

Addis, M. F., P. Rappelli, et al. (1999). "Identification of *Trichomonas vaginalis* alpha-actinin as the most common immunogen recognized by sera of women exposed to the parasite." J Infect Dis **180**(5): 1727-30.

A study on presence of antibodies to *Trichomonis vaginalis* in serum was done on a group of 500 pregnant, asymptomatic Angolan women. A serologic screening, done by ELISA, revealed that 41% of the women had IgG and IgM against the parasite. Analysis of sera by immunoblotting revealed that 94.4% of sera with anti-T. vaginalis IgG class antibodies were reactive against a common immunogenic protein of 115 kDa. The common immunogen was identified as the protozoan alpha-actinin. All sera recognizing the 115-kDa antigen were reactive against both native and recombinant T. vaginalis alpha-actinin and nonreactive against human alpha-actinin. The findings presented in this work offer a new tool for epidemiologic studies and open new perspectives for vaccination.

Adler, M. W., E. M. Belsey, et al. (1981). "Sexually transmitted diseases in a defined population of women." Br Med J (Clin Res Ed) **283**(6283): 29-32.

A study was conducted to identify and estimate the proportion of patients suffering from gonorrhoea, trichomoniasis, and candidosis, both with and without symptoms, seeking care or failing to seek care at all. Samples women in a defined population were studied in antenatal, gynaecology, family planning, and sexually transmitted diseases clinics and in general practice. The incidence rates varied according to the conditions and to whether cases not proved microbiologically were included or excluded. The incidence rate may be less important than the prevalence rate since the former takes into account patients who have sought care whereas the latter is largely contributed by asymptomatic women who do not consult. The highest prevalence rates, in different agencies, were found for candidosis followed by trichomoniasis, with very low or zero rates for gonorrhoea. In view of these results general practitioners could treat women with genital symptoms empirically so long as accurate sexual histories are taken and follow-up were guaranteed. There is no place for wide-scale screening for gonorrhoea, but limited screening for trichomoniasis in antenatal, gynaecology, and hospital family planning clinics should be encouraged.

Ament, L. A. and E. Whalen (1996). "Sexually transmitted diseases in pregnancy: diagnosis, impact, and intervention." J Obstet Gynecol Neonatal Nurs **25**(8): 657-66.

Sexually transmitted diseases are a major health problem for the 1990s. The etiology of gonorrhea, chlamydia, syphilis, trichomonas, and bacterial vaginitis are presented, along with their treatment, pregnancy-related factors, intrapartum and neonatal factors, and follow-up. The incidence of sexually transmitted diseases has increased, and health care professionals must teach not only about disease impact but also about lifestyle and behavioral changes.

Borchardt, K. A. (1994). "Trichomoniasis: its clinical significance and diagnostic challenges." Am Clin Lab **13**(9): 20-1.

Trichomoniasis is a significant STD worldwide. Clinical studies have demonstrated that trichomoniasis may have serious side effects both in pregnancy and in a predisposition to retrovirus infection. Therefore it is important that clinicians request the most accurate diagnostic test available. This is mandated by the significant percentage of both male and female patients that may be asymptomatic. Numerous clinical studies have indicated that the most sensitive test for *T. vaginalis* is with culture. The InPouch TV culture test has demonstrated high sensitivity, long shelf life, and microscopic advantages over other culture procedures.

Brabin, L., J. Kemp, et al. (1995). "Reproductive tract infections and abortion among adolescent girls in rural Nigeria." Lancet **345**(8945): 300-4.

Few studies from developing countries have investigated reproductive tract infections or other indicators of sexual health among unmarried adolescent girls in rural areas. We have obtained baseline demographic, clinical, and microbiological data on reproductive tract infections and induced abortion in girls in a rural area of southeast Nigeria, in order to assess the need for health care for adolescents. 868 females attended for interview and examination; 458 aged 20 and above and 410 aged 12-19, the latter representing 93.4% of the adolescent population. 43.6% of those < 17 and 80.1% aged 17-19 years were sexually active and at least 24.1% had undergone an induced abortion; only 5.3% had ever used a modern contraceptive. Vaginal discharge was reported by 82.4%, though few sought treatment. 94.1% of sexually active adolescents and 97.6% of sexually active women 20 years old or over were gynaecologically examined and screened for reproductive tract infections. Of those aged less than 17, 19.8% had symptomatic candida and 11.1% trichomonas infections. Among those aged 17-19 years, chlamydia was detected in 10.5%, and symptomatic candidosis in 25.6%; this was the group most likely to have any infection (43.8%). 42.1% of sexually active adolescents had experienced either an abortion or a sexually transmitted disease. Syphilis was the only infection for which the incidence clearly increased with age. Health-care services for adolescents in this community are needed and should include sex education, contraceptive provision (especially barrier methods), and access to treatment for reproductive tract infections. Investments in health for this age group will have an effect on subsequent reproductive health.

