***Attachment 7***

***Laboratory Assessments***

**Attachment 7 – NHANES Laboratory Assessments**

**Attachment 7a - Laboratory Analytes by Age Group**

| **Test Name** | **Sample** | **Matrix** | |
| --- | --- | --- | --- |
| **Ages 1-2** |  |  | |
| 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 | |
| **Ages 3-5** |  |  | |
| 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 | |
| **Ages 6-11** |  |  | |
| 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 | |
| **Ages 12-19** |  |  | |
| 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 | |
|  |  |  | |
| 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 | |
| **Ages 20 and older** |  | |  |
| 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 |
| **\*Biochemistry Profile** |  | |  |
| Albumin |  | |  |
| Alkaline phosphatase |  | |  |
| Aspartate aminotransferase (AST) |  | |  |
| Alanine aminotransferase (ALT) |  | |  |
| Blood urea nitrogen (BUN) |  | |  |
| Bicarbonate (HCO3) |  | |  |
| 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 |  | |  |
| \*\***Hepatitis Profile** |  | |  |
| 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** |
| **Adducts of Hemoglobin** | | | | | | | | | | |
| Acrylamide | packed rbcs | ● | ● | ● | ● |  | ● | ● | CCB | Vesper |
| Glycidamide | packed rbcs | ● | ● | ● | ● |  | ● | ● | CCB | Vesper |
| Ethylene Oxide | packed rbcs |  |  |  |  |  | ● | ● | CCB | Vesper |
| Formaldehyde | packed rbcs |  |  |  |  |  | ● | ● | CCB | Vesper |
| **Antiseptics** | | | | | | | | | | |
| 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 |
| **Disinfection By-Products** | | | | | | | | | | |
| 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 |
| **Environmental Phenols** | | | | | | | | | | |
| 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 |
| **Fungicides and Metabolites** | | | | | | | | | | |
| 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 |
| **Herbicides and Metabolites** | | | | | | | | | | |
| 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 |
| **Herbicides: Substituted Ureas** | | | | | | | | | | |
| 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 |
| **Insect Repellent** | | | | | | | | | | |
| N,N-Diethyl-*meta*-toluamide (DEET) | urine | ●WD | 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 |
| **Insecticides and Pesticides** | | | | | | | | | | |
| **Organochlorine Pesticides** | | | | | | | | | | |
| Aldrin | serum | ● |  |  |  |  |  |  | OAT | Sjodin |
| Dieldrin | serum | ● |  |  |  |  |  |  | OAT | Sjodin |
| Oxychlordane | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| Heptachlor Epoxide | serum | ● |  |  |  |  |  |  | OAT | Sjodin |
| *trans*-Nonachlor | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| *p,p'-*DDT | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| *p,p'*-DDE | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| *o,p'*-DDT | serum | ● |  |  |  |  |  |  | OAT | Sjodin |
| Endrin | serum | ● |  |  |  |  |  |  | OAT | Sjodin |
| Hexachlorobenzene | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| *beta*-Hexachlorocyclohexane | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| *gamma*-Hexachlorocyclohexane | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| Mirex | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,4,5-Trichlorophenol | urine | ● | **●** | **●** | **●** |  |  |  | OAT | Ye |
| 2,4,6-Trichlorophenol | urine | ● | **●** | **●** | **●** |  |  |  | OAT | Ye |
| **Organophosphorus Insecticides:  Dialkyl Phosphate Metabolites** | | | | | | | | | | |
| Dimethylphosphate | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Valentin |
| Dimethylthiophosphate | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Valentin |
| Dimethyldithiophosphate | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Valentin |
| Diethylphosphate | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Valentin |
| Diethylthiophosphate | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Valentin |
| Diethyldithiophosphate | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Valentin |
| **Organophosphorus Insecticides: Specific Pesticides and Metabolites** | | | | | | | | | | |
| Malathion dicarboxylic acid | urine | ●WD | not measured | ● | ● | ● | ● | ● | OAT | Valentin |
| 3,5,6-Trichloro-2-pyridinol (TCPy) | urine | ●WD | not measured | ● | ● | ● | ● | ● | OAT | Valentin |
| 2-diethylamino-6-methyl pyrimidin-4-ol | urine | ●WD | not measured |  |  |  |  |  | OAT | Valentin |
| 2-Isopropyl-4-methyl-6-hydroxypyrimidine | urine | ●WD | not measured | ● | ● | ● | ● | ● | OAT | Valentin |
| *para-*Nitrophenol | urine | ●WD | not measured | ● | ● | ● | ● | ● | OAT | Valentin |
| Dimethoate | urine | ● | ● | ● |  |  |  |  | OAT | Calafat |
| Omethoate | urine | ● | ● | ● |  |  |  |  | OAT | Calafat |
| Acephate | urine | ● | ● | ● |  |  |  |  | OAT | Calafat |
| Methamidaphos | urine | ● | ● | ● |  |  |  |  | OAT | Calafat |
| **Pyrethroid Pesticides** | | | | | | | | | | |
| *cis*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (cis-DCCA) | urine | ●WD | **not measured** | **method in dev** | ● | ● | ● | ● | OAT | Valentin |
| *trans*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (trans-DCCA) | urine | ●WD | **not measured** | ● | ● | ● | ● | ● | OAT | Valentin |
| 3-Phenoxybenzoic acid (3PBA) | urine | ●WD | **not measured** | ● | ● | ● | ● | ● | OAT | Valentin |
