



## Quantitative microbial risk assessment of *Giardia* cyst and *Ascaris* egg in effluent of wastewater treatment plants used for agriculture irrigation – a case study

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### ABSTRACT

The aim of this study was to determine the concentration of *Giardia* cyst and *Ascaris* egg in influent and effluent of six wastewater treatment plants (WWTPs) in Kermanshah province, Iran, and to assess human health risk imposed by these organisms. Samples were taken from influent and effluent at weekly interval during 6 months. Samples were analyzed for *Giardia* cyst and *Ascaris* egg using McMaster egg counting technique according to Bailenger method. The Monte Carlo simulation method was used to calculate daily and annual infection risks. The efficiencies of all WWTPs to remove *Giardia* cyst and *Ascaris* egg from raw wastewater were more than 95%. However, maximum concentrations of these organisms were higher than acceptable level in some WWTPs effluents. Maximum concentration of *Giardia* cyst (2 counts/L) and *Ascaris* egg (4 counts/L) in effluent were observed in Kermanshah WWTP. The results of risk assessment indicated that annual infection risk related to both organisms were much more than acceptable level ( $10^{-4}$  pppy). Also, the imposed risk by *Ascaris* was higher than *Giardia*. There is a need for more precautions to be considered by farmers and other susceptible groups in contact to reclaimed wastewater in agricultural land, landscape and parks. Also, responsible organization should conduct more vigorous safety plans in site where WWTPs effluent is used for irrigation.

**Keywords:** Risk assessment; *Giardia* cyst; *Ascaris* egg; Wastewater treatment plants; Agriculture irrigation

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