UK NATIONAL SCREENING COMMITTEE

Screening for blood lead levels in asymptomatic children aged 1 to 5 years

21 November 2013

Aim

1. To agree the UK National Screening Committee's (UK NSC) formal policy position on screening for blood lead levels in asymptomatic children aged 1 to 5 years

Background

2. A review of screening for screening for blood lead levels in asymptomatic children aged 1 to 5 years against the UK NSC criteria was carried out in March 2013 by Dr J. Spiby.

3. This paper uses evidence published up to January 2012 on screening for elevated blood lead levels in asymptomatic children aged one to five years against the UK National Screening Committee (NSC) Criteria for appraising the viability, effectiveness and appropriateness of a screening programme.

4. The present UK NSC policy is that screening for lead poisoning is not recommended.

Consultation

5. A public consultation on the screening review took place between 12th March and 16th June 2013. Two responses to the consultation were received. Responses are attached in Annex A.

Conclusion

There is insufficient evidence for screening for elevated lead levels in asymptomatic children aged 1 to 5 years.

Using the NSC criteria screening is not recommended because:

- there is a low prevalence of raised blood levels
- benefits from primary prevention have not been fully realised
- currently available testing strategies lack reliability
- there is a lack of a safe blood lead level and thus a lack of a suitable cut off level for screening
- there is a lack of proven treatment modalities for raised blood lead levels especially for the majority of cases (very low levels of raised blood lead levels) that would be identified by screening
- there is no RCT evidence on a screening programme in the UK context

Recommendation

6. The UK NSC is asked to agree the policy position on screening for elevated blood lead levels in asymptomatic children aged 1 to 5 years.

A national screening programme to screen for elevated blood lead levels in asymptomatic children aged 1 to 5 years is not recommended.

Annex A

UK National Screening Committee

Elevated Blood Levels in asymptomatic children aged 1 to 5 years - an evidence review

Consultation comments pro-forma

Organisation:	Public Health England, Centre for Radiation, Chemicals and Environmental Hazards, Epidemiology Department		
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Section and / or page number	**Text or issue to which comments relate**	**Comment** *Please use a new row for each comment and add extra rows as required.*
Page 9	conclusion on primary prevention “further research is required to understand the impact of more locally based interventions”	Evidence reviewed referred to a meta-analysis of dust control interventions that found insufficient evidence of reduction in blood lead levels, however RCT evidence from US indicates specific interventions were shown to be effective, for example wet dusting was effective and should be distinguished from dry dusting. Therefore the conclusion is based on an incomplete review of the available evidence.
Page 11	Conclusion on “the test”: The present screening tests have limitations especially as prevalence levels fall below 10 microgram/dl	It is agreed that defining a test result as “positive” only above a cut off of 10 microgram/dl is limited. However this is not a limitation of the test, but of how it is used and interpreted. The blood test is perfectly valid in itself, and would be much more informative if a screening programme defined its reporting as an absolute concentration value for each individual child (with attached analytical uncertainty) and as a distribution for a specific group of children (with its attached statistical uncertainty. Based on such definition of test results, the existing blood test is a simple safe and validated screening test.
Page 12	Conclusion on treatment “for children identified at lower level removal from the source of lead is advised and primary prevention	It is agreed that prevention of exposure is by far the most appropriate intervention for most children exposed to lead, and many UK children could benefit from that. However, the implication should be made clearer that targeted screening could be necessary in order to identify such children.

	interventions to remove the source long term”	
Page 13	Conclusion on the screening programme “there is insufficient evidence on the benefits of screening programmes for raised blood levels in children aged 1 to 5 years”	While this statement is likely correct regarding universal screening of children of this age, is probably incorrect regarding several forms of targeted screening informed by prior knowledge of specific geographical areas known to be hot spots for lead contamination, or specific behaviours or housing characteristics. Several factors have been identified that would make it feasible to identify with sufficient accuracy and precision categories of children where lead screening would be beneficial. For example this approach has been developed in France; The main elements of the approach to screening of children in France, guiding the design of targeted screening, have been the following (see Saturnisme: Quelles stratégies des dépistage chez l’ enfant. INSERM and INVS, 2008, ISBN 978-2-85598-865-9. Available at: http://www.invs.sante.fr/publications/2008/saturnisme_depistage/Saturnisme_depistage.pdf): • Improvement of knowledge about geographical areas at highest risk of environmental exposure to lead • Development of databases of addresses at higher risk, with defined appropriate access to these data by agencies relevant to the design and/or implementation of interventions • Extend the effort on identification and characterisation of legacy sites where lead contamination is the results of past industrial activities • Make available to public health authorities maps of segments of the water distribution system that pose a risk of potential exposure to lead • Development of studies to improve knowledge about the circumstances when exposure to lead is related to specific behaviours or habits
Page 14 and 15	Conclusion on evidence of benefits of the screening programme “there are no RCTs comparing benefits and harms of a lead screening	RCT evidence from the United States is available that demonstrates benefits of lead interventions. (see some references below)

