Circulating antibodies to *Chlamydia trachomatis* in women: relationship to antisperm and antichlamydial antibodies in semen of male partners

S.S. Witkin

Division of Immunology and Infectious Diseases, Department of Obstetrics and Gynecology, Cornell University Medical College, 515 East 71st Street, New York, NY 10021, USA

The relation between antibodies to *Chlamydia trachomatis* and spermatozoa in sera of 112 asymptomatic female partners of infertile couples with no history of *C. trachomatis* infections and antichlamydial antibodies in semen or antisperm antibodies on ejaculated spermatozoa of their male partners was examined. Samples were tested for immunoglobulin (Ig)A and IgG antibodies to *C. trachomatis* by enzyme-linked immunosorbent assay; antisperm antibodies in sera and on motile spermatozoa were assayed by immunobead binding. IgG antibodies to *C. trachomatis* were detected in 24 (21.4%) of the women; only five (4.5%) were positive for antichlamydial IgA. Antichlamydial IgG was detected in sera from 10 (40.0%) of 25 women whose partners had antichlamydial IgA in semen as opposed to 14 (16.1%) of 87 women whose partners' semen were negative for this antibody (*P* = 0.02). Similarly, antichlamydial IgG was detected in sera from five (50%) of 10 women whose partners had antichlamydial IgG in semen as opposed to 19 (18.6%) of 102 women whose partners' semen lacked this antibody (*P* = 0.03). There was no relation between antichlamydial antibodies in women and circulating antichlamydial antibodies in men. A strong correlation (*P* = 0.001) was observed between IgG antichlamydial antibodies in a woman's serum and antisperm antibodies on ejaculated spermatozoa of her partner [8 of 14 (57.1%) versus 16 of 98 (16.3%)]. Conversely, antichlamydial antibodies in a woman's serum was unrelated to the presence of antisperm antibodies in either her own serum or her partner's serum. The data demonstrate that chlamydial infections of the male genital tract, which are associated with antisperm antibody formation on ejaculated spermatozoa, are likely to be transmitted to the female partner. In contrast, the presence of antichlamydial antibodies in sera does not necessarily appear to indicate an infection of the genital tract and is not associated with the heterosexual transmission of *C. trachomatis*.

**Key words:** antisperm antibodies/*Chlamydia trachomatis*/ heterosexual transmission/infertility

Introduction

*Chlamydia trachomatis* genital tract infections are a major cause of infertility. In women, chlamydial infections can result in tubal occlusion and ectopic pregnancy (Cates and Wasserheit, 1991). In men, this infection can affect sperm quality and induce antisperm antibody formation (Close *et al*., 1987). *C. trachomatis* genital tract infections are often asymptomatic and may persist undetected, and therefore untreated, for long periods of time (McCormack *et al*., 1979). We recently demonstrated that male partners of infertile couples in New York City were frequently positive for immunoglobulin (Ig)A antibodies to *C. trachomatis* in their semen despite never having been diagnosed with this infection and never having had symptoms consistent with a chlamydial genital tract infection. Furthermore, the presence of antichlamydial antibodies in semen correlated with autoimmunity to spermatozoa (Witkin *et al*., 1995) This relationship, plus the much decreased prevalence of antichlamydial IgA in serum as opposed to semen, reinforced the likelihood that these men had had a genital tract *C. trachomatis* infection. To ascertain whether these chlamydial infections were sexually transmitted, and to assess their possible influence on antisperm antibody formation in women, we have now investigated the antichlamydial and antisperm antibody status of the female partners of those previously studied men.

**Materials and methods**

**Subjects**

A total of 112 female partners of infertile couples seeking antisperm antibody testing at The New York Hospital–Cornell Medical Center, NY, USA were studied. Couples with a history of *C. trachomatis* infection were excluded. The results of antichlamydial and antisperm antibody testing of the male partners have been reported recently (Witkin *et al*., 1995).

**Chlamydia antibody testing**

Blood was obtained from the women by venipuncture at the time of blood and semen collection from the male partners. Serum was obtained by centrifugation and stored in aliquots at −80°C. For testing, sera were diluted 1:50 (for IgA antibodies) or 1:100 (for IgG antibodies) and assayed by enzyme-linked immunosorbent assay for antibodies to a recombinant *Chlamydia*-specific lipo polysaccharide fragment (Medac, Hamburg, Germany) as previously described (Witkin *et al*., 1995). The lower limit of a positive serum test was defined as the optical density of a negative control serum plus 0.32, as suggested by the manufacturer. Differentiation of positive from negative samples was clear and unambiguous. The positive sera had a mean (SD) optical density of 0.925 (0.758) above the cut-off value.
Antichlamydial antibodies and antisperm antibodies in female partners

This was significantly greater than the 16.3% prevalence of antichlamydial IgG (Table I). Antisperm antibodies were present on ejaculated spermatozoa in 23 (20.5%) of the 102 men; eight (57.1%) of their female partners were positive for circulating antichlamydial IgG (Table I). This was significantly greater than the 16.3% prevalence of antisperm antibodies in sera from spouses of antichlamydial antibody negative men ($P = 0.001$). Antisperm antibodies were detected on the partners’ spermatozoa of one of five women with antichlamydial IgA in their serum. There was no statistically significant relation between antisperm antibodies in a man’s serum and antichlamydial antibodies in his spouse’s serum.

