

# ***Attachment 7***

## ***Laboratory Assessments***

**Attachment 7 – NHANES Laboratory Assessments  
Attachment 7a - Laboratory Analytes by Age Group**

<b>Test Name</b>	<b>Sample</b>	<b>Matrix</b>
<b>Ages 1-2</b>		
Complete Blood Count	Full	Whole blood
C-reactive Protein (CRP)	Full	Serum
Erythrocyte Folate	Full	Whole blood
Ferritin	Full	Serum
Hepatitis B Surface Antibody (Anti-HBs) 2 years and older	Full	Serum
Serum Total and Folate Forms	Full	Serum
Transferrin Receptor	Full	Serum
Vitamin D	Full	Serum
<b>Ages 3-5</b>		
Complete Blood Count	Full	Whole blood
C-reactive Protein (CRP)	Full	Serum
Erythrocyte Folate	Full	Whole blood
Ferritin	Full	Serum
Hepatitis Profile**	Full	Serum
Serum Total and Folate Forms	Full	Serum
Transferrin Receptor	Full	Serum
Urine Flow Rate	Full	Urine
Vitamin D	Full	Serum
<b>Ages 6-11</b>		
Albumin/Creatinine	Full	Urine
Cholesterol (Total)/ High Density Lipoprotein Cholesterol (HDL)	Full	Serum
Complete Blood Count	Full	Whole blood
Estradiol	Full	Serum
Erythrocyte Folate	Full	Whole blood
Fluoride, plasma	Full	Plasma EDTA
Fluoride, urine	Full	urine
Fluoride, water	Full	Water
Hepatitis Profile**	Full	Serum
Serum Total and Folate Forms	Full	Serum
Sex hormone binding globin	Full	Serum
Testosterone	Full	Serum
Urine flow rate	Full	Urine
Vitamin D	Full	Serum
<b>Ages 12-19</b>		
Albumin/Creatinine	Full	Urine
Biochemistry Profile*	Full	Serum
Chlamydia trachomatis (14-19 years)	Full	Urine
Cholesterol (Total)/ High Density Lipoprotein Cholesterol (HDL)	Full	Serum
Complete Blood Count	Full	Whole blood
C-reactive Protein (CRP) (females)	Full	Serum
Erythrocyte Folate	Full	Whole blood
Estradiol	Full	Serum
Ferritin (females)	Full	Serum
Fluoride, plasma	Full	Plasma EDTA
Fluoride, urine	Full	urine
Fluoride, water	Full	Water

Test Name	Sample	Matrix
Glucose (Oral Glucose Tolerance Test)	One-half	Plasma Na2F
Glucose, fasting	One-half	Plasma Na2F
Glycohemoglobin	Full	Whole blood
Hepatitis Profile**	Full	Serum
Herpes Simplex Virus (HSV) (14-19 years)	Full	Serum
Human Immunodeficiency Virus Antibody (18-19 years)	Full	Serum
Human Papilloma Virus (14-19 years)	Full	Serum
Human Papilloma Virus (Females and Males 14-19 years)	Full	Swab
Human Papilloma Virus (14-19 years)	Full	Rinse
Insulin	One-half	Serum
Serum Total and Folate Forms	Full	Serum
Sex hormone binding globulin	Full	Serum
Testosterone	Full	Serum
Transferrin Receptor (females)	Full	Serum
Triglycerides/Low Density Lipoprotein Cholesterol/Apolipoprotein B	One-half	Serum
Trichomonas vaginalis (14-19 years)	Full	Urine
Urine flow rate	Full	Serum
Vitamin D	Full	Serum
<b>Ages 20 and older</b>		
Albumin/Creatinine	Full	Urine
Biochemistry Profile*	Full	Serum
Chlamydia trachomatis (20-39 years)	Full	Urine
Cholesterol (Total)/ High Density Lipoprotein Cholesterol (HDL)	Full	Serum
Complete Blood Count	Full	Whole blood
C-reactive Protein (CRP) (females 20-49yrs)	Full	Serum
Erythrocyte Folate	Full	Whole blood
Estradiol	Full	Serum
Ferritin (females 20-49 yrs)	Full	Serum
Glucose (Oral Glucose Tolerance Test)	One-half	Plasma Na2F
Glucose, fasting	One-half	Plasma Na2F
Glycohemoglobin	Full	Whole blood
Hepatitis Profile **	Full	Serum
Herpes Simplex Virus (HSV) (20-49 years)	Full	Serum
Human Immunodeficiency Virus antibody (20-59 years)	Full	Serum
Human Papilloma Virus (20-59 years)	Full	Serum
Human Papilloma Virus (Females and Males 20-59 years)	Full	Swab
Human Papilloma Virus (20-69 years)	Full	Rinse
Insulin	One-half	Serum
Serum Total and Folate Forms	Full	Serum
Sex hormone binding globulin	Full	Serum
Testosterone	Full	Serum
Transferrin Receptor (females 20-49 yrs)	Full	Serum
Triglycerides/Low Density Lipoprotein Cholesterol/Apolipoprotein B	One-half	Serum
Trichomonas vaginalis (20-59 years)	Full	Urine
Urine flow rate	Full	Urine
Vitamin D	Full	Serum
<b>*Biochemistry Profile</b>		
Albumin		

Test Name	Sample	Matrix
Alkaline phosphatase		
Aspartate aminotransferase (AST)		
Alanine aminotransferase (ALT)		
Blood urea nitrogen (BUN)		
Bicarbonate (HCO <sub>3</sub> )		
Total calcium		
Total cholesterol		
Chloride		
CPK		
Creatinine		
Globulin		
Glucose		
v-glutamyltransferase (GGT)		
Iron		
Potassium		
Lactate dehydrogenase (LDH)		
Sodium		
Osmolality		
Phosphorus		
Total Bilirubin		
Total protein		
Triglycerides		
Uric acid		
<b>**Hepatitis Profile</b>		
Hepatitis A antibody (Anti-HAV)		
Hepatitis B Core antibody (Anti-HBc)		
Hepatitis B Surface Antibody (Anti-HBs)		
Hepatitis B Surface Antigen (HbsAg)		
Hepatitis C Antibody (Anti-HCV)		
Hepatitis C HCV genotype		
Hepatitis C Ribonucleic Acid (HCV-RNA)		
Hepatitis D antibody (anti-HDV)		
Hepatitis E antibody (anti-HEV)		

