Remaining Questions from "*Cyclospora* Facts and What You Can Do Right Now"

February 9, 2022

Below are the questions from the Q&A session that were not answered due to time. Identifying information has been removed and grammatical or spelling errors corrected (expressed in brackets), but the content of each question has not been changed from its original form.

Environmental Detection

1. What is the prevalence of farmers and farm workers having access to appropriate disinfectants for portable restrooms and verification these portable restrooms are cleaned and disinfected on a regular frequency?

   We do not have a good understanding of which disinfectants are more appropriate for inactivation of *Cyclospora* oocysts, but cleaning and sanitation remains critical. Cleaning and disinfection of portable toilets regularly (depending on use) can reduce the chance that oocysts could come in contact with individuals or materials. It's also important to be careful where you are cleaning and sanitizing portable restrooms. Be sure to do this in an area that is marked for such a purpose and distant from the growing area and water sources.

   -KK and MD

2. Anything related to survival of [oocysts] in soil?

   This is an excellent point. We are working on compiling the data available from related oocysts. In general, from the data available, oocysts likely survive in the soil for at least 6 months, but this is affected by soil moisture and temperature.

   -KK

3. Are the samples found in water unsporulated [oocysts]?

   We are unable to determine at this time the stage of sporulation when the nucleic acid is detected in water or on crops. Also, please note that in most cases, detection methods test for the genetic material of the oocysts not the intact oocyst.

   -KK

Host Infection and Interactions

1. *Cyclospora* are assumed to only infect humans. However, a related species [infects] a large number of animals[,] but only cats allow the formation of zygotes. Any possibility that the same could occur with *Cyclospora*?

   This question asks about the protozoan parasite *Toxoplasma gondii,* which is related to *Cyclospora* but has a very different life cycle. *Toxoplasma* has a life cycle in the definitive host where it undergoes sexual replication and formation of oocysts, which are only shed by the cats. *Toxoplasma* undergoes an extraintestinal life cycle in other hosts,

including humans. This life cycle is very different from *Cyclospora*. It is unlikely that the same thing occurs in humans, based on what we know so far.

-KK

2. Are doctors [diagnosing] *Cyclospora* easily/correctly when a patient goes in for medical help?

   It is my understanding that they are with the use of the GI FilmArray panel, but, honestly, I have not been able to find information on limitations associated with healthcare and health insurance, etc.

   -KK

3. Do we know anything about the mechanism of *Cyclospora* infection; where it binds, genes, etc.?

   There are no good, published papers sharing this information. However, there are some great papers looking at genetic biomarkers on the genetically related protozoa *Eimeria* and several scientists are hoping to look for similarities based on that data.

   -KK

4. Nematodes are known to carry pathogens (*Salmonella*, etc.). Can something similar happen with *Cyclospora*?

   Yes, possibly. There is a paper on *C. elegans* and *Cryptosporidium* oocysts: https://pubmed.ncbi.nlm.nih.gov/15562624/.

   -KK

5. The assumption is that the only host is humans. Has this been studied at all in environments that seldom see humans[?] This question comes from the fact that related protozoa (e.g. *Toxoplasma*) form oocysts in cats[,] but the larval stages infect a wide range of animals.

   Our understanding is still that this is a human-only pathogen; however, since so little is known many scientists are still studying this question with an open mind for additional information.

   -KK

Laboratory Cultivation

1. What is the process to collect [oocysts] for research?

   There is a great limitation on oocysts that are available for research. These may be available through the CDC or clinical partners when isolated from humans in cases of illness. To our knowledge this is very limited. This is a great need to be sure we can validate testing and develop better testing methodologies.

   -KK

2. What about [*Cryptosporidium*] as a surrogate? The oocysts are commercially available.

   Yes, this is a great idea, and several scientists are using purchased *Cryptosporidium* oocysts as a surrogate.

   -KK

3. In sexual reproduction leading to zygote formation, does it require two distinct though compatible strains[,] or can the same strain (with presumably the same genome) produce a zygote?

   The life cycle of *C. cayetanensis* has not been fully described. There is a nice review published in the journal Microorganisms 2019, 7, 317 by Almeria, Cinar, and Dubey, and is entitled "*Cyclospora cayetanensis* and Cyclosporiasis: An Update" (https://www.mdpi.com/2076-2607/7/9/317).

   -KK and MD

Treatment Strategies

1. What is the treatment for people who are [allergic] to [sulfa] drugs?

   Unfortunately, there are no drugs yet recommended as alternatives to the sulfa drugs. It seems that other medications are not effective.

   -KK

2. Is UV radiation [as] effective as for [*Cryptosporidium*]?

   Research in this area is limited. Some studies suggest that UV and chlorine dioxide may be effective on *Cyclospora* oocysts as these treatments are somewhat effective to inactivate *Cryptosporidium* oocysts. There is a need for more of this type of research to be funded and studied.

   -KK

If you have difficulty acquiring access to any of the references listed within this document, please contact the grant coordinator, Christina Kessler, at christinakessler@ufl.edu.