

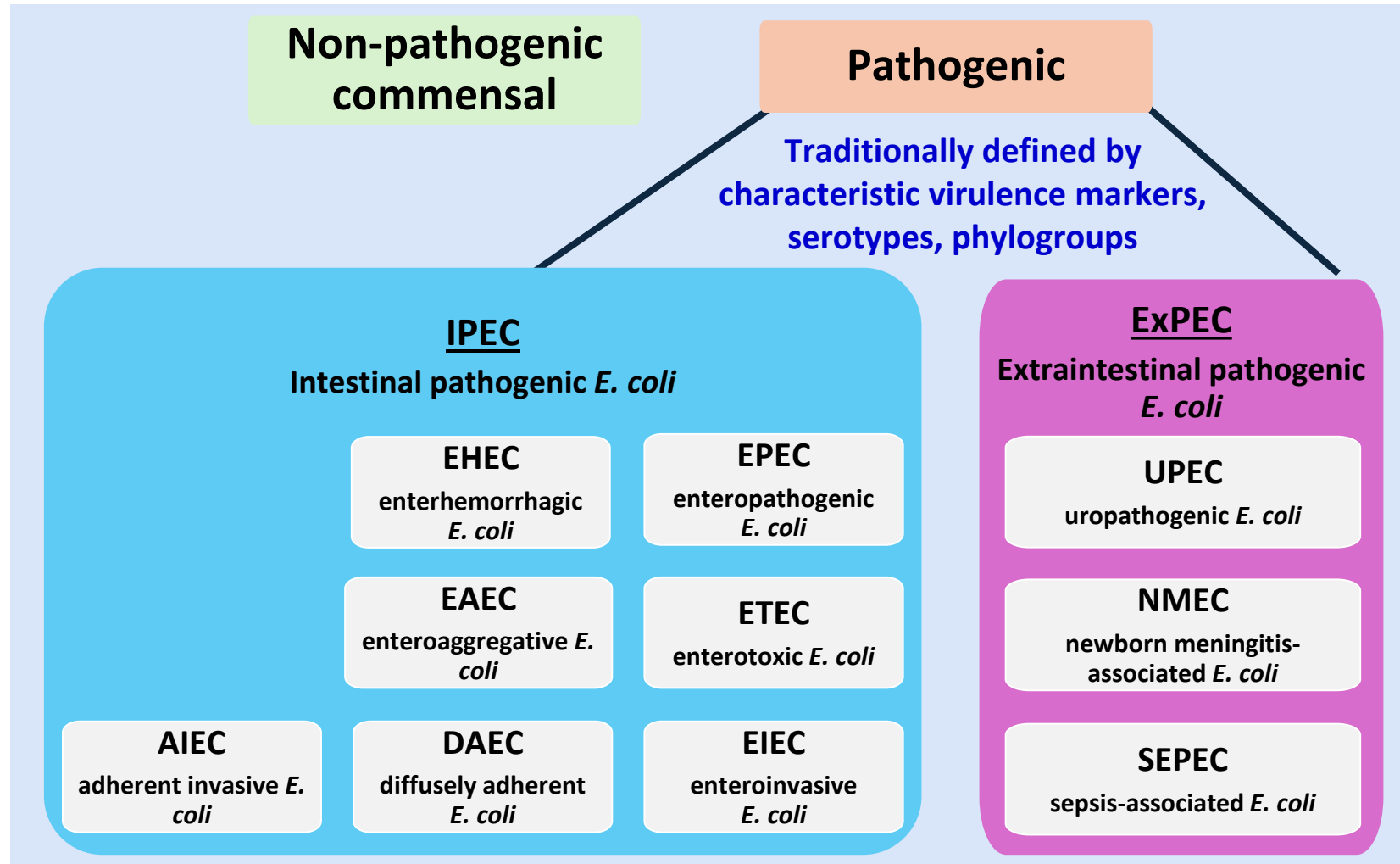
Impulses from microbiological research for preventing and treating diseases through food production and nutrition

