

# The gut flora under environmental aspects: metagenomic alterations of the intestinal microbiome associated with lifestyle and their role in the pathogenesis of inflammatory bowel diseases (IBD)

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**EIGHTH ANNUAL BROAD MEDICAL RESEARCH PROGRAM  
INVESTIGATOR MEETING**

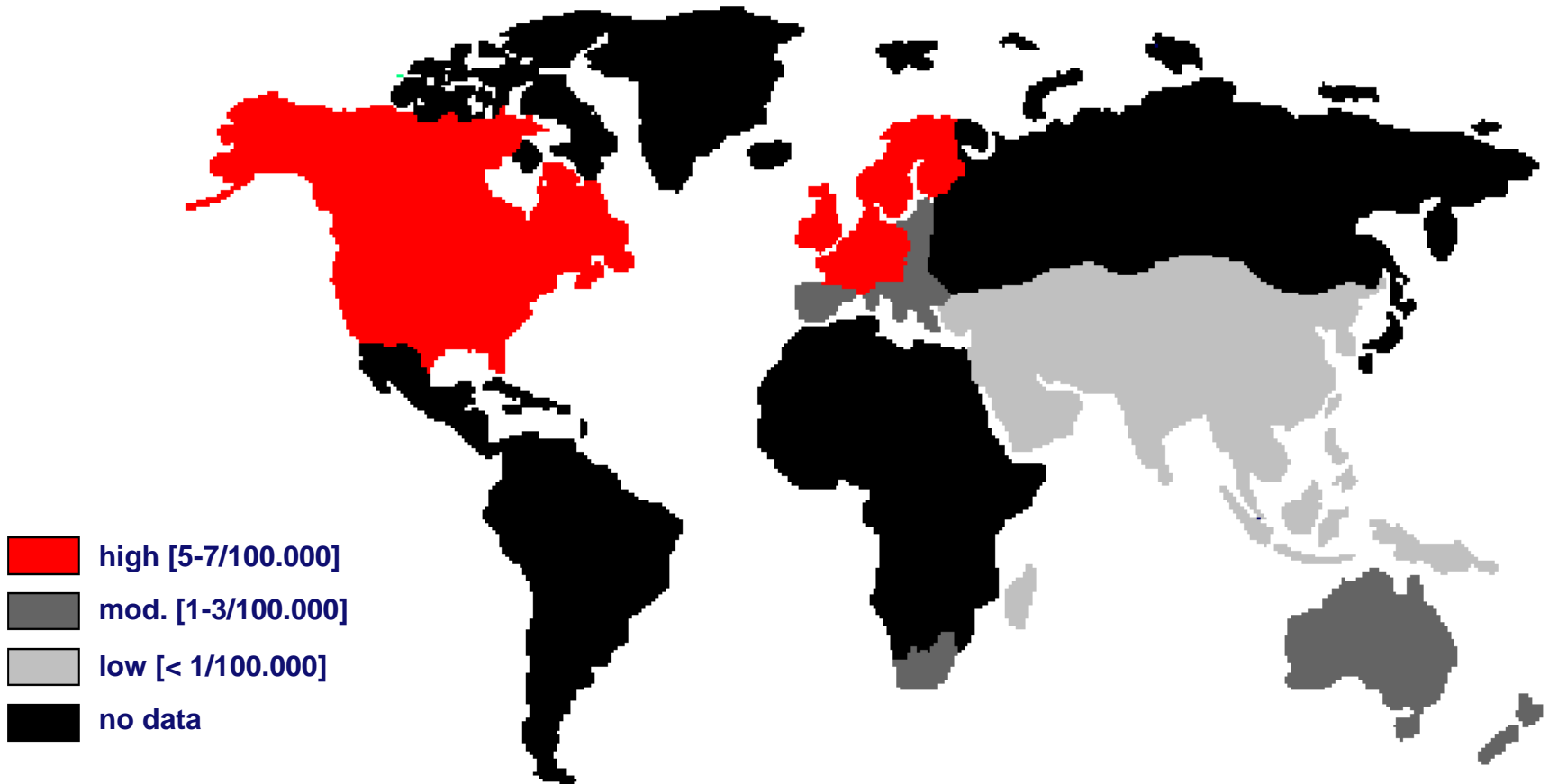
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Los Angeles, California