| 4-Fluoro-3-phenoxybenzoic acid (4F3PBA) | urine | ●WD | **not measured** | ● | ● | ● | ● | ● | OAT | Valentin |
| *cis*-3-(2,2-Dibromovinyl)-2,2-dimethylcyclopropane carboxylic acid (cis-DBCA) | urine | ●WD | **not measured** | ● | ● | ● | ● | ● | OAT | Valentin |
| **Other Pesticide Metabolites** | | | | | | | | | | |
| Carbofuranphenol | urine | ● |  |  |  |  |  |  | OAT | Calafat |
| 2,4-Dichlorophenol | urine | ● WD | ● | ● | ● | ● | ● | ● | OAT | Ye |
| 2,5-Dichlorophenol | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Ye |
| 2-Isopropoxyphenol | urine | ● |  |  |  |  |  |  | OAT | Calafat |
| **Metals and Metalloids** | | | | | | | | | | |
| 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 |
| Perflurododecanoic 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 |
| **Phytoestrogens** | | | | | | | | | | |
| 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 |
| **Polybrominated Diphenyl Ethers and Brominated Biphenyl 153** | | | | | | | | | | |
| 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 |
| **Polybrominated Dibenzo-*p*-dioxins** | | | | | | | | | | |
| 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-Tetrabromorodibenzo-*p*-dioxin (TBDD) | serum |  | **Pool** | **Pool** |  |  |  |  | OAT | Sjodin |
| **Polybrominated Dibenzofurans** | | | | | | | | | | |
| 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 |
| **Polychlorinated Dibenzo-*p*-dioxins** | | | | | | | | | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (HpCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin (HxCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (PeCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| **Polychlorinated Dibenzofurans** | | | | | | | | | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) | serum | ● | **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** | OAT | Sjodin |
| 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,7,8-Tetrachlorodibenzofuran (TCDF) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| **Dioxin-like Polychlorinated Biphenyls: Coplanar PCBs** | | | | | | | | | | |
| 3,3',4,4'-Tetrachlorobiphenyl (PCB 77) | serum |  | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 3,4,4',5-Tetrachlorobiphenyl (PCB 81) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| **Dioxin-like Polychlorinated Biphenyls: Mono-*ortho-*Substituted PCBs** | | | | | | | | | | |
| 2,3,3',4,4'-Pentachlorobiphenyl (PCB 105) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,3',4,4'-Pentachlorobiphenyl (PCB 114) | serum |  | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3',4,4',5-Pentachlorobiphenyl (PCB 118) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2',3,4,4',5-Pentachlorobiphenyl (PCB 123) | serum |  | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167) | serum | ● | **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** | OAT | Sjodin |
| **Polychlorinated Biphenyls: Non-Dioxin-Like** | | | | | | | | | | |
| 2,4,4'-Trichlorobiphenyl (PCB 28) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2'3,5'-Tetrachloro biphenyl (PCB 44) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2',4,5'-Tetrachloro biphenyl (PCB 49) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2',5,5'-Tetrachlorobiphenyl (PCB 52) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3',4,4'-Tetrachlorobiphenyl (PCB 66) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,4,4',5-Tetrachlorobiphenyl (PCB 74) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2’,3,4,5’-Pentachlorobiphenyl (PCB 87) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2',4,4',5-Pentachlorobiphenyl (PCB 99) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2',4,5,5'-Pentachlorobiphenyl (PCB 101) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,3,3’,4’,6-Pentachlorobiphenyl (PCB 110) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128) | serum | ● | **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** | OAT | Sjodin |
| 2,2',3,4',5,5'-Hexachlorobiphenyl (PCB 146) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2’,3,4’,5’,6-Hexachlorobiphenyl (PCB 149) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2’,3,5,5’,6-Hexachlorobiphenyl (PCB 151) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| 2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153) | serum | ● | **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** | OAT | Sjodin |
| 2,2',3,3',4,5,5'-Heptachlorobiphenyl (PCB 172) | serum | ● | **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** | OAT | Sjodin |
| 2,2',3,3',5,5',6-Heptachlorobiphenyl (PCB 178) | serum | ● | **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** | OAT | Sjodin |
| 2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183) | serum | ● | **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** | OAT | Sjodin |
| 2,2’,3,3’,4,4’,5,5’-Octachlorobiphenyl (PCB 194) | serum | ● | **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** | 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** | OAT | Sjodin |
| 2,2’,3,3’,4,5,5’,6-Octachlorobiphenyl (PCB 199) | serum | ● | **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** | OAT | Sjodin |
| 2,2',3,3',4,4',5,5',6,6'-Decachloro biphenyl (PCB 209) | serum | ● | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | **Pool** | OAT | Sjodin |
| **Hydroxylated Polychlorinated Biphenyls** | | | | | | | | | | |