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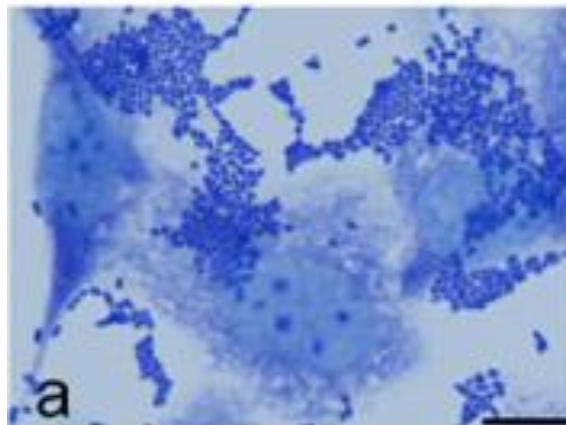


Escherichia coli



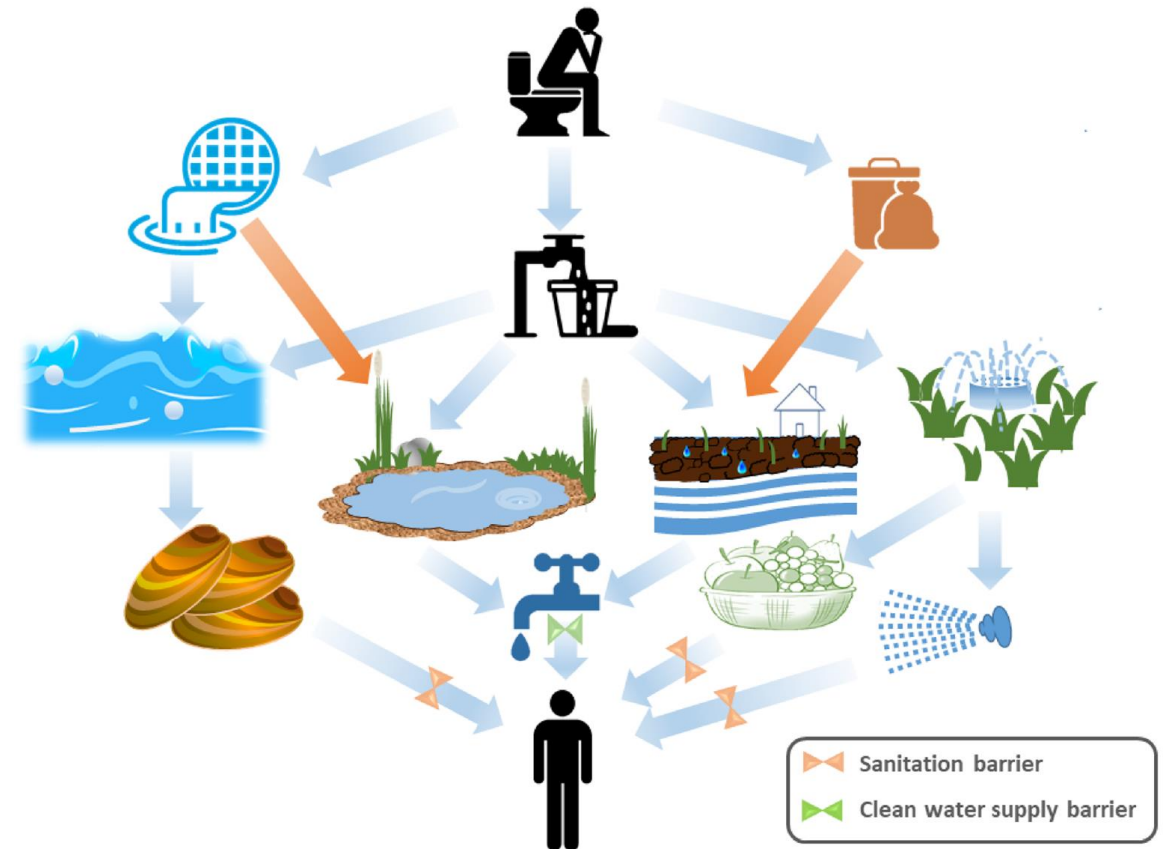
Enteroaggregative *E. coli* (EAEC)

- emerging and important diarrheal pathogen
- causes intestinal inflammation and severe persistent diarrhea worldwide
- correlates with impaired cognitive development and malnutrition
- developing and industrialized countries are susceptible to large EAEC-induced diarrheal outbreaks presenting significant public health concerns
- defined by characteristic aggregative adherence (AA) pattern to cultured epithelial cells



