Antimicrobial Susceptibilities of *Ureaplasma urealyticum* and *Mycoplasma hominis* in Pregnant Women

Eunha Koh1,3, Sunjoo Kim1,3, In-Suk Kim1, Kook-Young Maeng1, Soon-Ae Lee2,3

Departments of 1Laboratory Medicine, 2Obstetrics and Gynecology, and 3Institute of Health Science, Gyeongsang National University School of Medicine, Jinju, Korea

**Background:** *Ureaplasma urealyticum* and *Mycoplasma hominis* are associated with an increased risk of pregnancy complications, such as preterm birth and premature membrane rupture. The purpose of this study was to determine the isolation rates and antimicrobial susceptibilities of genital mycoplasma in a sample of pregnant women from Jinju, Korea.

**Methods:** Vaginal swabs were obtained from 258 pregnant women between 2004 and 2008 and tested for the presence of *U. urealyticum* and *M. hominis* at Gyeongsang National University Hospital. The identification and antimicrobial susceptibilities of *U. urealyticum* and *M. hominis* were determined with a commercially available kit, the Mycoplasma IST2 Kit (bioMérieux, Marcy-l’Etoile, France), and evaluated according to standards set by the Clinical and Laboratory Standards Institute (CLSI).

**Results:** *U. urealyticum* only was detected in 105 specimens (38.6%), while *M. hominis* only was detected only in 2 specimens (1.8%). Seven specimens (6.7%) were positive both for *U. urealyticum* and *M. hominis*. Susceptibilities of *U. urealyticum* to azithromycin, erythromycin, clarithromycin, and doxycycline were 75.2%, 82.9%, 88.6%, and 88.6%, respectively, while almost all of the isolates were susceptible to josamycin (99.0%) and pristinamycin (100%). The susceptibility of *U. urealyticum* to ofloxacin and ciprofloxacin was 56.2% and 15.2%, respectively.

**Conclusion:** The rate of isolation of genital mycoplasma in pregnant women was 44.2% in Jinju; most of the mycoplasma were *U. urealyticum*. *U. urealyticum* and *M. hominis* were highly resistant to quinolones, but susceptible to josamycin. Therefore, empirical treatment without prior identification and determination of the antimicrobial susceptibility of genital mycoplasma will fail in many cases. (Korean J Clin Microbiol 2009;12:159-162)

**Key Words:** *Ureaplasma urealyticum*, *Mycoplasma hominis*, Genital mycoplasma, Antimicrobial susceptibilities

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**INTRODUCTION**

*Ureaplasma urealyticum* and *Mycoplasma hominis* are commensals which can be detected in the lower genitourinary tract of sexually active women, resulting in colonization of genitalia by sexual contact[1,2]. Although most colonized women remain asymptomatic, vaginal colonization with *U. urealyticum* and *M. hominis* are associated with an increased risk of developing certain pathogenic conditions and pregnancy complications, such as bacterial vaginosis, pelvic inflammatory disease, postpartum fever, postpartum septicemia, infertility, premature rupture of the membranes, preterm labor, preterm birth, and systemic neonatal infections[2-5]. Such aggravating conditions require the therapeutic use of antimicrobials. Tetracyclines and quinolones are the drugs of choice[6-8], but obstetricians empirically use macrolides for treatment of pregnant women in many cases[9]. The antimicrobial susceptibility of genital mycoplasmas has changed over time and is different by geographic area[1,10-15]. It is important to know the antimicrobial susceptibilities of genital mycoplasmas in a specific geographic region for the successful treatment. No such a study regarding the antimicrobial susceptibilities of *U. urealyticum* and *M. hominis* has been reported in Korea so far. The present study was performed to investigate the isolation rates and the antimicrobial susceptibilities of *U. urealyticum* and *M. hominis* in pregnant women who reside in Jinju, a southern area of Korea.