Cotch, M. F., J. G. Pastorek, 2nd, et al. (1997). "Trichomonas vaginalis associated with low birth weight and preterm delivery. The Vaginal Infections and Prematurity Study Group." Sex Transm Dis **24**(6): 353-60.

BACKGROUND: Several studies have suggested that pregnant women infected with *Trichomonas vaginalis* may be at increased risk of an adverse outcome. GOAL: To evaluate prospectively the association between *T. vaginalis* and risk of adverse pregnancy outcome in a large cohort of ethnically diverse women. STUDY DESIGN: At University-affiliated hospitals and antepartum clinics in five United States cities, 13,816 women (5,241 black, 4,226 Hispanic, and 4,349 white women) were enrolled at mid-gestation, tested for *T. vaginalis* by culture, and followed up until delivery. RESULTS: The prevalence of *T. vaginalis* infection at enrollment was 12.6%. Race-specific prevalence rates were 22.8% for black, 6.6% for Hispanic, and 6.1% for white women. After multivariate analysis, vaginal infection with *T. vaginalis* at mid-gestation was significantly associated with low birth weight (odds ratio 1.3; 95% confidence interval 1.1 to 1.5), preterm

delivery (odds ratio 1.3; 95% confidence interval 1.1 to 1.4), and preterm delivery of a low birth weight infant (odds ratio 1.4; 95% confidence interval 1.1 to 1.6). The attributable risk of *T. vaginalis* infection associated with low birth weight in blacks was 11% compared with 1.6% in Hispanics and 1.5% in whites. CONCLUSIONS: After considering other recognized risk factors including co-infections, pregnant women infected with *T. vaginalis* at mid-gestation were statistically significantly more likely to have a low birth weight infant, to deliver preterm, and to have a preterm low birth weight infant. Compared with whites and Hispanics, *T. vaginalis* infection accounts for a disproportionately larger share of the low birth weight rate in blacks.

Draper, D., R. Parker, et al. (1993). "Detection of *Trichomonas vaginalis* in pregnant women with the InPouch TV culture system." J Clin Microbiol **31**(4): 1016-8.

Trichomonas vaginalis causes a common genitourinary infection which is frequently asymptomatic. At present, pregnant women are not usually screened for the infection unless they are symptomatic. In the present study, we screened and obtained samples for culture from all pregnant women attending a prenatal clinic with the InPouch TV culture system and compared results with those of standard culture in Diamond's medium and slide wet mount examination. The InPouch TV culture system was as reliable as Diamond's medium in detecting *T. vaginalis* and may be useful and effective in a pregnancy clinic setting.

El-Shazly, A. M., H. M. El-Naggar, et al. (2001). "A study on Trichomoniasis vaginalis and female infertility." J Egypt Soc Parasitol **31**(2): 545-53.

A total of 280 patients, 240 infertile and 40 pregnant were subjected to thorough history taking, general and local examination for exclusion of organic lesion, laboratory investigations to exclude parasitic, bacterial and fungal infections. Sterile vaginal swab from the posterior fornix was taken, and examined by wet smear preparation, Giemsa staining and cultivation on C.P.L.M. medium for trichomoniasis infection. The mean age of the infertile group was 25.75+/-3.92, and of the control group was 21.6+/-2.38 (in years). The mean duration of infertility was 2.81+/-1.51 (years). Out of 240 infertile women, 18.75% complained of discharge, 17.5% itching, 15.42% dysuria, 14.58% dyspareunia, and 10% had cervical lesion. Of the 40 controls, 5% complained of discharge, 2.5% complained of itching, dysuria, dyspareunia, but none had cervical lesion. Of the total cases (280), 36 (12.9%) had *T. vaginalis*. The clinical data observed were significantly higher among the infertile group than the control group. Cultures were positive in 14.58% of the infertile group and 2.5% in the control group. The difference between the 2 groups was statistically significant. No doubt, *T. vaginalis* plays an important role in female infertility.

