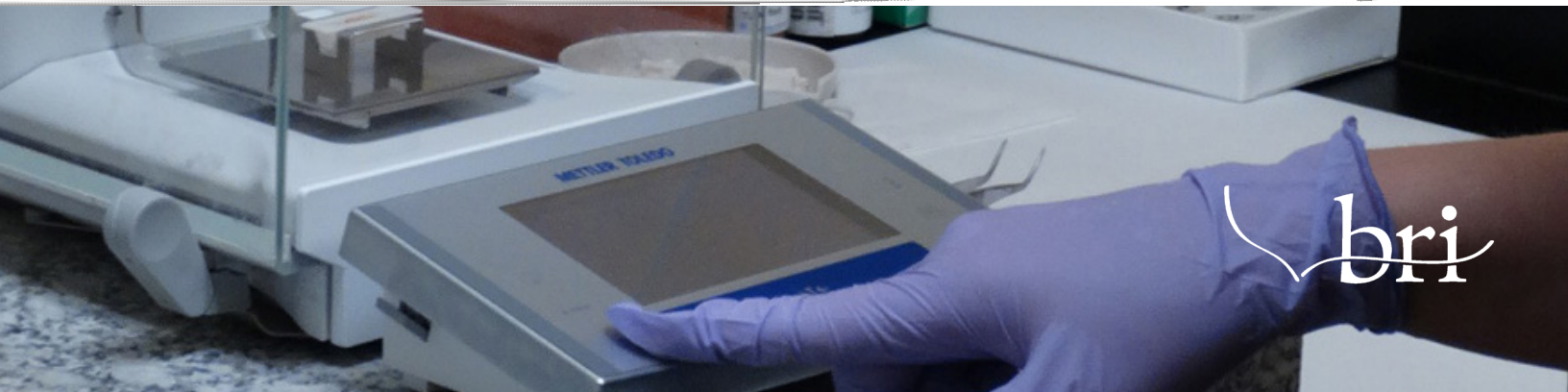
Human Hair
Field Sampling Methods



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HUMAN HAIR SAMPLING METHODS
Protocol for Sampling Human Hair for Mercury

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Biodiversity Research Institute (BRI) is a 501(c)3 nonprofit organization located in Portland, Maine, USA. Founded in 1998, BRI is dedicated toward supporting global health through collaborative ecological research, assessment of ecosystem health, improving environmental awareness, and informing science-based decision making. The following sampling protocol is based on over one thousand fur/hair samples analyzed since 2008.

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1.0 General Overview

Mercury is a pollutant of global importance. It is released into the environment via numerous, predominantly anthropogenic activities and can be transported across broad spatial scales. Mercury accumulates in top-level predators in both marine and freshwater ecosystems. High concentrations of methylmercury can adversely impact fish and wildlife and is detrimental to human health.

Humans become exposed to mercury and methylmercury primarily through the consumption of fish. Many national and international health organizations recognize both the benefits and the risks associated with a diet high in fish and international guidelines for the maximum amount of mercury in fish have been established. However, adhering to and enforcing these guidelines is difficult, particularly in developing and transition countries where data on mercury in fish are rare or unknown.

1.1 Protocol Overview

This sampling protocol is designed as a guide for the collection, processing, and shipping of human hair samples for the measurement of total mercury. Use of this methodology by all collaborators will ensure consistency in sampling in all locations and that data generated will be scientifically sound. Proper sample collection ensures suitability of the results for comparison with other global monitoring results.

Hair samples will be shipped to Biodiversity Research Institute (BRI) and analyzed in BRI's Wildlife Mercury Laboratory in Portland, Maine, USA. BRI's laboratory methods follow U.S. Environmental Protection Agency (EPA) standards. BRI will provide results, as well as a guide for their interpretation, (see Annex D) the collaborating third party (e.g., Ministry of Health) for distribution to all relevant participants and further use in the project.

Methods for sample collection, participant questionnaires, sample analysis, and data interpretation rely on previous work conducted by BRI. All participant forms and questionnaires have previously been approved by an Institutional Review Board (IRB) for Human Subjects through the University of Southern Maine (USM), Portland, Maine, USA, and incorporate techniques and approaches for engaging with participants used by national and international agencies. Information on mercury concentrations in individual hair samples will be returned to relevant participants. Along with this, participants will be provided, in an accessible manner, detailed information to assist with interpretation of mercury concentrations in hair. It is also important to obtain all necessary permissions for the collection of human hair sampling in this pilot effort prior to the sampling effort.

