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**global lead advice  
& support service**

# **In CHINA - Blood lead testing: who to test, when, and how to respond to the result**

*By Elizabeth O'Brien and Emma Tao Xu, Global Lead Advice and Support Service (GLASS), September 2009*

## **Who should have a blood lead test and when?**

All children under the age of 6 years should have a blood lead test at least annually, starting from the age of crawling, and more frequently if the blood lead level exceeds 2 micrograms per decilitre ( $\mu\text{g}/\text{dL}$ ), if they live in a house built before 1997 or if they suffer from pica (eating non-food items) or iron deficiency anaemia.

All children with learning difficulties, autism, ADD, ADHD or aggressive behaviour should be blood lead tested.

For everyone born before leaded petrol was banned in Australia in 2002 and in China in 2001 (PCFV, January 2009), after the age of 6, a blood lead test should be done every 5 years throughout life, or more frequently if the blood lead level exceeds 2  $\mu\text{g}/\text{dL}$ .

Anyone planning to move into and especially if you're planning to renovate a pre-1997 building in Australia should have a blood lead test prior to beginning the work and again within a couple of weeks of starting the work (especially preparation of paint for repainting or any demolition) to determine that their renovation methods are indeed lead-safe. If the family must remain in a home during renovation, all family members should be tested.

If your neighbour or your landlord starts demolishing or dry sanding or water blasting paint off their old building or your's, take everyone to the doctor for a blood lead test – get a copy of the results in case it ends up in a tribunal hearing.

People who work with lead or are involved in hobbies (leadlighting, ceramics, jewellery-making, fishing-sinker or diving weight or bullet-making, artist's painting, etc) which use lead, should have blood lead testing, prior to beginning the work or hobby, then a couple of weeks into it, and as often as dictated by the result and changes made to work-practices to reduce the blood lead level, but at least annually to ensure that the blood lead level never goes above 2  $\mu\text{g}/\text{dL}$ . If it does, consider switching to other non-lead work or hobbies.

Shooters should particularly be required to have blood lead tests before they ever take up a gun (or apply for a licence) and shortly after beginning their training, especially if they practice at an indoor firing range. Regular blood lead monitoring will let your doctor know whether you have the genotype or shooting frequency that dictate that you really are not safe to use a gun.

Anyone who has a lodged lead shot or bullet in them should have a blood lead test every 6 months or more frequently if the blood lead level rises above 2  $\mu\text{g}/\text{dL}$ . This can occur especially if the lodged lead object or fragment moves into the synovial fluid of a joint. Your doctors should be made aware that you have been shot and have retained the leaded ammunition, so that they can better monitor not only your blood lead level but also your nutritional status and regularly weigh the risks of surgical removal of the lead pellets against the risks of lead poisoning.

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Couples planning to conceive should aim to have a blood lead level as low as possible but certainly below 5 µg/dL and for the father, this level should be achieved before the sperm are manufactured (ie at least three months before conception).

People who are about to move to a known high-lead-risk area such as the communities surrounding lead mining, smelting, manufacturing or recycling facilities, should test everyone in their family, and themselves especially if they are about to start work at the lead facility.

Due to the synergistic effects of lead and mercury, anyone in the above categories who also has mercury amalgam fillings should have a blood lead test every couple of years throughout life and consider having their mercury amalgam fillings replaced if their blood lead level is above 2 µg/dL.

Because blood lead levels above 2 µg/dL have been found to have adverse effects on the developing brain in the foetus and in early childhood, we recommend that women in early pregnancy and again at the birth have a blood lead test. Pregnancies will generally raise the blood lead level (some pregnancies more than others). The early pregnancy blood lead level and final umbilical cord blood lead level are good baseline levels to know for the baby. (Organise in advance for the test to be carried out at the birth.) The placenta does not filter lead out so these results can be considered to be the baby's first blood lead tests. The peak blood lead level for a pregnancy (typically reached at the birth) will depend on a woman's *lifetime exposure* to lead so is a very important figure to obtain.

Anyone who has a high hair lead test result should have a blood lead test to determine if there is a problem and to have a result (the blood lead result) which will be followed up by the health department.

A blood lead test result can demonstrate that despite no obvious sources or pathways of current lead poisoning, lead is indeed currently being taken up. Additionally, a blood lead test can demonstrate that stored lead is moving from the bones back into the bloodstream. The movement of lead out of the bone stores and back into the bloodstream is a complex business and not all the provocations for that movement are fully understood.

Seventy-five percent of a child's body burden of lead and 95% of an adult's body burden of lead is stored in the bones. For this reason, in the absence of historical blood lead results, the best way to assess long-ago lead poisoning is with a bone XRF machine. Unfortunately no bone XRF machine is currently operational in Australia.

