

**MEMBRANE CONTACTOR PROCESSES FOR REMOVAL
OF NATURAL HORMONES FROM WASTEWATER**

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ABSTRACT: Growing drinking water demands have strained water resources and increased interest in wastewater reclamation for potable and non-potable reuse. This interest has brought increased attention to endocrine-disrupting chemicals (EDCs) as emerging contaminants in water. Studies have confirmed the impacts of EDCs on aquatic life at trace concentration levels which are often measured in wastewater treatment plant effluents. Although studies at this time cannot correlate these findings to human health effects, it is an area of growing concern. The effect of EDCs on humans is of particular interest in the study of wastewater reclamation for direct potable reuse in advanced life support systems (e.g., space missions and extreme environments) due to their ability to persist and accumulate in concentrated wastewaters. Natural steroid hormones, in particular, can be potentially harmful in closed systems because they are excreted in urine and have endocrine-disrupting potencies that are orders of magnitude higher than most other EDCs. This study investigates the capability of membrane contactor processes to treat EDC-contaminated waters. Two such processes, direct contact membrane distillation (DCMD) and forward osmosis (FO), are currently being investigated for use in treatment of space and domestic wastewater. Retention of the natural steroid hormones estrone (E1) and 17 α -estradiol (E2) by these two processes was investigated. DCMD rejects over 99.5% of the estrone and estradiol spiked into a representative wastewater stream. This is consistent with preliminary studies in which DCMD showed high retention of organic compounds, such as urea, with low volatility. FO rejects 80-90% of the hormones, and rejection is affected by time and feed solution chemistries. FO results are consistent with current studies involving the retention of hormones by RO membranes.

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