Franjola, R., R. Anazco, et al. (1989). "[*Trichomonas vaginalis* infection in pregnant women and newborn infants]." Rev Med Chil **117**(2): 142-5.

We studied 149 pregnant women at delivery and 113 newborns in order to determine the frequency of *T. vaginalis* infection. Neutral red stain, dark field microscopy and culture methods were used with comparable yields. The age of women ranged from 12 to 43 years. A 27.5% infection rate was detected in mothers but all newborns were free from infection. Infection rates in relation to age among mothers confirmed previously reports.

Franklin, T. L. and G. R. Monif (2000). "Trichomonas vaginalis and bacterial vaginosis. Coexistence in vaginal wet mount preparations from pregnant women." J Reprod Med **45**(2): 131-4.

OBJECTIVE: To identify how frequently trichomoniasis and characteristics of bacterial vaginosis (BV) occur concomitantly in wet mount preparations from pregnant women. STUDY DESIGN: Diagnosis of trichomoniasis was predicted on visualization of the organism. Diagnosis of BV required a positive volatile (whiff) test, presence of "clue cells" and one of two minor criteria: (1) absence of lactobacilli, or (2) a pH > 4.5. Pregnant women from January 1995 to July 1997 at our clinic had wet mount/KOH preparations performed as standard prenatal care. Corresponding medical charts were analyzed for symptoms, race, BV, sexually transmitted diseases, urinary tract infections and other infections. RESULTS: Of 191 pregnant women identified, 69 had trichomoniasis. Seventy-nine percent of the 69 were African American. Fifteen percent of pregnant women (17) had concomitant trichomoniasis and BV. Irrespective of race, 35-38% of pregnant women with trichomoniasis had another sexually transmitted disease or a urinary tract infection diagnosed in that pregnancy. CONCLUSION: BV, or bacteria excess syndrome, is a frequent coinfection in pregnant women harboring Trichomonas vaginalis.

Goldenberg, R. L., M. Klebanoff, et al. (2001). "Metronidazole treatment of women with a positive fetal fibronectin test result." Am J Obstet Gynecol **185**(2): 485-6.

Eighty-nine women with either bacterial vaginosis, Trichomonas vaginalis, or both, who also had a positive fetal fibronectin test result were randomized to two courses of metronidazole treatment as part of a Maternal-Fetal Medicine Network Units study of the National Institute of Child Health and Human Development. In this subgroup analysis, compared with the placebo group, women who were treated with metronidazole had a nonsignificant reduction in spontaneous preterm birth from 14.6% to 8.3%.

Hardy, P. H., J. B. Hardy, et al. (1984). "Prevalence of six sexually transmitted disease agents among pregnant inner-city adolescents and pregnancy outcome." Lancet **2**(8398): 333-7.

115 pregnant girls aged 13-17 years were investigated during the third trimester for endocervical infection with six sexually transmissible microorganisms. Specimens from 21 patients destroyed the tissue cell monolayers for propagation of Chlamydia trachomatis, but 11 were no longer toxic when recultured after freezing or with additional antimicrobial agents; Trichomonas vaginalis was present in 76% of the toxic specimens. C trachomatis was recovered from 37% of 105 specimens. T vaginalis was recovered from 34% of the 115 subjects, candida from 38%, Mycoplasma hominis from 70%, and Ureaplasma urealyticum from 90%. Neisseria gonorrhoeae was cultured from 1 of 12 girls infected earlier in pregnancy. T vaginalis infection, alone or with C trachomatis or candida, was associated with low gestational age and low birthweight. C trachomatis and candida infections alone had no effect on pregnancy outcome.

Heine, P. and J. A. McGregor (1993). "Trichomonas vaginalis: a reemerging pathogen." Clin Obstet Gynecol **36**(1): 137-44.