## Attachment 7 – NHANES Laboratory Assessments Attachment 7b - Laboratory Analytes by Survey Year

This list of chemicals represents those chemicals currently or planned as biomonitoring measurements by CDC. A blank cell indicates that the analyte will not be measured or reported in that NHANES cycle. WD=results were withdrawn d=cycled out (not measured)

Chemical / Metabolite Name	Matrix	03-04	05-06	07-08	09-10	11-12	13-14	15-16	Branch	Lab Contact
<b>Adducts of Hemoglobin</b>										
Acrylamide	packed rbc	•	•	•	•		•	•	CCB	Vesper
Glycidamide	packed rbc	•	•	•	•		•	•	CCB	Vesper
Ethylene Oxide	packed rbc						•	•	CCB	Vesper
Formaldehyde	packed rbc						•	•	CCB	Vesper
<b>Antiseptics</b>										
Butyl paraben	urine		•	•	•	•	•	•	OAT	Ye
Ethyl paraben	urine		•	•	•	•	•	•	OAT	Ye
Methyl paraben	urine		•	•	•	•	•	•	OAT	Ye
Propyl paraben	urine		•	•	•	•	•	•	OAT	Ye
Triclocarban	urine						•	•	OAT	Ye
Triclosan	urine	•	•	•	•	•	•	•	OAT	Ye
<b>Disinfection By-Products</b>										
Bromodichloromethane	whole blood	•	•	•	•	•			TVB	Silva
Bromodichloromethane	water	•	•	•	•				TVB	Silva
Dibromochloromethane (Chlorodibromomethane)	whole blood	•	•	•	•	•			TVB	Silva
Dibromochloromethane (Chlorodibromomethane)	water	•	•	•	•				TVB	Silva
Tribromomethane (Bromoform)	whole blood	•	•	•	•	•			TVB	Silva
Tribromomethane (Bromoform)	water	•	•	•	•				TVB	Silva
Trichloromethane (Chloroform)	whole blood	•	•	•	•	•			TVB	Silva
Trichloromethane (Chloroform)	water	•	•	•	•				TVB	Silva
<b>Environmental Phenols</b>										
Bisphenol A	urine	•	•	•	•	•	•	•	OAT	Ye
Bisphenol F	urine						•	•	OAT	Ye
Bisphenol S	urine						•	•	OAT	Ye
Benzophenone-3	urine	•	•	•	•	•	•	•	OAT	Ye
4-tert-Octyl phenol	urine	WD	•	•	•				OAT	Ye
<b>Fungicides and Metabolites</b>										
Ethylenethiourea (ETU)	urine	•	•	•					OAT	Calafat
ortho-Phenylphenol	urine	•	•	•	•				OAT	Calafat
Pentachlorophenol	serum			Pool	Pool	Pool	Pool		OAT	Sjodin
Pentachlorophenol	urine	•							OAT	Calafat
Propylenethiourea (PTU)	urine	•	•	•					OAT	Calafat
<b>Herbicides and Metabolites</b>										
Atrazine	urine	• WD	Not measured	•					OAT	Valentin

Atrazine mercapturate	urine	• WD	Not measured	•						OAT	Valentin
Desethyl atrazine	urine	• WD	Not measured	•						OAT	Valentin
Desethyl atrazine mercapturate	urine	• WD	Not measured	•						OAT	Valentin
Desisopropyl atrazine	urine	• WD	Not measured	•						OAT	Valentin
Desisopropyl atrazine mercapturate	urine		Not measured	•						OAT	Valentin
Diaminochlorotriazine	urine	• WD	Not measured	•						OAT	Valentin
2,4-Dichlorophenoxyacetic acid	urine	• WD	Not measured	•	•	•	•	•		OAT	Valentin
2,4,5-Trichlorophenoxyacetic acid	urine	• WD	Not measured	•	•	•	•	•		OAT	Valentin
<b>Herbicides: Substituted Ureas</b>											
Bensulfuron-methyl	urine	•	•	•						OAT	Calafat
Chlorsulfuron	urine	•	•	•						OAT	Calafat
Ethametsulfuron-methyl	urine	•	•	•						OAT	Calafat
Foramsulfuron	urine	•	•	•						OAT	Calafat
Halosulfuron	urine	•	•	•						OAT	Calafat
Mesosulfuron-methyl	urine	•	•	•						OAT	Calafat
Metsulfuron-methyl	urine	•	•	•						OAT	Calafat
Nicosulfuron	urine	•	•	•						OAT	Calafat
Oxasulfuron	urine	•	•	•						OAT	Calafat
Primisulfuron-methyl	urine	•	•	•						OAT	Calafat
Prosulfuron	urine	•	•	•						OAT	Calafat
Rimsulfuron	urine	•	•	•						OAT	Calafat
Sulfometuron-methyl	urine	•	•	•						OAT	Calafat
Sulfosulfuron	urine	•	•	•						OAT	Calafat
Thifensulfuron-methyl	urine	•	•	•						OAT	Calafat
Triasulfuron	urine	•	•	•						OAT	Calafat
Triflusulfuron-methyl	urine	•	•	•						OAT	Calafat
<b>Insect Repellent</b>											
N,N-Diethyl- <i>meta</i> -toluamide (DEET)	urine	• W D	Not measured	•	•	•	•	•		OAT	Valentin
3-(diethylcarbamoyl)benzoic acid (DEET acid)	urine		Not measured	•	•	•	•	•		OAT	Valentin
N-ethyl-3-methyl-benzamide (Desethyl DEET)	urine		Not measured	•	•	•	•	•		OAT	Valentin
N,N-diethyl-3-(hydroxymethyl)benzamide (Desethyl hydroxy DEET)	urine		Not measured	•	•	•	•	•		OAT	Valentin
<b>Insecticides and Pesticides</b>											
<b>Organochlorine Pesticides</b>											
Aldrin	serum	•								OAT	Sjodin
Dieldrin	serum	•								OAT	Sjodin

