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| **Biomarker of exposure to nicotine-containing products - Urine** | |
| **Protocol Id:** | 91701 |
| **Description of Protocol** | A biospecimen is collected from the respondent to measure cotinine, a marker of either smoking or of environmental tobacco smoke exposure. One of the most common methods is via a urine sample obtained from the respondent. Cotinine in urine is measured by gas chromatography mass spectrometry (GC-MS). |
| **Specific Instructions** | Caffeine may interfere with the accuracy of the results. During the gas chromatography analysis, this interference can be minimized by ramping up the temperature and eluting the caffeine later than the cotinine. |
| **Protocol:** | The respondent is asked to urinate in a sterile 90-mL urine specimen container. Children above the age of 10 and adults can self-collect the urine. The specimen should be refrigerated immediately after collection. Aliquot 3mLs into a 4 mL cryovial. Freeze the cryovial at -20°C until analysis. If the samples need to be stored greater than 1 year freeze at -80°C.  Gas chromatography mass spectrometry (GC-MS) is the preferred method to accurately measure cotinine in urine samples. (See source references for details.) The limit of detection is 0.20 ng/mL. A result of 100 ng/mL urinary cotinine or more is indicative of an active smoker. |
| **Selection Rationale** | Urine is easily collected and with the proper laboratory equipment, cotinine can be measured accurately from a sterile urine sample. Urinary cotinine is a frequently measured biomarker and produces more quantifiable results than other metabolites.  There are other assays (e.g., radioimmunoassay and enzyme-linked immunosorbent assays) used to measure cotinine but gas chromatography mass spectrometry (GC-MS) is preferred. |
| **Source** | Man, C. N., L.-H. Gam, Ismail, S., Lajis, R., Awang, R. 2006. Simple, rapid and sensitive assay method for simultaneous quantification of urinary nicotine and cotinine using gas chromatography-mass spectrometry. J of Chromatography *B* 844(2): 322-327. |
| **Language** | English |
| **Participant** | Ages 3 and up |
| **Personnel and Training Required** | Urine samples can be self-collected by children aged 10 or older with adequate instructions. A laboratory technician trained to process and analyze biological specimens is necessary to analyze urine samples. |
| **Equipment Needs** | Standard urine collection supplies that have been sterilized. Laboratory supplies and instruments are needed to measure cotinine in biological fluids. Biological samples may be shipped using appropriate shipping procedures to laboratories that specialize in these types of analysis. |
| **Standards:** | |  |  |  |  | | --- | --- | --- | --- | | **Standard** | **Name** | **ID** | **Source** | | Common Data Element (CDE) | Person Urine Cotinine Assay Concentration Level Code | 3061171 | [CDE Browser](https://cdebrowser.nci.nih.gov/CDEBrowser/search?elementDetails=9&FirstTimer=0&PageId=ElementDetailsGroup&publicId=3061171&version=1.0) | | Logical Observation Identifiers Names and Codes (LOINC) | Resp urine assay smoke exp proto | 62641-6 | [LOINC](http://s.details.loinc.org/LOINC/62641-6.html?sections=Web) | |
| **General references** | Avila-Tang E, Al-Delaimy WK, Ashley DL, Benowitz N, Bernert JT, Kim S, Samet JM, Hecht SS. (2013). Assessing secondhand smoke using biological markers. Tob Control, 22(3): 164-871.  Benowitz, N.L. (1999). Biomarkers of Environmental Tobacco Smoke Exposure. *Environ Health Perspect.* 107(Suppl 2):3 49-355.  Benowitz, N. L. (1996). Cotinine as a biomarker of environmental tobacco smoke exposure. *Epidemiol Rev*, *18*(2), 188-204.  Dhar, P. (2004). Measuring tobacco smoke exposure: quantifying nicotine/cotinine concentration in biological samples by colorimetry, chromatography and immunoassay methods. *J Pharm Biomed Anal*, *35*(2004), 155-168.  Kuo, H.W., Yang, J.S., Chiu, M.C. (2002). Determination of urinary and salivary cotinine using gas and liquid chromatography and enzyme-linked immunosorbent assay. *J Chromatogr B Analyt Technol Biomed Life Sci.* 768(2):297-303. |
| **Protocol Type** | Bioassay |
| **Derived Variables** | None |
| **Requirements** | |  |  | | --- | --- | | **Requirement Category** | **Required** | | Major equipment  This measure requires a specialized measurement device that may not be readily available in every setting where genome wide association studies are being conducted. Examples of specialized equipment are DEXA, Echocardiography, and Spirometry | No | | Specialized training  This measure requires staff training in the protocol methodology and/or in the conduct of the data analysis. | Yes | | Specialized requirements for biospecimen collection  This protocol requires that blood, urine, etc. be collected from the study participants. | No | | Average time of greater than 15 minutes in an unaffected individual  Average time of greater than 15 minutes in an unaffected individual | No | |
| **Process and Review:** | The [Expert Review Panel #6](http://phenx.org/node/118) (ERP 6) reviewed the measures in the Respiratory domain.  Guidance from ERP 6 includes:   * Revised descriptions of the measure * Changed the name of the measure from "Urine Assay for Tobacco Smoke Exposure" to "Biomarker of Exposure to Nicotine-containing Products"   Previous version can be found in the Toolkit archive ([link](https://www.phenxtoolkit.org/index.php?pageLink=browse.archive.protocols&id=90000)) |