NSW HEALTH

Interim Report from Expert Panel considering the four blood dioxin levels for Sydney Harbour Fishermen and their family members reported by ABC's 7.30 Report.

23 May 2006

The NSW Minister for Health requested that the NSW Health Department convene an expert panel to consider the blood dioxin levels for four individuals reported by the 7.30 report. These four individuals included two Sydney Harbour fishermen and two immediate family members. The Terms of Reference for the panel are;

Sydney Harbour Fishermen and Family Blood Dioxin Tests Expert Panel

Terms of Reference:

1. To review the results of the four blood dioxin tests completed to date and advise on:

   a. The likely source of the dioxin and dioxin-like chemicals;

   b. The comparison between these results and Australian and international blood dioxin levels for:
      i. the general population;
      ii. high fish eating communities;
      iii. industrial workers;
      iv. accident exposed populations;

   c. The degree of clinical significance that can be attributed to these blood dioxin levels;

   d. The advice that should be provided to these fishermen/family members on the basis of these blood dioxin levels, including the necessity for repeat testing.

2. To comment on future blood dioxin test results from Sydney Harbour fishermen and their families in line with the issues raised in point 1.

The following experts are members of the expert panel;

Professor Bernard Stewart
Professor and Head
Cancer Control Program
South Eastern Sydney and Illawarra Area Health Service

A/Prof Jochen Mueller
Principal Research Fellow
National Research Centre for Environmental Toxicology
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Dr Gerard Neville
Senior Medical Officer
Environmental Health Unit
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Dr Caroline Gaus
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Interim Report

Teleconferences were held on Thursday, 27 April & 16 May 2006 to consider the matters raised in the Terms of Reference. Professor Stewart, A/Professor Mueller and Dr Neville participated in the teleconference on 27th April and all four members were involved in the teleconference on 16th May.

The summary of discussions that took place at the teleconferences follows and constitutes the interim report of the panel. As at the time of the teleconferences the panel was unable to consider point 2 of the Terms of Reference as only the four reported individual results were available to be considered and no additional test results were available.

The following table summarises the four results provided to the expert panel members for consideration and has been reproduced from the report supplied by the Australian Broadcasting Corporation entitled : Results from Investigation on polychlorinated dibenzodioxins and furans (PCDDs/PCDFs) and WHO-PCBs in human blood. Hamburg, April 11th 2006. Olaf Päpke, Nina Lohmann.

Age & Sex of individual tested	**2,3,7,8 TCDD (pg/g WHO TEQ)**	**PCDD/F (pg/g WHO TEQ)**	**PCB (pg/g WHO TEQ)**	**Total PCDD/F & PCB (pg/g WHO TEQ)**
Male, 74 yrs	44.9	66.5	47.0	113.5
Male, 40 yrs	25.1	34.2	9.1	43.2
Male, 6 yrs	8.8	14.0	1.6	15.7
Female, 45 yrs	6.2	11.4	2.7	14.1

Summary of discussion from Sydney Harbour Fisherman and Family Blood Dioxin Tests Expert Panel Teleconferences held on 27 April & 16 May, 2006

1(a) The Likely Source of the Dioxin and Dioxin-Like chemicals

Notwithstanding the limitations associated with attempting to identify PCDD/F and PCB sources from profiles that have undergone alteration due to bioaccumulation and biomagnification, on the balance of probabilities it is highly likely that 2,3,7,8 TCCD from Sydney Harbour seafood is the major contributor to the serum dioxin levels demonstrated in the 4 cases being reviewed. Evidence to support this includes that:

- the 4 cases are reported to have been very regular consumers of Sydney Harbour seafood and probably at intake levels in excess of the recommendations arising from the NSW Food Authority assessment
- the particular dioxin 2,3,7,8-TCDD, which is known to be significantly represented in samples of seafood from Sydney Harbour, was also the predominant PCDD found in the blood samples from the 4 cases

1(b) The comparison between these results and known Australian and international blood dioxin levels

General Comments

- In general, comparison of blood dioxin Toxic Equivalence (TEQ) levels of a few individuals to levels for population groups should be undertaken considering age group, gender, year of sampling, years of exposure, occupational exposure and the Toxic Equivalent Factor scheme applied to calculate the TEQ.
- The 4 results demonstrate considerable variation as would be expected with the differing gender and age groups of the 4 individuals (3 males v 1 female; 3 adults v 1 child; age range 6-74 years).
- Most data on blood TEQ levels is reported in terms of mean results (due to pooling of samples from many individuals) and it is inherently difficult to compare an individual's level with these population level measures. Information about the distribution of individual readings that make up the population needs to be considered when attempting to compare an individual's level with a mean value of a population. Should an individual reading be different from a mean value and this information not be available it doesn't necessarily imply that the level does not occur in some individuals from that population.