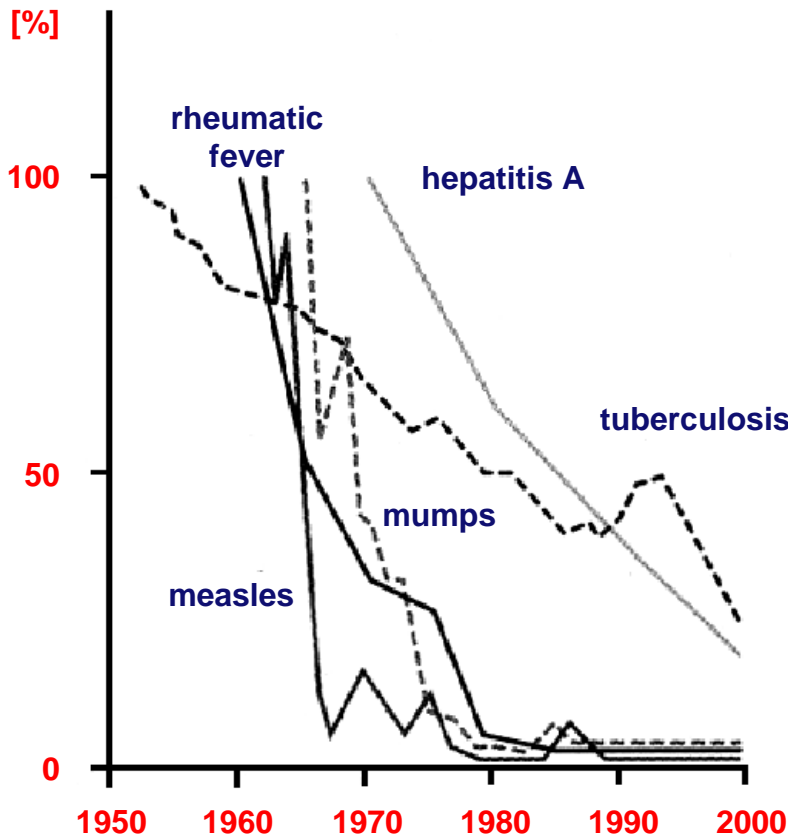


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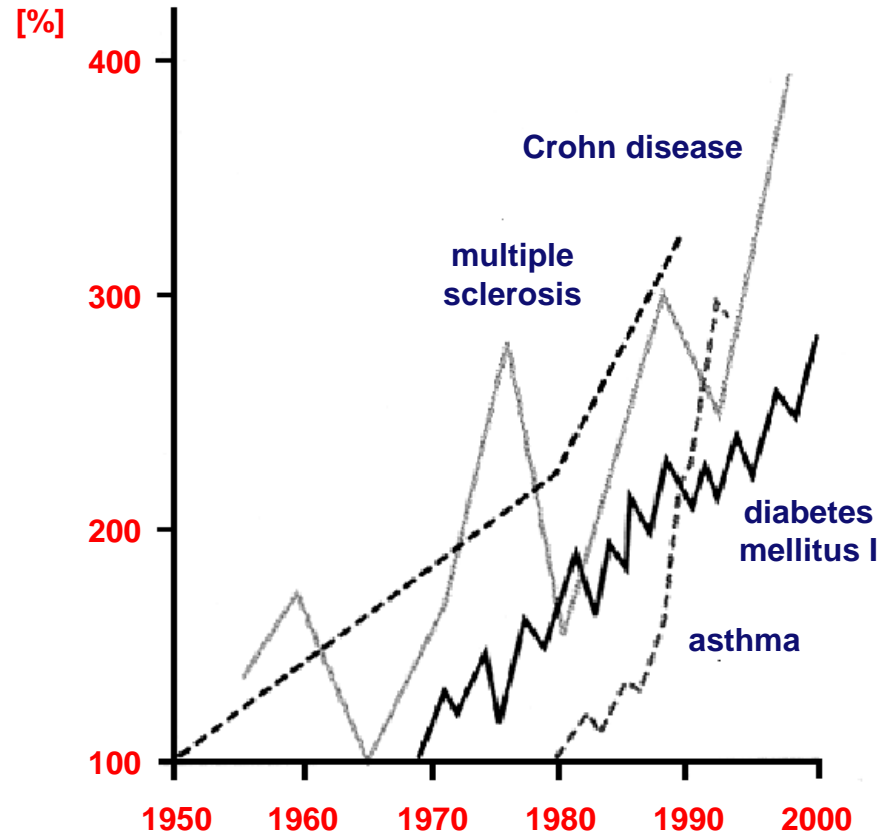
**→ Prevalence of IBD: Geographic Differences**



