A study of bacterial growths by disinfection method in centrally distributed reverse osmosis water

Jong-Hwan Jeong[1], San Yub Han[2] and Seon-Ho Ahn[1]

[1]Division of Nephrology, Department of Internal Medicine, Wonkwang University College of Medicine, Iksan, Korea

[2]Division of Nephrology, Department of Internal Medicine, Inje University College of Medicine, Ilsan, Korea

Introduction

The water used for dilution of hemodialysis concentrates has to meet official quality recommendations regarding microbiology and chemical parameters. To avoid chemical use and to simplify treatments, hot water has been used to control microbial contamination of water distribution systems. In this study we evaluated experience on bacterial growths by heat disinfection in maintaining the quality of dialysis water generated by reverse osmosis (RO).

Methods

This retrospective study was performed between February 2012 and December 2014 in our hospital dialysis unit. We consecutively used (1) A method: monthly chemical disinfection, (2) B method: a combination of weekly 90℃ heat disinfection (maintaining hot water ≥ 90℃ entering the distribution loop) and bimonthly chemical disinfection and (3) C method: a combination of weekly 95℃heat disinfection (maintaining hot water ≥ 85℃ returning from the distribution loop) and bimonthly chemical disinfection while checking bacterial count and endotoxin level every 4 weeks.

Results

The endotoxin levels at all sampling points of the water treatment system were lower than 0.005/ ml throughout the study. Bacterial counts were consistently <100 CFU/ ml except sometimes in A and B method. It is noteworthy that the application of weekly heat and bimonthly chemical disinfection reduced bacterial levels to acceptable levels, but an escape phenomenon of microbiological growth was noted in B method. Bacterial growths were 28.31±123.13, 19.58±112.31 and 0.65±9.83 CFU/mL in A, B and C method, respectively. Bacterial growths in C method was significantly decreased than in A and B method (p<0.001). In Logistic regression analysis by disinfection method, bacterial contamination risk of dialysis water was associated with A (OR, 33.151; 95% CI, 10.039-109.477; p<0.001) and B (OR, 19.107; 95% CI, 5.608-65.096; p<0.001) disinfection method when compared with C disinfection method.

Conclusion

This study suggests that it is more important to maintain 85℃returning water temperature from the distribution loop than entering water temperature into that in disinfection of the RO water.

Table 1. Differences of Bacterial Growth by Disinfection Method

	Mean	SD	F	P value	Scheffe
A method	28.31	123.13	37.358	<0.001	C < A, B
B method	19.58	112.31			
C method	0.65	9.83			

Abbreviation: A method, monthly chemical disinfection only; B method, a combination of weekly 90℃ heat disinfection (maintaining hot water ≥ 90℃ entering the distribution loop) and bimonthly chemical disinfection; C method; a combination of weekly 95℃heat disinfection (maintaining hot water ≥ 85℃ returning from the distribution loop) and bimonthly chemical disinfection. Results are expressed as CFU count/mL

Table 2. Logistic Regression Analysis on Contamination Risk by Disinfection Method

	B	S.E	Wald	p-value	Exp(B)	95% CI
A method	3.501	0.610	32.994	<0.001	33.151	10.039-109.477
B method	2.950	0.625	22.249	<0.001	19.107	5.608-65.096
C method			33.417	<0.001	1	-

Abbreviation: A method, Chemical disinfection only; B method, a combination of weekly 90℃ heat disinfection (maintaining hot water ≥ 90℃ entering the distribution loop) and chemical disinfection; C method; a combination of weekly 95℃heat disinfection (maintaining hot water ≥ 85℃ returning from the distribution loop) and weekly chemical disinfection

DOI: 10.3252/pso.eu.53era.2016