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| **Urinary Microalbumin Assay for Kidney Function** | |
| **Protocol Id** | 141501 |
| **Version #** | 1 |
| **Description of Protocol** | This protocol provides basic instructions for collecting and processing urine according to National Health and Nutrition Examination Survey (NHANES) methods. Albumin concentration is measured according to a fluorescent immunoassay (FIA). The protocol also lists reference ranges for healthy adults. |
| **Specific Instructions** | The Diabetes Working Group recommends that the urine albumin assay be performed on urine collected during a participant’s first morning void but notes that a random sample is also acceptable. The Sickle Cell Disease Research and Scientific Panel notes that the terms "microalbuminuria" and "macroalbuminuria" have been used clinically to describe different levels of abnormal albumin excretion rate: 30-299 mg/g urine creatinine, and >300 mg/gr urine creatinine, for microalbuminuria and macroalbuminuria, respectively. Recently, a new terminology has been proposed: "low level albuminuria" instead of microalbuminuia, and "high level albuminuria" for macroalbuminuria, since the older terminology could be interpreted as measuring different molecular forms of albumin. Because albuminuria may be affected by non-pathological factors (exercise, menstruation contamination, biological variability, etc.), abnormal values should be confirmed within 1-2 months. |
| **Protocol Text** | The following is a summary version of the full National Health and Nutrition Examination Survey 2007-2008 protocol.  **Urine Collection**  *Editor’s Note:**Please review chapter 5 of the Laboratory Procedures Manual from the National Health and Nutrition Examination Survey2007-2008 for a full description of urine collection and processing procedures:*[2007-2008 NHANES Lab Manual](file:///C:\Users\hpan\Downloads\toolkit_content\supplemental_info\diabetes\additional_info\NHANES_Lab_Manual.pdf)*.*  The coordinator explains the following instructions to the subject before urine collection:  • Wash hands with soap and water;  • It is important that the cup and cap not touch or come into contact with any parts of the body, clothing, or external surfaces; and  • Close container to minimize exposure to air.  Refrigerate all insufficient urine samples. When additional urine is obtained, pool the urine, mix, and process.  **Record the Results of Urine Specimen Collection**  Note whether or not urine was collected, whether the volume of urine was sufficient or required a second specimen.  Note whether blood is present / visible in the specimen.  **Process the Urine for the Urinary Albumin Assay**  Pour 3-mL of the specimen for urine creatinine into a 5-mL vessel.  *Note from the Diabetes Working Group: Urine should be stored at -80°C until testing and shipped on dry ice to prevent thawing.*  **Laboratory Procedure for Urinary Albumin**  The Diabetes Working Group recommends that urine albumin concentration be determined according to a fluorescent immunoassay such as the one developed by the University of Minnesota for use in the National Health and Nutrition Examination Survey:[Urinary Albumin Lab Assay](file:///C:\Users\hpan\Downloads\toolkit_content\supplemental_info\diabetes\additional_info\NHANES_Urinary_Albumin.pdf)*.*  To aid comparability, the Diabetes Working Group recommends that the investigator record the make and manufacturer of equipment used and the repeatability and coefficients of variation for the assay.  **REFERENCE RANGES**  (from the NHANES / University of Minnesota laboratory protocol)   | Urinary Albumin in Healthy Subjects | | | | | | | --- | --- | --- | --- | --- | --- | | Number of Subjects | Author | Method | mg/L μg/mL | μg/min | mg/24 h | | 100 adults | Chavers et al. (1994) | FIA | 0.2-17.3\* | 0.8-14.6 | 1.1-21.0 | | 20 adults | Mogenson (1976) | RIA |  | 5-20 | 3.6-23 | | 11 adults | Howey et al. (1987) | RIA | 8.13+ | 7.1\*\*,+ | 10.2+ | | 20 children | Fielding et al. (1983) | ELISA |  | 1.2-15.9\*\* | 1.7-22.9 | | NHANES III | Jones et al. (2002) | FIA | < 30 |  |  |   \* obtained from subject data in the published manuscript \*\* calculated from published units + mean values |
