Aluminium Intoxication

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Dear Sir,

How aluminium exerts its toxicity is not quite as obscure as your reviewers [1] imply. On page 310 of my book [2] it says that toxic metals impair neuronal function by binding to acidic phospholipids such as phosphatidylserine and phosphatidylcholine. Metals displace calcium from its normal binding site on the acidic phospholipids in the order: $Al > Cu > Mg > Ca > Na$.

As for an effect on cell nuclei it is known that calcium, being cationic, will displace histones from the chromatin and so interact with the negatively charged phosphate groups on the DNA. I am sure that aluminium is likely to act similarly. Perhaps this explains why aluminium has been linked to Alzheimer's disease, whereas in a more acute toxicity situation the binding to acidic phospholipids could be affecting the function of neuronal Na/K ATPase.

I understand that aluminium can inhibit alkaline phosphatase activity and, as for the anemia, it has been shown that after an initial stimulation aluminium (and zinc) inhibits ALA dehydratase [3]. Thus speculation might even allow a parallel with acute porphyria, whilst at the other end of its spectrum of activity we might recall that the insolubility of granite is largely due to its aluminium content!

References

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