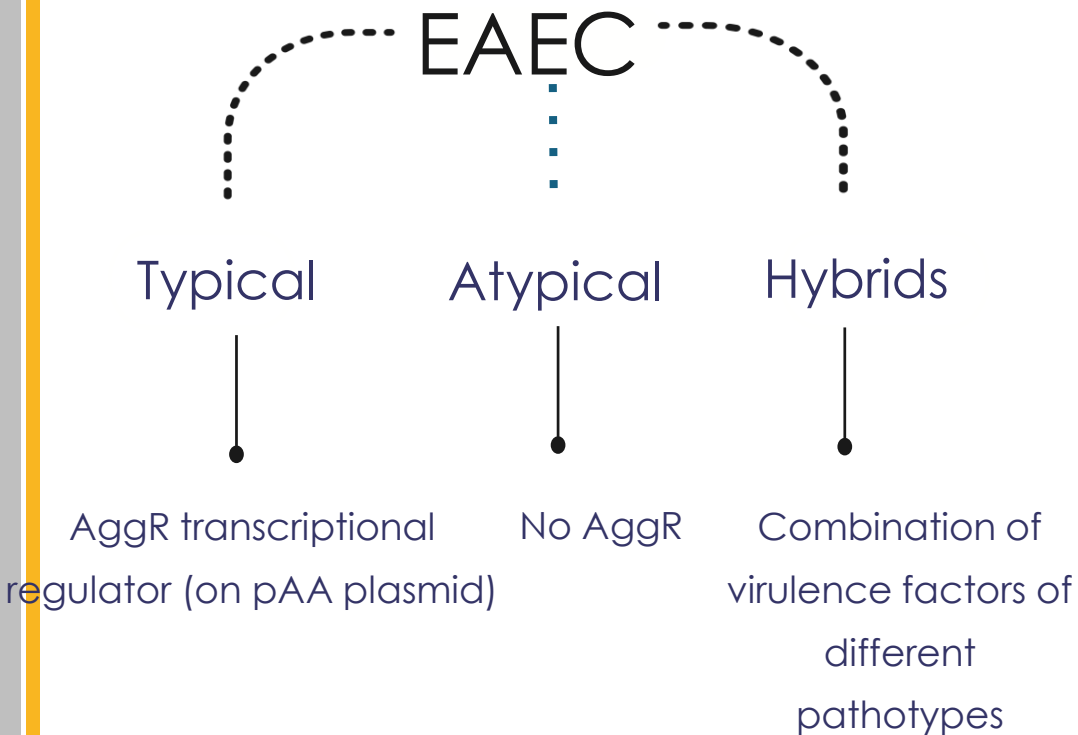
Nataro et al., 1998. Emerg Infect Dis 4:251–261.
Huang et al., 2006. J Med Microbiol 55: 1303-1311.
Lima et al., 2018. J Pediatr Gastroenterol Nutr 66:325-333.
Toval et al., 2014. Infect Immun 82:

Regional prevalence of diarrheagenic *E. coli* in Latin America and their fecal–oral route of transmission



EHEC/ETEC

Genomic diversity of EAEC strains complicates reliable diagnostics



Improvement of molecular diagnostics, search for genomic differences:

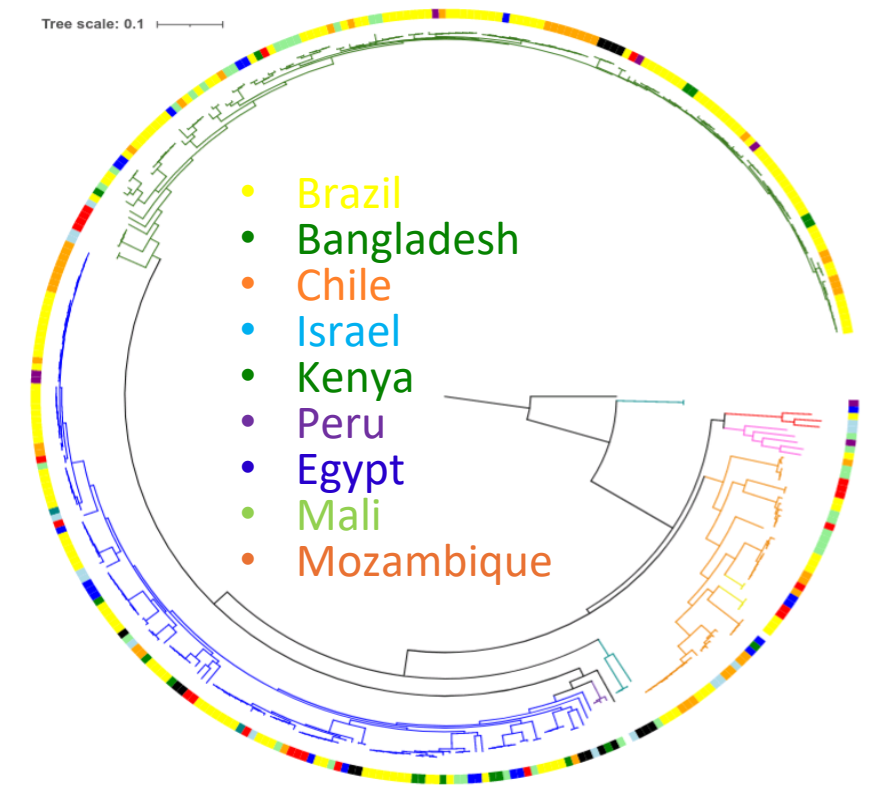
- between isolates from different continents?
- between isolates from infants vs. adults?
- between malnutrition
- prevalence of different types of aggregative adherence fimbriae (AAF)

Development of innovative immunoserological diagnostic assays

Whole genome sequence analysis of 352 EAEC isolates

Origin	No. of isolates	Donor
Brazil, Chile	216	Children
Israel	15	Children
Bangladesh/Africa	75	Children
Afghanistan, Djibouti, Kenya, Honduras	46	Adult

typical (*aggR*+) EAEC strains: 227
atypical (*aggR*-) EAEC strains: 125



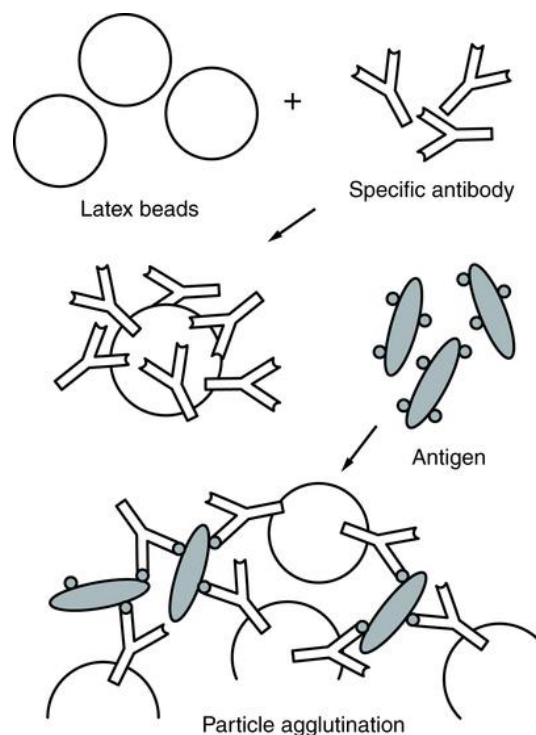
Genome content analysis of 352 EAEC isolates

- no significant differences between EAEC isolates from malnourished and nourished children
- no significant differences between EAEC isolates from adults and children
- no significant differences between EAEC isolates from different continents

Establishment of innovative immunoserological diagnostic assays

- development of Latex particles coated with IgG anti-dispersin for agglutination assays for rapid diagnosis of EAEC