**→ Antigen-Exposure (Pathogen Burden) and Immun-Mediated Inflammatory Diseases**

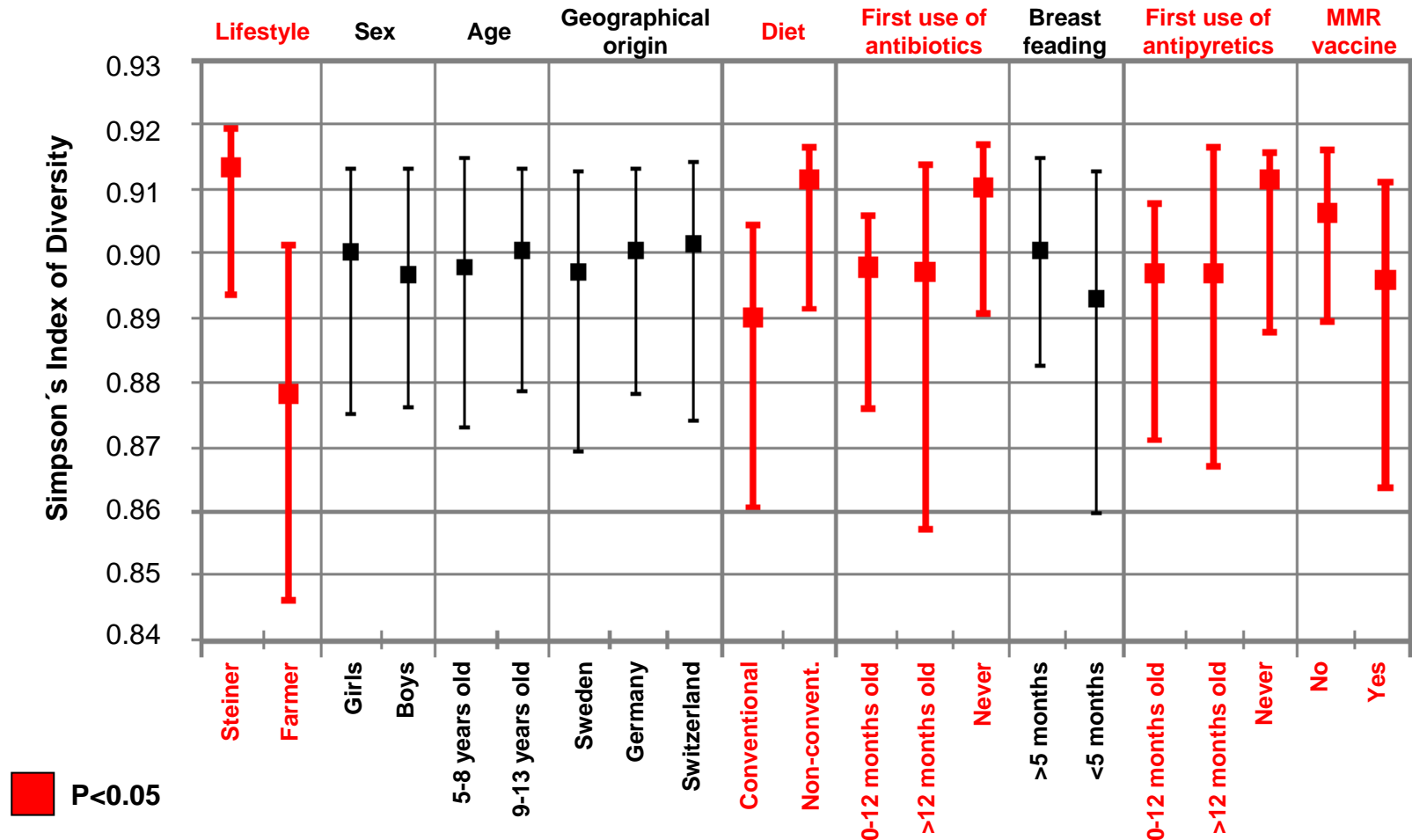


**Incidence of infectious diseases**



**Incidence of immune-mediated diseases**

# → Influence of Lifestyle on Intestinal Diversity



■ P < 0.05

## → Influence of Environmental Factors on the Intestinal Microbiome – Comparison of Different Cultures and Lifestyles – Major Objectives

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### → Background:

Epidemiologic studies point to the critical role of environmental factors in the pathogenesis of chronic inflammatory barrier diseases, e.g. the chronic inflammatory bowel diseases (IBD) or asthma (‘civilization diseases’). Lifestyle factors, e.g. nutrition, hygiene, and improved medical services, were accounted for the raising incidence of these disorders over the last decades in the industrialized countries (‘hygiene hypothesis’). Intestinal microbiota as an integral part of the enteric mucosal barrier reflects the evolution of lifestyle factors.