Oxychlorthane	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
Heptachlor Epoxide	serum	•								OAT	Sjodin
<i>trans</i> -Nonachlor	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<i>p,p'</i> -DDT	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<i>p,p'</i> -DDE	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<i>o,p'</i> -DDT	serum	•								OAT	Sjodin
Endrin	serum	•								OAT	Sjodin
Hexachlorobenzene	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<i>beta</i> -Hexachlorocyclohexane	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<i>gamma</i> -Hexachlorocyclohexane	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
Mirex	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,4,5-Trichlorophenol	urine	•	•	•	•					OAT	Ye
2,4,6-Trichlorophenol	urine	•	•	•	•					OAT	Ye
<b>Organophosphorus Insecticides: Dialkyl Phosphate Metabolites</b>											
Dimethylphosphate	urine	•	•	•	•	•	•	•	•	OAT	Valentin
Dimethylthiophosphate	urine	•	•	•	•	•	•	•	•	OAT	Valentin
Dimethyldithiophosphate	urine	•	•	•	•	•	•	•	•	OAT	Valentin
Diethylphosphate	urine	•	•	•	•	•	•	•	•	OAT	Valentin
Diethylthiophosphate	urine	•	•	•	•	•	•	•	•	OAT	Valentin
	urine	•	•	•	•	•	•	•	•	OAT	Valentin
<b>Organophosphorus Insecticides: Specific Pesticides and Metabolites</b>											
Malathion dicarboxylic acid	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
3,5,6-Trichloro-2-pyridinol (TCPy)	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
2-diethylamino-6-methyl pyrimidin-4-ol	urine	• W D	not measured			-	-	-	-	OAT	Valentin
2-Isopropyl-4-methyl-6-hydroxypyrimidine	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
<i>para</i> -Nitrophenol	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
Dimethoate	urine	•	•	•						OAT	Calafat
Omethoate	urine	•	•	•						OAT	Calafat
Acephate	urine	•	•	•						OAT	Calafat
Methamidaphos	urine	•	•	•						OAT	Calafat
<b>Pyrethroid Pesticides</b>											
<i>cis</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid ( <i>cis</i> -DCCA)	urine	• W D	not measured	metho d in dev	•	•	•	•	•	OAT	Valentin
<i>trans</i> -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid ( <i>trans</i> -DCCA)	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
3-Phenoxybenzoic acid (3PBA)	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
4-Fluoro-3-phenoxybenzoic acid (4F3PBA)	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin
<i>cis</i> -3-(2,2-Dibromovinyl)-2,2-	urine	• W D	not measured	•	•	•	•	•	•	OAT	Valentin

dimethylcyclopropane carboxylic acid (cis-DBCA)			d								
<b>Other Pesticide Metabolites</b>											
Carbofuranphenol	urine	•								OAT	Calafat
2,4-Dichlorophenol	urine	• WD	•	•	•	•	•	•	•	OAT	Ye
2,5-Dichlorophenol	urine	•	•	•	•	•	•	•	•	OAT	Ye
2-Isopropoxyphenol	urine	•								OAT	Calafat
<b>Metals and Metalloids</b>											
Antimony	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Arsenic (total)	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Arsenic (V) acid	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Arsenobetaine	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Arsenocholine	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Arsenous (III) acid	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Dimethylarsinic acid	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Monomethylarsonic acid	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Trimethylarsine oxide	urine	•	•	•	•	•				IRAT	Caldwell
Barium	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Beryllium	urine	•	•	•	•					IRAT	Caldwell
Cadmium	whole blood	•	•	•	•	•	•	•	•	IRAT	Caldwell
Cadmium	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Cesium	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Chromium	Whole blood								•	IRAT	Caldwell
Cobalt	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Cobalt	Whole blood								•	IRAT	Caldwell
Copper	serum						•	•	•	IRAT	Caldwell
Lead	whole blood	•	•	•	•	•	•	•	•	IRAT	Caldwell
Lead	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Manganese	whole blood						•	•	•	IRAT	Caldwell
Manganese	urine						•	•	•	IRAT	Caldwell
Mercury (total)	whole blood	•	•	•	•	•	•	•	•	IRAT	Caldwell
Mercury (inorganic)	whole blood	•	•	•	•	•	•	•	•	IRAT	Caldwell
Mercury (ethyl)	whole blood						•	•	•	IRAT	Caldwell
Mercury (methyl)	whole blood						•	•	•	IRAT	Caldwell
Mercury	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Molybdenum	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Platinum	urine	•	•	•	•	d				IRAT	Caldwell
Selenium	whole blood						•	•	•	IRAT	Caldwell
Selenium	serum						•	•	•	IRAT	Caldwell
Strontium	urine						•	•	•	IRAT	Caldwell
Thallium	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Tin	urine						•	•	•	IRAT	Caldwell
Tungsten	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Uranium	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell
Zinc	serum						•	•	•	IRAT	Caldwell
Iodine	urine	•	•	•	•	•	•	•	•	IRAT	Caldwell



