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Letter to the Editor

# Beyond the zero-liquid discharge: Consider a "fit for purpose" water philosophy in hemodialysis

## Más allá de la descarga de líquido cero: considere una filosofía de agua "adecuada para su propósito" en hemodiálisis

*Dear Editor:*

We read with great interest the article entitled "Towards zero liquid discharge in hemodialysis. Possible issues" by Tarrass et al.

In this report, the authors have described a strategic wastewater management system that is expected to lead to zero liquid discharge (ZLD) inside hemodialysis units. The ZLD plan as developed by the authors could be deployed at three levels. The first one is a well-known issue related to the huge amount of water necessary to provide hemodialysis as renal replacement therapy (500 L of feed water to perform a 4 h HD session). At this level, reusing reverse osmosis (RO) reject water as proposed by the authors, is definitely to be a good attitude. This high-quality RO reject water is fit for multiple purposes such as Toilet flushing, garden watering, cooling water for sterilizers, irrigation of landscape. Two biological parameters are set by the authors for this purpose, the total dissolved solids (TDS) and sodium adsorption ratio (SAR) allowing the establishment of an "RO reject water reusing" algorithm. At the two following levels, authors discuss possible reusing and regeneration of the dialysate fluid. Processes such reverse osmosis coupled with nanofiltration are the cornerstone technologies for reusing dialysate effluent while sorbent dialysis system is expected to reconstitute a safe and efficient dialysate effluent.[1]

We congratulate the authors for their commitment to raise the issue of hemodialysis water supply in the context of global warming and growing water scarcity and to propose these technical solutions in order to reduce water consumption.

Nevertheless, we have a few comments on this important report. We believe that, any water economy should be based on a waste hierarchy that prioritizes first, all reduction tools able to decrease water consumption. Hence, when all reduction efforts are exhausted, then, reuse water opportunities should be carefully studied. At the last level recycling used water represents a reasonable but costly option.[2]

During the last decades, innovative water treatment and dialysis technologies have contributed to perform significant economy in water consumption. Several reports have shown that the updating of the water treatment system could lead to cut water consumption by half. Furthermore, recent designed RO system is able to calculate total water consumption.[3]

On the other hand, with the new dialyzers designed to enhance dialysate flow distribution, reduction in dialysate flow rates is becoming an alternative set on the table. Multiple studies underlined the fact that decreasing dialysate flow (Qd) from 500 to 400 ml/min might allow important water economy without altering dialysis quality (maintaining acceptable Kt/v, and phosphorus and B2 microglobulin clearances). In the same vein, some dialysis machine software (such as autoflow and ecoflow) are reported to contribute to water economy.[3]

Reusing the dialysate effluent water remains challenging. Although there is no evidence of environmental contamination, the cost and a theoretical risk of such activity represent a serious obstacle to scheduled dialysate effluent reusing.[4]

In conclusion, the number of hemodialysis patients is expected to double by 2030 (around 5,000,000 patients) which represents a real burden for water resources.[5] Because of global warming, countries from both sides of the Mediterranean Sea such as Spain and Morocco are expected to struggle with serious and prolonged drought periods. Facing such a threatening situation, we have to improve not only our knowledge of dialysis technologies but also to develop how to implement audit process, regulatory framework, and staff education in order to promote a "fit for purpose" water philosophy in hemodialysis.

Once again, we congratulate the authors for discussing such a relevant and very important topic.

## Conflict of interest

All the authors of this article declare no conflict of interest.

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# Glomerulonefritis con depósitos fibrilares simulando enfermedad por anticuerpos antimembrana basal glomerular con microangiopatía trombótica asociada y ANCAp

## Fibrillary glomerulonephritis simulating glomerular basal antimembrane antibody disease with associated thrombotic microangiopathy and ANCAp

*Sr. Director:*

La glomerulonefritis fibrilar (GNF) es una enfermedad glomerular con depósitos organizados de inmunoglobulinas, rojo congo negativos y fibrillas de 16-24 nm en el microscopio electrónico (ME). El síndrome clínico en estos pacientes es variable, síndrome nefrítico o nefrótico, microhematuria, hipertensión arterial, insuficiencia renal y, raramente, glomerulonefritis rápidamente progresiva (GRP), hemorragia pulmonar o microangiopatía trombótica (MAT)[1-6]. Describimos una GNF, con GRP, hemorragia pulmonar, con ANCAp positivos y MAT.

Mujer, 51 años, sin antecedentes de interés, consulta por disnea y edemas. En la exploración, presión arterial 170/100 mmHg, ritmo sinusal, crepitantes bibasales y edemas. Analítica: anemia normocítica normocrómica, sin anemia hemolítica microangiopática (AHM), creatinina 6 mg/dl, proteinuria nefrótica con albúmina normal y microhematuria. Radiografía de tórax: infiltrado intersticial algodonoso bilateral, con diagnóstico de hemorragia pulmonar con estudio inmunológico con ANCAp positivos 1/320, resto normal/negativo, incluidos los anticuerpos antimembrana basal glomerular. Se inician plasmaféresis, corticoides y ciclofosfamida por vía intravenosa. A la semana del ingreso, AHM con frotis con esquistocitos y haptoglobina indetectable, ante la sospecha de MAT, con cultivo de heces negativo, ADAMTS 13 normal, se decide iniciar tratamiento eculizumab, con estudio genético a posteriori normal. Biopsia renal: 49 glomérulos, 10 esclerosados, 29 con semilunas epiteliales, algunos con necrosis segmentaria, PAS y plata de Jones positivos. Sin signos de MAT. Inmunofluorescencia directa positiva intensa para IgG con patrón lineal, kappa y lambda positiva, débil C3 con patrón granular parietal y mesangial, IgG4 positiva (fig. 1)

Al alta de hospitalización, presenta remisión de hemorragia pulmonar y resolución de la AHM, creatinina de 3,8 mg/dl, proteinuria y microhematuria, manteniendo tratamiento con ciclofosfamida, corticoides y eculizumab hasta 2 meses tras resolución de AHM. A los 30 días de suspender el eculizumab presenta un nuevo episodio de probable MAT y se recibe el resultado ME: depósitos densos, en MBG y mesangio, constituidos por fibrillas aleatorias, con un grosor medio de 18,41 nm, compatible con glomerulopatía fibrilar, con depósitos lineales de IgG (fig. 1). Se realiza DNAJB9 por inmunohistoquímica, que resulta positiva y se reinicia el eculizumab, con sospecha de MAT secundaria. Tras 6 meses de ciclofosfamida, se inicia mantenimiento con azatioprina. Durante 2,5 meses, presenta estabilidad clínica y de función renal, sin datos de AHM; se mantiene tratamiento con eculizumab durante 3 meses y posteriormente persiste mejoría de la función renal sin datos de AHM. A los 3 meses de la suspensión, la paciente presenta