Virus inactivation mechanisms by metals alone and in combination with other disinfectants

Proposal

Diarrhea-related illnesses are the second most common cause of child deaths worldwide. Approximately 88 % of these diseases are linked to poor hygiene and the inadequate access to drinking water and sanitation facilities. Enteric viruses, which are major agents of diarrheal illnesses, are persistent in the aquatic environment for long periods and not readily removed by water treatment processes. To overcome this burden in low income countries, simple and cheap treatment options for the inactivation of enteric viruses are needed. This will help to improve the water supply quality and protect drinking water from pollution with enteric pathogens which can contribute to the reduction of diarrheal disease transmission. In recent years, numerous household water treatment and safe storage (HWTSS) systems including ultraviolet (UV) light and oxidation process technologies have been developed and implemented but there is still a need to assess alternative and low cost technologies. UV irradiation treatment and also antimicrobial metals have found their way into a number of disinfection applications, particularly because of its effectiveness against a wide range of pathogenic viruses. The separate and synergistic effect of metals such silver and UV light on viruses has been already investigated. However, the role of reactive oxygen species (ROS) and Fenton-system in a metal-based UV disinfection system to remove viruses is still unclear. Furthermore, none of these research studies has been focussing on the elucidation of virus inactivation mechanisms by these disinfectants.

In this study we determine which essential virus functions such as host binding, genome injection and replication are affected by the above mentioned treatment methods. This in respect to produce handles for improvement of design and operation of household water treatment systems (with respect to virus elimination) and engineering of new systems.

The student will be introduced to many experimental techniques including culturing and enumeration of model viruses, disinfection treatments of using metals and UV light as well as molecular techniques such as quantitative reverse transcription polymerase chain reaction (qRT-PCR).

The workplace is at Wetsus in Leeuwarden, The Netherlands.

- Excellent career possibilities after graduation through the extensive network of businesses and academic institutions associated with Wetsus
- Have a great insight in working at an institute on sustainable water technology
- Working in a multidisciplinary environment
- Leeuwarden is a fantastic city (with 17,000 students) to study in. Another advantage - there's no shortage of accommodation in Leeuwarden.

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