



SOIL - FOOD - HEALTH

Unearthing the relationship between soil & gut health

The importance of soil is not new thinking. Sir Howard Albert, Lady Eve Balfour, Aldo Leopold and Masanobu Fukuoka are some of the many people who have connected soil and human health. Over the last few years there has been a considerable increase in soil research, particularly in relation to improving food security and mitigating climate change. Other areas of research have focused on how soil influences the immune system, how healthy soil underpins nutritious and healthy food and how gardening and growing your own food improves mental health & well-being.

Human health is intrinsically linked to the soil. Both directly and indirectly microbial diversity in the soil supports and reinforces the complex gut microbiome and its pivotal role in human health. We have evolved with, not separate, from soil and this ancient relationship is key to our wellbeing.

A recent scientific study ^① undertaken at the University of Natural Resources and Life Sciences in Vienna explored the link between soil and human gut microbiomes. They found that soil micro-organisms influence the human gut microbiome, not only through the food we eat but through direct contact with soil. They concluded that a relationship with healthy, diverse soil could positively influence the human gut.

The evolution of the human immune system starts in utero when a mother passes antibodies to her unborn baby. A vaginal birth bathes babies in the lactobacillus-rich, microbial community of the birth canal and breast milk supports the growth of microbes that prime the immune system.

As children grow, research has shown when they are allowed to play in close contact with healthy soil it increases their immune responses and in particular improves immunity to asthma and eczema. ^② There is a whole body of emerging science around the role soils play within the human immune system.

Soils can contain pathogenic organisms. In healthy soil, these are kept in check by beneficial micro-organisms (just like in a healthy gut microbiome). There is interesting research that suggests not only commensal microbes but also soil pathogens potentially contribute to human immune tolerance by stimulating immunoregulatory pathways ^③. Soil-borne diseases impact immunosuppressed people the most.

The health of any microbiome is determined by the diversity and abundance of micro-organisms. The greater the diversity the more resilient it is and the more resistant to disease.

In the soil, the quantity and diversity of micro-organisms, particularly bacteria and fungi, affect the health of plants. These micro-organisms protect plants from pathogens, transform inorganic nutrients in soil particles into organic nutrients suitable for plants and play a critical role in the all-important structure of the soil. Good soil structure provides the ecosystem benefits of water storage and carbon sequestration.

Modern agricultural use of chemical fertilisers, fungicides, herbicides and pesticides along with a failure to add sufficient organic matter and heavy tillage devastate the soil microbiome essential to plant health.

Studies ④ have shown that plants grown in an agro-ecological farming system with well-aerated soil, rich in humus and teeming with microbial life have significantly greater levels of vitamin C, iron, magnesium, and phosphorus than varieties of the same foods grown using chemicals and artificial fertilisers. Food from an agro-ecological farming system also provides greater levels of several important antioxidant phytochemicals.

Dr. Zach Bush, ⑤ a US physician argues that *'the health of our soil microbiome is the single most potent factor determining how healthy, or unhealthy we are'*. His research highlights a positive correlation between soil health and human health.

In the human gut the quantity and diversity of micro-organisms, predominantly bacteria, is a key factor in determining the host's health. The bacteria perform many important tasks including; influencing metabolic function, protecting against opportunistic infection, helping to develop and regulate the immune system, producing neurotransmitters that impact neurological function and behaviour, synthesising B vitamins and vitamin K and promoting absorption of minerals, converting fibre to short-chain fatty acids which provide energy for muscles, kidneys, heart and brain.

A highly diverse gut microbiome with intact keystone species (those exerting considerable influence on microbiome structure) is associated with optimal gut health ⑥ and a lower risk of chronic diseases such as type 2 diabetes, obesity, cognitive decline, Parkinson's disease and depression.

Western lifestyle has negatively influenced microbial complexity in the gut. In particular diets high in refined carbohydrates and sugar adversely affect the gut microbiome. The Western diet lacks fibre which acts as a prebiotic reinforcing populations of beneficial bacteria.

Comparative analysis of the gut microbiota of hunter-gatherers with those of westernised industrial populations is also beginning to yield important insights into the correlation between soil and human health. ⑦. The microbial diversity in industrial groups is far below that of the Hadza, as well as those of other rural farming communities in Burkina Faso, Malawi and South Africa

Dr. Martin Blaser, director of the Human Biome Program at New York University, warns the decline of gut microbes will lead to a continued increase in autoimmune diseases like asthma, rheumatoid arthritis, inflammatory bowel disease; and a persisting epidemic of obesity and metabolic diseases.

Soil health is key to our mental health and well-being – there is a growing movement promoting the role gardening and community growing initiatives can play in overcoming depression. GPs are now referring patients to the garden to improve mental health and well-being through time spent with 'hands in the earth.'

Growing Health is a national scheme set up by Garden Organic and Sustain, ⑧ the alliance for better food and farming to evaluate research into how gardening can impact health. Evidence confirmed that the physical activity of gardening can improve mental well-being.

A diet that supports human health also supports the health of soil, animals and the wider environment. All are closely linked and interdependent. ⑨

Understanding the relationship between soil and gut health and being attentive to what we eat and how we produce food is the ultimate health care plan.

Key pointers

Eat food, as far as you are able, from natural farming systems (conservation, bio-dynamic, organic, agroecological). These farming systems nurture the soil and produce nutritious food whilst storing carbon and improving water and air quality.

Eat a diverse range of seasonal plants. Our gut microbiome loves plants and knows how to utilise the fibres and phytonutrients to benefit our health. Polyphenols are an important kind of phytonutrient found in a variety of plant foods including onions, red cabbage, apples, blackberries and linseed. Polyphenols feed beneficial bacteria in the colon, converting them into health-promoting metabolites. Polyphenols encourage the growth of beneficial bacteria and suppress pathogens.

Eat more fibre; fresh fruit, vegetables and legumes all provide fibre that promotes microbial diversity.

Eat traditionally fermented and cultured foods such as fermented vegetables, dairy & beans. The fermenting process creates beneficial gut bacteria.

Avoid ultra processed food, refined carbohydrates and keep sugars to a minimum. These foods are nutrient poor and starve the beneficial gut microbes.

1. Does soil contribute to the human gut microbiome
www.ncbi.nlm.nih.gov/pmc/articles/PMC6780873/
2. Linking the Gut Microbial Ecosystem with the environment
www.frontiersin.org/articles/10.3389/fmicb.2017.01935/
3. www.nature.com/articles/nature15744
4. <https://bit.ly/46FZcXs>
5. <https://zachbushmd.com/blog/gut-health/>
6. www.frontiersin.org/articles/10.3389/fcell.2021.719072/
7. [Hunter–Gatherers Have Diverse Gut Microbes - Scientific American](#)
8. www.sustainweb.org/capitalgrowth/growing_health/growing_culture/
9. [Soil microbiomes and one health | Nature Reviews Microbiology](#)

Further resources

Dirt is Good: The Advantage of Germs for Your Child's Developing Immune System -

Professor Jack Gilbert, Robert Knight

www.npr.org/sections/health-shots/2017/07/16/537075018/dirt-is-good-why-kids-need-exposure-to-germs

Earth Microbiome Project - <https://earthmicrobiome.org>

Human Microbiome Project - <https://www.hmpdacc.org>