2.0 Human Hair Sample Methodology

2.1 Sampling Overview

Prior to sample collection, each participant will be required to complete a standardized questionnaire to record information relevant to the sampling program. Information recorded as part of the questionnaire will be attributed to an anonymous participant or used in an aggregated manner. A code number referred to as a "sample label" will link the participants, their questionnaire and the sample taken to assist with contextual feedback to the participants on their recorded personal mercury levels and, if necessary, measures to reduce mercury exposure.

Collected samples will provide important information in developing awareness about potential risks associated with mercury pollution and can contribute to the global mercury monitoring efforts of the UNEP Global Mercury Partnership. It is important to make sure all samples are collected in a safe and clean manner with particular attention to steps that will prevent any potential contamination of the sample from other personnel or sampling equipment. The target sample volume is one bundle of hair sample from each relevant participant.

2.2 Collection of Data

Target sample size is generally 30-35 samples per sampling location. The right of confidentiality is granted to each individual participant unless he/she voluntarily waives it through written communication. For the purposes of this project, data will be presented in an aggregated analysis that does not enable identification of individual participants. Data will not be stored linking identifying information with results. Once individual participant sample data are generated and communicated back to the participant, that individual has the right to voluntarily release that information. This is consistent with an individual's right to know about their personal health information and disclose it if they wish to do so.

2.3 Mercury Measurements

Total mercury in hair will be analyzed at BRI's Wildlife Mercury Research Laboratory following U.S. Environmental Protection Agency method 7473 by gold-amalgamation atomic absorption spectroscopy following thermal desorption of the sample using a Nippon MA-3000. A blank and two calibration standards (DOLT-5 and CE-464) are used in each of the two detector cells. Instrument responses are evaluated immediately following calibration, and thereafter, following every 10 samples and at the end of each analytical run by running two certified reference materials and a check blank. Instrument detection limit is approximately 0.050 ng. An acetone wash of the hair samples followed by a rinse with milli-Q water can be used to remove external contamination, such as hair products. BRI has analyzed over one thousand fur/hair samples since 2008 and has published the results in scientific, peer-reviewed papers and BRI reports (e.g., to the Mexican government; Rinker et al. 2013).

2.4 Assessment

The interpretation of sample results will be based on the comparison of data generated from the field samples with the EPA's reference dose for mercury in human hair (EPA 2001). Mercury concentrations above 1.0 ppm in hair have been related to neurological impairments in adults (Yokoo et al. 2003; Karagas et al. 2012). These data will help determine contaminant

concentrations in participating human subjects and potentially identify regions that require more intensive investigations. Because there is not a parallel analyses of fish mercury concentrations in this survey, only categorical inferences will be made when comparing hair mercury concentrations and the foods that they eat.

The combination of all the data generated in this project will contribute to developing data and information in participating countries, elevating public knowledge about the threats of global mercury pollution, and contributing to knowledge of mercury levels internationally.

2.5 Equipment Needed for Sampling

Materials for hair sample collection are listed below.

Item	Purpose
Stainless-steel scissors	Cutting hair
Self-adhesive label or tape that can be written on	Labelling and securing the hair sample
Small plastic zip lock style bags	Storing the hair sample after collection
Hair sample log	To be completed after collection of samples to serve as an inventory for the BRI Lab
Hair Sampling Consent Form and Questionnaire	To be filled out for each individual sample collected
Permanent marker & ballpoint pen	For labeling sample bags and data sheets
Nitrile examination gloves	To be worn during sample handling. Wear a fresh pair of gloves for each sample when possible.
Alcohol wipes	For cleaning scissors before and after each sample is collected.

3.0 Hair Sampling Methods

Standard protocols for the collection of human hair samples are below. It is important that all steps are followed carefully to ensure the data collected is of the highest quality.

For each sample, a consent form must be signed (Annex A) and the questionnaire provided in Annex B must be completed by the sample subject before taking the samples.