Testing for lead in the blood answers the critical question: is lead moving out of the bones or coming in from the environment, and being circulated to all organs and tissues, via the blood? The type of change that can move lead out of bone storage, includes, but may not be limited to: treatments for lead poisoning (eg saunas, chelation therapy etc including mega doses of Vitamin C, which is known as "the natural chelator"), some drug treatments for other conditions (eg cortisone), bone breaks, drastic changes in exercise level (eg suddenly training for a marathon without previous running experience, or suddenly being immobilised in hospital for a period), the bone demineralisation associated with pregnancy, lactation, menopause and ageing, and possibly excess sun exposure.

Women being treated with Hormone Replacement Therapy (HRT) and anyone on cortisone should have a blood lead test every 6 months to determine whether the treatment or the medical problem is associated with a rise in the blood lead level.

Anyone suffering any of the health effects or behaviour problems mentioned in "Dangers of a blood lead level above 2 µg/dL and below 10 µg/dL to both adults and children" at [www.lead.org.au/fs/Dangers\\_of\\_BPb\\_Level\\_Above\\_2ug\\_dL\\_and\\_Below\\_10ug\\_dL\\_20090813.pdf](http://www.lead.org.au/fs/Dangers_of_BPb_Level_Above_2ug_dL_and_Below_10ug_dL_20090813.pdf) and in "Lead, Ageing and Death" at [www.lead.org.au/fs/LID\\_9496.pdf](http://www.lead.org.au/fs/LID_9496.pdf) should also ask their GP or specialist for a blood lead test.

## Various individual and government responses to blood lead levels

For the individual who knows the dangers of a blood lead level above 2 µg/dL, the critical steps in responding to a blood lead level above 2 µg/dL are to identify the sources of lead and remove them (or remove the person from the lead), as well as to implement nutritional intervention. A well-informed doctor can assist greatly in these two vital responses.

Government health agencies should be able to help in the lead source identification process (home lead assessment etc), but, should it be necessary, you can find details of The LEAD Group's excellent DIY-sampling for lab lead testing (in Australia) kits at

[www.lead.org.au/fs/DIY\\_sampling\\_lead\\_analysis\\_kits\\_flyer\\_20090715.pdf](http://www.lead.org.au/fs/DIY_sampling_lead_analysis_kits_flyer_20090715.pdf)

### “Acceptable” blood lead levels

The National Health and Medical Research Council of Australia has issued a statement on 6<sup>th</sup> August 2009 that the goal is that all Australians should have a blood lead level below 10 micrograms per 100 millilitres of blood (10 µg/dL). This is the level recommended by the US Centers for Disease Control and Prevention in 1991 and the World Health Organisation in 1992. It is also the level which the NHMRC itself recommended in 1993.

The LEAD Group believes that the “acceptable” blood lead level should be two micrograms per decilitre (100 millilitres), based on research referred to in “Dangers of a blood lead level above 2 µg/dL [two micrograms per decilitre] and below 10 µg/dL to both adults and children” at

[www.lead.org.au/fs/Dangers\\_of\\_BPb\\_Level\\_Above\\_2ug\\_dL\\_and\\_Below\\_10ug\\_dL\\_20090813.pdf](http://www.lead.org.au/fs/Dangers_of_BPb_Level_Above_2ug_dL_and_Below_10ug_dL_20090813.pdf)

By “acceptable”, governments mean a level below which the harmful effects of lead are acceptable considering what a huge boost to the national economy lead mining, smelting and export affords the country.

As a “goal”, that is, a level which all Australians or all Chinese should be below, we propose 5 micrograms per 100 millilitres of blood (5 µg/dL).

As a marker on the way to achieving this, we propose below 10 µg/dL as a “target” level for all Australians and Chinese – to be reached by 2012. We do not find it acceptable that the current occupational action level for moving a worker from a lead task is 50 µg/dL under the Australian standard. Workers are people too and a little bit of extra pay doesn't make up for early death, especially if you are not advised that that is the risk you are taking. In China the occupational action level for moving a worker from a lead task is 60 µg/dL. (MOH, China, 1<sup>st</sup> Jun 2002)

### “Notifiable” blood lead levels

In NSW, Queensland or Tasmania, if a non-occupationally exposed person's blood lead level is found by a pathology laboratory to be 15 micrograms per decilitre (15 µg/dL) or over, the lab must notify the state department of health. A home lead assessment would normally then be carried out by the local Public Health Unit.

In other states and territories there is no requirement in public health regulations to notify the health department if your blood lead level is above 15 µg/dL. We therefore advise you or your GP or obstetrician to request the relevant state department to do a home lead assessment. This is done by phoning:

- Environmental Health Unit, Department of Human Services, **Victoria** on 1300761874;
- Department of Health, **South Australia** on 0882266000;
- Health Department, **Western Australia** on 0893884999;
- ACT (**Australian Capital Territory**) Health Protection Service on 0262051700;
- **Northern Territory** Environmental Health Department, Territory Health Services on 0889227152.