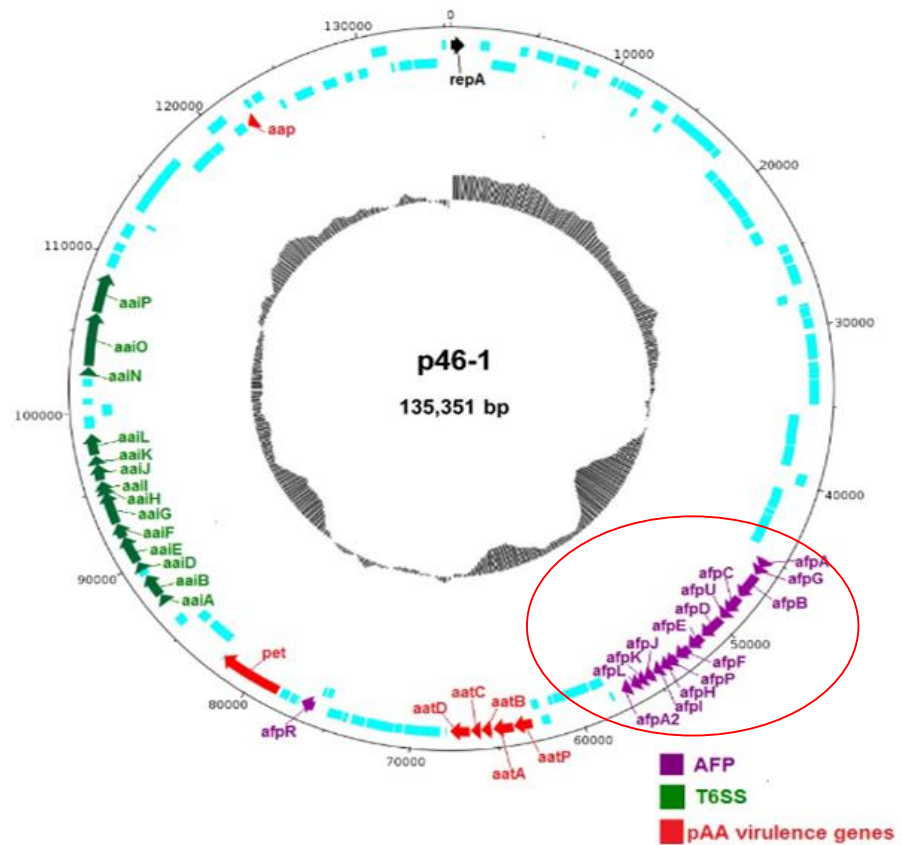
Comparison of novel Latex agglutination assay to ELISA for detection of dispersin



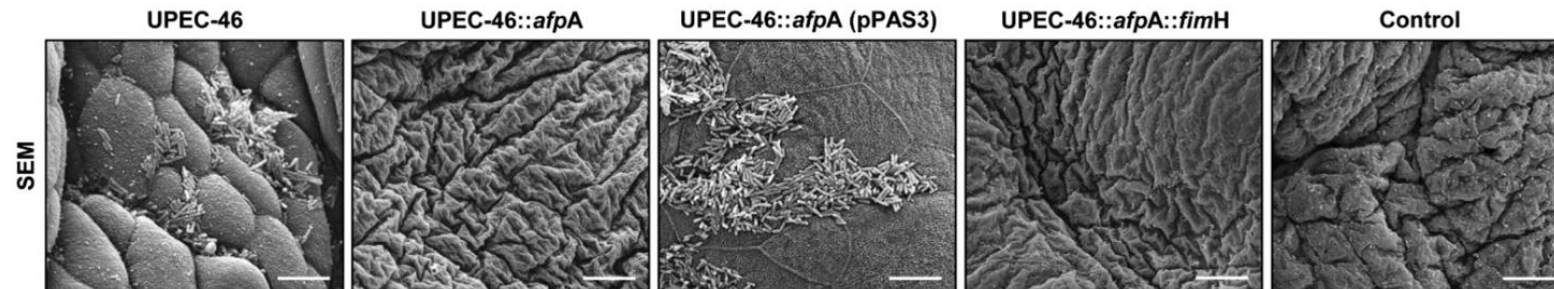
[<https://oncohemakey.com/agglutination-methods/>]

Sensitivity	90%
Specificity	100%
Efficiency	95%
Positive predictive value	100%
Negative predictive value	92%

Characterization of UPEC/EAEC hybrid isolates



Aggregate-forming pilus (AFP) contribute to bacterial adherence and colonization of both, the intestinal and urinary tract



Schüroff et al., 2021. Virulence 12:3073–3093.
Schüroff et al., 2022. Virulence 13:1423–1433.