- Ensure the Consent Form is signed (see Annex A).
- Complete the provided Questionnaire (see Annex B).
- The collector should wear a new pair of nitrile examination gloves when collecting and handling each sample.
- Use an alcohol wipe to clean the cutting surfaces of the stainless-steel scissors.
- Grasp a bundle of hair approximately the diameter of a pencil eraser (approximately 30 strands of hair) in the occipital region of the head (i.e., near the nape; Figure 1). An adjacent area may be used if hair length is limited.
- Cut the bundle of hair as close to the scalp as possible.

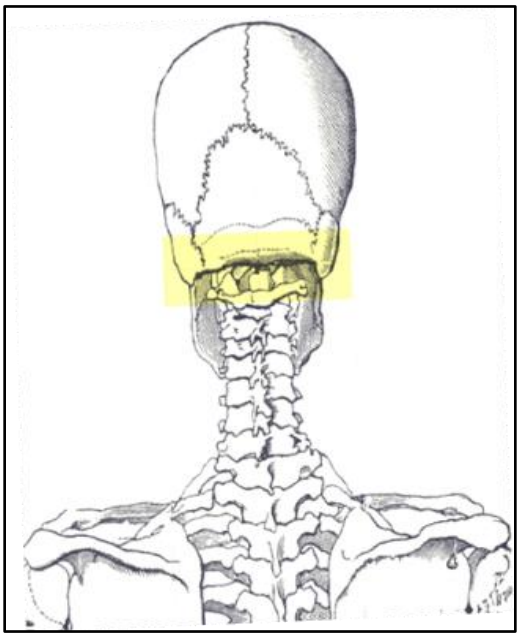

Figure 1. Occipital Region: Target sample area

- Secure the hair sample with a small self-adhesive label using an arrow to indicate the direction of the scalp. See Figure 2 below.

Figure 2: Securing the sample

- Please leave 3-4 cm of hair exposed from the label. The hair closest to the scalp will be analyzed for mercury. If it is not possible to leave 3-4 cm of hair, leave as much hair as possible.
- If hair is shorter than 2 cm, please do not use a label. Just place the short hair in the zip lock bag.
- Place the hair sample in a small zip lock bag.
- Identify the sample by placing a unique sample label on the bag. DO NOT write subject name or any other personal identifiers on the bag (Figure 3).

Figure 3: Labeled sample in zip lock style plastic reclosable bag.

3.1 Sample Labeling Format

The pilot project will be analyzing human hair samples from several countries. It is important that all sample labels are written legibly and clearly. In addition, it is imperative that all samples have a unique sample label ID. Each country is assigned a unique three-letter code, following the country codes developed by the International Organization for Standardization (ISO). The full list of country codes is available online at:

https://www.iso.org/obp/ui/#search/code/

When labeling each human hair sample, please use the following convention:

Record your 3-letter country code, a number corresponding to the sampling site (as there could be multiple sites in one country, label sample 1, 2, or 3) followed by the word HAIR, and the two-digit, sequential number of the sample (from 01 to 35). Below the label, please record the date the sample was collected, using the format of DD-MM-YYYY. As an example, the first human hair sample collected from the first community in Vanuatu (VUT) on May 4, 2021, would be labeled as follows:

VUT-1-HAIR-01
04-MAY-2021

NOTE: The Sample Label will also serve as the participant identification.

3.2 Sample Data Sheet

Following sample collection, a Hair Sample Data Sheet (Annex C) needs to be completed and included with the shipment of hair to BRI. This data sheet will provide BRI with an accurate inventory of samples included in the shipment. Please retain an electronic copy for your records in case it gets lost in transit.

3.3 Questionnaire Form for Donors

Each sample donor will have to fill out a questionnaire (Annex B). This can be done as an interview of the donor by local staff or by having the donor fill out the questionnaire (in this case the donor needs to understand English, or the questionnaire needs to be translated into a local language). The questionnaires (which are to be recorded electronically or as hardcopy then scanned) must be sent to BRI (mark.burton@briloon.org) with the third party collaborator keeping a back-up copy, OR the completed hard copy questionnaires can be re-written to an electronic format. Please use the Word template for that purpose.

3.4 Participant Information

Prior to shipping human hair samples to BRI, sample donors' names and their corresponding sample labels should be recorded and securely retained. This ensures that results can be sent back to each individual participant upon completion of analysis. Mercury values will be listed with their corresponding sample label and submitted at the request of the third party collaborator.

