

**FSIS 03/07     May 2007**

**SURVEY OF METALS IN WEANING FOODS AND FORMULAE FOR INFANTS-  
ADDITIONAL INFORMATION ON INORGANIC ARSENIC AND METHYL MERCURY  
LEVELS**

**Summary**

The Food Standards Agency published the results of a survey of the concentrations of 15 metals and other elements in a wide range of commercial weaning foods and formulae for infants in September 2006 (FSIS 17/06). A linked research project investigating the levels of inorganic arsenic, methyl mercury and the different chromium species present in a new set of samples of certain brands of weaning foods included in this survey has now been completed.

The assessment of infants' exposures from these elements in these foods has now been revised.

The key facts are:

- Inorganic arsenic and methyl mercury levels were measured in fresh samples of certain commercial weaning foods included in the 2006 survey<sup>1</sup>.
- Levels of total arsenic and mercury in weaning foods were similar to those measured in the 2006 survey<sup>1</sup> and were in all cases within permitted Regulatory limits<sup>2,3</sup>.
- Estimated inorganic arsenic and methyl mercury intakes have been compared with relevant safety guidelines<sup>4,5</sup> and the 2006 estimated exposure assessment has been revised<sup>1</sup>, confirming that measured levels do not give concern for the health of infants.

## **Background**

### **Brand Names**

In accordance with the Food Standards Agency policy for the release of brand names when reporting the results of food chemical surveillance, details about the individual samples are given in full in Annex 2. It should be noted that the absence of any particular brand from this survey means only that the brand was not included in the survey. No further meaning should be read into the absence of any brand from this Food Survey Information Sheet.

## **Methodology**

### **Sampling & Analysis**

Samples of commercial weaning foods were purchased from various retail outlets in York and London by Central Science Laboratories and Food Standards Agency staff, during November and December 2006. Twenty-seven samples were analysed for inorganic arsenic at Central Science Laboratories and eleven at the University of Pau (France) for methyl mercury. Although included in the original plan, levels of the different chromium species were not measured in any weaning foods samples as the method development exercise required prior to the samples being analysed, was not successful in some of the food matrices investigated. Further information is available in the contractor's final report<sup>6</sup>.

### **Quality Control**

CSL is UKAS accredited to ISO 17025 for a wide range of determinations in analytical chemistry. Limits of detection (LOD) and quality control reports (including measurement uncertainties) are included in the final report of this project<sup>6</sup>. The LODs for the speciation analysis of weaning foods are detailed in Table 1.

## **Results**

Details of individual results are detailed in Annex 1. The results were compared with data from previous studies and checked for compliance against limits laid down in the UK Arsenic in Food Regulations 1959 setting maximum levels for arsenic in foods<sup>2</sup> and Commission Regulation 1881/2006 setting maximum levels for certain contaminants in

foodstuffs<sup>3</sup>, including mercury.

For the purposes of this survey 'weaning foods' refer to processed cereal based foods and baby foods for infants and young children as defined in the Processed Cereal-based Foods and Baby Foods for Infants and Young Children (England) Regulations (S.I. 2003/3207)<sup>7</sup>.

Results for each category of foods are discussed separately below. All mean results are upper value estimates i.e. they assume metals that are not detected are present at the limit of detection. Methyl mercury results are reported as dry weight analysis but have been converted to fresh weight equivalents when used to carry out the risk assessment in table 3.

### **Arsenic**

Total arsenic concentrations found in all of the samples analysed in this survey are well below the general limit of 1 mg/kg for all foods set in the UK 1959 Arsenic in Food Regulations<sup>2</sup>.

Inorganic arsenic levels were mostly investigated in products containing fish, rice and poultry, as these products seemed to have highest levels of total arsenic<sup>9</sup>. The mean total and inorganic arsenic concentration were 0.135 and 0.082 mg/kg respectively, with products containing an average of 66% inorganic arsenic. The highest level of inorganic arsenic (0.230 mg/kg) and the highest percentage of inorganic arsenic (94%) were found in samples containing rice, whilst the lowest percentages were seen in samples containing fish (<2%). These results are comparable to those reported previously<sup>1,8</sup>.

### **Mercury**

Regulatory limits for mercury are only set for fish, in which much higher levels of mercury can accumulate than other foods. There are two limits for mercury in fish set in EC legislation<sup>3</sup>, a limit of 0.5 mg/kg that applies to most species, and a higher limit of 1 mg/kg for those species that naturally accumulate higher levels. All of the samples of weaning foods analysed for this survey are well within the lower limit.

