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Investigations on waterborne *Giardia*, *Cryptosporidium* and *Toxoplasma* in the hydrological environment in the lower Rhine area of Germany

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Abstract

Protozoan parasites are distributed worldwide and causative responsible for a range of diseases in animals and humans. Out of a multitude of these parasites *Giardia duodenalis*, *Cryptosporidium* species and *Toxoplasma gondii* are of an immense scientific interest, because worldwide annual new infection rates are enormous and the rate of mortality, especially in developing countries is terrifying. The three parasites have common features: robust parasitic stages (oocysts or cysts) are capable of persisting for an extended time in the environment and are highly resistant against various chemicals and disinfection. Dissemination of (oo) cysts is possible by several ways; this means primarily: water, foodstuff and recently discussed air. The actual study focuses on the distribution of (oo) cysts in the hydrological environment. Therefore, a model area in the Lower Rhine of Germany was investigated between 2009 and 2011. *Giardia* cysts and *Cryptosporidium* oocysts were quantified from different sampling points in the aquatic environment. Molecular investigation of the three parasites was performed by nested PCR and LAMP (Loop Mediated Isothermal Amplification). The study demonstrated distribution of parasitic stages in the hydrological circuit. *Cryptosporidium* occurs in each water matrix, *Giardia* not in raw water and drinking water and *Toxoplasma* only in sewage. Reduction of contamination by wastewater treatment, riverbank filtration, underground passage and drinking water treatment was demonstrated. The present findings of the model area are of worldwide benefit. The risk of infections by bathing in surface waters and consuming drinking water could not be excluded.

Biography

Carmen Gallas-Lindemann graduated in biology from the University of Düsseldorf in 2002 and she completed her PhD studies in 2012 at the University of Cologne under the supervision of Professor P. Karanis in the field of waterborne protozoa. She is the deputy head of the biology department of the LINEG, a water management organization on the Lower Rhine, Germany. She has 25 years of experience in the fields of water management, limnology and microbiology partly resulting from her occupation as a biological technical assistant prior to starting her studies. She has published some papers in reputed journals, scientific posters and one monograph.