3.5 Hair Sample Shipment

All samples will be shipped directly to the BRI's Wildlife Mercury Lab using FedEx or DHL. Human hair samples and the Sample Data Sheet should be shipped to BRI as a package. The third party collaborator conducting sampling must retain an electronic copy of all documents by scanning hard copies and saving them or directly entering data in electronic form during the sampling activity. Hair samples are to be stored at ambient temperature until shipment.

1. Place the human hair samples and Sample Data Sheet in a DHL or shipping envelope obtained from the shipping provider. Please try to obtain a padded envelope to give the hair samples extra protection during shipment. (Third party collaborators will also need to email a copy of the same Data Sheet to BRI; Figure 4).

Figure 4: Example of a DHL envelope

2. Email the electronic versions of completed hair Questionnaires and Consent Forms to BRI (mark.burton@briloon.org).

3. Email a copy of your Sample Data Sheet to BRI (mark.burton@briloon.org) and await further instructions about shipping. Once BRI receives this information and you are ready to ship, BRI will

arrange the shipment online with DHL. You will receive instructions from DHL via email to complete the shipments. If DHL is not in your area, BRI will arrange shipping through another courier, such as UPS or FedEx. BRI will pay for the shipping costs and track the shipment.

4.0 Literature Cited

Karagas, M., Choi, A.L., Oken, E., Horvart, M., Schoeny, R., Kamai, E., Grandjean, P., and Korrick, S. (2012) Evidence on the human health effects of low level methylmercury exposure. Environmental Health Perspectives, 120: 799-806.

Rinker, H.B., Lane, O., Meattey, D., and Regan, K. (2013) Limpia Guerrero 2013: A pilot study of environmental contaminants in Mexico. BRI report 2013-38. 55pgs.

United States Environmental Protection Agency, (2001) Water quality criterion for the protection of human health: methylmercury. US EPA Office of Science and Technology, Office of Water. Report EPA-823-R-01-001. 303pgs.

Yokoo, E.M., Valente, J.G., Grattan, L., Schmidt, S.L., Platt, I. and Silbergeld E.K. (2003) Low level methylmercury exposure affects neuropsychological function in adults. Environmental Health 2(1):8.

Annex A: Consent Form

Sample Label #_____

Consent Form

Survey Overview

The primary goal of the pilot project will be to generate new data and raise awareness about global mercury pollution around the world. The mercury monitoring information generated will include sampling results from biomonitoring (via hair sampling) of specific communities, to improve knowledge about their mercury while also elevating public knowledge about the threats of global mercury pollution.

Hair samples will be collected and examined by an internationally certified laboratory to indicate the level of mercury detected in the individuals sampled. Results will be anonymous and included in outreach and education about mercury in the environment. **Names of participants in this analysis will never be used publicly unless agreed to by the participants.**

Voluntary Participation

Individuals are free to decline participation in this project or withdraw from participation at any point. In addition, participants in this study do not forfeit any legal rights by signing this informed consent form.

Consent

I have read this consent document and understand the nature of this assessment and procedures for hair sampling. I understand that my participation in this study is voluntary and agree to allow the analysis of my hair sample to be included in this project. I agree to complete this *Mercury Hair Sampling Survey* and, if asked, agree to a follow-up interview to discuss my results.

_____ _____ Participant's Name

(Print) Date

_____

Signature

Confidentiality

The results from this test will be compiled and included as data in a report on mercury exposure and contamination in humans. ***The right of confidentiality is granted to each individual participant unless she voluntarily waives it.***

I, _____(print), voluntarily waive my right to keep the results of this test confidential.

Signed: _____Date: _____

I understand that by waiving my confidentiality, I am allowing the results of my sample to be discussed in publications, press, or other educational means, **but that my name will never be used unless I agree to it.**

Annex B: Questionnaire Form: Sampling Hair for Mercury

Sample label: _____

The results from this test will be compiled and included as data in a press material fact sheet on mercury exposure and contamination in humans, for raising awareness of mercury body burden in the people preparing the initiative of a global legally binding instrument on mercury. **The right of confidentiality is granted to each individual participant unless she/he voluntarily waives it.**

Consent: Each participant is providing hair samples and responses to the questionnaire at their free will. The participant can consent verbally to the individual collecting the sample and questionnaire response.