1(b)(i) General Population Dioxin level data

- Direct comparison of the 4 levels with the appropriate age and gender mean serum dioxin data (PCDD/F & PCB) reported in the Australian National Dioxin Program[1] shows that;
    - the total TEQ for the 74 year old male is approximately 6 times South Eastern Urban (SEU) mean level (113.5 v's 20 pg/g lipid in >60 year old males)
    - the total TEQ for the 40 year old male is approximately 4-5 times the SEU mean level (43.2 v's 9.6 pg/g lipid in 31-45 year old males)

[1] Dioxins in the Australian population: Levels in Blood, National Dioxins Program Technical Report No 9 2004.

- the total TEQ for the 45 year old female is similar compared to the SEU mean level (14.1 v's 12.5 pg/g lipid in 31- 45 year old females)
- the total TEQ for the 6 year old male is approximately 2 times the SEU mean level (15.7 v's 6.9 pg/g lipid in <16 year old males) Note: the demographics of the < 16 year old age group is unknown and may not be representative of a 6 year old child.

Based on these data it is likely that the levels for the 40 & 74 year old males are higher compared to other individuals of corresponding age and gender from the South East Urban Australian community although without an estimate in the variation of individual levels that make up the mean population estimate this can not be conclusively stated. The level for the 6 year old male is also elevated compared to the mean level reported by the Australian National Dioxin Program for males less than 16 years, but interpretation of this result is more problematic.

- There is considerable variation in mean estimates of PCDD/F and/or PCB TEQs levels among international data. In general, mean levels in many other parts of the world are approximately 2 to 10 times higher than levels determined for the general Australian population[2].
- The blood PCDD/F TEQ levels for the 40 and 74 year old male Sydney fishermen were higher at 34 and 66 pg/g respectively compared to average blood PCDD/F TEQ levels reported in some individuals from Germany (approximately 20 pg/g lipid) or Spain (approximately 10-15 pg/g lipid) but were similar compared to some reports from populations with higher general seafood consumptions, such as Finland (approximately 50 pg/g lipid).
- Levels of dioxin have decreased several fold over the last 30 years in developed countries. In the mid 90's, 286 German children aged <12 years were tested for PCDD/F with average levels of 10 pg/g lipid[3], which is similar to the PCDD/F level of the 6 year old boy at 14 pg/g lipid.
- Some recent U.S. data[4] is particularly informative as it reports individual level data for 1081 individuals and provides an indication of the variation in PCDD/F & PCB TEQ levels both as a whole group and when stratified by age and gender. The raw data demonstrated that there is a range of values of 8 – 208 pg/g lipid for participants, with an inter-percentile range of 17.7 (25%) to 35.0 pg/g (75%). The 95% percentile for all participants was 69.3 pg/g lipid. In general, the estimated mean levels of various age and gender groups is higher than that of the general population in Australia with the overall mean being estimated at 30.4 pg/g or approximately 3 times the Australian estimated mean level.
    - The PCDD/F & PCB TEQ levels reported for the 40 & 74 year old fishermen were above the US comparable 95th percentile value reported for their age/gender groups but below the maximum values recorded
    - The 45 year old female PCDD/F & PCB TEQ level was below the 25th percentile for her comparable age/gender group
    - There were no appropriate age group levels reported that could be used in a comparison for the 6 year old. (no individuals under 20 years of age participated in the US sample)

[2] Figures 3-5 & 6: Human Health Risk Assessment of Dioxins in Australia, National Dioxins Program Technical Report No 12, 2004

[3] Wuthe et al . First data on background levels of non-ortho and mono-ortho PCBs in blood of residents from Southern Germany. Chemosphere 32:567-574

[4] Evaluation of PCDD/F and Dioxin-like PCB Serum Concentration Data from the 2001-2002 National Health and Nutrition Examination Survey of United States Citizens . LL Ferriby, JJ Knutsen, M Harris et al (in press) note: this research was sponsored by Dow Chemicals.

1(b)(ii) High Fish Eating / Fishing Communities

- There are no relevant data available from Australian fishers for direct comparison.
- TEQ levels in communities with high fish consumption are typically elevated compared to background populations. This is particularly the case in highly contaminated areas, such as the Baltic Sea. Levels of PCDD/F TEQ in adult males have been reported in the order of 70-200 pg/g lipid in high Baltic seafood consumers, and 30-140 pg/g lipid in low to moderate Baltic seafood consumers[5]. Average PCDD/F TEQ levels in Inuits from Northern Quebec have been reported at 19 pg/g lipid[6] (TEQ incl. PCBs = 42.3 pg/g lipid). A study of 40 residents from a community along the St Laurence River in Quebec demonstrated a mean Dioxin Like Compound (DLC) serum level of 102 TEQ (range 37-287). The PCDD/F TEQ levels of the two adult male Sydney fishermen are similar to the levels reported above, whereas the levels for the 45 yo female and 6 yo child are lower.