Infestation with T. vaginalis is a common and potentially morbid infection. In addition to reproductive tract discharge and irritation, infection with this protozoa is increasingly recognized to be associated with reproductive tract complications, including postabortal infection, postcesarean

infection, preterm birth, and PROM. Clinical diagnosis is often difficult and newer approaches using specific antigen and nucleic acid technologies will probably replace "wet prep" microscopic techniques. Effective treatments continue to depend on oral metronidazole treatment. Cure of resistant strains, which remain rare, depends on administration of higher, more prolonged doses of metronidazole. Improved understanding of the natural history, pathobiology, diagnosis, and treatment of this common protozoa is urgently needed. Practitioners should consider routinely screening and treating women for trichomoniasis before any reproductive tract surgery (chorionic villi sampling, hysterectomy, cesarean section, dilatation and curettage, therapeutic abortion, and so on), after changing sexual partners, and during pregnancy. Both symptomatic and asymptomatic patients and their sexual contacts should be treated.

James, J. A., J. L. Thomason, et al. (1992). "Is trichomoniasis often associated with bacterial vaginosis in pregnant adolescents?" Am J Obstet Gynecol **166**(3): 859-63.

The same criteria for identifying bacterial vaginosis are often present in women with trichomoniasis. These criteria include elevated vaginal pH, vaginal odor, homogeneous discharge, increased anaerobic bacteriologic vaginal flora, and elevated levels of bacterial enzymes. Clinically mixed vaginal infections occur, and because the treatment for these two conditions can be different, it is important to distinguish between them. Trichomoniasis can interfere with a Gram stain diagnosis or the proline aminopeptidase test for bacterial vaginosis. Clue cells are not generally found in women with *Trichomonas vaginalis*, but when present, they strongly indicate the concomitant presence of bacterial vaginosis.

Locksmith, G. and P. Duff (2001). "Infection, antibiotics, and preterm delivery." Semin Perinatol **25**(5): 295-309.

The relationship between genital tract infection and preterm delivery has been established on the basis of biochemical, microbiological, and clinical evidence. In theory, pathogenic bacteria may ascend from the lower reproductive tract into the uterus, and the resulting inflammation leads to preterm labor, rupture of the membranes, and birth. A growing body of evidence suggests that preterm labor and/rupture of the membranes are triggered by micro-organisms in the genital tract and by the host response to these organisms, ie, elaboration of cytokines and proteolytic enzymes. Epidemiologic and in vitro studies do not prove a cause-and-effect relationship between infection and preterm birth. However, the preponderance of evidence indicates that treatment of asymptomatic bacteriuria and symptomatic lower genital tract infections such as bacterial vaginosis (BV), trichomoniasis, gonorrhea, and chlamydia will lower the risk of preterm delivery. Based on current evidence, pregnant women who note an abnormal vaginal discharge should be tested for BV, trichomonas, gonorrhea, and chlamydia. Those who test positive should be treated appropriately. A 3- to 7-day course of antibiotic treatment for asymptomatic bacteriuria during pregnancy is clinically indicated to reduce the risk of pyelonephritis and preterm delivery. Routine screening for chlamydia and gonorrhea should be performed for women at high risk of acquiring sexually transmitted diseases. The practice of routine screening for BV in asymptomatic women who are at low risk for preterm delivery cannot be supported based on evidence from the literature. Routine screening for asymptomatic bacteriuria during pregnancy is cost-effective, particularly in high-prevalence populations. The results of antibiotic trials for the treatment of preterm labor have been inconsistent. In the absence of reasonable evidence that antimicrobial therapy leads to significant prolongation of pregnancy in the setting of preterm labor, antibiotics should be used only for protecting the neonate from group B streptococci sepsis. They should not be used for the purpose of prolonging pregnancy. Multiple investigations have shown that, in patients with preterm premature rupture of the membranes, prophylactic antibiotics are of value in prolonging the latent

period between rupture of the membranes and onset of labor and in reducing the incidence of maternal and neonatal infection. The most extensively tested effective antibiotic regimen for prophylaxis involves erythromycin alone or in combination with ampicillin. Controversy still exists regarding the appropriate length and route of antibiotic prophylaxis.

Lossick, J. G. and H. L. Kent (1991). "Trichomoniasis: trends in diagnosis and management." Am J Obstet Gynecol **165**(4 Pt 2): 1217-22.

