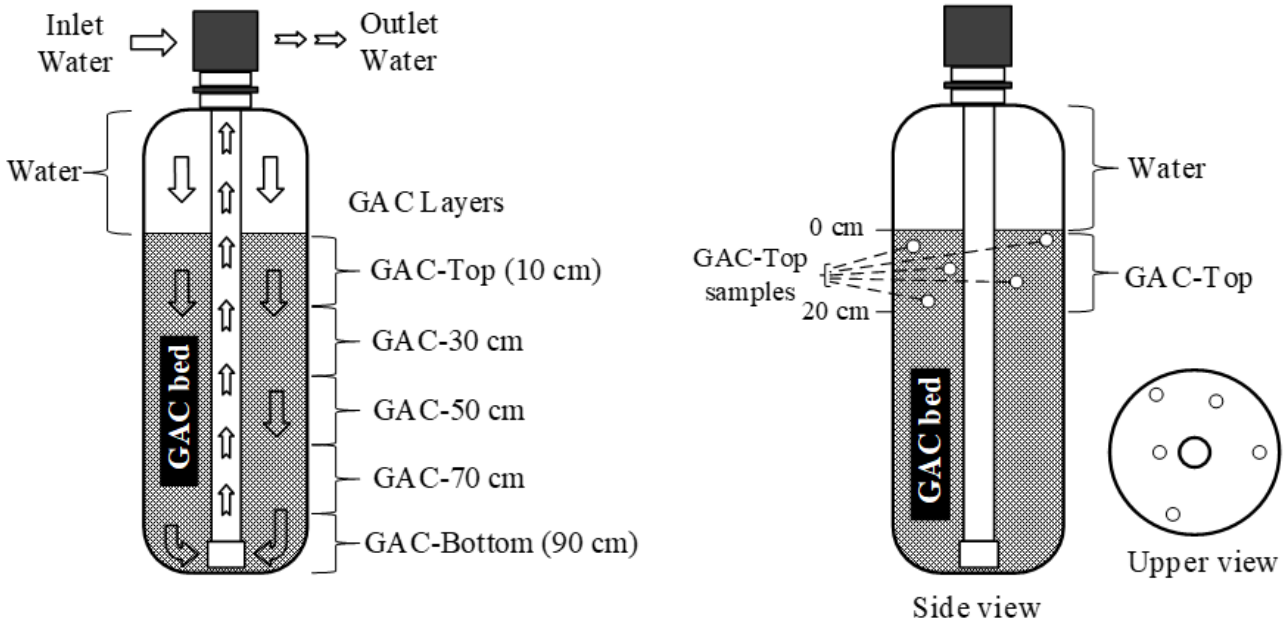

Figure S1 Schematic diagram of the water treatment filter used for obtaining dialysis water for hemodialysis treatments and the location of samples at different layers in the GAC bed (a) and schematic diagram of the sampling process developed (b).

Procedure to construct the breakthrough curves for the regeneration, the free chlorine removal and the hardness ions adsorption experiments.

The measurements of the pH of the solutions and the construction of the breakthrough curves for the regeneration of the scaled columns using HCl (20 %(v/v)) and CH_3COOH (15 %(v/v)) were developed using the methodology described in [1]. For chlorine removal tests in scaled columns different solutions of free chlorine(0.4, 0.8, 1.2, 2.0 and 4.0 mg/L) were prepared from a stock solution of NaClO at a concentration of 10 mg/L according to Standard Method for chlorine spectroscopic determination [2-4].

Diethyl phenylenediamine sulfate (DPD) was used as a colorimetric agent for free chlorine determination; 5 mg of DPD-sulfate was mixed with 25 mL of the NaClO solutions to obtain the calibration curve (see Figure 2S). Finally, a 4.0 mg free Cl_2/L was used for the free chlorine removal experiments in scaled columns.