| 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 |
| **Polychlorinated Naphthalenes** | | | | | | | | | | |
| 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 |
| **Polycyclic Aromatic Hydrocarbons** | | | | | | | | | | |
| 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-Hydroxynapthalene (1-Naphthol) | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Calafat |
| 2-Hydroxynapthalene (2-Naphthol) | urine | ● | ● | ● | ● | ● | ● | ● | OAT | Calafat |
| **Volatile Organic Compounds (VOCs)** | | | | | | | | | | |
| 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 |
| 1,1,2,2-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/α,α,α-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 |
| **Volatile Organic Compound Metabolites (VOC metabolites)** | | | | | | | | | | |
| 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 |
| **Diisocyanate/TMAO/BMAA Compound Metabolites (Diisocyanate metabolites and urinary amines)** | | | | | | | | | | |
| 2,4-Diaminotoluene | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| 2,6-Diaminotoluene | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| 4,4'-Diaminodiphenylmethane | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| 1,5-Diaminonaphthalene | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| *o-*Phenylenediamine | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| *p*-Phenylenediamine | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| 5-Amino-1,3,3-trimethylcyclohexanemethylamine | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| Hexamethylenediamine | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| β-N-Methylamino-L-alanine | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| Trimethylamine N-oxide | urine |  |  |  |  | ● surplus |  | ● | TVB | Alwis |
| **Tobacco Biomarkers: Cotinine and Nicotine Analogs** | | | | | | | | | | |
| 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 |
| **Tobacco Biomarkers: Aldehydes** | | | | | | | | | | |
| 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 |
| *trans*-2-nonenal | serum |  |  |  |  |  | ● | ● | TVB | Silva |
| Octanal | serum |  |  |  |  |  | ● | ● | TVB | Silva |
| o-Tolualdehyde | serum |  |  |  |  |  | ● | ● | TVB | Silva |
| Pentanal | serum |  |  |  |  |  | ● | ● | TVB | Silva |
| Propionaldehyde | serum |  |  |  |  |  | ● | ● | TVB | Silva |
| **Tobacco Biomarkers: Aromatic Amines** | | | | | | | | | | |
| 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 |
| **Tobacco Biomarkers: Heterocyclic Amines** | | | | | | | | | | |
| 3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole (Trp-P-1) | urine |  |  |  |  |  | ● | ● | TVB | Xia |
| 2-Amino-3-methyl-9H-pyriodo[2,3-b]indole (MeA-α-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-α-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 |
| **Tobacco Biomarkers: TSNAs** | | | | | | | | | | |
| 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'-Nitrosonornicotine (NNN) | urine |  |  |  |  |  | ● | ● | TVB | Xia |
| **Tobacco Biomarkers: N-Nitrosamines** | | | | | | | | | | |
| N-Nitrosodiethylamine (NDEA) | urine |  |  |  | surplus |  | ● | ● | TVB | Seyler/Wang |
| N-nitrosodimethylamine (NDMA) | urine |  |  |  | surplus |  | ● | ● | TVB | Seyler/Wang |
| N-Nitrosoethylmethylamine (NMEA) | urine |  |  |  | surplus |  | ● | ● | TVB | Seyler/Wang |
| N-nitrosomorpholine (NMOR) | urine |  |  |  | surplus |  | ● | ● | TVB | Seyler/Wang |
| N-Nitrosopiperidine (NPIP) | urine |  |  |  | surplus |  | ● | ● | TVB | Seyler/Wang |
| N-Nitrosopyrrolidine (NPYR) | urine |  |  |  | surplus |  | ● | ● | TVB | Seyler/Wang |
| ***trans* Fatty Acids** | | | | | | | | | | |
| *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 |
| **Caffeine and Metabolites** | | | | | | | | | | |
| 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 |
| 1,3,7-trimethylxanthine (caffeine) | urine |  |  |  | ● | ● | ● |  | NBB | Ryback |
| **Iron-Status and Inflammation Indicators** | | | | | | | | | | |
| 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 |
| **Water Soluble Vitamins and Related Compounds** | | | | | | | | | | |
| 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 |
| **Fat-Soluble Vitamins and Micronutrients** | | | | | | | | | | |
| Vitamin A | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| Vitamin E | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| Retinyl palmitate | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| Retinyl stearate | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| *gamma-*Tocopherol | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| *alpha*-carotene | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| *trans-beta-*Carotene | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| *cis-beta-*Carotene | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| *beta-*Cryptoxanthin | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| Lutein/zeaxanthin | serum |  | ● |  |  |  |  |  | NBB | Schleicher |
| *trans-*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 |
| **Fatty acids (30)** | | | | | | | | | | |
| 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 |
| **Hormones and Binding Protein** | | | | | | | | | | |
| Estradiol | serum |  |  |  |  |  | ● | ● | CCB | Vesper |
| Testosterone | serum |  |  |  |  | ● | ● | ● | CCB | Vesper |
| Steroid Hormone Binding Globulin | serum |  |  |  |  |  | ● | ● | CCB | Vesper |