Summary EAEC research

- EAEC is an important pathogen in Brazil and worldwide.
- The cooperation of experts from Münster and São Paulo enabled the integration of different functional and genomic research approaches and access to clinical samples to address the problem of intestinal and extraintestinal EAEC infection in Brazil.
- Comprehensive research in basic biomedical research (pathogen variability, resistance, reservoirs, bacterial pathogenicity), hygiene (diagnostics, transmission routes) is required, but also in applied research (e.g. food safety and patient care (diagnostics, therapy)) to successfully interfere with these infections.
- The established diagnostic markers and diagnostic assay can improve and facilitate detection of EAEC in clinical specimen, environmental samples, water, and food.

Traditional plant urologicals – how to they protect against UTI ?

Classical treatment: antibiotics

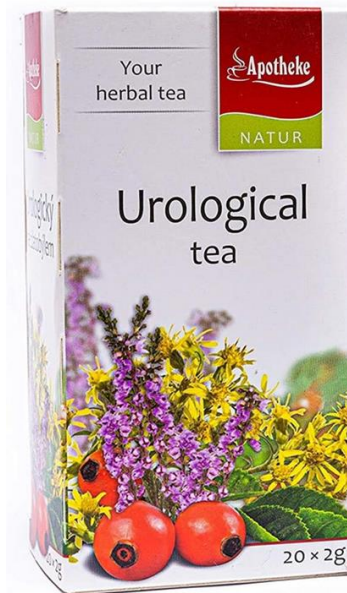


Need for alternative treatments !

- Recurrence of UTI
- spread of antibiotic resistance
- gastrointestinal symptoms

Traditionally used plant extracts

(Flavonoids, Terpenoids, Alkaloids, other compounds with anti-inflammatory, antipyretic, and analgesic effects)





Traditional plant urologicals according to German Pharmacopoea

Individual Plant Extracts

- Apii fructus (1)
- Maydis stigma (2)
- Levistici radix (3)
- Mate folium (4)
- Phaseoli pericarpium (5)
- Urticae folium (6)
- Taraxaci herba cum radice (7)
- Betulae folium (8)
- Agropyri repentis rhizoma (9)

- Solidaginis virgaureae herba (10)
- Ononidis radix (11)
- Orthosiponis folium (12)
- Equiseti herba (13)

Standard marketing authorizations

- Std I (combination of 8, 9, 10, 11)

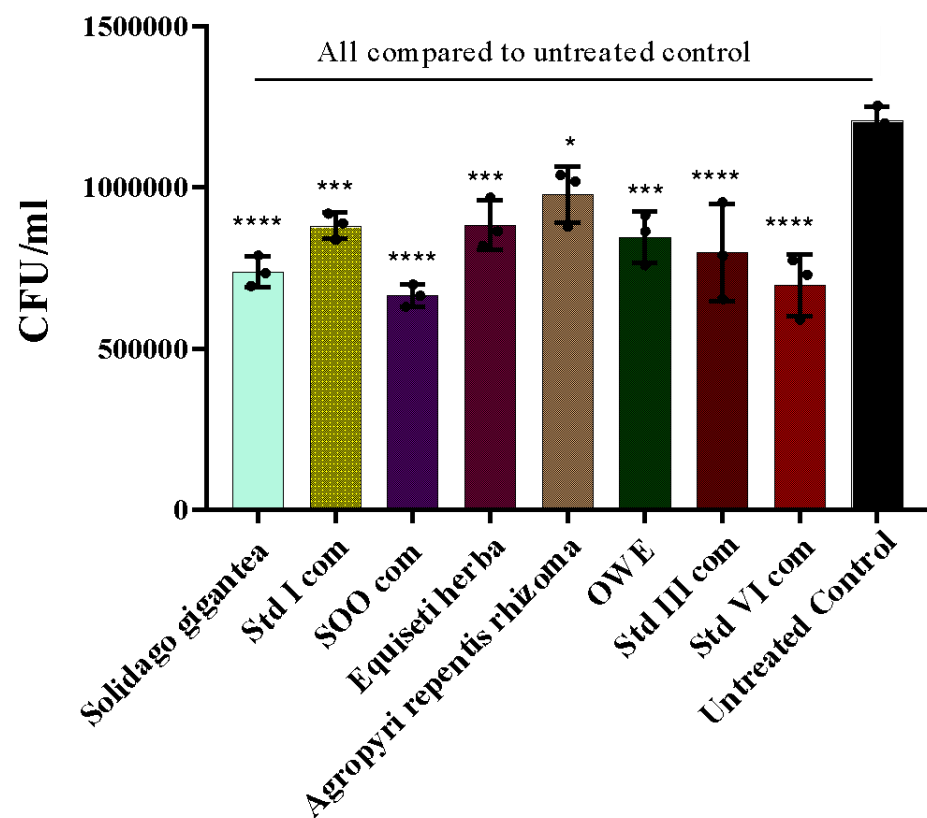
- SOO (combination of 10, 11, 12)