Privacy & Anonymous Samples: Each participant will receive a sample label, to be utilized in collecting results and to conceal the names of participants.

1. Date:	
2. Participant ID Code= Sample Label:	
3. Country:	
4. Gender:	Female ( ) Male ( )
5. Year you were born:	
6. Do you want to be contacted by email to know your personal mercury burden? Email Address:	Yes ( ) No ( ) Post address in case that e-mail address is not available:
7. Do you eat fish?	Yes ( ) No ( )
8. If you eat fish, what is your favorite or top two favorite kind of fish to eat?	
9. Do you eat _____ (first sampled fish species name), and if so how often?	Yes ( ) No ( ) ≤ 1 ( ) 2-3 ( ) 4-5 ( ) 6-7 ( ) ≥8 ( )

10. Do you eat _____ (second sampled fish species name), and if so, how often in a week?	Yes ( ) No ( ) ≤ 1 ( ) 2-3 ( ) 4-5 ( ) 6-7 ( ) ≥8 ( )
11. Approximately how many meals of fish are you eating every week?	No fish ( ) ≤ 1 ( ) 2-3 ( ) 4-5 ( ) 6-7 ( ) ≥8 ( )
12. Have you eaten fish during last 14 days? How many fish meals approximately? What species of fish?	No fish ( ) ≤ 1 ( ) 2-3 ( ) 4-5 ( ) 6-7 ( ) ≥8 ( ) …….. ……..
13. Do you avoid or limit your fish consumption because of concerns for mercury?	Yes ( ) No ( )
14. Do you use skin-lightening creams	Yes ( ) No ( )
15. What is your occupation?	
Note: There are more than one type of mercury, organic and inorganic. Sampling hair for mercury illustrate organic mercury in the body. However, you may be exposed to inorganic mercury by sources like dental amalgam filling ("silver fillings"), skin cream or by occupation.	
16. Are you aware of the different routes of your body's mercury exposures?	Yes ( ) No ( ) In case that yes, please specify: In case you are exposed because of your occupation, specify your working place? (e.g., chlor-alkali plant, in dentistry, waste incinerator, on landfill etc.)
17. Do you live or work nearby any facility that can be source of mercury pollution?	Yes ( ) No ( ) Specify: ……
We would like to keep your results and the information you provided above in our CONFIDENTIAL research database.	

Annex C: Hair Sample Data Sheet

Below is an example of the data sheet to be used for the human hair sampling. The data sheet has space for up to 35 samples. This completed form should be included in the package containing the human hair samples to BRI and must also be emailed to BRI (mark.burton@briloon.org). Note: for each sample listed below, a completed questionnaire form (see Annex B) must be completed and sent to BRI. Any questions about the information requested on the sample data sheet should be directed to BRI (mark.burton@briloon.org).

MERCURY HAIR MONITORING		
Contact name:		
Date	Sample label	Location of Residence

Annex D: Participant Report Back Form

Below is an example of how the results will be reported back to each participant:

DATE

Mercury in Hair Survey Results

Dear _____,

Thank you for participating in the pilot project monitoring mercury in hair in XXXX country. This project is focused on raising awareness about mercury levels in your community as well as across the globe.

In total we had XXXX participants from YYYY countries contribute to this project.

All hair samples collected were examined by a certified laboratory at Biodiversity Research Institute's Wildlife Mercury Research Laboratory Total mercury in hair will be analyzed following EPA method 7473 by gold-amalgamation atomic absorption spectroscopy following thermal desorption of the sample using a Nippon MA-3000. A blank and two calibration standards (DOLT-5 and CE-464) are used in each of the two detector cells. Instrument responses are evaluated immediately following calibration, and thereafter, following every 10 samples and at the end of each analytical run by running two certified reference materials and a check blank. Instrument detection limit is approximately 0.050 ng.

Mercury levels in human hair ranged from XXXX parts per million (ppm) to YYYYYY ppm with an average of ZZZZZZ ppm.

Your result: _____ Mercury ppm

What we estimate in the hair sample is the body burden of methylmercury (organic mercury).

What Does this Mean?

In 1990, the World Health Organization (WHO) decided that a level of total mercury in hair of less than 10,000 micrograms per kilogram (noted as µg/kg) of hair is unlikely to be associated with adverse health effects. Levels of mercury above this limit in a pregnant woman correspond to a risk of harm to the nervous system of the fetus. In 2000, the United States National Research Council established a "reference dose" of 1000 µg /kg (1 ppm) and noted that this level should not be exceeded in women of child-bearing age (EPA 2001).