Mercury was detected at concentrations at or above the LOD in only about one half of the eleven samples included in this project, all of these containing fish. The mean total and methyl mercury concentrations in all samples were 0.020 mg/kg and 0.010 mg/kg respectively, with products containing an average of 46% methyl mercury. The highest

level of methyl mercury (0.025mg/kg) and the highest percentage of methyl mercury (74%) were found in samples of tagliatelle with fish and fisherman's pie respectively. These results are comparable to those previously reported<sup>1,8</sup>.

### **Assessment of dietary exposures**

The assumptions behind this risk assessment were explained in detail in the recently published 2006 Food Survey Information Sheet. Total arsenic and mercury levels analysed were used to calculate dietary exposures to these elements, which were then compared to provisional tolerable intakes set by the Joint Expert Committee on Food Additives and Contaminants of the Food and Agriculture Organisation and World Health Organisation (JECFA). These guideline values only apply to inorganic arsenic and methyl mercury<sup>4,5</sup> and therefore comparisons with these standards of levels of total mercury or total arsenic are considered conservative assessments. The original risk assessments for the implications of the levels of arsenic and mercury found in weaning foods have now been revised with new data on inorganic arsenic and methyl mercury results from this report, and results can be found in table 3. Total arsenic and mercury levels found in the rest of weaning foods and all infant formulae samples analysed in the 2006 were in most cases below the limits of detection and are still included in this assessment. This new data lowers the estimated dietary exposure assessments for inorganic arsenic and methyl mercury calculated in 2006, confirming that measured levels do not give concern for the health of infants.

## **References**

1. Food Standards Agency (2006). Survey of metals in weaning foods and formulae for infants. Food Survey Information Sheet No. **17/06**.
2. The Arsenic in Food Regulations 1959 (S.I. 1959/831) as amended. The Stationary Office, London.
3. Commission Regulation (EC) 1881/2006. Available from [http://eur-lex.europa.eu/Result.do?T1=V2&T2=2006&T3=1881&RechType=RECH\\_naturel&Submit=Search](http://eur-lex.europa.eu/Result.do?T1=V2&T2=2006&T3=1881&RechType=RECH_naturel&Submit=Search)
4. WHO (1989). Toxicological Evaluations of Certain Food Additives and Contaminants; Arsenic. 33rd Report of the JECFA, WHO Food Additives Series No **24**.
5. WHO (2003). Summary and conclusions of the 61st meeting, Methylmercury. Available at: [http://www.fao.org/es/esn/jecfa/whatisnew\\_en.stm](http://www.fao.org/es/esn/jecfa/whatisnew_en.stm)
6. FD 06/08 Development of a chromium speciation methodology and FD 06/12 Survey of speciated forms of arsenic and mercury in weaning foods and formula for infants.
7. The Processed Cereal-based Foods and Baby Foods for Infants and Young Children Regulations 2003 (S.I. 2003/3207). The Stationary Office, London.
8. Food Standards Agency (2003). Multi-element survey of infant foods. Food Survey Information Sheet No. **42/03**.
9. Food Standards Agency (2004). 2000 Total Diet Study: Metals and Other Elements. Food Survey Information Sheet No. **48/04**.

## **Further Information**

Further information on this survey can be obtained from:

Ignacio Vazquez  
Room 707C  
Food Standards Agency  
Aviation House  
125 Kingsway  
London  
Tel: +44 (0) 20 7276 8726  
Fax: +44 (0)20 7276 8717  
E-mail: ignacio.vazquez@foodstandards.gsi.gov.uk

Further copies of this Information Sheet can be obtained from:

The Food Standards Agency Library  
Ground Floor  
Aviation House  
125 Kingsway  
London WC2B 6NH  
Tel: +44 (0) 20 7276 8281/8182  
Fax: +44 (0) 20 7276 8193  
E-mail: library&info@foodstandards.gsi.gov.uk

A copy of the final report of this survey has been placed in the FSA Library - address detailed above. If you wish to consult a copy please contact the library for an appointment giving at least 24 hours notice or alternatively, copies can be obtained from the library: a charge will be made to cover photocopying and postage.

**Table 1. Quantification limits adjusted for sample weight.**

Limits of detection\* ( $\mu\text{g}/\text{kg}$ )

<b>Total As (wet wt)</b>	<b>Inorganic As (wet wt)</b>	<b>Total Hg (dry wt)</b>	<b>Methylmercury (dry wt)</b>
0.5	3	5	5

\*The limit of detection (LOD) is calculated from 3 x standard deviation of reagent blank values adjusted for dilution and sample weight.