Perchlorate and Other Anions											
Perchlorate	urine	•	•	•	•	•	•	•	•	TVB	Morel
Perchlorate	water		•	•	•					TVB	Morel
Thiocyanate	urine		•	•	•	•	•	•		TVB	Morel
Nitrate	urine		•	•	•	•	•	•		TVB	Morel
Nitrate	water		•	•	•					TVB	Morel
Fluoride	urine								•	TVB	Morel
Iodide	water	•	•	•						TVB	Morel
Perfluorinated Compounds											
Perfluorobutane sulfonic acid (PFBuS)	serum	•	•	•	•	•	•	•		OAT	Ye
Pefluorodecanoic acid (PFDeA)	serum	•	•	•	•	•	•	•		OAT	Ye
Perfluorododecanoic acid (PFDoA)	serum	•	•	•	•	•				OAT	Ye
Perfluoroheptanoic acid (PFHpA)	serum	•	•	•	•	•				OAT	Ye
Perfluorohexane sulfonic acid (PFHxS)	serum	•	•	•	•	•	•	•		OAT	Ye
Perfluorononanoic acid (PFNA)	serum	•	•	•	•	•	•	•		OAT	Ye
Perfluorooctanoic acid (PFOA)	serum	•	•	•	•	•	•	•		OAT	Ye
Perfluorooctane sulfonic acid (PFOS)	serum	•	•	•	•	•	•	•		OAT	Ye
Perfluorooctane sulfonamide (PFOSA)	serum	•	•	•	•	•				OAT	Ye
2-(N-Ethyl- Perfluorooctane sulfonamido) acetic acid (Et-PFOSA-AcOH)	serum	•	•	•	•	•				OAT	Ye
2-(N-Methyl-perfluorooctane sulfonamido) acetic acid (Me-PFOSA-AcOH)	serum	•	•	•	•	•	•	•		OAT	Ye
Perfluoroundecanoic acid (PFUA)	serum	•	•	•	•	•	•	•		OAT	Ye
n-Perfluorooctanoic acid (n-PFOA)	serum							•	•	OAT	Ye
iso-Perfluorooctanoic acid (iso-PFOA)	serum							•	•	OAT	Ye
n-Perfluorooctane sulfonic (n-PFOS)	serum							•	•	OAT	Ye
iso-Perfluorooctane sulfonic acid mixture 1 (1-iso-PFOS)	serum							•	•	OAT	Ye
iso-Perfluorooctane sulfonic acid mixture 2 (2-iso-PFOS)	serum							•	•	OAT	Ye
Phthalate Metabolites and Phthalate Alternatives											
Mono-benzyl phthalate (MBzP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-iso-butyl phthalate (MiBP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-n-butyl phthalate (MnBP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-cyclohexyl phthalate (MCHP)	urine	•	•	•	•					OAT	Ye
Mono-ethyl phthalate (MEP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-2-ethylhexyl phthalate (MEHP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHPP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-(2-ethyl-5-carboxypentyl) phthalate (MECPP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-(2,7-dimethyl-7-carboxyheptyl) phthalate (MCNP)	urine			•	•	•	•	•		OAT	Ye
Mono-isononyl phthalate (MiNP)	urine	•	•	•	•	•	•	•		OAT	Ye
Mono-(2,6-dimethyl-6-carboxyhexyl) phthalate (MCOP)	urine			•	•	•	•	•		OAT	Ye

Mono-methyl phthalate (MMP)	urine	•	•	•	•	•	•	•	OAT	Ye
Mono-(3-carboxypropyl) phthalate (MCPP)	urine	•	•	•	•	•	•	•	OAT	Ye
Mono-n-octyl phthalate (MOP)	urine	•	•	•	•				OAT	Ye
Cyclohexane 1,2-dicarboxylic acid mono hydroxy isononyl ester (MHNCH)	urine					•	•	•	OAT	Ye
Mono-2-hydroxyisobutyl phthalate (2OH-MHiBP)	urine						•	•	OAT	Ye
Mono-2-hydroxybutyl phthalate (2-OH-MHBP)	urine						•	•	OAT	Ye
<b>Phytoestrogens</b>										
Daidzein	urine	•	•	•	•				NBB	Ryback
Enterodiol	urine	•	•	•	•				NBB	Ryback
Enterolactone	urine	•	•	•	•				NBB	Ryback
Equol	urine	•	•	•	•				NBB	Ryback
Genistein	urine	•	•	•	•				NBB	Ryback
O-Desmethylangolensin	urine	•	•	•	•				NBB	Ryback
<b>Polybrominated Diphenyl Ethers and Brominated Biphenyl 153</b>										
2,2',4'-Tribromodiphenyl ether (BDE 17)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,4,4'-Tribromodiphenyl ether (BDE 28)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',4,4'-Tetrabromodiphenyl ether (BDE 47)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,3',4,4'-Tetrabromodiphenyl ether (BDE 66)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',3,4,4'-Pentabromodiphenyl ether (BDE 85)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',4,4',5-Pentabromodiphenyl ether (BDE 99)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',4,4',6-Pentabromodiphenyl ether (BDE 100)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE 153)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',4,4',5,6'-Hexabromodiphenyl ether (BDE 154)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',3,4,4',5',6'-Heptabromodiphenyl ether (BDE 183)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',3,3',4,4',5,5',6,6'-Decabromodiphenyl ether (BDE 209)	serum		Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
2,2',4,4',5,5'-Hexabromobiphenyl (BB 153)	serum	•	Pool	Pool	Pool	•	Pool	•	OAT	Sjodin
<b>Polybrominated Dibenzo-p-dioxins</b>										
1,2,3,4,6,7,8-Heptabromodibenzo-p-dioxin (HxBDD)	serum		Pool	Pool					OAT	Sjodin
1,2,3,4,7,8-and 1,2,3,6,7,8-Hexabromodibenzo-p-dioxin (HxBDD)	serum		Pool	Pool					OAT	Sjodin
1,2,3,7,8,9-Hexabromodibenzo-p-dioxin (HxBDD)	serum		Pool	Pool					OAT	Sjodin
1,2,3,7,8-Pentabromodibenzo-p-dioxin (PeBDD)	serum		Pool	Pool					OAT	Sjodin
2,3,7,8-Tetrabromodibenzo-p-dioxin (TBDD)	serum		Pool	Pool					OAT	Sjodin

<b>Polybrominated Dibenzofurans</b>											
1,2,3,4,6,7,8-Heptabromodibenzofuran (HpBDF)	serum		Pool	Pool						OAT	Sjodin
1,2,3,4,7,8-Hexabromodibenzofuran (HxBDF)	serum		Pool	Pool						OAT	Sjodin
1,2,3,7,8-Pentabromodibenzofuran (PeBDF)	serum		Pool	Pool						OAT	Sjodin
2,3,4,7,8-Pentabromodibenzofuran (PeBDF)	serum		Pool	Pool						OAT	Sjodin
2,3,7,8-Tetrabromodibenzofuran (TBDF)	serum		Pool	Pool						OAT	Sjodin
<b>Polychlorinated Dibenzo-<i>p</i>-dioxins</b>											
1,2,3,4,6,7,8-Heptachlorodibenzo- <i>p</i> -dioxin (HpCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,7,8-Hexachlorodibenzo- <i>p</i> -dioxin (HxCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,6,7,8-Hexachlorodibenzo- <i>p</i> -dioxin (HxCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,7,8,9-Hexachlorodibenzo- <i>p</i> -dioxin (HxCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,6,7,8,9-Octachlorodibenzo- <i>p</i> -dioxin (OCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,7,8-Pentachlorodibenzo- <i>p</i> -dioxin (PeCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin (TCDD)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<b>Polychlorinated Dibenzofurans</b>											
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<b>Dioxin-like Polychlorinated Biphenyls: Coplanar PCBs</b>											
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	serum		Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
3,4,4',5'-Tetrachlorobiphenyl (PCB 81)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
3,3',4,4',5'-Pentachlorobiphenyl (PCB 126)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin

<b>Dioxin-like Polychlorinated Biphenyls: Mono-ortho-Substituted PCBs</b>											
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,3',4,4'-Pentachlorobiphenyl (PCB 114)	serum		Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	serum		Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<b>Polychlorinated Biphenyls: Non-Dioxin-Like</b>											
2,4,4'-Trichlorobiphenyl (PCB 28)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,5'-Tetrachloro biphenyl (PCB 44)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',4,5'-Tetrachloro biphenyl (PCB 49)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3',4,4'-Tetrachlorobiphenyl (PCB 66)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,4,4',5-Tetrachlorobiphenyl (PCB 74)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',4,4',5-Pentachlorobiphenyl (PCB 99)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,3,3',4',6-Pentachlorobiphenyl (PCB 110)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4,4',5' and 2,3,3',4,4',6-Hexachlorobiphenyl (PCB 138 & 158)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4',5,5'-Hexachlorobiphenyl (PCB 146)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4',5',6-Hexachlorobiphenyl (PCB 149)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,5,5',6-Hexachlorobiphenyl (PCB 151)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,5,5'-Heptachlorobiphenyl (PCB 172)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,5',6'-Heptachlorobiphenyl (PCB 177)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',5,5',6-Heptachlorobiphenyl (PCB 178)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin

2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB 187)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (PCB 194)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5,6' and 2,2',3,4,4',5,5',6-Octachlorobiphenyl (PCB 196 & 203)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 199)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB 206)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (PCB 209)	serum	•	Pool	Pool	Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<b>Hydroxylated Polychlorinated Biphenyls</b>											
2,3,3',4',5-pentachloro-4-biphenylol (4-HO-CB107) (PCB 105+118)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4',5,5'-hexachloro-4-biphenylol (4-HO-CB146) (PCB 138+153)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
2,2',3,4',5,5',6'-heptachloro-4-biphenylol (4-HO-CB187) (PCB 187)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<b>Polychlorinated Naphthalenes</b>											
1,2,3,4-Tetrachloronaphthalene (PCN 27)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,5,7- and 1,2,4,6,7-Pentachloronaphthalene (PNC 52 & 60)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,5,7- and 1,2,3,5,6,8-Hexachloronaphthalene (PNC 64 & 68)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,6,7- and 1,2,3,5,6,7-Hexachloronaphthalene (PNC 66 & 67)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,5,6,7-Heptachloronaphthalene (PCN 73)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
1,2,3,4,5,6,7,8-Octachloronaphthalene (PCN 75)	serum				Pool	Pool	Pool	Pool	Pool	OAT	Sjodin
<b>Polycyclic Aromatic Hydrocarbons</b>											
2-Hydroxyfluorene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
3-Hydroxyfluorene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
9-Hydroxyfluorene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
1-Hydroxyphenanthrene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
2-Hydroxyphenanthrene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
3-Hydroxyphenanthrene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
4-Hydroxyphenanthrene	urine	•	•							OAT	Calafat
1-Hydroxypyrene	urine	•	•	•	•	•	•	•	•	OAT	Calafat
1-Hydroxynaphthalene (1-Naphthol)	urine	•	•	•	•	•	•	•	•	OAT	Calafat
2-Hydroxynaphthalene (2-Naphthol)	urine	•	•	•	•	•	•	•	•	OAT	Calafat
<b>Volatile Organic Compounds (VOCs)</b>											
Benzene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Chlorobenzene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers

1,2-Dichlorobenzene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
1,3-Dichlorobenzene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
1,4-Dichlorobenzene (Paradichlorobenzene)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
1,2-dibromo-3-chloropropane (DBCP)	whole blood	•	•	•	•	•				TVB	Chambers
2,5-Dimethylfuran	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Ethylbenzene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Dichloromethane (Methylene chloride)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Trichloroethene (Trichloroethylene)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Tetrachloroethene (Perchloroethylene)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Dibromomethane	whole blood	•	•	•	•	•				TVB	Chambers
1,1-Dichloroethane	whole blood	•	•	•	•	•				TVB	Chambers
1,2-Dichloroethane (Ethylene dichloride)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
1,1-Dichloroethene (Vinylidene chloride)	whole blood	•	•	•	•	•				TVB	Chambers
cis-1,2-Dichloroethene	whole blood	•	•	•	•	•				TVB	Chambers
trans-1,2-Dichloroethene	whole blood	•	•	•	•	•				TVB	Chambers
1,2-Dichloropropane	whole blood	•	•	•	•	•				TVB	Chambers
1,1,1-Trichloroethane (Methyl chloroform)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
1,1,2-Trichloroethane	whole blood	•	•	•	•	•				TVB	Chambers
1,1,1,2-Tetrachloroethane	whole blood	•	•	•	•	•				TVB	Chambers
Tetrachloromethane (Carbon tetrachloride)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Hexachloroethane	whole blood	•	•	•	•	•				TVB	Chambers
Methyl-tert-Butyl Ether (MTBE)	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Methyl-tert-Butyl Ether (MTBE)	water	•	•	•	•					TVB	Chambers
Nitrobenzene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Styrene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Toluene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
m-/p-Xylene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
o-Xylene	whole blood	•	•	•	•	•	•	•	•	TVB	Chambers
Cumene/Isopropylbenzene	whole blood			•	•	•	•	•	•	TVB	Chambers
1,2-Dibromoethane	whole blood			•	•	•	•	•	•	TVB	Chambers
1,4-Dioxane	whole blood			•	•	•	•	•	•	TVB	Chambers
Furan	whole blood			•	•	•	•	•	•	TVB	Chambers
n-Hexane	whole blood			•	•	•	•	•	•	TVB	Chambers
Nitromethane	whole blood			•	•	•				TVB	Chambers
1,1,1,2-Tetrachloroethane	whole blood			•	•	•	•	•	•	TVB	Chambers
1,2,3-Trichloropropane	whole blood			•	•	•	•	•	•	TVB	Chambers
AAA-Trifluorotoluene/ $\alpha,\alpha,\alpha$ -Trifluorotoluene	whole blood							•	•	TVB	Chambers
Benzonitrile	whole blood							•	•	TVB	Chambers
1-Bromopropane/Propyl bromide	whole blood							•	•	TVB	Chambers
Chloroethane	whole blood							•	•	TVB	Chambers
Cyclohexane	whole blood							•	•	TVB	Chambers
Ethyl acetate	whole blood							•	•	TVB	Chambers
Heptane	whole blood							•	•	TVB	Chambers