1(b)(iii & iv) Industrial workers & accident exposed populations

- In general, levels among people exposed via industrial & accidental related scenarios can be substantially higher than those among general populations or communities eating fish having higher 2,3,7,8 TCDD levels.
- The WHO IARC Monograph Volume 69, *Polychlorinated Dibenzo*-para-*dioxins and Polychlorinated Dibenzofurans* 1997 reports the following industrial worker & accident exposed population levels;
  - 9 New Zealand 2,4,5-T herbicide applicator workers have reported back calculated 2,3,7,8 TCCD levels of approximately 300 pg/g lipid.
  - The largest Vietnam Veteran study involving veterans spraying “agent orange” was conducted among veterans from the Ranch Hand Operation and in 1987 measured serum 2,3,7,8 TCDD levels for 888 individuals. A median level of 12.4 pg/g lipid was reported with a range in levels of 0.0 to 617.7 pg/g lipid (back calculated median level ~ 50 pg/g).
  - The most extensive data available for industrial workers is from the NIOSH study that included approximately 253 workers with average back calculated serum 2,3,7,8 TCDD level of 2000 pg/g lipid.
  - Residents of Seveso in Italy were contaminated with 2,3,7,8 TCDD as a result of a TCP production reactor accident in 1976. The area affected by the chemical dispersal was divided into Zone A (~750 individuals, soil levels ≤ 580 µg/m^2), B (~5000 individuals, soil levels ≤ 50 µg/m^2) and R (~30,000 individuals, soil levels ~5 µg/m^2) depending on TCDD contamination in soil. All inhabitants from these zones were considered exposed. 2,3,7,8-TCDD levels in blood from 19 Seveso residents collected in the year of exposure (1976) have been reported in the range of 828 - 56000 pg/g lipid (Zone A). Another study of 6 individuals from Zone A reported a mean level of 334 pg/g lipid when back-extrapolation to year of exposure was undertaken based upon blood levels measured in 1992/3. This study also reported a back-extrapolated mean level of 111 pg/g for a group of 52 individuals from Zone B.

- Comparing 2,3,7,8 TCDD TEQ levels among the 4 Sydney fishermen and family to the above 2,3,7,8 TCDD levels the following can be said;
  - The 2,3,7,8 TCDD levels in the 4 people tested are far lower than those recorded in zone A of the Seveso accident.

[5] Assmuth, Jalonen 2005
[6] Van Oostdam et al., 1999

- The 2.3,7,8 TCDD levels in the 2 males are lower than the average levels reported for industrial workers and far below the average level for the largest study (NIOSH study)
- The 2,3,7,8 TCDD levels for the 2 males are below or within the lower mean exposure ranges for herbicide applicators at time of exposure and within the mean exposure ranges estimated for Operation Ranch Hand Vietnam Veterans.
- The levels in the female and child are not comparable to occupational or veterans cohorts.

1(c) Clinical Significance that can be attributed to 4 individual blood levels recorded

- Technical Report No.12 of the National Dioxin Program has comprehensively summarised the epidemiological evidence relating to human illness and dioxin exposure. The report specifically states in reference to cancer that; “It is difficult to find epidemiological data that have sufficient dose-response information to provide reliable risk estimates in exposed human populations.”

- The International Agency for Research on Cancer has classified 2,3,7,8 TCDD as a group 1 carcinogen.

- 2,3,7,8 TCDD is not a genotoxic carcinogen. There is a consequent implication of a threshold below which health effects are not thought to occur but evidence is insufficient to specify a threshold level in numerical terms.

- Qualitative assessment of risk using population exposure-level data can infer differences in risk. For populations with higher than background exposure levels it is reasonable to assume that the community as a whole may be at some increased health risk but such extrapolation cannot readily be related to any postulated threshold.

- Given current scientific knowledge, individual serum dioxin levels should be considered as an indicator of exposure rather than as a clinical indicator to assess an individual’s health risk or need for healthcare.

- At the levels found in the four individuals, it is not possible to extrapolate population health effects to individual levels to infer adverse health effects.

- At the levels observed among the 4 people tested it cannot be asserted that they will experience adverse health effects.

- Current inability to relate serum dioxin levels to individual prognosis might be further illustrated by the consideration that it is impossible to assert that either of the adult males in the present group of 4 persons under consideration is at greater risk of dioxin-related disease than the adult female, or to assert that the adult female is free of any such risk based upon her lower serum level.

- Some health effects such as chloracne have been definitely attributed to dioxin exposure. However these have almost exclusively occurred at high levels of exposure and not in all individuals known to have been exposed. It would not be expected that these effects would be reported in the four cases reviewed.

1(d) Advice to 4 individuals already tested including repeat testing

- It would be expected that the levels of dioxin in the 4 people tested will decrease with time provided that they adhere to the current dietary guidance recommended by NSW Health in regard to the consumption of Sydney Harbour seafood.

- The repeating of serum dioxin testing or other clinical examination of any of the 4 individuals tested is not justified to determine risk of disease or to monitor their health. The basis for this includes:
    - that repeat testing will not provide additional information to better inform them of their level of risk.
    - the lack of a typical clinical syndrome related to dioxin exposure.
    - the lack of an appropriate screening test with an ability to influence prognosis.

- However, if such repeat testing of the 4 individuals is undertaken, it is recommended strongly that the people be clearly counselled in advance that the tests are only relevant to identifying exposure and can not be used in any meaningful way to determine risks to health now or at some future time.

- Naturally, if any of the cases have any symptoms that are of concern, they should consult their usual medical practitioner for assessment in line with normal medical practice.