Free chlorine determination in samples obtained after free chlorine removal experiments were done using a total sample volume of 3 mL(taking into account the photometer cuvette volume), 1 mL of the effluent was collected (each 15 min) and mixed with 0.5 mL DPD solution at a concentration of 2 mg/mL corrected for the sample volume used according to [2-4]. The previous solution was further rinsed up to 3 mL and the initial concentration of the collected sample was calculated using the equivalent law.

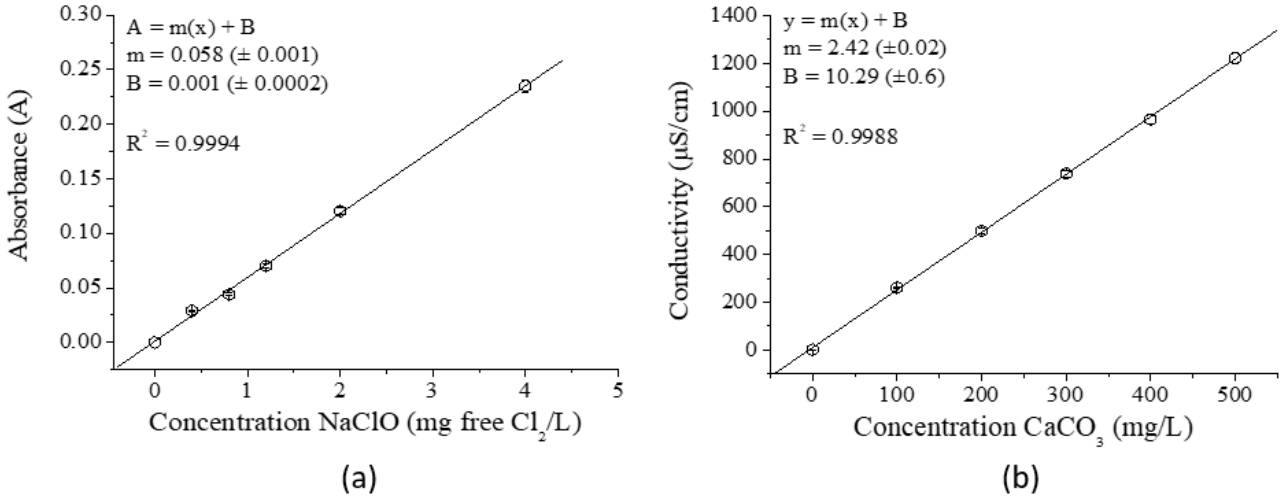

Figure S2 Calibration curve of absorbance(A) as a function of different NaClO concentrations (in mg free Cl_2/L) (a) and calibration curve of conductivity(µS/cm) vs hardness of synthetic water solutions, in mg $CaCO_3$/L(b).

For the hardness adsorption test using scaled columns a concentrated solution of 500 mg/L (expressed as mg of $CaCO_3$/L) was used; the calibration curves and conductivity measurements were developed according to [1].

The absorbance of the inlet-free chlorine solution and the conductivity of the synthetic water was measured after calibration in order to obtain the reference value to stop the experiment (Absorbance at the inlet equal to the effluent absorbance and conductivity in the effluent within the 5% experimental error of the inlet conductivity).

Effluent absorbance and conductivity values were measured each 10 min and 20 min respectively. The corresponding concentration of free chlorine and conductivity value in the effluent were obtained using the calibration curve. The breakthrough curves were plotted using the ratio between the effluent concentration and the initial free chlorine concentration (Ce/Co) versus time in min.

Table S1 Ionic composition in mg/L reported in Ciego de Avila aquifers. Adapted from [5].

HCO_3^-	Ca^{2+}	Na^+	Mg^{2+}	Cl^-	SO_4^{2-}	H_2S	K^+	Al^{3+}	Fe^{2+}	Mn^{2+}	Zn^{2+}	Br^-	I^-
971	324	42	8	42	54	0.1	0.4	0.2	0.2	0.1	0.2	0.1	0.1

Table S2 Detected elements in acid solutions after batch regeneration experiments using HCl.