Methyl isobutyl ketone	whole blood							•	•	TVB	Chambers	
Methylcyclopentane	whole blood							•	•	TVB	Chambers	
Octane	whole blood							•	•	TVB	Chambers	
Tetrahydrofuran	whole blood							•	•	TVB	Chambers	
Vinyl bromide	whole blood							•	•	TVB	Chambers	
<b>Volatile Organic Compound Metabolites (VOC metabolites)</b>												
N-Acetyl-S-(2-carbamoylethyl)-L-cysteine (AAMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(N-methylcarbamoyl)-L-cysteine (AMCA)	urine		•					•	•	•	TVB	Alwis
2-Aminothiazoline-4-carboxylic acid (ATCA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(benzyl)-L-cysteine (BMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(n-propyl)-L-cysteine (BPMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(2-carboxyethyl)-L-cysteine (CEMA)	urine		•					•	•	•	TVB	Alwis
N-acetyl-S-(1-cyano-2-hydroxyethyl)-L-cysteine (CYHA)	urine		•							•	TVB	Alwis
N-Acetyl-S-(2-cyanoethyl)-L-cysteine (CYMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(1,2-dichlorovinyl)-L-cysteine (1DCV)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(2,2-dichlorovinyl)-L-cysteine (2DCV)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(3,4-dihydroxybutyl)-L-cysteine (DHBM)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(dimethylphenyl)-L-cysteine (DPMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(2-carbamoyl-2-hydroxyethyl)-L-cysteine (GAMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(2-hydroxyethyl)-L-cysteine (HEMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(3-hydroxypropyl)-L-cysteine (HPMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(2-hydroxypropyl)-L-cysteine (HPM2)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(3-hydroxypropyl-1-methyl)-L-cysteine (HPMM)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(1-hydroxymethyl-2-propenyl)-L-cysteine (MHB1)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(2-hydroxy-3-butenyl)-L-cysteine (MHB2)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(4-hydroxy-2-butenyl)-L-cysteine (MHB3)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(phenyl-2-hydroxyethyl)-L-cysteine (PHEM)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(phenyl)-L-cysteine (PMA)	urine		•					•	•	•	TVB	Alwis
N-Acetyl-S-(trichlorovinyl)-L-cysteine (TCVM)	urine		•					•	•	•	TVB	Alwis
Mandelic acid (MADA)	urine		•					•	•	•	TVB	Alwis
2-Methylhippuric acid (2MHA)	urine		•					•	•	•	TVB	Alwis
3- & 4-Methylhippuric acid (34MH)	urine		•					•	•	•	TVB	Alwis
t,t-Muconic acid (MUCA)	urine		•					•	•	•	TVB	Alwis
Phenylglyoxylic acid (PHGA)	urine		•					•	•	•	TVB	Alwis

2-Thioxothiazolidine-4-carboxylic acid (TTCA)	urine		•				•	•	•	TVB	Alwis	
N-Acetyl-S-(2-hydroxy-2-methyl-3-buten-1-yl)-L-cysteine (IPM2)	urine							•	•	TVB	Alwis	
N-Acetyl-S-(2-hydroxy-3-methyl-3-buten-1-yl)-L-cysteine (IPM1)	urine							•	•	TVB	Alwis	
N-Acetyl-S-(4-hydroxy-2-methyl-2-buten-1-yl)-L-cysteine (IPM3)	urine								•	TVB	Alwis	
<b>Diisocyanate/TMAO/BMAA Compound Metabolites (Diisocyanate metabolites)</b>												
2,4-Diaminotoluene	urine						• surplu s		•	TVB	Alwis	
2,6-Diaminotoluene	urine						• surplu s		•	TVB	Alwis	
4,4'-Diaminodiphenylmethane	urine						• surplu s		•	TVB	Alwis	
1,5-Diaminonaphthalene	urine						• surplu s		•	TVB	Alwis	
o-Phenylenediamine	urine						• surplu s		•	TVB	Alwis	
p-Phenylenediamine	urine						• surplu s		•	TVB	Alwis	
5-Amino-1,3,3-trimethylcyclohexanemethylamine	urine						• surplu s		•	TVB	Alwis	
Hexamethylenediamine	urine						• surplu s		•	TVB	Alwis	
β-N-Methylamino-L-alanine	urine						• surplu s		•	TVB	Alwis	
Trimethylamine N-oxide	urine						• surplu s		•	TVB	Alwis	
<b>Tobacco Biomarkers: Cotinine and Nicotine Analogs</b>												
Anabasine	urine								•	•	TVB	Wang
Anatabine	urine								•	•	TVB	Wang
Cotinine	serum	•	•	•	•	•			•	•	TVB	Sosnoff
Cotinine	urine								•	•	TVB	Wang
Cotinine-n-oxide	urine								•	•	TVB	Wang
Hydroxycotinine	serum								•	•	TVB	Sosnoff
Hydroxycotinine	urine								•	•	TVB	Wang
Norcotinine	urine								•	•	TVB	Wang
Nicotine-1'N-oxide	urine								•	•	TVB	Wang
Nornicotine	urine								•	•	TVB	Wang
Nicotine	urine								•	•	TVB	Wang
4-Hydroxy-4-(3-pyridyl) butanoic acid	urine								•	•	TVB	Wang
<b>Tobacco Biomarkers: Aldehydes</b>												
Acetaldehyde	serum								•	•	TVB	Silva
Acrolein	serum								•	•	TVB	Silva
Benzaldehyde	serum								•	•	TVB	Silva
Butyraldehyde	serum								•	•	TVB	Silva
Crotonaldehyde	serum								•	•	TVB	Silva
Decanal	serum								•	•	TVB	Silva



