CLINICAL STUDY ON LEAD POISONING OF WATERFOWL

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To establish procedures for useful diagnosis and therapy of lead poisoning in waterfowl caused by ingestion of lead shot pellets, the effect of chelating agents and the diagnostic and therapeutic significance of erythrocyte delta-aminolevulinic acid dehydratase (ALA-d ; [EC 4.2.1.24]) were investigated. The results were as follows :

1. In 7 ducks abdominal radiographs revealed that one lead pellet disappeared within 15 to 29 days, average 22 days of administration.
2. Two ducks died after administration of 7 lead pellets, one on day 19 and the other on day 22. These ducks exhibited droopy wings on day 9 and proventricular impaction on day 13, and the other on day 17. A remarkable increase in plasma CK and LDH were observed on day 17.
3. Successive administrations of $CaNa_2EDTA$ or $CaNa_2CyDTA$ were carried out on ducks and geese given 7 lead pellets from day 3. All of these birds lived showing no lead poisoning crisis. Erythrocyte ALA-d activities were remarkably reduced on the 3rd day in association with the elevated lead concentration in their blood. Lead concentration began to fall just after administration of the chelating agents with simultaneous increase in ALA-d activity. Significant correlation was demonstrated between lead concentration and the ALA-d activity or the activity ratio. The positive correlation between lead concentration and the activity ratio would be more reliable for diagnostic purposes since the activity ratio (active + inactive form/active form) indicates the degree of inhibition of the enzyme.
4. Goose and canine erythrocytes were treated with lead to inhibit ALA-d, then incubated for several days in the presence of $CaNa_2EDTA$. Recovery of ALA-d activity was observed in both types of red cells to the same extent, indicating as a possible mechanism that the lead released from the enzyme is chelated outside the red blood cells resulting in a rise in cellular enzyme activity.

These results demonstrate that both erythrocyte ALA-d activity and activity ratio are very useful indicators for diagnosis and evaluation of the therapeutic effects of lead poisoning in waterfowls.