Nx produced the clinical effects observed in our patient (Cuello 1983).

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References

Lithium and RBC Water Permeability
To the Editor:

The concentration of choline in the red blood cell (RBC) increases in lithium-treated patients at the same time that the choline carrier system appears to be inhibited (see Domino et al. 1981). Water permeates the RBC membrane primarily via hydrophilic protein channels, which also provide an important route for the passive flux of monovalent cations (Vieira et al. 1970). Hence, alterations in intracellular steady-state levels of choline may correlate with changes in the hydrophilic protein channels, therefore affecting water permeability. Our experiment measured RBC water permeability in lithium-treated patients and normal volunteers.

The mean lifetime of a water molecule in an average RBC (τ) was determined using a modification of the 1H-NMR method of Conlon and Outhred (1972). Adding Mn²⁺ to whole blood diluted 1:4 with 0.9% NaCl shortens the plasma spin–spin relaxation time. This allows the water external to the RBC to be "pulsed-away" using a Standard Carr-Purcell-Meiboom-Gill (CPMG) pulse sequence on a JEOL-FX90Q NMR spectrometer. The CPMG conditions were an 18.5-μsec pulse to induce a 90° spin flip, a 39.0-μsec pulse for a 180° spin flip, and an interpulse interval of 30 msec. The second half of the spin echo was Fourier transformed after an 8-Hz exponential apodization. The internal water peak linewidth (νw) is related to τ by τ = π/νw. Titrating blood samples with Mn²⁺ from 2.5 to 30 mM showed that the internal peak width depended linearly on Mn²⁺ concentration. Each blood sample was titrated with Mn²⁺ and the titration curve extrapolated to zero to determine τw without Mn²⁺.

This method was applied to blood from eight lithium carbonate-treated patients and four normal volunteers. The lithium-treated patients had a mean water lifetime of 8.4 ± 1.2 msec, whereas the normal volunteers had a mean water lifetime of 8.1 ± 0.6 msec. The treated versus normal groups did not differ significantly by Student’s t-test. The two groups compare to the mean water lifetime of approximately 8 msec reported by Solomon (Vieira et al. 1970).

No differences in water permeability were observed between lithium-treated patients and normal volunteers, suggesting that the choline accumulation is not due to modification of the membrane protein channels responsible for passive efflux of water. Lithium, in fact, may alter
the properties of a specific RBC membrane choline carrier or may affect endogenous choline metabolism.

This present investigation may be limited by the small sample size of the two groups studied, making the results vulnerable to type II statistical error. It would also be interesting to compare the same patients before and during lithium treatment.

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