### → Aim of the study:

The aim of this study is to compare the composition of the intestinal microbiota of rural areas with low incidence of civilization diseases (representing the “ancient” lifestyle of the pre-industrialization period) and a region in an urban area, which is over decades influenced by multiple environmental factors (“modern” lifestyle).

# → Influence of Environmental Factors on the Intestinal Microbiome – Comparison of Different Cultures and Lifestyles – Study Design

**Patients N=90**

→ **Lithuania**

Ulcerative Colitis N=10  
Crohn Disease N=10  
Healthy Controls N=10

→ **Germany**

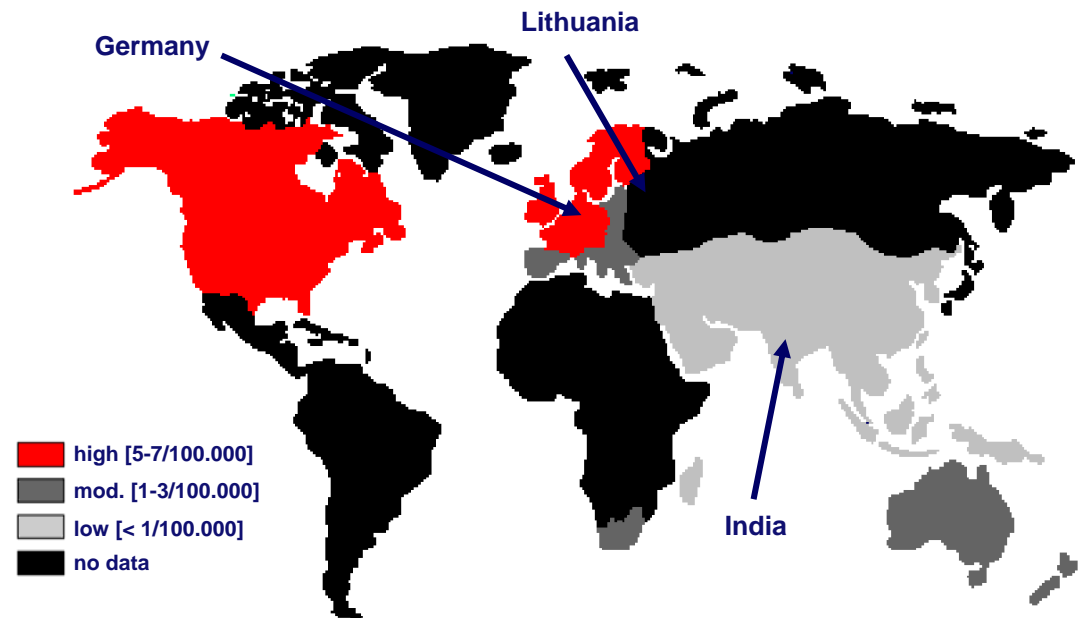
Ulcerative Colitis N=10  
Crohn Disease N=10  
Healthy Controls N=10

→ **India**

Ulcerative Colitis N=10  
Crohn Disease N=10  
Healthy Controls N=10

→ **Source Material**

Sigma Biopsies



→ **Metagenomics**

Large Scale Clone Libraries  
I-Chip analysis



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# → Influence of Environmental Factors on the Intestinal Microbiome – Comparison of Different Cultures and Lifestyles – Milestones after one year of work

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## → Patient Recruitment

Complete set of samples from all 90 individuals

## → DNA/RNA Extraction

Completed for all 90 samples.