**Table 2. Mean, minimum and maximum levels of arsenic and mercury found (mg/kg).**

	<b>Mean</b>	<b>Minimum</b>	<b>Maximum</b>
Total arsenic (wet wt)	0.135	0.001	0.318
In arsenic (wet wt)	0.082	<0.003	0.230
(%) Inorganic arsenic	66	<2	94
Total mercury (dry wt)	0.020	<0.005	0.060
Methylmercury (dry wt)	0.010	<0.005	0.025
(%) Methyl mercury	47	20	74

**Table 3: Revised risk assessment for dietary exposure to inorganic arsenic and methyl mercury for all foods**

Age (months)	Food type	Mean intakes ( $\mu\text{g}/\text{kg}$ bw/day)		% Contribution to PTDI	
		Inorganic arsenic	Methyl mercury	Inorganic arsenic <sup>c</sup>	Methyl mercury <sup>d</sup>
<b>0-3<sup>a,b</sup></b>	<b>All</b>	0.11	0.03	5	11
	<b>Milk</b>	0.11	0.03	5	11
	<b>Solid</b>	n/a	n/a	n/a	n/a
<b>4-6<sup>a</sup></b>	<b>All</b>	0.45	0.04	21	17
	<b>Milk</b>	0.10	0.02	5	10
	<b>Solid</b>	0.35	0.01	16	6
<b>7-9<sup>a</sup></b>	<b>All</b>	1.07	0.06	50	25
	<b>Milk</b>	0.06	0.01	3	6
	<b>Solid</b>	1.01	0.04	47	20
<b>10-12<sup>a</sup></b>	<b>All</b>	1.53	0.07	72	31
	<b>Milk</b>	0.06	0.01	3	5
	<b>Solid</b>	1.48	0.06	69	26

<sup>a</sup> Age range in months.

<sup>b</sup> The maximum intake guideline does not apply to babies under 3 months and this value is only shown as a reference.

<sup>c</sup> Safety guideline value for comparison for inorganic arsenic of  $2.14 \mu\text{g}/\text{kg}$  bw/day.

<sup>d</sup> Safety guideline value for comparison for methyl mercury of  $0.23 \mu\text{g}/\text{kg}$  bw/day.



## Annex 1. Results for individual samples of weaning foods

Sample code	Product as described	Concentration in sample (µg/kg)					
		Total As (wet wt)	Inorganic As (wet wt)	% inorganic	Total Hg (dry wt)	Methylmercury (dry wt)	% Methylmercury
S06-031438	Pure baby rice	255	122	48	<5	<5	n/a
S06-031439	Spaghetti bolognese	n/a	n/a	n/a	<5	<5	n/a
S06-031440	Cheesy vegetable pasta	113	61	54	n/a	n/a	n/a
S06-031441	Organic pure baby rice	232	144	62	n/a	n/a	n/a
S06-031442	Pure baby rice	236	155	66	n/a	n/a	n/a
S06-031443	First organic baby rice	150	96	64	<5	<5	n/a
S06-031444	Fisherman's pie	117	<3	<2	19	14	74
S06-031445	Organic baby rice	149	76	51	n/a	n/a	n/a
S06-031446	First organic banana porridge	6	<3	<2	n/a	n/a	n/a
S06-031447	Organic rice cakes orange	151	142	94	n/a	n/a	n/a
S06-031448	Cottage pie	3	<3	<2	n/a	n/a	n/a
S06-031449	Baby whole rice meal	248	202	81	<5	<5	n/a
S06-031450	Vegetables & turkey with mash	102	69	68	n/a	n/a	n/a
S06-031451	Salmon & spinach pasta bake	165	<3	<2	26	5	20
S06-031452	Truly fruit bar - plum	11	7	69	n/a	n/a	n/a
S06-031453	Roast turkey dinner	92	46	51	n/a	n/a	n/a
S06-031454	Seaside pasta	n/a	n/a	n/a	60	16	27
S06-031455	Organic rice cakes	223	166	74	<5	<5	n/a
S06-031456	Chocolate rice sandwiches	198	147	74	n/a	n/a	n/a
S06-031457	Apricot & strawberry breakfast	n/a	n/a	n/a	<5	<5	n/a
S06-031458	Cauliflower & broccoli cheese	132	82	62	n/a	n/a	n/a
S06-031459	Organic baby rice	107	73	68	n/a	n/a	n/a
S06-031460	Organic vegetable & chicken	1	<3	<2	n/a	n/a	n/a
S06-031461	Pure rice fusilli	98	67	68	n/a	n/a	n/a
S06-031462	Organic rice porridge	193	139	72	n/a	n/a	n/a
S06-031463	First organic apple & raspberry cereal	96	71	74	n/a	n/a	n/a
S06-031464	First organic apple & banana muesli	86	50	58	n/a	n/a	n/a
S06-031465	Organic rice cakes -apple	318	230	72	n/a	n/a	n/a
S06-031982	Tagliatelle, tomato & fish bake	n/a	n/a	n/a	43	20	47
S06-031983	Tagliatelle with fish in a creamy broccoli sauce	53	<3	<2	39	25	64
S06-031984	Honey Pops	99	61	62	n/a	n/a	n/a

