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Frequency of *Chlamydia trachomatis* as the Cause of Pharyngitis

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We evaluated the incidence of *Chlamydia trachomatis* as the etiologic agent of uncomplicated pharyngitis by the cell culture procedure recommended by the Centers for Disease Control, Atlanta, Ga., and by the MicroTrak direct immunofluorescent stain (Syva Co., Palo Alto, Calif.) for elementary bodies on throat swabs collected from 126 symptomatic patients. Of the 126 cultures, 8% were positive for group A beta-hemolytic streptococci. Of 126 chlamydia cultures, none was positive. The MicroTrak test gave one borderline positive result. In contrast to a previously published report that *C. trachomatis* is the most frequent nonviral cause of adult pharyngitis (A. L. Komaroff, M. D. Aronson, T. M. Pass, C. T. Ervin, and W. T. Branch, Jr., Science 222:927–929, 1983), our data indicated an infection rate of less than 1%.

Pharyngitis in adults is a frequent health problem. It results in 40 million visits to physicians each year, generating some 30 million specimens to be examined by bacterial culture. Over 100 million work days are lost to employee absence each year due to sore throat (4, 6, 9). *Chlamydia trachomatis* is an important human pathogen for body sites such as the eye, respiratory tract, and reproductive tract. It is the leading cause of preventable blindness in the world and is thought to be the leading cause of sexually transmitted disease in the United States (1). Recently, *C. trachomatis* was suggested as one of the major causes of pharyngitis in adults. Using serology to detect significant rises in specific antibody, Komaroff et al. (9) found evidence of *C. trachomatis* infection in 20.5% of the patients in their study. Culture confirmation of chlamydia infection in adult pharyngitis is needed before the role of chlamydia can be established.

Our goal was to detect the presence or absence of *C. trachomatis* in throat specimens collected from persons whose primary complaint was pharyngitis so that the relationship of the organism to the infection could be established in a direct manner. We attempted to detect the organism by two independent techniques: visualization of the elementary bodies directly by a fluorescent-antibody stain and growth of the organism in tissue culture. We also monitored the incidence of infection with beta-hemolytic streptococci.

Our study population consisted of 126 patients with sore throats presenting to the Family Medicine Clinic and the Employee Health Clinic of Thomas Jefferson University Hospital. Specimens were collected over a 4-month period from February through May 1984.

Three Rayon throat swab specimens were collected from each patient. The physicians were instructed to take samples from the entire infected area. The first swab was immediately placed in 2-sucrose phosphate transport medium containing 3% fetal bovine serum for chlamydia (2, 11). The specimen in 2-sucrose phosphate was frozen at −75°C until it was used for chlamydia culture. The second swab was rolled onto the glass slide contained in the Syva MicroTrak specimen collection kit (Syva Co., Palo Alto, Calif.). It was immediately fixed in acetone and was held at −75°C until it was stained with fluorescent antibody specific for chlamydia. The third swab was used to culture for beta-hemolytic streptococci.

Chlamydia cultures were performed according to the recommended procedure of the Centers for Disease Control (2) in McCoy cells purchased from Flow Laboratories, Inc. (McLean, Va.).

The Syva MicroTrak test for *C. trachomatis* elementary bodies was used (12). The kit contains a fluorescent tagged monoclonal antibody specific for the organism. The staining procedure was performed according to the package insert except that specimens from the throat were used. Stained slides were examined at 43× and 60× (lens objective) with a Leitz fluorescent microscope with a 50-W mercury bulb.

Cultures for beta-hemolytic streptococci were made by using 5% sheep blood agar plates incubated anaerobically. All beta-hemolytic streptococci were tested with a bacitracin disk to identify presumptively the isolate as group A or not group A (5).

Figure 1 shows the age distribution for the 126 patients studied. Most were at an age at which they could be considered potentially sexually active. Previous studies of our patient population have demonstrated that chlamydia infection is the most prevalent sexually transmitted disease, with an incidence as high as 13% in some groups. Of the patients studied, 70% were female.

The results of our tests for chlamydia and beta-hemolytic streptococci in the throat swabs from our patients showed that none of the cultures was positive for chlamydia, and only one questionable positive result was seen by direct immunofluorescent staining for elementary bodies. There were many negative cells on the smear, but one cell had on it a sufficient number of apple-green particles of the correct size and shape to be considered positive for elementary bodies. Therefore, the percentage of patients with a positive chlamydia test was very low (0.8%).

The bacterial cultures showed an incidence of group A beta-hemolytic streptococcus infection (8%) similar to that found by others. Both Komeroff et al. (9) and Gerber et al. (6) found that 9% of their study population was infected with group A streptococcus. Positive results for beta-hemolytic streptococcus infection in groups other than group A occurred in 13% of patients.

