

ETHERPATHS- Characterization and modelling of dietary effects mediated by gut microbiota on lipid metabolism

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Dysregulation of lipid homeostasis is related to multiple major global healthcare problems today, including aging, diabetes and cardiovascular disease. It has already been shown that nutritional modulation of lipid homeostasis via direct supplementation, e.g., n-3 fatty acids, or via indirect mechanisms, e.g., dietary polyphenols, has beneficial effects on human health.

There is growing evidence that ether phospholipids such as plasmalogens play a central role in mediating the beneficial effects, but the underlying mechanisms are not understood. ETHERPATHS will develop systems biology tools that will facilitate studies of dietary interventions aiming to modulate lipid homeostasis. Specifically, we will develop

- models that enable studies of gut microbiota and its effect on host cell metabolism,
- dynamic models of systemic lipid metabolism, and
- pathway reconstruction methods to study tissue-specific effects of dietary interventions.

All models will be optimized in the context of studies of dietary interventions and will be integrated into a sophisticated software platform. In silico strategies will be complemented by multiple experimental approaches, including

- dietary interventions involving n-3 fatty acids and polyphenols, combined with tracer studies in vitro and in vivo
- in vitro colon model
- in vivo germ-free and conventional models of altered lipid metabolism, specifically of plasmalogen deficiency.

ETHERPATHS includes academic and industrial partners with combined unique expertise in information technology, bioinformatics, metabolic and physiological modelling, systems engineering, biochemistry, microbiology, lipid metabolism, metabolomics, obesity and metabolic syndrome, and clinical nutrition. We expect the ETHERPATHS tools to be broadly applied in nutrition research, and anticipate that the novel findings generated within the project will be applied for development of new food products for better health.

Coordinator

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Start date 01/01/2009

End date 31/12/2012

Duration 48 mesi

Project cost 7.97 million euro

Project Funding 5.95 million euro

Subprogramme Area Systems Biology and bioanalytical tools for nutrition research

Contract type Large-scale integrating project