## → Microbial Molecular Investigation

Completed for Lithuanian cohort and main part of the German cohort.

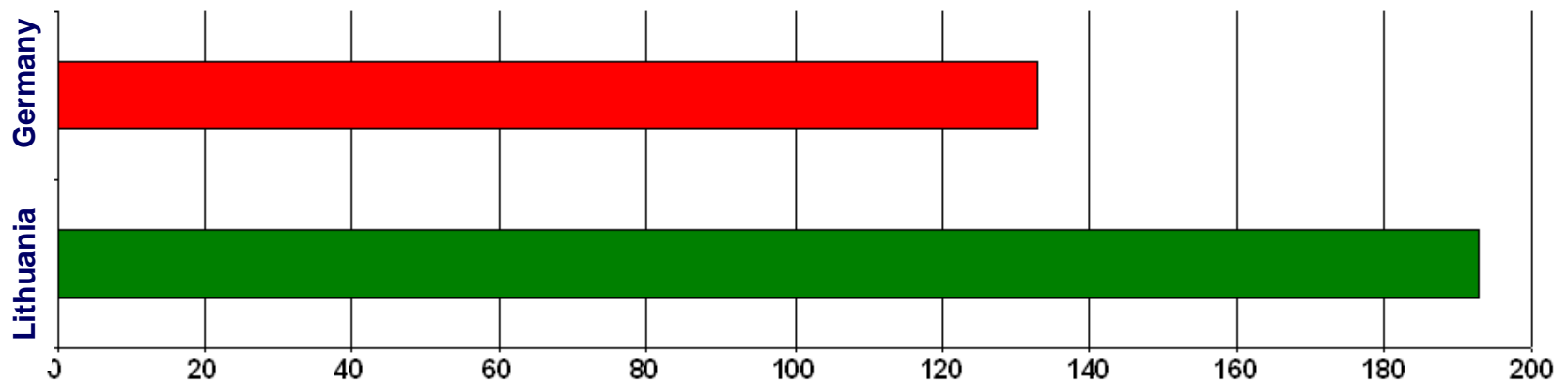
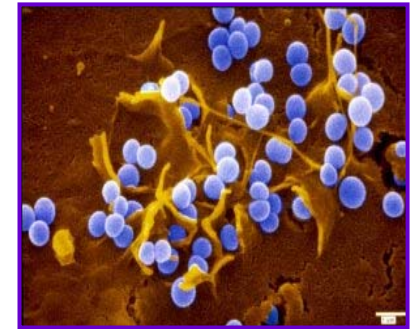
## → Statistical Analysis

First data for comparison of Germany vs. Lithuania.

## → Influence of Environmental Factors on the Intestinal Microbiome – Comparison of Different Cultures and Lifestyles – Overall Biodiversity