	Al	Ca	Fe	K	Mg	Mn	Na	Zn
HCL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
5% 2h	0.909	400.5	0.062	1.610	21.39	0.160	59.10	6.611
10% 2h	1.085	426.3	0.335	1.621	21.42	0.161	57.88	6.503
15% 2h	1.208	450.5	0.610	1.660	21.73	0.165	61.89	6.555
20% 2h	1.345	482.5	1.084	1.974	23.57	0.176	67.19	7.429
5% 4h	1.097	451.0	0.072	1.660	23.24	0.169	65.52	7.203

10% 4h	1.105	460.1	0.267	1.634	23.32	0.167	65.31	6.995
15% 4h	1.374	470.0	0.760	1.631	22.52	0.171	64.61	6.888
20% 4h	1.438	471.9	1.095	1.885	22.91	0.176	63.53	6.869
5% 6h	0.886	333.6	0.074	1.241	17.32	0.133	48.98	5.571
10% 6h	1.310	463.1	0.376	1.647	23.28	0.173	65.47	7.117
15% 6h	1.781	474.3	1.019	1.715	23.33	0.185	64.50	7.240
20% 6h	1.436	432.9	1.424	1.661	21.05	0.181	59.92	6.395
5% 48h	1.188	377.2	0.082	1.469	19.95	0.151	55.39	6.172
10% 48h	1.569	434.9	0.489	1.657	21.96	0.168	61.39	6.840
15% 48h	1.775	430.6	0.966	1.761	21.55	0.170	59.78	6.530
20% 48h	1.954	446.4	1.419	1.797	21.63	0.175	60.77	6.798

Table S3 Detected elements in acid solutions after batch regeneration experiments using CH_3COOH.

	Al	Ca	Fe	K	Mg	Mn	Na	Zn
CH_3COOH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
5% 2h	0.084	86.978	<0.050	1.029	6.856	0.044	30.179	0.922
10% 2h	0.349	85.221	<0.050	1.140	7.109	0.154	31.180	0.730
15% 2h	0.021	69.905	<0.050	0.954	6.587	0.025	32.936	0.475
20% 2h	0.115	83.371	<0.050	0.898	6.533	0.051	26.553	0.852
5% 4h	0.039	60.907	<0.050	0.910	6.498	0.030	27.668	0.473
10% 4h	0.571	75.622	<0.050	0.935	6.714	0.122	27.566	0.632
15% 4h	0.043	98.931	<0.050	1.058	8.132	0.046	34.094	0.882
20% 4h	0.566	82.891	<0.050	0.920	6.587	0.155	27.205	0.857
5% 6h	0.215	57.826	<0.050	0.726	5.859	0.014	27.630	0.408
10% 6h	0.351	55.214	<0.050	0.676	5.295	0.017	22.390	0.512
15% 6h	0.305	97.226	<0.050	1.053	8.056	0.200	34.116	0.856
20% 6h	0.029	81.527	<0.050	0.762	6.359	0.033	26.918	0.831

Table S4 Detected elements in acid solutions after leaching experiments using HCl virgin GAC samples.

	Al	Ca	Fe	K	Mg	Mn	Na	Zn
HCL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
20% 2h	0.985	40.41	0.023	0.226	3.778	0.692	0.874	0.012
Blank	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.050	<0.050

Table S5 Detected elements in acid solutions after batch regeneration experiments using CH_3COOH on virgin GAC samples.

	Al	Ca	Fe	K	Mg	Mn	Na	Zn
CH3COOH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
15% 4h	2.39	31.8	3.42	0.236	3.403	0.692	0.886	0.018

Blank	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.050	<0.050

Table S6 Detected elements in blank HCl solutions.

	Al	Ca	Fe	K	Mg	Mn	Na	Zn
HCL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
5%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050
10%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050
15%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050
20%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050

Table S7 Detected elements in blank CH_3COOH solutions.

	Al	Ca	Fe	K	Mg	Mn	Na	Zn
CH_3COOH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
5%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050
10%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050
15%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050
20%	<0.050	<0.050	<0.050	<0.100	<0.005	<0.005	<0.100	<0.050

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