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### **Atherosclerosis and hypertension induction by lead and cadmium ions: an effect prevented by calcium ion.**

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#### **Abstract**

In epidemiological studies, both positive and negative correlations have been found between cardiovascular disease and mortality and the presence of several inorganic ions in the drinking water. In an attempt to resolve this apparent disagreement, we exposed White Carneau pigeons to drinking water containing calcium (100 ppm), magnesium (30 ppm), lead (0.8 ppm), or cadmium (0.6 ppm) and used a 2(4)-factorial design to measure the effects of these elements in atherosclerosis and hypertension. The results indicate that (i) lead and cadmium induced aortic atherosclerosis and hypertension, and (ii) calcium protects against the cardiovascular effects of cadmium. Furthermore, the effects of lead and cadmium were promoted by magnesium, and there were indications that magnesium antagonized the atherosclerotic protective effect of calcium. We suggest that, if these results with the pigeon can be applied to humans, the incidence of aortic atherosclerosis and hypertension should be significantly higher in areas where the drinking water contains magnesium, lead, and cadmium with a relatively low calcium concentration. Furthermore, if hard and soft water produce similar levels of lead and cadmium uptakes, the level of magnesium may be an additional factor in aortic atherosclerosis.