

## THE INFLUENCE OF DIETARY FAT ON LEAD TOXICITY

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In recent years it has become evident that even low quantities of lead may produce a wide spectrum of adverse effects including psychological, behavioural and intellectual impairment, especially among young children. Since lead enters the body mainly by absorption from the gastrointestinal tract, any factor which enhances lead absorption would increase the potential hazard from lead exposure (Mahaffey and Michaelson 1980). The present study investigated the influence of dietary fat on the toxicity of orally ingested lead in the rat.

Four groups of 10 male weanling Wistar rats were fed purified diets providing 11.5, 20, 40 or 60% of energy from fat. The diet for the control group (11.5% group) was based on the AIN-76 purified diet recommended for rats (AIN 1977). Dietary fat was increased in the remaining diets by replacing carbohydrate with fat on an equal energy basis so that all diets provided the same amount of protein, vitamins, minerals and fibre per kJ. All diets contained low levels of lead (1.25 mg Pb as lead acetate per 1000 kJ). Food and water were provided ad libitum. After 8 weeks blood samples were collected by heart puncture and analysed for free erythrocyte protoporphyrin (FEP) and  $\delta$ -aminolaevulinic acid dehydratase activity (ALAD), the widely used biochemical indicators of lead toxicity. The animals were then killed and bone, brain, kidney and liver removed and analysed for lead.

The level of dietary fat did not affect total energy consumption, lead exposure or body weight. Increasing dietary fat significantly increased lead content of all tissues. Although groups receiving 11.5 and 20% of energy as fat had similar levels of tissue lead, increasing the fat level to 40 and 60% of energy resulted in significant increases in tissue lead concentrations. The groups receiving 60% of energy as fat had more than twice the level of lead in femur, kidney, liver and brain compared to the control rats fed 11.5% energy as fat, even though they ingested the same amounts of lead. ALAD activity was not affected when dietary fat was increased from 11.5 to 20%, however there was a significant reduction in activity when fat was increased to 40 or 60% of energy. FEP was not affected by the level of dietary fat. This research demonstrates that dietary fat in the range normally consumed in Western diets increases the potential toxicity of orally ingested lead.

AIN AD HOC COMMITTEE ON STANDARDS FOR NUTRITIONAL STUDIES (1977). *J.Nutr.* 107: 1340.

MAHAFFEY, K.R. and MICHAELSON, I.A. (1980). In 'Low Level Lead Exposure. The Clinical Implications of Current Research', p. 159, ed. H.L. Needleman. (Rowen Press: New York).