What can be done to lower your mercury level? Is there treatment available?

BRI is not able to give individual medical advice. If you are concerned about the mercury levels in your body, you should talk to your healthcare professional. Research on the benefits and harms of seafood highlights the importance of choosing species low in mercury and high in omega-3 polyunsaturated acids (see the enclosed additional information related to mercury and frequently asked questions).

Fish Advisories

The Environmental Protection Agency and the Food and Drug Administration of the United States issued a joint draft advisory in 2014 warning pregnant women, women of child-bearing age and children to avoid shark, swordfish, king mackerel, and tilefish from the Gulf of Mexico and to limit consumption of certain other fish, especially albacore tuna and fresh tuna.[1]

What will BRI do with this data?

BRI will analyze all the data collected as part of this project to release a report on mercury levels in human hair. The project is expected to contribute to the development of data and information in countries across the globe, and therefore improve the knowledge on human exposure to mercury. However, please be assured that your results are confidential.

If you have any questions regarding your results or the process we used to obtain them, please do not hesitate to contact us.

Thank you again for your participation in this study.

Please find below information about mercury sampling in human hair.

Sincerely,

NAME of LOCAL contact and BRI contact

[1]http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories/index.cfm

Mercury Information and Frequently Asked Questions regarding hair sampling

Please see fact sheet N°361 from the World Health Organization (WHO) entitled "Mercury and health," which notes these key facts:

- Mercury is a naturally occurring element that is found in air, water, and soil.
- Exposure to mercury – even small amounts – may cause serious health problems and is a threat to the development of the child *in utero* and early in life.
- Mercury may have toxic effects on the nervous, digestive, and immune systems, and on lungs, kidneys, skin and eyes.
- Mercury is considered by WHO as one of the top ten chemicals or groups of chemicals of major public health concern.
- People are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain the compound.

http://www.who.int/mediacentre/factsheets/fs361/en/

THE HAIR TESTING

Q° 1. Why was hair sampling chosen as the method for investigating mercury levels?

Hair sampling was chosen because it is not an invasive technique and can provide information about exposure to mercury over time, making it preferable to blood analysis.

Q° 2. Is hair sampling the only method to measure mercury levels?

No. Other methods to monitor mercury levels exist, such as analysis of blood, urine and saliva. Hair is particularly relevant in assessing exposure to methylmercury in the diet.

THE RESULTS OF THE TEST

Q° 3. What is recommended as a safe level of mercury in a hair sample?

In 1990, the World Health Organization (WHO) decided that a level of total mercury in hair of less than 10,000 micrograms per kilogram (noted as µg/kg) of hair is unlikely to be associated with adverse health effects. Levels of mercury above this limit in a pregnant woman correspond to a risk of harm to the nervous system of the fetus. In 2000, the US National Research Council established a "reference dose" of 1000 µg /kg and noted that this level should not be exceeded in women of child-bearing age (EPA 2001).

Q° 4. If my level is above this limit, does the result of the hair test tell me anything about my state of health?

No. Your result indicates the concentration of total mercury in your hair and your exposure to mercury during the past few months, depending on the length of your hair sent to the laboratory (as the average rate of growth of hair is approximately 1 cm per month). It does not mean that the mercury to which you have been exposed has necessarily caused a negative impact on your body or state of health. However, if your hair level is above the WHO limit, we would advise you to look for the source of exposure and reduce it if possible. For example, if you are regularly eating fish that are likely to be contaminated with high levels of mercury, you may want to switch to fish with lower mercury levels (see below).

SOURCES OF MERCURY EXPOSURE

Q° 5. What are the current sources of mercury exposure?

The most common route of exposure to mercury (methylmercury) is through the diet, especially fish. Some people may also be exposed to mercury vapor (elemental mercury) due to participation in certain gold mining activities. Exposure can also occur in other occupational settings or from mercury-containing wastes. However, air and water, depending on local mercury pollution load, can contribute significantly to the daily intake of total mercury.

Use of skin-lightening creams and soaps, and the presence of mercury in the home (e.g., broken thermometers) or in the working environment can result in substantial elevations of mercury exposure.