**MATERIALS AND METHODS**

Vaginal swabs were obtained from 258 pregnant women (range, 20~46 years; mean, 29.6 years) between 2004 and 2008 and were tested for the presence of *U. urealyticum* and *M. hominis* at Gyeongsang National University Hospital. Identification and antimicrobial susceptibilities of *U. urealyticum* and *M. hominis* were
determined with a commercially available Mycoplasma IST2 kit (bioMerieux, Macrcy-l’Etoile, France), as indicated by the manufacturer. Briefly, the cotton swab included in the kit was inoculated in R1 transport medium, which inhibits most Gram-negative and -positive bacteria. The inoculated R1 medium was vortexed rapidly and 3 mL was added to the growth R2 medium, which contained 1 mL of lyophilized urea/arginine broth. After reconstitution and shaking, 55 μL was dispensed into each of the 22 test wells on the strip. Two drops of mineral oil were added to each well. The remainder of the R2 medium and the inoculated strip were then incubated at 37°C and observed for color changes at 24 and 48 h. The antimicrobial susceptibility testing included tetracycline, doxycycline, erythromycin, azithromycin, clarithromycin, josamycin, ofloxacin, ciprofloxacin, and pristinamycin. The development or absence of red color on the relevant part of the strip provided an index of resistance or susceptibility to each antimicrobial agent, respectively, according to the guidelines of the CLSI. The breakpoints for the antimicrobials tested are given in Table 1.

### RESULTS

*U. urealyticum* and *M. hominis* were detected in 114 of 258 cultures (44.2%). *U. urealyticum* was detected in 105 cultures (38.6%) and *M. hominis* was detected in 2 cultures (1.8%). Seven cultures (6.7%) were positive both for *U. urealyticum* and *M. hominis*. The susceptibilities of *U. urealyticum* to azithromycin, erythromycin, and clarithromycin were 75.2%, 82.9%, and 88.6%, respectively, while nearly all of the strains were susceptible to josamycin (99.0%) and pristinamycin (100%). The susceptibilities of ofloxacin and ciprofloxacin were shown to be 56.2% and 15.2% against *U. urealyticum*. Two strains of *M. hominis* were susceptible to doxycycline, josamycin, and pristinamycin, while resistant to azithromycin, erythromycin, and clarithromycin. The antimicrobial susceptibility pattern of the mixed strains was similar to that of *M. hominis* (Table 1).

### DISCUSSION

Genital mycoplasmas have been detected more frequently in the group with preterm deliveries compared to the women who delivered at term. The presence of mycoplasma in the lower genital tract early in pregnancy is known as a risk factor for preterm delivery. Among the pregnant women with premature labor, the duration of pregnancy was prolonged after the onset of premature labor in the *M. hominis*-positive group than that in *M. hominis*-negative group[16]. Early pregnancy screening for genital mycoplasmas and following treatment may reduce preterm deliveries[16,17]. In the present study, the isolation rate of *U. urealyticum* and *M. hominis* in pregnant women was 44.2% and our findings are similar to that of other reports, with a higher rate of *U. ureaplasma* colonization (38.6%) and a lower rate of *M. hominis* (1.8%) [18-20]. However, it is difficult to regard all isolates of *U. urealyticum* and *M. hominis* as pathogens or risk factors of preterm delivery because we did not compare the preterm labor group with the term group. We did not review the clinical outcomes after the tests.

