Detection of Serum Antibodies to *Chlamydia pneumoniae* in Patients with Endogenous Uveitis and Acute Conjunctivitis

*Chlamydia pneumoniae* is an etiologic agent that commonly causes acute infection of the respiratory tract and that has also been associated with coronary artery disease and atherosclerosis both by seroepidemiologic studies and by demonstration of the organism by culture and enzyme immunoassay [1]. Seroepidemiologic studies show that primary infections due to *C. pneumoniae* occur during early childhood [2]. Although reinfections are common, serum IgM antibodies to *C. pneumoniae* are rarely detected in patients who are reinfected with *C. pneumoniae*.

Various other clinical syndromes have been associated with *C. pneumoniae* infection. Kawasaki disease is an acute inflammatory condition that is associated with coronary artery disease, mainly in children <5 years of age. However, the etiology of Kawasaki disease is still unknown. The prevalence of serum IgM antibodies to *C. pneumoniae* in infants and children in the acute phase of Kawasaki disease was significantly higher than that in age-matched healthy controls [3].

Several acute and chronic diseases have also been presumptively associated with *C. pneumoniae* infection. Although serological studies suggested an association between the detection of antibodies to *C. pneumoniae* and pulmonary sarcoidosis, an etiologic association has also not yet been established [4, 5]. An organism cultured from the eye of a child in Iran in 1968 and isolated in a chicken egg yolk sac (IOL-207) has proven to be *C. pneumoniae* [6]. Despite the conjunctival source of these clinical isolates, serological studies suggested that the organism was not related to eye disease.

We determined the titer of serum antibodies to *C. pneumoniae* for 48 adult patients with endogenous uveitis (29 had sarcoidosis, 10 had Behçet’s disease, and 9 had Vogt-Koyanagi disease) and for 28 adult patients with acute conjunctivitis. We also determined the titer of serum antibodies to *C. pneumoniae* in 30 healthy adults who served as controls. The titer of serum IgG, IgA, and IgM antibodies to *C. pneumoniae* was determined by microimmunofluorescence with use of formalinized elementary bodies of *C. pneumoniae* TW-183; TWAR strain was used as antigen (provided by Washington Research Foundation, Seattle). The titers of chlamydial IgG, IgA, and IgM antibodies were measured with use of goat fluorescein isothiocyanate-conjugated antibody to human IgG, IgA, and IgM (Cappel Laboratories, Malvern, PA). With use of microimmunofluorescence, serum antibody titers of 1:16 or higher were considered to be positive [7].

Of 30 healthy adults, IgG antibodies to *C. pneumoniae* were detected in 17 (56.7%), and IgA antibodies were detected in 15 (50.0%); IgM antibodies to *C. pneumoniae* were detected in 6 (20%) adults. Of 29 patients with sarcoidosis, IgG antibodies to *C. pneumoniae* were detected in 21 (72.4%), and IgA antibodies were detected in 15 (51.7%); IgM antibodies to *C. pneumoniae* were detected in 17 (58.6%) patients. IgG antibodies to *C. pneumoniae* were detected in seven (70%) of 10 patients with Behçet’s disease and in three (33%) of nine patients with Vogt-Koyanagi disease. Neither IgA or IgM antibodies to *C. pneumoniae* were detected in the patients with Behçet’s or Vogt-Koyanagi disease. Of 28 patients with active conjunctivitis, IgG antibodies to *C. pneumoniae* were detected in 16 (57.1%); in 2 (7.1%) of these patients, IgA and IgM antibodies to *C. pneumoniae* were detected. The prevalence of serum IgA and IgM antibodies to *C. pneumoniae* in patients with endogenous uveitis associated with sarcoidosis was significantly higher than that in patients with other endogenous uveitis (P < 0.01; t-test; Welch’s modification).

Although *Chlamydia trachomatis* has been associated with trachoma, a sequela of ocular infection, the etiologic role of *C. pneumoniae* in eye diseases is still unknown. Much of our knowledge about the epidemiology of *C. pneumoniae* infection has been derived from serological studies that use microimmunofluorescence. Pulmonary lesions and uveitis are the most common clinical manifestations of sarcoidosis. Erythema nodosum can also occur concomitantly with sarcoidosis. The results of serological studies have also suggested an association between detection of antibodies to *C. pneumoniae* and various syndromes including erythema nodosum [8].