	programme" (page 14) and "there is no RCT evidence on cost benefit and opportunity costs of a lead screening programme in the UK"	Together with good quality observational evidence from France, this points to the likely benefits to UK children of targeted screening programmes for lead exposure. A main strategy of the French approach is to couple screening of children and reduction of exposure to achieve prevention.
Page 16	Overall conclusions. Screening is not recommended because (commented one by one below)	
	The low prevalence of raised blood levels	The reviewer had indicated they are aware that current definition of "raised blood level" (10 microgram/dl) is indicative of possible clinical poisoning and is not sufficiently sensitive for detection of harm to the child, as the latter typically occurs at concentrations in blood below 10 microgram/dl, and there is no evidence of a threshold for this effect. Therefore, the low prevalence of raised blood level is a consequence of using a definition of 10 microgram/dl as cut off. Screening of children based on an overall understanding of the distribution of exposure in the population, and targeted sampling of children, would overcome this limitation. Using the test systematically as part of a targeted screening programme would provide appropriate information on the actual population prevalence of exposure to lead. If a screening programme is implemented, an action level could be defined as appropriate based on the available evidence of harm, and not the concentration at which clinical effects are typically visible.
	Benefits from primary prevention	It is agreed that primary prevention is the most appropriate approach to achieve the objective of reduction of health effects attributable to lead exposure. However, targeted screening could help define areas where prevention should be implemented and monitored. In the absence of targeted screening, it is likely that many opportunities for primary prevention will be ignored and missed, simply because the presence of exposure to lead is not reaching the awareness of health care workers.
	Lack reliability in currently available testing strategies	Again, if a testing strategy is aimed at passively recording cases where a lead concentration happened to have been documented by an alert clinician, and uses the value of 10 microgram/dl as cut off, we agree that such strategy would not be reliable.

		However, currently available testing strategies are not limited to this particular one. For example in France (see citations).
	Lack of a safe blood lead level and this the lack of a suitable cut off level for screening	This has not been an obstacle for the management of similar environmental problems in the past, for example the radon programme is based on a screening of areas and homes for a hazard lacking a safe level, and has led to interventions that have reduced the exposure to radon and plausibly also its health effects. In order to achieve this for lead, the whole distribution of blood lead levels in blood of a group of children would need to be considered, and based on a "action level" this could inform a targeted primary prevention programme.
	The lack of proven treatment modalities for raised blood levels especially for the majority of cases (very low levels of raised blood levels) that would be identified by screening	This point conflates two very different situations: (a) When pharmacological treatment is required. (b) When prevention is required. This comment only refers to (b). The majority of UK children exposed to lead would benefit from prevention of harm caused by lead exposure, and interventions to achieve this are sufficiently well described in the literature to support a targeted screening programme. For example, a programme that included several steps: - Hazard-based selection of areas for screening (contaminated areas) - Further selection (or alternative selection criterion) of children based on housing location and characteristics. This could be accompanied by home inspection and testing in a small subgroup to validate exposure definition at larger group level - Further selection of children based on specific behaviours within the household - Blood test in targeted subgroup - Isotope ratio analysis in pre-defined proportion of children who had the blood test, could indicate likely source of lead - Detailed lead analysis of deciduous tooth in pre-defined individual cases where further examination of timing of exposure (before or after birth) is required. Programmes along these lines are being developed in the United States, France, and Spain.
	There is no RCT evidence on a screening programme in	This may be true, but there is RCT evidence from the US that could be used and provides a sufficient basis for recommending the development of a UK targeted