→ **Germany:** 133 different OTUs

→ **Lithuania:** 193 different OTUs

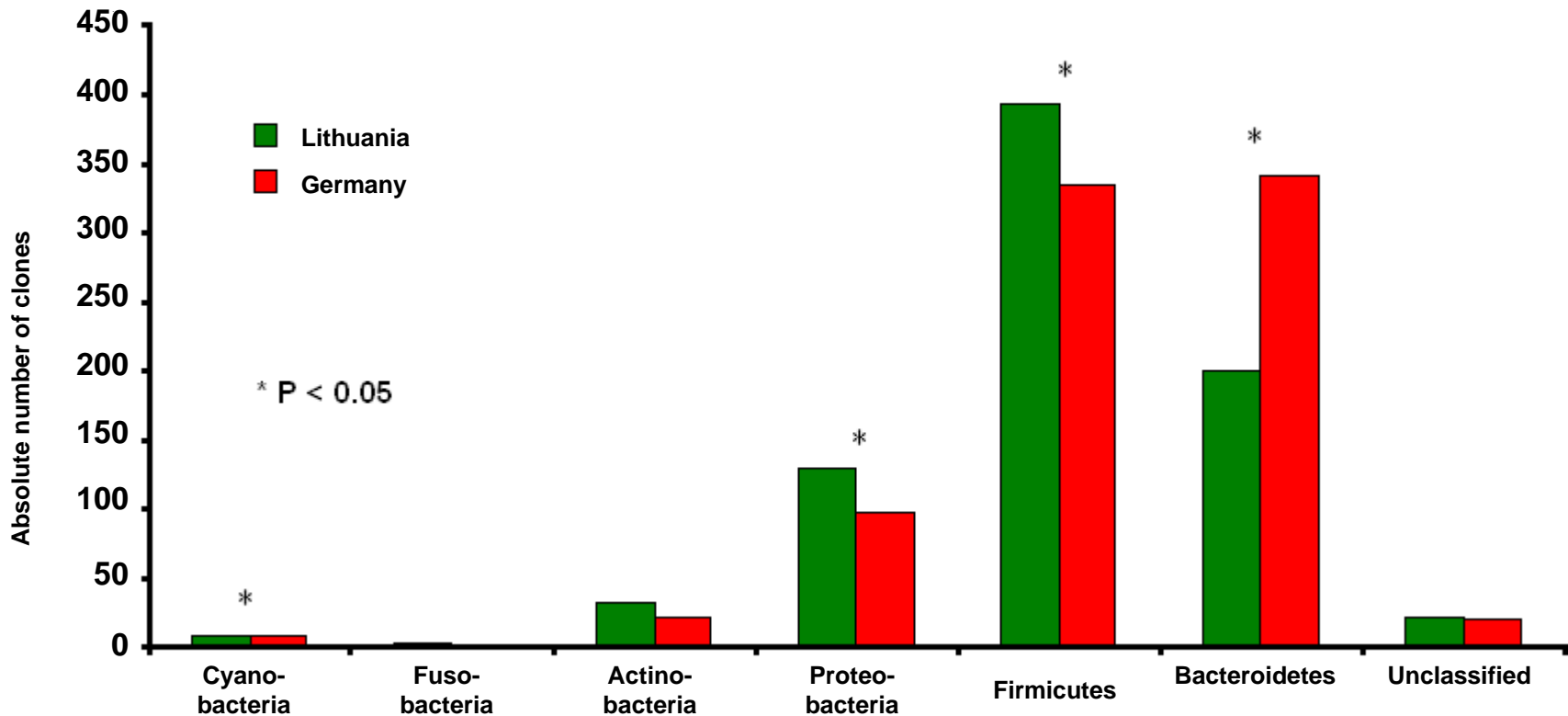


**→ Influence of Environmental Factors on the Intestinal Microbiome – Comparison of Different Cultures and Lifestyles – Phylum Level Percentages**

Phylum	Lithuania	Germany	
Cyanobacteria *	0	1	
Fusobacteria	0.4	0.1	
Actinobacteria	4.1	2.6	
Proteobacteria*	16.5	11.9	
Firmicutes *	50.5	40.6	* P<0.05
<b>Bacteroidetes *</b>	<b>25.7</b>	<b>41.4</b>	
Unclassified	2.7	2.3	

