibre, and fuel. This has resulted in a substantial and largely irreversible loss in the diversity of life on Earth.
Gut microbial community development is an example of ecological succession, starting when the embryonic intestinal organ is developing in the uterus. We can apply Waddington's notion of an epigenetic landscape, and consider the ecological dynamics of the gut microbiota in a similar way to the development of any other human organ presenting phenotypic changes from ontogeny until death.
The **microbiota** should be considered as just another component of the human epigenetic landscape. Thus, health is also a reflection of the diversity and composition of **gut microbiota** and its metabolic status.

The **phytobiome** should be considered as just another component of the human epigenetic landscape. Thus, health is also a reflection of the diversity and composition of **soil microbiota** and its metabolic status.

“The Nation that destroys its soils destroys itself” – Franklin D Roosevelt
Deep sequencing of the gut microbiomes of 1135 participants from a Dutch population-based cohort shows relations between the microbiome and 126 exogenous and intrinsic host factors, including 31 intrinsic factors, 12 diseases, 19 drug groups, 4 smoking categories, and 60 dietary factors.
Eating for trillions

Three studies investigate the bacteria in the guts of malnourished children and find that, when this microbiota is transferred into mice, supplements of certain microbes or sugars from human breast milk can restore normal growth.


It is becoming increasingly apparent that our diet, gut microbiota and health are inextricably linked. We must be conscious that, when we make dietary interventions, we affect the growth of trillions of bacteria.
Human metabolic phenotypes, and multiple disease processes, are highly dependent on gut-microbial activity.
......depends on the ability of the microbiota to react and return to the pre-disturbed state, that is, one in which the microbiota is considered stable. This notion of Stability, however, must be considered from both the standpoint of Composition (Diversity), Redundancy and Function.
The concept of the mammalian ‘supraorganism’, with the gut microbiota collectively acting as a major virtual organ that augments host metabolism and physiology, has resulted in a paradigm shift in understanding human biology and medicine.

‘Metabotypes’ vary extensively between individuals and populations, and result from the complex interplay between host genes, lifestyle, diet and gut microbes.

Demonstrate that the gut microbiota can be used to predict individualised blood glucose responses to particular foods, which differ between individuals.
Bottom-up approaches emphasising microbiota-derived metabolites - Metabolomics data can complement data derived from standard taxonomic approaches (e.g. 16S sequencing).

Engaging patients to change behaviour will be easier if we give them more of what they want.

‘Better health’ rather than more health services.

That means effective, early, functional assessments/interventions (nutrition and lifestyle) with less reliance on historical notions of the absence of disease being the arbiter of health.

Pharmaco/nutri-metabonomic approaches
Thank you for your attention