Isolation and identification of potentially pathogenic free-living amoeba in dialysis fluid samples of hydraulic systems in hemodialysis units

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Abstract:

Background: Free-living amoeba (FLA), including Acanthamoeba, Naegleria, Balamuthia and Vermamoeba, have been isolated from water, sand, soil, dust and air. Numerous studies considered that FLA are a significant cause of neurological and ocular complications in high-risk groups, including immunocompromised individuals. The present study aimed to identify morphological and molecular characteristics of FLA isolates in dialysis fluid samples of hydraulic systems in hemodialysis units in Iran.

Methods: A total of 328 dialysis fluid samples were collected from 16 dialysis machines, including 164 samples before hemodialysis sessions (after cleaning) and 164 samples after hemodialysis sessions (before cleaning). Filtration and cultivation were performed on non-nutrient agar medium. Also, PCR and sequencing were applied by using the genus-specific primers along with a common primer set on positive samples.

Results: Both morphology and molecular investigations showed that 22.5% (74/328) of dialysis fluid samples were positive for FLA. There was a positive relationship between the high frequency of FLA after hemodialysis sessions (before cleaning) compared with before hemodialysis sessions (after cleaning) (OR=2.86; 95% CI 1.5 to 5.45). Considering the PCR assay, 16.46% (54/328) samples were identified as Acanthamoeba spp. (belonging to T3 and T4 genotypes), 5.18% (17/328) as Vermamoeba vermiformis and 0.91% (3/328) as Vahlkampfiidae family (Naegleria australiensis, Naegleria pagei and Allovahlkampfia).

Conclusion: The present results support a need to improve filtration and purification methods for dialysis fluid of hydraulic systems in hemodialysis units. They also highlight the relevance of periodic screenings for FLA-related diseases in hemodialysis patients.

Keywords: Iran; amoeba; hospital hemodialysis unit.