Global Grand Challenge – Environmental niches of Salmonella Typhi (Round 23)

SUSTAINABLE DEVELOPMENT GOALS (SDG) focus area(s)

APPLICATION DEADLINE

10 April 2019

BACKGROUND

Evidence suggests that S. Typhi survival in the environment is enhanced in the presence of protozoans such as Acanthamoeba castellani (Frédéri Douesnard-Malo and Daigle 2011). Salmonella Typhimurium survives within Acanthamoeba polyphaga; whereas this survival is dependent on genes in the Salmonella Pathogenicity Island 2 (which have been shown to be necessary for virulence and invasion of macrophages), we might ask if the original function of these genes was to enhance environmental survival (Bleasdale et al. 2009). S. Dublin also exists within an amoeba, Acanthamoeba rhysodes (Tezcan-Merdol et al. 2004), and whether S. Typhi similarly can survive within a protozoan or other aquatic species is unknown. Shellfish have been shown to be a source of S. Typhi infection among humans, but the duration of S. Typhi survival in shellfish, especially in warm, tropical waters, is unknown (Jordan 1925). Other niches may exist in the soil and in water. S. Typhi DNA has been detected in drinking water from Kathmandu, Nepal, and in Dhaka, Bangladesh, but whether this represents a viable, pathogenic organism remains unknown (Karkey et al. 2016; Saha et al. 2019).
In this grand challenge, we are interested in learning if environmental niches exist in which S. Typhi can survive, and whether (and how much) such niches contribute to transmission of disease in humans.

We solicit proposals to examine the environmental niches of S. Typhi. We are interested in understanding:

1. Survival of S. Typhi in the context of the soil and water microbiomes. S. Typhi survives for 3 weeks in the presence of A. castellani, but for no more than 10 days by itself (Frédéric Douesnard-Malo and Daigle 2011). Do interactions with other organisms impact survival of S. Typhi? How do they impact transmissibility of the bacterium?
2. Survival of S. Typhi within other organisms. Similar to V. cholerae, which thrives within zooplankton (Lipp, Huq, and Colwell 2002), does S. Typhi interact with aquatic multicellular organisms? If yes, how does this impact the transmission and epidemiology of typhoid?
3. Impact of environmental niches on the development of antibiotic resistance in S. Typhi. What is the relative amount of time S. Typhi spends in the environment compared to in infected individuals? How does this impact its exposure to antibiotics, and the development of antibiotic resistance in S. Typhi strains?

ELIGIBILITY CRITERIA

- Studies of S. Typhi in the context of soil and water microbiomes, with clear implications for survival, virulence, or antibiotic resistance.
- Examining survival of S. Typhi within or in the presence of free-living protozoans
- Examining the role of the environment (soil, water, residual antibiotics) in the development of AMR in S. Typhi
- Transcriptome analysis and mutagenesis of S. Typhi to identify genes associated with particular environmental niches.

In all cases, the relevance of findings to the epidemiology of typhoid must be clear

What we will not fund:

- Studies of only other Salmonella enterica serovars, without a focus on S. Typhi

- Clinical studies of typhoid with no environmental focus
- Solely lab-based mutagenesis studies of S. Typhi with no data to link findings to environmental samples or typhoid epidemiology

IMPORTANT NOTIFICATIONS:

Please download and read through the following documents:
Rules and guidelines
Privacy Policy and Terms of Use
Frequently asked questions
Tips for applicants

HOW TO APPLY

Download the application form for specific instructions on the format and content of your application. Proposals must be submitted through this link. This application portal will enable you to register for an open challenge as well as create, edit, and submit your proposal. After you have created an account and registered for a challenge, you can start the online application process.

APPLICATION DEADLINES:

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