**Results**

**Antibodies to *C. trachomatis* and spermatozoa in sera from female partners**

IgG antibodies to *C. trachomatis* were detected in 24 (21.4%) of the sera tested. IgA antichlamydial antibodies were present in only five (5.5%) samples.

Antisperm antibodies were present in sera from 23 (20.5%) women. In most subjects, a mixture of IgG, IgA and/or IgM antibodies was detected. A total of 20 women were positive for IgG antisperm antibodies, seven women had IgA antibodies, while 12 had IgM antibodies. There was no relationship between antichlamydial and antisperm antibodies; 16% of women with and 23% of women without antisperm antibodies were positive for antichlamydial IgG. None of the five women with antichlamydial IgA had antisperm antibodies.

Women with antichlamydial antibodies were 34.7±6.2 (mean ± SD) years old. This was very similar to the 35.3±5.3 years mean age of women negative for these antibodies.

**Antichlamydial antibodies in couples**

IgA antibodies to *C. trachomatis* were detected in semen samples from 25 men; 40% of their wives were antichlamydial IgG positive (Table I). This was significantly greater than the 16.1% prevalence of antichlamydial IgG antibodies in spouses of men whose semen samples were *C. trachomatis* antibody negative ($P = 0.02$). Similarly, antichlamydial IgG antibodies were present in 50% of wives whose partners had antichlamydial IgA in semen, as compared to 18.6% of women whose spouses lacked this antibody ($P = 0.03$) (Table II). Three of the five women with circulating antichlamydial IgA had spouses with antichlamydial IgA in seminal fluid. In contrast, there was no relation between antichlamydial antibodies in a woman’s serum and antibodies in her partner’s semen.

**Antichlamydial antibodies and antisperm antibodies**

Antisperm antibodies were present on ejaculated spermatozoa from 14 of the 102 men; eight (57.1%) of their female partners were positive for circulating antichlamydial IgG (Table III). This was significantly greater than the 16.3% prevalence of antichlamydial IgG in sera from spouses of antisperm antibody negative men ($P = 0.001$). Antisperm antibodies were detected on the partners’ spermatozoa of one of five women with antichlamydial IgA in their serum. There was no statistically significant relation between antisperm antibodies in a man’s serum and antichlamydial antibodies in his spouse’s serum.

**Discussion**

The presence of antichlamydial IgG in a woman’s serum correlated with the occurrence of antichlamydial IgA and IgG in her partner’s semen. Since *C. trachomatis* is the only chlamydial species to infect the genital tract, and many of these men had antichlamydial antibodies in semen but not in serum (Witkin et al., 1995), these observations demonstrate that a *C. trachomatis* infection of the male genital tract was transmitted to the female partners in this study with a frequency of ~40%. Others have shown that, when a culture-documented *C. trachomatis* infection was present in the male genital tract, between 50 and 63% of the female partners were also chlamydial culture positive (Lycke et al., 1980; Worm and Petersen, 1987).

We previously demonstrated that the presence of antichlamydial antibodies in semen was highly correlated with the presence of antisperm antibodies on ejaculated spermatozoa (Witkin et al., 1995). Therefore, the observed relationship between antichlamydial antibodies in a woman’s serum and antisperm antibodies in her partner is probably a reflection of the occurrence of antichlamydial antibodies in the semen of these men. It reinforces the observation that a male genital tract chlamydial infection capable of inducing antisperm antibodies in men can also be transmitted to female partners. However, the lack of a correlation between antichlamydial antibodies and antisperm antibodies in women’s sera indicates that chlamydial infections have a low probability of inducing circulating antisperm antibodies in women and/or that the antibodies detected were not specific for *C. trachomatis* (see below). Unfortunately, cervical samples from women in the present study were not available for testing. Thus, it still...
remains to be tested whether a localized mucosal female genital tract immune response to spermatozoa may be induced by *C. trachomatis* in the apparent absence of a systemic immune response to this organism.

There was no relationship between antichlamydial antibodies in a woman's serum and antichlamydial antibodies in her partner's serum. This suggests that, in marked contrast to seminal antichlamydial antibodies, the presence of circulating antichlamydial antibodies does not necessarily indicate a *C. trachomatis* genital tract infection. Infection with *C. pneumoniae* or *C. psittaci* can also result in antichlamydial antibody formation (Moss *et al.*, 1993). Individuals infected with these organisms, therefore, may yield false positive results in *C. trachomatis* serum antibody assays that are only genus-specific.

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**References**


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