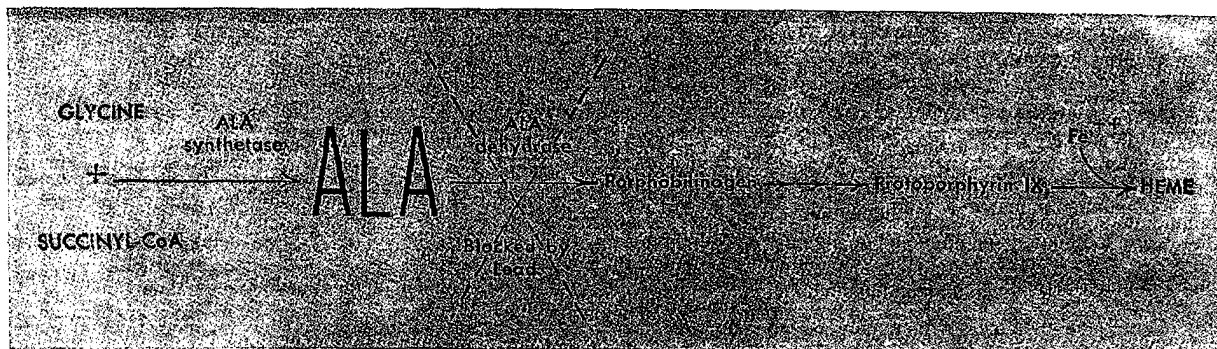




Mechanism of delta-aminolevulinic acid (ALA) accumulation in lead poisoning.

Mass Screening 'Practical'

Lead Poisoning Test Simple, Rapid

A simplified laboratory procedure, using piggy-back disposable chromatographic columns, may permit mass screening of ghetto children and industrial workers exposed to lead poisoning.

Last summer, use of the method in a random survey of some 3,500 Chicago children led Loyola clinicians to estimate that over 14,750 children had abnormal lead exposure in that city alone.

Instead of the conventional 5 to 10 ml of blood required in other tests, 0.5 ml urine samples are used in the test developed by Joseph R. Davis, MD, PhD, and colleagues. A single technician can conduct 200 measurements within five hours, he told an Atlantic City audience.

A modification of previous, more cumbersome methods, the new test measures urinary concentration of delta-aminolevulinic acid (ALA)—instead of lead itself. In 1960, Scandinavian workers established that ALA, an intermediate product in porphyrin biosynthesis, is increased with abnormal lead exposure. Recent evidence indicates this is because the enzyme, ALA dehydratase, is blocked by lead.

Each summer, heat and other factors precipitate serious illness and death in children who may have consumed lead months before, said Dr. Davis, associate professor of pharmacology, Loyola University Stritch School of Medicine.

Because many potential victims are asymptomatic, rapid, inexpensive and accurate screening procedures are necessary, he said. Experi-

ence with over 10,000 urinary ALA determinations show the test is reliable.

In an early study of 250 children with suspected lead poisoning, an ALA concentration of 1.00 mg/100 ml was established as the upper limit of normal. Fewer than 5% of those with ALA levels below this benchmark required chelation therapy because of clinical symptoms. But over 65% of children with urinary ALA exceeding 1.00 mg/100 ml required therapy.

Further single-blind studies indicated that urinary ALA results correlate with serum concentrates and clinical criteria in 91% of cases. Of the remainder about 6% are false-positive, 3% false-negative.

Last summer, a Loyola-Chicago Board of Health team conducted a random sample of children ages 1 to 7 years in "high-risk" predominantly ghetto areas. Among the 3,500 children who contributed urine samples to mobile collecting units, 5.9% had elevated ALA levels. Statistical projections would place the number of abnormally-exposed Chicago children at about 14,750, he commented. "This further emphasizes the need for such determinations in appar-

ently well, asymptomatic children."

The test appears equally applicable in adults. Among groups now being evaluated are 300 workers at a Naval ordnance plant.

Urine samples are frozen up to ten hours after collection. In this way stored samples retain stable ALA levels for many months.

The Chicago test originally depended on plunger-less syringes suitably packed to become small chromatography columns. A disposable plastic unit in kit form is now available commercially.

The newer units contain two small columns mounted piggy-back. The tube on top contains an anionic exchange resin which filters porphobilinogen from the urine. The bottom column, with a cationic exchange resin, captures ALA while allowing urea and other substances to pass through.

The 10-step procedure concludes with a heat condensation reaction to form the ALA pyrrole and the addition of Ehrlich's reagent. Elevated ALA is marked by a reddish condensation, with normal values usually faint yellow. Precise concentrations are calculated with the aid of a standard laboratory colorimeter.

Random survey indicates some 14,750 children in a single city have abnormal lead exposure. Emphasizes need for testing before symptoms.