In *C. trachomatis* infection, immune reactions may cause scarring of the conjunctiva as a consequence of reinfection, and delayed hypersensitivity has been implicated in the pathogenesis of blindness due to trachoma. Elevated titers of serum antibodies to *C. pneumoniae* and the presence of circulating *Chlamydia*-specific immune complexes have been found in several patients with chronic *C. pneumoniae* infections. Chlamydial infections induce inflammatory changes that might induce modulation of secretion of cytokines. The 60-kDa heat-shock protein may also have a role in inducing nonspecific hypergammaglobulinemia, delayed-type hypersensitivity reaction, and autoimmune reaction associated with chlamydial infections. Whether the *C. pneumoniae* GroEL gene product might play a similar role in the pathogenesis of *C. pneumoniae* infection is still unknown.

Immune abnormalities, including raised serum levels of IFN-γ and other cytokines, have been documented and implicated in the pathogenesis of *C. pneumoniae* infection [9]. Although it has been hypothesized that endogenous uveitis due to sarcoidosis is associated with active *C. pneumoniae* infection, further studies are necessary to establish the role of *C. pneumoniae* infection in the pathogenesis of endogenous uveitis.

Kei Numazaki, Shunzo Chiba, Koki Aoki, Katsuya Suzuki, and Shigeaki Ohno

Department of Pediatrics, Sapporo Medical University School of Medicine, Sapporo; and Aoki Eye Clinic, Sapporo; and Department of Ophthalmology, Yokohama City University School of Medicine, Yokohama, Japan

References
A Semiquantitative Analysis of the Fecal Flora of Patients with Vancomycin-Resistant Enterococci: Colonized Patients Pose an Infection Control Risk

Vancomycin-resistant enterococci (VRE) have rapidly emerged as major nosocomial pathogens in hospitals throughout the United States. VRE fecal carriage can be widespread among hospitalized patients [1]. To determine whether VRE fecal colony counts differ in VRE-colonized and VRE-infected patients, we performed a semiquantitative study of the aerobic fecal flora of hospitalized patients with VRE.

Stool samples were obtained from patients with VRE. Stool suspensions equivalent to $10^{-1} \text{g/mL}$ were made and serially diluted up to $10^{-12} \text{g/mL}$ with use of sterile saline. One mL of each dilution was inoculated into trypticase soy broth, Enterococcus broth (Becton-Dickinson Microbiology Systems, Cockeysville, MD), and Enterococcus broth plus vancomycin (6 mg/mL) and incubated at 35°C for 48 hours.

Enterococcus broths (with or without vancomycin) exhibiting growth were plated onto sheep blood agar; trypticase soy broths were plated onto Columbia and MacConkey agars. Three to five colonies of each colony type were isolated from each plate. Enterococci were identified and tested for vancomycin resistance with use of standard methods [2]. Aerobic gram-negative bacilli (GNB) were identified by colony morphology.

VRE-colonized and VRE-infected patients were compared with use of Wilcoxon’s rank sum test or Fisher’s exact test. A log10 transformation of VRE cfu per g of stool was performed. Comparisons between mean log10 VRE and dichotomous variables were analyzed with use of the unpaired t-test. The Friedman test was used to assess differences among VRE, vancomycin-susceptible enterococci (VSE), and GNB cfu/g; the Student-Newman-Keuls test was used to determine which counts differed. P values were determined by two-tailed tests.

Financial support: This work was supported by contract #200-94-0860 with the Centers for Disease Control and Prevention (CDC).

Reprints or correspondence: Dr. Marisa A. Montecalvo, Division of Infectious Diseases, New York Medical College, Macy Pavilion 209 S.E., Valhalla, New York 10595.

Clinical Infectious Diseases 1997;25:929–30
© 1997 by The University of Chicago. All rights reserved.
1058-4839/97/2504–0029$03.00

Figure 1. The number of vancomycin-resistant enterococci (VRE), vancomycin-susceptible enterococci (VSE), and aerobic gram-negative bacilli (GNB) recovered from the stool of 25 patients. Each symbol represents the highest number of organisms recovered. The line in each group of symbols indicates the median number of organisms for the group. Patients for whom VSE or GNB were not detected are indicated by log10 = none.