Q° 6. How can I reduce my exposure to mercury?

Among the various forms of mercury, methylmercury is the most toxic form. The general population is primarily exposed to methylmercury through the diet, with fish and fish products being the dominant source of methylmercury. Intakes of methylmercury from fish are dependent on fish consumption habits and the concentration of methylmercury in the fish consumed.

Large predatory fish, and mammals like seals and whales contain the highest average concentrations of methylmercury (see question 9).

RECOMMENDATIONS

Q° 7. Should I continue breastfeeding even if my result showed I had been exposed to mercury?

Yes. Although mercury can pass into breast milk, the amount of mercury in breast milk is not a problem under normal circumstances and health experts advise all breastfeeding women to continue to breastfeed for six months or more. The mother's diet appears to be the main source of mercury in breast milk. The primary danger from methylmercury in fish is to the developing nervous system of the unborn child, and mercury levels in breastfed babies usually decline significantly after 2-3 months.

Q° 8. Should I have my dental amalgams removed if I am pregnant or breastfeeding?

No. Women should avoid having dental amalgams removed while pregnant and breastfeeding. Replacement of amalgam fillings should also be postponed. Both of these interventions can generate an increase of mercury vapor, which can be transmitted from mother to developing fetus. If an intervention is necessary, the dentist should then take all precautions in order to minimize mercury vapor inhalation.

Q° 9. What is the kind and quantity of fish that I can eat safely?

The European Commission, based on a recommendation from the European Food Safety Authority (EFSA), advises:

> *"Women who might become pregnant, women who are pregnant or women who are breastfeeding should not eat more than one small portion (<100g) per week of large predatory fish, such as swordfish, shark, marlin and pike. If they eat this portion, they should not eat any other fish during this period. Also, they should not eat tuna more than twice per week. The advice also applies to young children."*

At national levels in the European Union, some Food Safety Authorities have issued recommendations that are more or less stringent than those of EFSA. They are adapted to the situation in each country.

Please consult your national food safety authority to know if there is any recommendation on fish consumption in your country. For the fish types mentioned above, we recommend that women who are pregnant or thinking of becoming pregnant, or breastfeeding follow the most stringent recommendation.

Q° 10. If I am pregnant or breastfeeding, should I stop eating fish?

No. Pregnant women should continue to eat fish at least twice a week, varying the types of fish eaten and favouring less contaminated types of fish. Seafood is an important source of indispensable nutrients, and essential fatty acids are necessary for optimal neurological development of the fetus and young children.

Q° 11. Are mercury thermometers at home a risk?

Yes. These types of thermometers contain elementary mercury which, if the thermometer breaks, can vaporize at the temperature of the surrounding air, and be inhaled and pass into the blood stream. Elemental mercury can also pass into the blood stream following skin contact. Very high exposures to mercury vapor can cause acute poisoning (see question 12).

Note, if a thermometer breaks in a child's mouth it is not an acute danger as the elemental mercury is absorbed very poorly from the gastrointestinal tract (digestive system).

There are safe alternatives to mercury thermometers (e.g., digital thermometers), and in some countries, the sale of mercury thermometers has already been banned. We urge you to replace your mercury

thermometer before it breaks, and to give the mercury thermometer to a pharmacy or the appropriate hazardous waste facility near your home.

Q° 12. What should I do and not do with the mercury spill from a broken thermometer?

Immediately after the spill, all people, especially children, should be kept away from the spill area. To minimize mercury vapors, heaters and air conditioners should be turned off, and the area should be ventilated by opening windows as long as possible.

First of all, do not touch mercury with bare hands - you should wear gloves. Never collect mercury spills with a vacuum cleaner. All mercury beads should be collected with a carton and put in a sealed plastic bag. Once all beads of mercury are collected, put the material used for clean up into the bag, close it and label it as mercury waste before taking it to the pharmacy or to the appropriate hazardous waste facility near your home. On a carpet or a rug, the mercury-contaminated section should be cut out. In a sink of water, mercury will sink to the bottom and mercury should be recovered with eyedropper and placed in a bag.

Never collect mercury spills with a vacuum cleaner. The heat of the vacuum will vaporize the mercury into the air and increase exposure. If you have done so, take the vacuum bag in collection facilities for hazardous waste. Do not touch the mercury.