Furaldehyde	serum					•	•	TVB	Silva
Heptanal	serum					•	•	TVB	Silva
n-Hexanal	serum					•	•	TVB	Silva
Isobutyraldehyde	serum						•	TVB	Silva
Isovaleraldehyde	serum					•	•	TVB	Silva
Nonanal	serum					•	•	TVB	Silva
<i>trans</i> -2-nonenal	serum					•	•	TVB	Silva
Octanal	serum					•	•	TVB	Silva
o-Tolualdehyde	serum					•	•	TVB	Silva
Pentanal	serum					•	•	TVB	Silva
Propionaldehyde	serum					•	•	TVB	Silva
<b>Tobacco Biomarkers: Aromatic Amines</b>									
Aniline	urine					•	•	TVB	Seyler
1-Aminonaphthalene	urine					•	•	TVB	Seyler
2-Aminonaphthalene	urine	surplus				•	•	TVB	Seyler
2-Aminobiphenyl	urine					•	•	TVB	Seyler
3-Aminobiphenyl	urine					•	•	TVB	Seyler
4-Aminobiphenyl	urine	surplus				•	•	TVB	Seyler
Anisidine	urine					•	•	TVB	Seyler
Benzidine	urine					•	•	TVB	Seyler
2,6-Dimethylaniline	urine					•	•	TVB	Seyler
Quinoline	urine					•	•	TVB	Seyler
o-Toluidine	urine	surplus				•	•	TVB	Seyler
m-Toluidine	urine					•	•	TVB	Seyler
p-Toluidine	urine					•	•	TVB	Seyler
<b>Tobacco Biomarkers: Heterocyclic Amines</b>									
3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole (Trp-P-1)	urine					•	•	TVB	Xia
2-Amino-3-methyl-9H-pyrido[2,3-b]indole (MeA- $\alpha$ -C)	urine					•	•	TVB	Xia
2-Amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (Ph1P)	urine					•	•	TVB	Xia
2-Amino-9H-pyrido[2,3-b]indole (A- $\alpha$ -C)	urine					•	•	TVB	Xia
2-Amino-3-methylimidazo[4,5-f]quinoline (IQ)	urine					•	•	TVB	Xia
2-Amino-6-methyldipyrido[1,2-a:3',2'-d]imidazole (Glu-P1)	urine					•	•	TVB	Xia
2-Aminodipyrido[1,2-a:3',2'-d]imidazole (GLU-P2)	urine					•	•	TVB	Xia
Harman	urine					•	•	TVB	Xia
1-Methyl-3-amino-5H-pyrido[4,3-b]indole (Trp-P-2)	urine					•	•	TVB	Xia
Norharman	urine					•	•	TVB	Xia
<b>Tobacco Biomarkers: TSNA's</b>									
4-(Methylnitrosamino)-1-(3-pyridyl)-1-Butanol (NNAL)	urine		•	•	•	•	•	TVB	Xia
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)	urine					•	•	TVB	Xia
N'-Nitrosanabasine (NAB)	urine					•	•	TVB	Xia

N'-Nitrosanatabine (NAT)	urine					•	•		TVB	Xia
N'-Nitrososornicotine (NNN)	urine					•	•		TVB	Xia
<b>Tobacco Biomarkers: N-Nitrosamines</b>										
N-Nitrosodiethylamine (NDEA)	urine				surplu s	•	•		TVB	Seyler/ Wang
N-nitrosodimethylamine (NDMA)	urine				surplu s	•	•		TVB	Seyler/ Wang
N-Nitrosoethylmethylamine (NMEA)	urine				surplu s	•	•		TVB	Seyler/ Wang
N-nitrosomorpholine (NMOR)	urine				surplu s	•	•		TVB	Seyler/ Wang
N-Nitrosopiperidine (NPIP)	urine				surplu s	•	•		TVB	Seyler/ Wang
N-Nitrosopyrrolidine (NPYR)	urine				surplu s	•	•		TVB	Seyler/ Wang
<b>trans Fatty Acids</b>										
trans-9-Hexadecenoic acid	plasma				•				CCB	Vesper
trans-9-Octadecenoic acid	plasma				•				CCB	Vesper
trans,trans-9,12-Octadecadienoic acid	plasma				•				CCB	Vesper
trans-11-Octadecanoic acid	plasma				•				CCB	Vesper
<b>Caffeine and Metabolites</b>										
5-acetylamino-6-amino-3-methyluracil	urine				•	•	•		NBB	Ryback
1-methyluric acid	urine				•	•	•		NBB	Ryback
3-methyluric acid	urine				•	•	•		NBB	Ryback
7-methyluric acid	urine				•	•	•		NBB	Ryback
1,3-dimethyluric acid	urine				•	•	•		NBB	Ryback
1,7-dimethyluric acid	urine				•	•	•		NBB	Ryback
3,7-dimethyluric acid	urine				•	•	•		NBB	Ryback
1,3,7-trimethyluric acid	urine				•	•	•		NBB	Ryback
1-methylxanthine	urine				•	•	•		NBB	Ryback
3-methylxanthine	urine				•	•	•		NBB	Ryback
7-methylxanthine	urine				•	•	•		NBB	Ryback
1,3-dimethylxanthine (theophylline)	urine				•	•	•		NBB	Ryback
1,7-dimethylxanthine (paraxanthine)	urine				•	•	•		NBB	Ryback
3,7-dimethylxanthine (theobromine)	urine				•	•	•		NBB	Ryback
	urine				•	•	•		NBB	Ryback
<b>Iron-Status and Inflammation Indicators</b>										
Ferritin	serum	•	•	•	•			•	NBB	Pfeiffer
Transferrin receptor	serum	•	•	•	•			•	NBB	Pfeiffer
Iron	serum								NBB	Pfeiffer
TIBC	serum								NBB	Pfeiffer
Transferrin saturation	serum								NBB	Pfeiffer
Protoporphyrin	serum								NBB	Pfeiffer
<b>Water Soluble Vitamins and Related Compounds</b>										
Folate (serum)	serum	•	•	•	•				NBB	Pfeiffer
Folate (RBC)	RBC	•	•	•	•	•	•	•	NBB	Pfeiffer
Folate forms by LC-MS/MS (serum)	serum								NBB	Pfeiffer
Total folate	serum					•	•	•	NBB	Pfeiffer
5-Methyltetrahydrofolate	serum			•		•	•	•	NBB	Pfeiffer