There are a limited number of drugs available against genital mycoplasmas in pregnant women. Agents like β-lactams are completely inactive against *U. urealyticum* and *M. hominis* due to the lack of a cell wall. The antimicrobial susceptibilities to macrolides, which are empirical treatment regimen for genital mycoplasma infection, were different between the two species[21-24]. With respect to antimicrobial susceptibilities of genital mycoplasmas, the *U. urealyticum* strains were susceptible to tetracycline and doxycycline (81.0% and 88.6%, respectively). *M. hominis* strains (N=2) were susceptible to tetracycline and doxycycline (50% and 100%, respectively). Among the macrolides, the highest susceptibility against *U. urealyticum* was observed by josamycin (99.0%), followed by clarithromycin (88.6%), and erythromycin (82.9%), while the susceptibility to azithromycin, which is most commonly used antimicrobial for pregnant women in our region, was not as high (75.2%) as the other macrolides. *M. hominis*
strains are known to be naturally resistant to C14 macrolides (erythromycin, clarithromycin, and roxithromycin)[8,21-24], which is fully in agreement with our results. M. hominis was resistant to three types of the macrolides tested, except josamycin. All strains of U. urealyticum and M. hominis were completely susceptible to tetracycline, doxycycline, and pristinamycin. Ofloxacin and ciprofloxacin proved to be ineffective against the majority of strains of U. urealyticum and M. hominis and a significant number of U. urealyticum strains were immediately susceptible (39% for ofloxacin and 62.8% for ciprofloxacin). The pattern of antimicrobial susceptibilities against mixed isolates (U. urealyticum and M. hominis) was similar to that of M. hominis. U. urealyticum strains isolated from the women with cervicitis in Athens, Greece were highly susceptible to tetracycline, doxycycline, and pristinamycin, while erythromycin, azithromycin, clarithromycin, ciprofloxacin, and ofloxacin were inactive against most of the strains. M. hominis strains were completely susceptible to tetracycline, doxycycline, and pristinamycin[18]. The susceptibilities of macrolides against U. urealyticum strains in Greece were much lower (14.4~79.2%) than our results (75.2~99%). Susceptibilities of erythromycin and ofloxacin against U. urealyticum strains were only 10.3% and 11.4%, respectively in Bolu, Turkey[19]. However, doxycycline or ofloxacin was used as a first choice in the empirical treatment of U. urealyticum and M. hominis infections in Japan[1]; we observed that erythromycin was still active, but quinolone derivatives (ofloxacin and ciprofloxacin) were inactive against U. urealyticum and M. hominis in our region. These discrepancies might be due to the different antimicrobial-use policies, which lead to the emergence of resistance to one or another antimicrobial agents. The empirical treatment can be ineffective for these reasons. Thus, it is difficult to establish common guidelines for the empirical treatment of genital mycoplasma infections. In the present study, we determined the antimicrobial susceptibilities for genital mycoplasma in Jinju, which represents a specific geographic region, rather than whole country. A nationwide survey may enable us to establish new guidelines for the treatment of genital mycoplasma infections in Korea.

In conclusion, the isolation rate of genital mycoplasma in pregnant women was 44.2% in Jinju. Both isolates were resistant to quinolones, but susceptible to josamycin and doxycycline. Characteristically, susceptibility of azithromycin, the empirical treatment regimen for pregnant women in our geographic region, was not as high as we expected. All of the mixed isolates were resistant to azithromycin. Therefore, empirical treatment without the isolation and identification of genital mycoplasma would fail in many cases. In vitro determination of the antimicrobial susceptibility of the genital mycoplasma in each clinical case is required to avoid therapeutic failures.

REFERENCES


임산부에서 비뇨생식기 Mycoplasma의 빈도 및 항균제 감수성

경상대학교 의학전문대학원 1진단검사의학교실, 2산부인과학교실, 3건강과학연구원
고은하1,3, 김선주1,3, 김인숙1, 맹국영1, 이순애2,3

배경: 비뇨생식기 Mycoplasma는 초기부전 및 조기양막염과 같은 산과적 합병증을 일으킬 수 있다. 저자들은 진주지역 임산부에서 U. urealyticum과 M. hominis의 분리율과 항균제감수성양상을 알아보자 하였다.


결과: U. urealyticum은 105검체(38.6%), M. hominis는 2검체(1.8%)에서 분리되었다. 두 가지가 혼합 분리된 것은 7검체(6.7%)였다. U. urealyticum의 azithromycin, erythromycin, clarithromycin 및 doxycycline에 대한 항균체감수성율은 각각 75.2%, 82.9%, 88.6% 및 88.6%였다. Josamycin (99.0%)과 pristinamycin (100%)에 대해서는 거의 모든 균주가 감수성을 보였다. 전증기 Mycoplasma의 동정 및 감수성검사 없이 경험적인 항균제를 투여할 경우 치료에 실패할 수 있다.

결론: 진주지역 임산부에서의 생식기 Mycoplasma의 빈도 및 항균제 감수성

교신저자: 김선주, 660-702, 경남 진주시 칠암동 90번지
Tel: 055-750-8239, Fax: 055-762-2696
E-mail: sjkim8239@hanmail.net