## Action required in China for children's elevated blood lead levels

The following paragraphs are taken from a document published by MOH China (9th Feb 2006)

### 1. Diagnosis and classification

*Plumbism and lead poisoning in children, high lead blood lead levels of children should be the basis for diagnosis.*

*High lead plumbism: two consecutive blood lead level of 10 ~ 19.9 µg/dL;*

*Plumbism: two consecutive blood lead levels equal to or greater than 20 µg/dL; and based on blood lead levels were divided into mild, moderate and severe lead poisoning.*

*Mild lead poisoning: blood lead level of 20 ~ 24.9 µg/dL;*

*Moderate lead poisoning: blood lead level of 25 ~ 44.9 µg/dL;*

*Severe lead poisoning: blood lead levels equal to or greater than 45 µg/dL;*

### 2. Regulations for Children Plumbism

*Children with high lead plumbism and should be managed for lead poisoning at medical and health institutions qualified to conduct such treatment. Medical personnel should be in the process of complying with environmental interventions, health education and treatment of the basic principles of driving lead and help to identify lead sources of pollution, and inform the children's guardians as soon as possible sources of pollution from lead; be suitable for various situations of Health guidance, the views of nutrition helps; right lead poisoning, children should be appropriate and timely treatment.*

#### (A) Sources of pollution from lead

*When the children's blood lead level of 10 µg/dL or more should be asked in detail about environmental pollution and living conditions, family members and peers has a long history of lead exposure and lead poisoning in history. Blood lead level of 10 ~ 19.9 µg/dL, often hard to find a clear lead pollution sources, but should actively seek, and strive to cut the lead pollution sources and channels; blood lead level of 20 µg/dL or more, often able to find more clear-cut sources of lead contamination, should actively help to find a specific lead sources, and as soon as possible out of.*

### Actions recommended by government departments at blood lead levels less than 15 µg/dL

The Western Australian Health Department is now following up blood lead levels above 5 micrograms per decilitre in Esperance, Western Australia and the Queensland Health Department is following up blood lead levels above 10 micrograms per decilitre in Mount Isa lead mining & smelter town.

If anyone in your family has a blood lead level below 15 micrograms per decilitre but above 2 micrograms per decilitre, then you would be wise to do some testing in your home or otherwise think about any potential lead exposure in work or hobbies, in order to identify and then eliminate any lead sources. You could also try phoning your state health department to ask them to carry out a home lead assessment in view of policies elsewhere.

See above list and additionally:

- Department of Health, **New South Wales** on 0293919000;
- **Queensland** Health on 0732340111;
- Department of Health and Human Services (DHHS) **Tasmania** on 1300135513.

In the United Kingdom, doctors are advised to carry out blood lead testing on children diagnosed with learning difficulties and autism.

All state and local health departments in the United States were, on 7<sup>th</sup> August 2009, recommended to increase the rate of blood lead screening of at-risk children under 6 years of age, in just one of many strategies to achieve the US national Healthy People target, set in 2000, that no child between the ages of 1 to 6 years in the US should have a blood lead level higher than 10 µg/dL by 2010.

In some government agencies in the United States, the follow-up (search for sources) blood lead level has been set at 5 µg/dL. For instance "Understanding Your Child's Lead Test" by the Oregon Department of Human Services (DHS), states: "parents should take steps to identify possible sources of lead in their child's environment in order to prevent any further exposure" [if the blood lead level is 5 µg/dL or higher].

The Forsyth County (North Carolina - Winston-Salem area) Board of Health approved, in November 2008, regulations requiring environmental investigations for children with a blood lead level of 8 µg/dL or higher and allows parents with children with a level of 5 µg/dL or higher to request inspections.

## References for information about China

PCFV (Partnership for Cleaner Fuels and Vehicles), United Nations Environment Program (UNEP), ASIA-PACIFIC LEAD MATRIX - Last updated Jan 2009 [www.unep.org/pcfv/PDF/APLeadMatrix-Jan09.pdf](http://www.unep.org/pcfv/PDF/APLeadMatrix-Jan09.pdf)

MOH, China (Ministry of Health of the People's Republic of China), Diagnostic Criteria of Occupational Chronic Lead Poisoning. (1st Jun 2002)

[www.qb99.cn/info/4058.html](http://www.qb99.cn/info/4058.html)

MOH, China (Ministry of Health of the People's Republic of China), Lead poisoning in children, high lead acidosis and the principles of classification and treatment (9<sup>th</sup> Feb 2006)

[www.moh.gov.cn/publicfiles/business/htmlfiles/mohfybjysqwss/s3585/200804/18189.htm](http://www.moh.gov.cn/publicfiles/business/htmlfiles/mohfybjysqwss/s3585/200804/18189.htm)

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