This is the first reported study that used two independent test methods for detection of *C. trachomatis* in throat specimens from patients with pharyngitis. The use of the MicroTrak stain to detect *Chlamydia* particles gave us the opportunity to determine if there was a positive sample with a strain of *Chlamydia* that did not grow well in the McCoy

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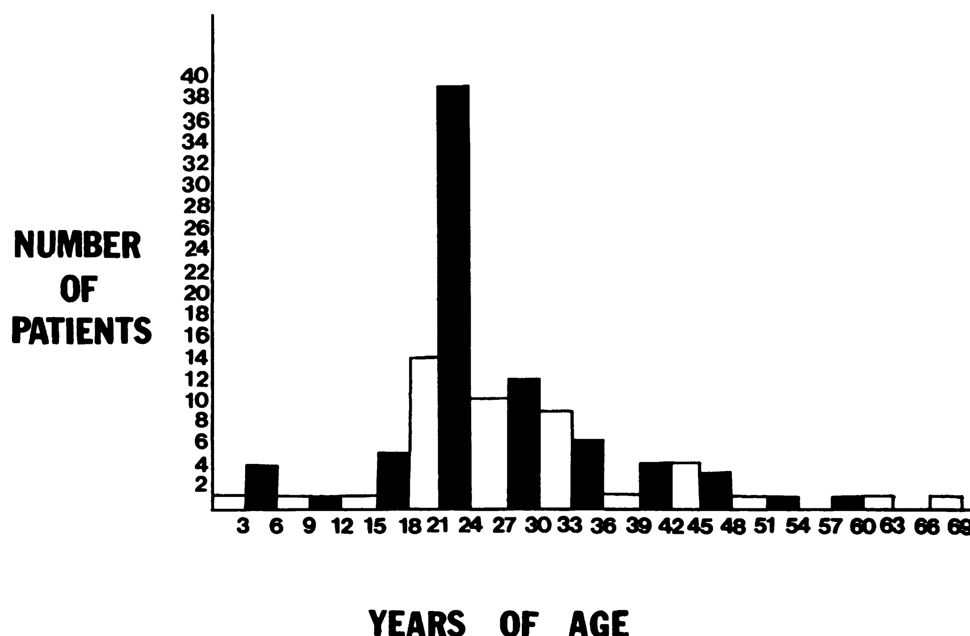

FIG. 1. Age distribution of 126 patients with pharyngitis. Each bar, either black or white, represents the number of patients in a 3-year age span.

cell system. There were no culture-proved cases of chlamydia pharyngitis and only one positive direct fluorescent-antibody smear from 126 patients. A previous publication that suggested that chlamydia infection could account for up to 20.5% of the cases of adult pharyngitis could not be confirmed by our findings (9).

While *C. trachomatis* has been isolated from the pharynx in cases of symptomatic pharyngitis and from the pharynges of asymptomatic patients who engage in orogenital sex, these cases have been few (10, 14). The isolation rate of *C. trachomatis* from the genital tract of homosexual men is very high, but isolation from pharyngitis in this same population is uncommon (10). A study was conducted to isolate *C. trachomatis* from the pharynges of women who practiced fellatio on sex partners with culture-proved *C. trachomatis* urethritis, but no positive cultures were found (3). In one study that examined the infection of three chimpanzees with *C. trachomatis*, clinical urethritis could be created with urethral inoculation of 80 inclusion-forming units. When the researchers attempted to induce pharyngitis by inoculation of the pharynges, they found that they were unable to produce infection in one subject, and inoculations of 10^5 and 10^2 inclusion-forming units were needed to induce infection in the other two subjects. The two chimps in which *C. trachomatis* could be isolated from the pharyngeal area showed no clinical symptoms (8). Our culture results were similar to those of Gerber et al. (6), who attempted to isolate *Chlamydia* spp. from throat specimens of 95 college students with acute pharyngitis, but were unable to find any positive cultures.

In the study that reported a high pharyngeal infection rate based upon serological findings (9), the author listed several possibilities for positive results other than pharyngeal infection. It was suggested that the antibodies could have been produced by infection of another body site, or that polyclonal activation of antibody by another organism or cross-reactive antibody to another antigen may have caused false-positive results for chlamydia. It should also be noted that demonstrating antibodies to chlamydia in a patient is not unusual. Seroepidemiological studies have revealed that chlamydial antibodies are more prevalent than was anticipated (7). Wang et al. (13) screened patients for chlamydial antibodies and found that 60% of patients attending a venereal disease clinic were positive for these antibodies and that 25% of adults without venereal disease and 9% of children under 15 years of age also demonstrated antibodies to chlamydia. Consideration must also be given to the possibility that unrecognized chlamydial strains exist that are capable of causing respiratory disease but are not necessarily detected by either the Syva monoclonal antibody on direct smears or by iodine staining of cell cultures. The data collected by our group and others indicate that *C. trachomatis* is not a major demonstrable cause of pharyngitis. Further studies are needed, however, to explain the discrepancy between the reported positive serological results and the negative direct fluorescent-antibody stain and culture results.

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