

Soil and the Gut Microbiome: Supporting the 'Hygiene Hypothesis'

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Abstract : Background: According to the 'hygiene hypothesis' the current rise in allergies and autoimmune diseases stems mainly from reduced microbial exposure due, amongst other factors, to urbanisation and distance from soil. However, this hypothesis is based on epidemiological and not biological data. Useful insights into the underlying mechanisms of this hypothesis can be gained by studying our interaction with soil. Soil microbiota may be directly ingested or inhaled by humans, enter the body through skin-soil contact or using plants as vectors. This study aims to examine the ability of soil microbiota to colonise the gut, study the interaction of soil microbes with the immune system and their potential protective activity. Method: The nutrition of the rats was supplemented daily with fresh or autoclaved soil for 21 days followed by 14 days of no supplementations. Faecal samples were collected throughout and analysed using 16S sequencing. At the end of the experiment rats were sacrificed and tissues and digesta were collected. Results/Conclusion: Results showed significantly higher richness and diversity following soil supplementation even after recovery. Specific soil microbial groups identified as able to colonise the gut. Of particular interest was the mucosal layer which emerged as a receptive host for soil microorganisms. Histological examination revealed innate and adaptive immune activation. Findings of this study reinforce the 'hygiene hypothesis' by demonstrating the ability of soil microbes to colonise the gut and activate the immune system. This paves the way for further studies aimed to examine the interaction of soil microorganisms with the immune system.

Keywords : gut microbiota, hygiene hypothesis, microbiome, soil

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