	the UK context	screening programme. Based on that, RCT evidence from the UK could be provided as well.
Page 17-19	References	In addition to the references included in the review, the following are relevant: **The French experience on lead screening in children:** 1. 'Saturnisme. Quelles strategies de depistage chez l'enfant?' Expertise operationnelle. (Lead Poisoning. What strategies for screening in children?) InVS and Inserm (2008) (in French). Available at: http://www.invs.sante.fr/publications/2008/saturnisme_depistage/Saturnisme_depistage.pdf 2. Pichery,.C, et al (2011) Childhood lead exposure in France: benefit estimation and partial cost-benefit analysis of lead hazard control. Environmental health, 10:44. 3. Etchevers, A. et al (2011) The French survey on blood lead level in children, Saturn-Inf 2008-2009. InVS. Poster presented at ISEE, Barcelona, September 2011. 4. 'Dépistage du saturnisme chez l'enfant en France : données de surveillance 2005-2007' (Lead poisoning screening in children in France: surveillance data from 2005 to 2007). (In French and English) Bulletin Epidemiologique Hebdomadaire, INVS, 12 October 2010, no. 38-39. P379-400. 5. Bierkens, J, et. al (2012) Health impact assessment and monetary valuation of IQ loss in pre-school children due to lead exposure through locally produced food. Science of the Total Environment, 414, pp90-97. 6. Lecoffre, C, et.al. (2011) Childhood lead poisoning screening activity in France: a fifteen-year experience (1995-2009) Poster presented at ISEE, Barcelona, September 2011. 7. Etchevers, A. et.al, (2010) Imprégnation des enfants par le plomb en France en 2008-2009 (Blood lead level in children in France, 2008-2009) (in French, English abstract only) BEH Web, no. 2, 27th May 2010 p1-8. 8. Glorennec, P, et.al. (2012) French children's exposure to metals via ingestion of indoor dust, outdoor playground dust and soil: Contamination data. Environment International, 45, pp129-134. 9. Lacarce, E. et.al. (2012) Mapping soil Pb stocks and availability in mainland France combining regression trees with robust geostatistics. Geoderma, 170, pp359-368. 10. Oulhote, Y. et al (2011) Identification of sources of lead exposure in French children by lead isotope analysis: a cross sectional study. Environmental Health, 10, 75.

		11. Oulhote A, Anne Etchevers A, Le Bot B, Lucas J-P, Mandin C, Le Strat Y, Lanphear B, Glorennec P. Implications of different residential lead standards on children's blood lead levels in France: Predictions based on a national cross-sectional survey. International Journal of Hygiene and Environmental Health (2013). In press. Available at: http://www.sciencedirect.com/science/article/pii/S1438463913000345 **Examples of RCTs from the US documenting benefits of local interventions on lead:** 1. Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials. CDC November 1997. 2. Aschengrau. A et.al (1997) Residential Lead-Based-Paint Hazard Remediation and Soil Lead Abatement; The impact among Children with mildly Elevated Blood Lead levels. American Journal of Public Health, Vol 87 (10), pp1698-1702. 3. Etre, L.A. et. al. (1999) An Evaluation of the Effectiveness of Lead Paint Hazard Reduction when conducted by Homeowners and Landlords. Applied Occupational and Environmental Hygiene. Vol 14 (8), pp522-529. 4. Weitzman. M. et al. (1993) Lead-Contaminated Soil Abatement and Urban Children's Blood lead levels. JAMA, Vol 269, No. 13. 5. Farrell, K. et. al. (1998) Soil lead abatement and children's blood lead levels in an urban setting. American Journal of Public Health. Vol 88 (12), pp1837-1839. 6. Aschengrau. A et.al. (1994) The impact of soil lead abatement on urban children's blood lead levels: phase II, results from the Boston lead-in-soil demonstration project. Environmental Research, Vol 67 (2), pp125-148. **Evidence of lead effects at low concentrations relevant to UK:** 1. Lanphear BP,et al. Low-Level Environmental Lead Exposure and Children's Intellectual Function: An International Pooled Analysis. Environ Health Perspect 113:894–899 (2005). doi:10.1289/ehp.7688 available via http://dx.doi.org/ 2. Zhang N, Baker HW, Tufts M, Raymond RE, Salihu H, Elliott MR. Early Childhood Lead Exposure and Academic Achievement: Evidence From Detroit Public Schools, 2008–2010. Am J Public Health. 2013;103:e72–e77. doi:10.2105/AJPH.2012.301164. 3. Nigg J, et al.Confirmation and Extension of Association of Blood Lead with Attention-

		Deficit/Hyperactivity Disorder (ADHD) and ADHD Symptom Domains at Population-Typical Exposure Levels. J Child Psychol Psychiatry. 2010 January ; 51(1): 58–65. doi:10.1111/j.1469-7610.2009.02135.x. **Other work relevant to development of a screening programme for lead in the UK:** 1. Deshommes E, Prevost M, Levallois P, Lemieux F, Nour S. Application of lead monitoring results to predict 0-7 year old children's exposure at the tap. Water Research 4 7 (2013) 2409-2420.

The other response to this consultation was from HPA (as provided by Centre for Radiation, Chemical and Environmental Hazards, Head of Unit, Greg Hodgson).

"Further to the review outlined below, CRCE (General Toxicology and Environmental Hazards) have reviewed the proposals and we would agree with the approach proposed, no issues have been identified that we consider should be raised. "