Folic acid	serum			•		•	•	•	NBB	Pfeiffer
5-Formyltetrahydrofolate	serum					•	•	•	NBB	Pfeiffer
Tetrahydrofolate	serum					•	•	•	NBB	Pfeiffer
5,10-Methenyltetrahydrofolate	serum					•	•	•	NBB	Pfeiffer
MeFox oxidation product	serum					•	•	•	NBB	Pfeiffer
Homocysteine	plasma	•	•						NBB	Pfeiffer
Methylmalonic acid	plasma/ serum	•				•	•		NBB	Pfeiffer
Vitamin B12	serum	•	•			•	•		NBB	Pfeiffer
Vitamin B6 (pyridoxal-5'-phosphate)	serum		•	•	•				NBB	Pfeiffer
Vitamin B6 (4-pyridoxic acid)	serum		•	•	•				NBB	Pfeiffer
Vitamin C (ascorbic acid)	serum	•	•						NBB	Pfeiffer
<b>Fat-Soluble Vitamins and Micronutrients</b>										
Vitamin A	serum		•						NBB	Schleicher
Vitamin E	serum		•						NBB	Schleicher
Retinyl palmitate	serum		•						NBB	Schleicher
Retinyl stearate	serum		•						NBB	Schleicher
<i>gamma</i> -Tocopherol	serum		•						NBB	Schleicher
<i>alpha</i> -carotene	serum		•						NBB	Schleicher
<i>trans-beta</i> -Carotene	serum		•						NBB	Schleicher
<i>cis-beta</i> -Carotene	serum		•						NBB	Schleicher
<i>beta</i> -Cryptoxanthin	serum		•						NBB	Schleicher
Lutein/zeaxanthin	serum		•						NBB	Schleicher
<i>trans</i> -Lycopene	serum		•						NBB	Schleicher
Total lycopene	serum		•						NBB	Schleicher
25-OH Vitamin D	serum	•	•						NBB	Schleicher
25-OH Vitamin D2	serum			•	•	•	•	•	NBB	Schleicher
25-OH Vitamin D3	serum			•	•	•	•	•	NBB	Schleicher
epimer-25-OH Vitamin D3	serum			•	•	•	•	•	NBB	Schleicher
<b>Fatty acids (30)</b>										
Capric acid (C10:0)	plasma /serum					•	•		NBB	Schleicher
Lauric acid (C12:0)	plasma /serum					•	•		NBB	Schleicher
Myristic acid (14:0)	plasma /serum	•				•	•		NBB	Schleicher
Pentadecanoic acid (C15:0)	plasma /serum					•	•		NBB	Schleicher
Palmitic acid (16:0)	plasma /serum	•				•	•		NBB	Schleicher
Margaric acid (C17:0)	plasma /serum					•	•		NBB	Schleicher
Stearic acid (18:0)	plasma /serum	•				•	•		NBB	Schleicher
Arachidic acid (20:0)	plasma /serum	•				•	•		NBB	Schleicher
Docosanoic acid (22:0)	plasma /serum	•				•	•		NBB	Schleicher
Tricosanoic acid (C23:0)	plasma /serum					•	•		NBB	Schleicher
Lignoceric acid (24:0)	plasma /serum	•				•	•		NBB	Schleicher
Myristoleic acid (14:1n-5)	plasma /serum	•				•	•		NBB	Schleicher
Palmitoleic acid (16:1n-7)	plasma /serum	•				•	•		NBB	Schleicher

cis-Vaccenic acid (18:1n-7)	plasma /serum	•				•	•		NBB	Schleicher
Oleic acid (18:1n-9)	plasma /serum	•				•	•		NBB	Schleicher
Eicosenoic acid (20:1n-9)	plasma /serum	•				•	•		NBB	Schleicher
Nervonic acid (24:1n-9)	plasma /serum	•				•	•		NBB	Schleicher
Linoleic acid (18:2n-6)	plasma /serum	•				•	•		NBB	Schleicher
alpha-Linolenic acid (18:3n-3)	plasma /serum	•				•	•		NBB	Schleicher
gamma-Linolenic acid (18:3n-6)	plasma /serum	•				•	•		NBB	Schleicher
Stearidonic acid (C18:4n-3)	plasma /serum					•	•		NBB	Schleicher
Eicosadienoic acid (20:2n-6)	plasma /serum	•				•	•		NBB	Schleicher
homo-gamma-Linolenic acid (20:3n-6)	plasma /serum	•				•	•		NBB	Schleicher
Eicosatrienoic acid (C20:3n-9)	plasma /serum					•	•		NBB	Schleicher
Arachidonic acid (20:4n-6)	plasma /serum	•				•	•		NBB	Schleicher
Eicosapentaenoic acid (20:5n-3)	plasma /serum	•				•	•		NBB	Schleicher
Docosatetraenoic acid (22:4n-6)	plasma /serum					•	•		NBB	Schleicher
Docosapentaenoic acid (22:5n-3)	plasma /serum	•				•	•		NBB	Schleicher
Docosapentaenoic acid (22:5n-6)	plasma /serum	•				•	•		NBB	Schleicher
Docosahexaenoic acid (22:6n-3)	plasma /serum	•				•	•		NBB	Schleicher
<b>Hormones and Binding Protein</b>										
Estradiol	serum						•	•	CCB	Vesper
Testosterone	serum					•	•	•	CCB	Vesper
Steroid Hormone Binding Globulin	serum						•	•	CCB	Vesper