



Blood Lead

Indications

Background exposure to lead in the UK has declined since the practice of using lead as an “anti-knock” additive in petrol was discontinued. However, occupational exposure and accidental exposure remains a problem. An annual blood test is recommended if risk assessment shows there is potential exposure to lead. Subjects with low level toxicity can present with ill-defined symptoms including general aches and pains, especially abdominal pains, without having developed clinical microcytic anaemia and basophilic stippling. Acute lead poisoning in adults is characterized by abdominal pain, tiredness, aching limbs and joints, and irritability. Nerve palsy and wrist drop are rarely observed. In children and animals lead poisoning is accompanied by CNS signs such as convulsions, irritability and vomiting, as well as anaemia.

Lead is used in storage batteries, ammunition, cable sheaths, solders and in the plastics industry. Petrol containing anti-knock lead is still used, for example, in lawnmower engines. Lead can also be a problem in the home, particularly from sanding old lead-based paints and from fishing weights, as well as in artists' studios and potteries. Users of indoor small bore rifle ranges are also at risk.

Activities with a high risk of lead exposure include:

- 1) Radiator repair - solder (60% lead, 40% tin) is used; after repair the excess solder is buffed off using a grinder, creating dust. In addition radiators were formerly painted with lead based paint but this practice has been discontinued.
- 2) Smelting - the heat generated in the furnace leads to production of lead fumes. Lead (2-3%) is added to brass (copper/zinc alloy) and some bronzes (copper/tin alloy) eg gunmetal, as it gives the metal a lubrication quality.
- 3) Car exhaust repair - exhaust systems may have deposits of lead oxide from lead petrol. This creates fine dust and lead fumes during welding
- 4) Scrap metal recovery – which includes burning off the covering from old cables, cutting lead enameled baths, handling lead batteries and smelting down lead using crude furnaces.
- 5) Container repair - welding, brushing and sandblasting of lead paint in the confined spaces of containers produces dusts and fumes.
- 6) Smallbore rifle shooting - lead fumes may arise from both the bullet and the primer. There is additional lead in the dust in the shooting range and older ranges may not be ventilated.
- 7) Lead battery manufacture - used lead batteries are recycled by smelting down into lead ingots. Manufacture of new lead batteries involves making the lead plates, pasting them with a lead oxide paste and assembling the battery.

Activities with a medium risk of lead exposure include:

- 1) Metal machining - dust is created by the cutting and spinning of metal alloys containing lead (for example, brass).
- 2) Ceramics/arts - lead based glazes may be used; some artists still use lead-based paints.

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- 3) Plastic production - PVC contains tri-basic lead sulphate as an acid scavenger to slow the degradation of PVC and improve thermal stability. Exposure can occur where the bags of powder are opened and mixed to give a free flowing powder that is approximately 2% lead.

Activities with a low risk of lead exposure include:

- 1) Plumbing - plumbers may still use red lead putty as a sealant, but most risk is from old lead-based solder joints and during preparation of lead flashings.
- 2) Bright soldering (used in jewellery manufacture).
- 3) Motor car assembly and repair - lead is used in car assembly lines as a gap filler on seams (it is illegal to use synthetic fillers). The excess lead metal is removed by hand file. Restorers of vintage cars still use lead. In the past anti-rust paint also contained lead.

Interpretation

Population reference range (from the literature):

Age group	Whole blood lead		PCV
	µmol/l	(mg/dL)	
adult male	0.0-0.50	(0 – 10.0)	0.40-0.55
adult female	0.0-0.35	(0 – 7.0)	0.38-0.45
child 5-16 yrs	0.0-0.55	(0 – 11.0)	0.35-0.40
child 9 mths - 4 yrs	0.0-0.55	(0 – 11.0)	0.33-0.37
child < 9 mths	0.0-0.50	(0 – 10.0)	0.30-0.35

Patient preparation

No special preparation is required and the patient can continue to take nutritional supplements and medication before the collection of the sample.

Specimen requirements

An 8 ml heparinised blood sample is collected in a blood tube shown to be free of lead contamination. Collection tubes and needles can be supplied by Biolab.

Methodology

Whole blood lead is measured by inductively coupled plasma - mass spectrometry (ICPMS).

Turn around time

3-4 working days.

References

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3. Zierold KM, Anderson H. Trends in blood lead levels among children enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children from 1996 to 2000. *Am J Public Health* 2004;94:1513-5
4. Rogan WJ, Dietrich KN, Ware JH et al. The effect of chelation therapy with succimer on neuropsychological development in children exposed to lead. *NEJM* 2001;344:1421-1426.