| **Selection Rationale** | The National Health and Nutrition Examination Survey 2007-2008 protocol was selected as the best methodology and one of the most widely used protocols to measure urine creatinine. Additionally, the fluorescent immunoassay (FIA) protocol used by NHANES and developed by the University of Minnesota has been used in other studies, including Atherosclerosis Risk in Communities (ARIC) and Family Investigation of Nephropathy and Diabetes (FIND). |
| **Source** | Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Questionnaire. Laboratory Procedures Manual. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007.  Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Questionnaire. University of Minnesota Laboratory Procedures Manual for Urinary Albumin by Sequoia-Turner Digital Fluorometer, Model 450. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007. |
| **Language** | English, Spanish |
| **Participant** | Participant 6 years of age or older. |
| **Personnel and Training Required** | Personnel to collect the urine Laboratory to perform the fluorescent immunoassay |
| **Equipment Needs** | Supplies to collect and process urine |
| **Standards** | |  |  |  |  | | --- | --- | --- | --- | | **Standard** | **Name** | **ID** | **Source** | | Common Data Elements (CDE) | Urine Albumin To Creatinine Protein Ratio Measurement Value in mg/l | 3070901 | [CDE Browser](https://cdebrowser.nci.nih.gov/CDEBrowser/search?elementDetails=9&FirstTimer=0&PageId=ElementDetailsGroup&publicId=3070901&version=1.0) | | Logical Observation Identifiers Names and Codes (LOINC) | Urinary microalbumin assay proto | 62809-9 | [LOINC](http://s.details.loinc.org/LOINC/62809-9.html?sections=Web) | |
| **General References** | References for Reference Values from the lab protocol:  Chavers BM, Mauer SM, Ramsay RC, Steffes MW. (1994). Relationship between retinal and glomerular lesions in IDDM patients. *Diabetes* 43: 441-6.  Mogenson CE. (1976) Renal function changes in diabetes. *Diabete*s 25: 872-9.  Howey JEA, Browning MCK, Fraser CG. (1987). Selecting the optimum specimen for assessing slight albuminuria, and a strategy for clinical investigation: novel uses of data on biological variation. *Clin Chem* 33: 2032-8.  Fielding BA, Price DA, Houlton CA. (1983). Enzyme immunoassay for urinary albumin. *Clin Chem*29: 355-7.  Jones CA, Francis ME, Eberhardt MS, et al. (2002). Microalbuminuria in the US Population: Third National Health and Nutrition Examination Survey. *Am L Kidney Dis*39:445-459.  Allon, M., Lawson, L., Eckman, J.R., Delaney, V., & Bourke, E. (1988). Effects of nonsteroidal antiinflammatory drugs on renal function in sickle cell anemia. Kidney International, 34, 500-506.  de Jong, P.E., de Jong-Van Den Berg, T.W., Sewrajsingh, G.S., Schouten, H., Donker, A.J.M., & Statius van Eps, L.W. (1980). The influence of indomethacin on renal hemodynamics in sickle cell anemia. Clinical Science, 59, 245-250.  Guasch, A., Cua, M., & Mitch, W.E. (1996). Early detection and the course of glomerular injury in patients with sickle cell anemia. Kidney International, 49, 786-791.  Guasch, A., Navarrete, J., Zayas, C.F., Nass, K., & Eckman, J.R. (2006). Glomerular involvement in adults with sickle hemoglobinopathies: prevalence and clinical correlates of progressive renal failure. Journal of the American Society of Nephrology, 17, 2228-2235.  Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. (2013). KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney International Supplement, 3, 1-150. |
| **Protocol Type** | Bioassay |
| **Derived Variables** | **Microalbuminaria**Ratio of urine microalbumin to urine creatinine   |  |  | | --- | --- | |  | Ratio of albumin / creatinine (ug/mg) | | Normal | <30 | | Microalbuminaria | 30-299 | | Macroalbuminaria | >299 |   American Diabetes Association. (2010). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, 33 (Supplement 1), S11 - S61. |
| **Requirements** | |  |  | | --- | --- | | **Requirement Category** | **Required** | | Average time of greater than 15 minutes in an unaffected individual  Average time of greater than 15 minutes in an unaffected individual | No | | 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 requirements for biospecimen collection  This protocol requires that blood, urine, etc. be collected from the study participants. | No | | Specialized training  This measure requires staff training in the protocol methodology and/or in the conduct of the data analysis. | No | |