

Attachment 15: Biomonitoring Table –Testing Times and Analytes*

	Dad	Mom		Baby		
	<i>enrollment</i>	<i>enrollment</i>	<i>3rd trimester or delivery</i>	<i>Delivery</i>	<i>2-6 mos</i>	<i>12 mos</i>
	<i>ml</i>	<i>ml</i>	<i>ml</i>	<i>ml</i>	<i>ml</i>	<i>ml</i>
URINE						
Multi-element panel**	2	2	2	2	2	2
Total Arsenic	1	1	1	1	1	1
Iodine/Mercury panel			2	2		
arsenic speciation		1	1	1		
PAH (10)		5			5	
Biomarkers/cytokines	10	10		5		5
Isotopic species of U degradation	20	20		5***		
total urine volume	33 ml	39 ml	6 ml	16 ml	8 ml	8 ml
BLOOD						
Pb, Cd, Hg total ***			1	1*		
Hg speciation				1*		
PAH (if do urine)		1				
biomarkers/Cytokines	1	1		1*	1**	1**
Immune cells	3	3		2*	1**	1**
total volume blood	4 ml	5 ml	1 ml	5 ml	2 ml	2 ml
Meconium (when available)						
Alcohol metabolites				500 mg		
Isotopic species of U degradation				500 mg plus		

*Analyte testing is dependent on funding; All analytes may not be tested if funding is not available

**Multi-element panel includes: uranium, antimony, barium, beryllium, cadmium, cesium, cobalt, lead, molybdenum, platinum, titanium, tungsten

*** Mercury, lead, cadmium panel also includes manganese and selenium

Attachment 14 continued: Justification for Analytes in Exposure Assessment

ANALYTE (S)	MATR IX	JUSTIFICATION
Uranium	Urine	Primary exposure of interest; Levels of urinary uranium reflect recent and accumulated exposure. This exposure metric as well as information obtained from surveys (occupational history, water sources, proximity to uranium mine or mill site) and environmental home assessments will help to give an overall understanding of participants' current and past exposures to uranium. Uranium has been associated with adverse reproductive, birth, and renal outcomes.
Antimony	Urine	Included in analysis panel with uranium (primary exposure of interest)
Barium	Urine	Included in analysis panel with uranium (primary exposure of interest)
Beryllium	Urine	Included in analysis panel with uranium (primary exposure of interest)
Cadmium	Urine Blood	Included in analysis panel with uranium (primary exposure of interest). Cadmium has also been associated with lower birth weight, hypertension, and diabetes. Pre-eclampsia and gestational diabetes are conditions that may affect the health outcome of the infant. Cadmium is a frequent component in "silver solder" used in in-home jewelry making .It is not found to be present in concentrations of concern in mine wastes. Based on results from the 2008 CDC Water Hauling Study, cadmium has been found in unregulated water sources.
Cesium	Urine	Included in analysis panel with uranium (primary exposure of interest)
Cobalt	Urine	Included in analysis panel with uranium (primary exposure of interest)
Lead	Urine Blood	Included in urine analysis panel with uranium. Lead is an important confounder. High lead exposures have been associated with developmental delays and lower IQ in children
Molybdenum	Urine	Included in analysis panel with uranium (primary exposure of interest)

Platinum	Urine	Included in analysis panel with uranium (primary exposure of interest)
Titanium	Urine	Included in analysis panel with uranium (primary exposure of interest)
Tungsten	Urine	Included in analysis panel with uranium (primary exposure of interest)
Mercury	Blood	Coal-fired power plants located in Navajo Nation may contribute to potential mercury exposure. Elevated mercury levels have been associated with developmental delays in children
Manganese	Blood	Included in analysis panel with mercury (strong confounder with uranium); High prenatal manganese in mothers has been linked to behavioral problems in their children
Selenium	Blood	Included in analysis panel with mercury (strong confounder with uranium); Component of prenatal vitamins; Selenium deficiency has been associated with adverse birth outcomes
Arsenic	Urine	Arsenic MCL was exceeded in unregulated water sources tested by CDC. Arsenic has also been associated with developmental delays and birth defects
Biomarkers/cytokines	Urine	Biomarkers/cytokine testing will help to understand immunological and kidney dysfunction in participants which may be associated with adverse outcomes in their children
Isotopic species of U degradation	Urine	Uranium decay produces a series of isotopes which are primarily alpha and beta emitters, although some gamma emissions continue to be associated with decay. When used in home construction, these radioactive elements can contribute to chronic radiation exposures
Fetal Alcohol metabolites	Meconium	Community members and health care workers have suggested that alcohol consumption will continue through pregnancy among some individuals.; Alcohol consumption during pregnancy has been associated with adverse birth outcomes
PAHs	Blood	Previous studies by the Diné Network for Environmental Health (DiNEH) project have reported that some Navajo tribal members cook their food directly over open flames inside the home. Therefore, there is a potential for PAH exposure through inhalation and ingestion. PAHs have been linked to neural tube defects in children
Immune cells	Immune cells	The results of the biomarker analysis from the DiNEH Project indicated a relationship among the proximity surrogate for exposures, changes in

		cytokines such as IL-4, and changes in immune cell type percentages suggesting hyper reactivation and dysfunction in the immune system.; Immune dysfunction may have an adverse effect on babies
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