- Std III (combination of 8, 10, 11, 13)

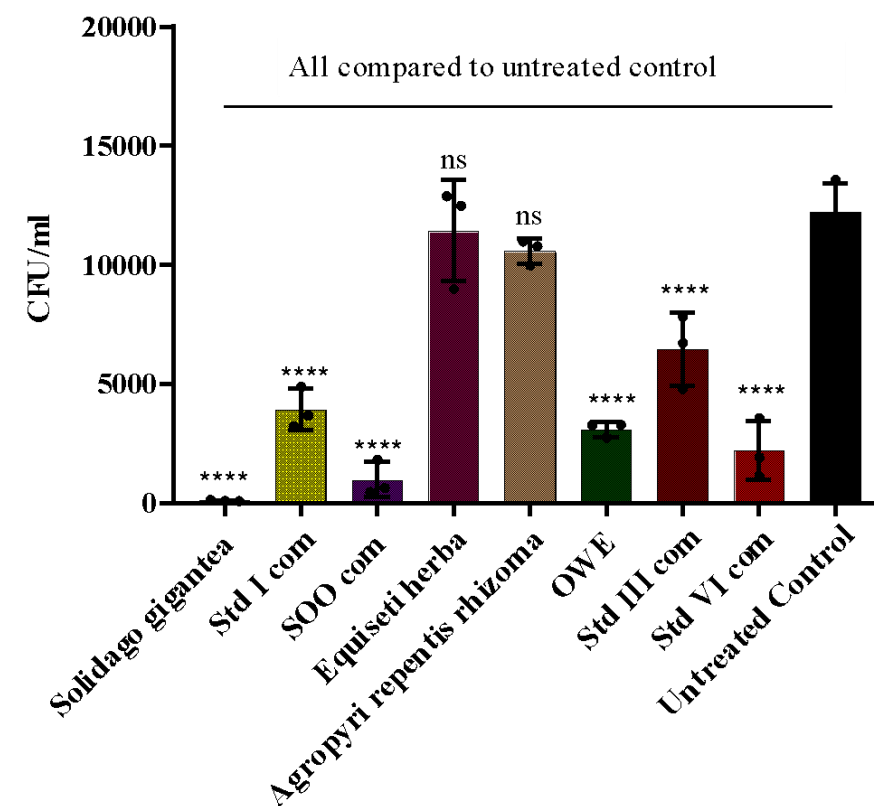
- Std VI (combination of 8, 10, 11, 12)

Water-based plant extracts decrease significantly UPEC adhesion and intracellular survival in human bladder epithelial cells

Adhesion



Invasion (& intracellular survival)



Support of successful cooperation between researchers in São Paulo and Münster

- DWIH-SP, Fundação Butantan, UM: International Workshop „Intestinal pathogenic *E. coli*: Pathogenesis, Epidemiology, and Diagnostics“ in São Paulo (02./03.05.2019)
- Cooperation UM & USP: Research stay of PhD student in Münster (11/2019 - 01/2020)
- CNPq-FAPESP Program: Postdoc research stay in Münster (01/2023 - 07/2023)
- FAPESP-UM SPRINT 2023: „New diagnostic options for enteroaggregative *Escherichia coli* (EAEC)“
- 2 FAPESP Research Internship Abroad – Doctorate Fellowships (2025 - 2026)



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