## Annex 2. Details for individual samples of baby foods and infant formulae collected

Sample code	Product as described	Brand	Best before	Batch code	Date purchased	Retail Outlet	Address 1	Address 2	Postcode
S06-031438	Pure baby rice	Cow & Gate	14/09/08	022750 & 022751	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031439	Spaghetti bolognese	Cow & Gate	26/12/07	009295	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031440	Cheesy vegetable pasta	Heinz	1/3/08	638BX	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031441	Organic pure baby rice	Heinz	01/01/08	627E	24/11/2006	Sainsbury's, Monks Cross	Jockey Lane	York	YO32 9LG
S06-031442	Pure baby rice	Heinz	01/04/08	640B	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031443	First organic baby rice	Organix	09/08	60920-B	24/11/2006	Sainsbury's, Monks Cross	Jockey Lane	York	YO32 9LG
S06-031444	Fisherman's pie	Heinz	07/07	K11 3225	24/11/2006	Sainsbury's, Monks Cross	Jockey Lane	York	YO32 9LG
S06-031445	Organic baby rice	Boots	11/07	51122-B	28/11/2006	Boots The Chemist	5 St. Marys Square	York	YO1 9NY
S06-031446	First organic banana porridge	Organix	30/06/07	M	23/11/2006	Asda, Monks Cross	Jockey Lane	York	YO32 9LF
S06-031447	Organic rice cakes orange	Organix	09/07	L6276-B	23/11/2006	Asda, Monks Cross	Jockey Lane	York	YO32 9LF
S06-031448	Cottage pie	Heinz Mum's Own	03/08	V42A 6270	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031449	Baby whole rice meal	Biobim	17/12/07	None	28/11/2006	Out Of This World	Unit 21, 25 George Hudson Street	York	YO1 6JL
S06-031450	Vegetables & turkey with mash	Heinz	01/12/07	623DX R14	27/11/2006	Tesco	Askham Bar, Tadcaster Road	York	YO24 1LW
S06-031451	Salmon & spinach pasta bake	Cow & Gate Organic	05/05/09	104849	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031452	Truly fruit bar - plum	Cow & Gate	25/04/07	None	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ

S06-031453	Roast turkey dinner	Cow & Gate	22/11/07	022067	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031454	Seaside pasta	Heinz Mum's Own	10/07	146B 6210	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031455	Organic rice cakes	Organix	07/07	L6285-B	27/11/2006	Tesco	Askham Bar, Tadcaster Road	York	YO24 1LW
S06-031456	Chocolate rice sandwiches	Cow & Gate	05/09/07	None	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031457	Apricot & strawberry breakfast	Heinz Organic	01/03/08	636D	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031458	Cauliflower & broccoli cheese	Heinz	01/07/08	641AX	23/11/2006	Tesco	Stirling Rd	York	YO30 4XZ
S06-031459	Organic baby rice	Hipp	01/08	L65276534 018	23/11/2006	Boots the Chemist	6 Monks Cross Retail Park	York	YO32 9LF
S06-031460	Organic vegetable & chicken	Boots	06/08	L29299 N: DE NR008717, DE NR030066, DE NR036568	23/11/2006	Boots the Chemist	6 Monks Cross Retail Park	York	YO32 9LF
S06-031461	Pure rice fusilli	Peter Rabbit Organics	03/04/08	None	23/11/2006	Boots the Chemist	6 Monks Cross Retail Park	York	YO32 9LF
S06-031462	Organic rice porridge	Holle	10/07	L 62087 K 009	28/11/2006	Tullivers	1 - 2 Colliergate	York	YO1 8BP
S06-031463	First organic apple & raspberry cereal	Organix	10/07	51021-A	28/11/2006	Out Of This World	Unit 21, 25 George Hudson Street	York	YO1 6JL
S06-031464	First organic apple & banana muesli	Organix	10/07	51020-A	24/11/2006	Sainsbury's, Monks Cross	Jockey Lane	York	YO32 9LG
S06-031465	Organic rice cakes -apple	Organix	09/07	L6298-A	23/11/2006	Asda, Monks Cross	Jockey Lane	York	YO32 9LF
S06-031982	Tagliatelle,	Hipp Growing	02/08	L30234 DE	06/12/2006	Waitrose	Canada Place	London	E14 5EW

	tomato & fish bake	Up Meal		NR001246 DE NR001120					
S06-031983	Tagliatelle with fish in a creamy broccoli sauce	Hipp	04/08	L31034 DE NR008488 DE NR001155 DE NR001174 DE NR009114	06/12/2006	Waitrose	Canada Place	London	E14 5EW