NHANES 1999-2000 Public Data Release File (June 2002)

Laboratory 19 – Measles, Rubella, and Varicella

Description

Measles

Measles is a highly infectious disease targeted for elimination in the United States by the year 1996. The elimination strategy called for vaccination of all susceptible persons at age 12-15 months and at 4-11 years. NHANES will assess age-specific population immunity, taking into account vaccinees who never develop antibodies, persons who may lose immunity over time, and persons who are immune from natural disease. The U.S. measles elimination goal for 1996 came at a time when measles elimination was being considered as an achievable goal worldwide by the World Health Organization. If success can be demonstrated in the U.S. as well as other countries in the hemisphere, world-wide efforts to eliminate measles will be encouraged. The benefit from a study of measles seroprevalence will be to document age-specific immunity that is found following measles elimination efforts and to help judge the levels of immunity that are needed to eliminate measles.

Rubella

Congenital rubella syndrome (CRS) is the term used to describe the serious birth defects that occur among infants born to women infected with rubella while pregnant. A single rubella vaccination, usually given as measles-mumps-rubella (MMR) vaccine, is thought to confer lifelong immunity. Widespread use of the vaccine has resulted in near elimination of CRS in the United States. In recent years, an increasing proportion of rubella cases have been reported among adults, and outbreaks have occurred among persons of Hispanic ethnicity. Population-based rubella seroprevalence studies will provide valuable information about specific groups that lack rubella immunity and therefore could be targeted for immunization. Therefore serologic testing of NHANES participants will be conducted to document the level of immunity to rubella by race and ethnicity and allow comparison data from NHANES III.

Varicella

In 1995, a vaccine for prevention of varicella (chicken pox) was licensed for use in persons 1 year of age and older. Wide use of the vaccine may change the epidemiology of the disease with a shift in incidence to older persons who are at higher risk than are younger persons for more severe disease and complications. Older persons may have severe complications such as encephalitis and/or death if they develop varicella. Additionally, pregnant women can pass on varicella if they develop it in the last weeks of gestation with severe life-threatening consequences to the newborn. NHANES provides a unique opportunity to assess changes in the seroprevalence of immunity to varicella after introduction of the vaccine. Demographic data on immune and susceptible persons will help target vaccination programs toward groups at risk for disease.

Eligible Sample
Participants aged 6 to 49 years who do not meet any of the exclusion criteria

Data Collection Methods
Blood specimens are processed, stored, and shipped to the Viral and Rickettsial Disease Laboratory, California State Department of Health Services, Berkeley, California for analysis.

Examination Protocol
Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Vials were stored under appropriate frozen (-20 degrees Centigrade) conditions until they were shipped to Viral and Rickettsial Disease Laboratory, California State Department of Health Services, Berkeley, California for testing. The analytical methods are described in the Analytic methodology section.

Survey Staff
The NHANES 1999-2000 laboratory staff consists of medical technologists and phlebotomists. The medical technologists hold baccalaureates in medical technology. The American Society for Clinical Pathologists or a similar organization certifies the medical technologists and the phlebotomists. All laboratory staff completes comprehensive training in standardized laboratory procedures before they begin working in the MEC. The MEC phlebotomists complete comprehensive training in pediatric phlebotomy techniques, including instruction by a pediatric nurse practitioner.

Analytic Methodology

Measles, Rubella, and Varicella

The staff of the Immunoserology Unit of the California State Department of Health Services (CSDHS), Viral and Rickettsial Disease Laboratory (VRDL) developed these EIA tests. The procedures described below are the standardized protocols of the VRDL's in-house EIA tests for serodiagnosis of viral infections and are currently routinely used for the following viruses: adeno, cytomegalo, herpes simplex, influenza A and B, measles, mumps, rubella, parvo-B19, respiratory syncytial, St. Louis encephalitis, varicella-zoster, and western encephalitis. The individual steps in the test are the same for all these viruses, except that production and purification of viral and control antigens used in the assay are different for individual viruses. These assays are approved and routinely monitored by CLIA staff.

In the indirect EIA, a suitable antigen material (i.e., solubilized varicella-zoster virus) is coated on the wells of a 96-well microtiter plate, which is subsequently incubated with a diluted test specimen. If the specimen contains antibody to the

antigen, the antibody will form complexes with the antigen on the coated plate. After washing unreacted serum components from the plate, an antibody-enzyme conjugate is added to the wells and incubated. The conjugate consists of anti-human IgG covalently coupled to the enzyme alkaline phosphatase. The conjugate will react with the antigen-antibody complex on the surface of the well resulting in a sandwich of well-antigen-antibody-antibody-enzyme. If the test specimen does not contain IgG antibody to the antigen, the conjugate will not bind to the well surface and will be removed by washing. The presence of enzyme in the complex is determined by adding an enzyme substrate (indicator system) to the well and incubating while a color reaction occurs. The enzyme substrate reaction will result in a yellow colored product, which is measured in a spectrophotometer adjusted to a wavelength of 405 nanometers with a side band adjusted to 630 nanometers.

Analytic Notes

LBXRU

Rubella index

Rubella antibody data are reported both as an optical density index and in International Units. The index is calculated by subtracting the absorbance of the control well from the absorbance of the antigen well (AG-NS) and dividing the difference by the cut-off value. The cut-off value is calculated as the mean AG-NS value of duplicate 10 IU standards. The equation used is:

O.D. index = (AG-NS)/Cut-off value

An LBXRU (O.D. index) greater than or equal to one indicates the presence of antibody.

LBDRUIU

Rubella International Units

Rubella antibody data are reported both as an optical density index and in International Units. International Units are calculated based on a standard curve using a regression analysis of duplicate AG-NS values of 10, 40, & 100 IU standards and their squares. An International Unit value greater than or equal to 10 is considered significant for Rubella.