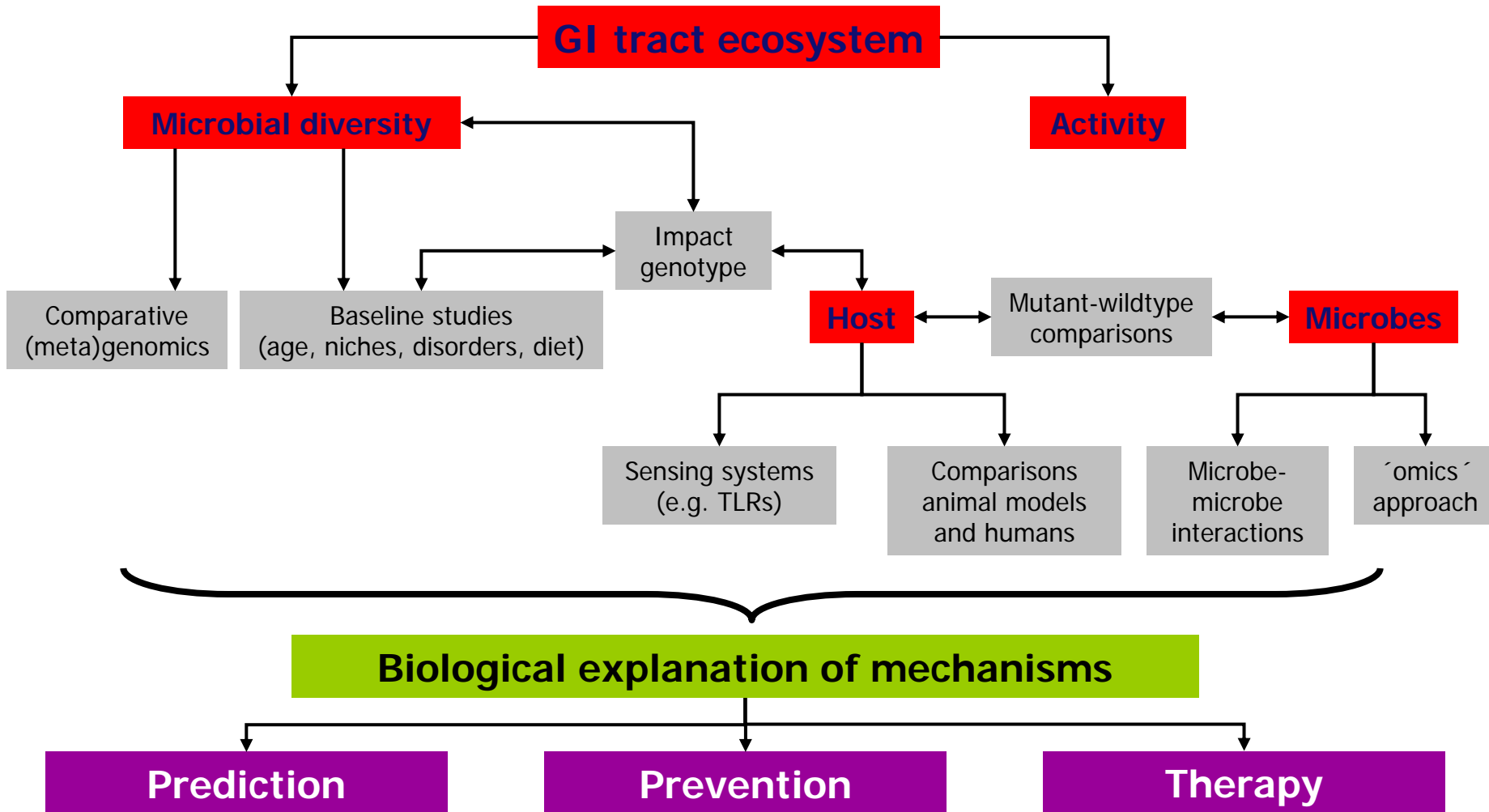
Percentages of sequenced clones on phylum level

**→ Influence of Environmental Factors on the Intestinal Microbiome – Comparison of Different Cultures and Lifestyles – Phylum Level Absolute Numbers**



Absolute numbers of sequenced clones on phylum level

**→ Prospects**



## → Funding

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Christian-Albrechts-Universität zu Kiel

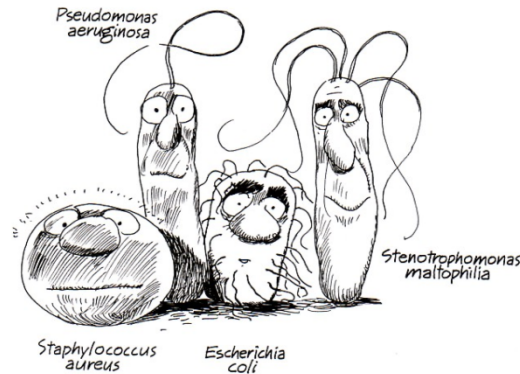
→ I. Medizinische Klinik,  
Klinik für Allgemeine Innere Medizin

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