The mainstay of the diagnosis of trichomoniasis has been the saline vaginal wet preparation. With a less than desirable sensitivity, the wet preparation may be replaced in the near future by newer methods employing monoclonal antibodies, such as the enzyme immunoassay, which has the potential to become an in-office procedure. The direct fluorescent antibody test also represents an advance in laboratory diagnosis. However, until the sensitivity, specificity, and cost of these newer techniques are defined outside the research arena, the wet preparation will remain the first-line diagnostic tool. Current treatment of trichomoniasis in the United States is with metronidazole, which in repeated or increased dosage can often overcome the organism's resistance to the drug. Other treatments offer little or no chance for cure but may provide some relief of symptoms. Tinidazole (not available in the United States) may be effective in curing refractory cases of metronidazole resistance. Metronidazole treatment during pregnancy should be resorted to only when absolutely essential.

Minkoff, H., A. N. Grunebaum, et al. (1984). "Risk factors for prematurity and premature rupture of membranes: a prospective study of the vaginal flora in pregnancy." Am J Obstet Gynecol **150**(8): 965-72.

Prematurity remains a major cause of perinatal mortality in the United States. Some research has indicated that infectious agents play a role in either initiating preterm labor, causing premature rupture of the membranes, or preventing tocolysis. This study attempted to determine if the presence of various vaginal pathogens in early pregnancy was associated with the subsequent development of premature rupture of membranes or preterm labor. We found that among 233 evaluable patients those with *Trichomonas vaginalis* were significantly more likely to have premature rupture of the membranes (p less than 0.03), and those with *Bacteroides* sp. were more likely to be delivered of their infants before 37 weeks (p less than 0.03) and to have infants weighing less than 2500 gm (p less than 0.05). Those with *Ureaplasma urealyticum* more frequently began preterm labor (p less than 0.05). Preterm premature rupture of the membranes was found significantly more often among patients with *Bacteroides* sp. Stepwise multiple logistic regression analysis indicated that those associations were not related to the number of previous abortions, deliveries, or preterm deliveries or to maternal age. We conclude that microbiologic screening in early pregnancy may aid in the assessment of patient risk for preterm delivery.

Read, J. S. and M. A. Klebanoff (1993). "Sexual intercourse during pregnancy and preterm delivery: effects of vaginal microorganisms. The Vaginal Infections and Prematurity Study Group." Am J Obstet Gynecol **168**(2): 514-9.

OBJECTIVE: Our aim was to investigate the influence of vaginal colonization with specific microorganisms on the relationship between sexual intercourse during pregnancy and preterm delivery. STUDY DESIGN: As part of a multicenter, prospective study interviews and physical examinations were conducted with and genital cultures were obtained from women seeking

prenatal care from 23 to 26 weeks' gestation. At 31 to 36 weeks interviews were conducted with a randomly selected sample of these patients. RESULTS: Frequent intercourse (defined a priori as once per week or more) at 23 to 26 weeks was associated with a significantly reduced risk of subsequent preterm delivery in women without *Trichomonas vaginalis*, *Mycoplasma hominis*, or bacterial vaginosis, possibly because of the relative health and lack of complications in the pregnancies of those women engaging in sexual intercourse. Frequent intercourse was not significantly associated with preterm delivery in women with *T. vaginalis*, *M. hominis*, or bacterial vaginosis. Neither *T. vaginalis*, *M. hominis*, nor bacterial vaginosis was associated with preterm delivery among women with infrequent intercourse at 23 to 26 weeks. However, *T. vaginalis* and *M. hominis* were risk factors for preterm delivery among those with frequent intercourse. CONCLUSIONS: Frequent sexual intercourse by itself is not associated with an increased risk of preterm birth. However, women who are colonized with specific microorganisms and who engage in frequent intercourse are at increased risk of preterm delivery.

Sherman, K. J., W. H. Chow, et al. (1988). "Sexually transmitted diseases and the risk of tubal pregnancy." J Reprod Med **33**(1): 30-4.

Women who were hospitalized for tubal pregnancy in five hospitals in King County, Washington, between 1975 and 1979 were interviewed regarding a prior history of gonorrhea, genital herpes, genital warts and trichomoniasis. Their responses were compared to those of women who delivered a live-born child during the same period. Multiple logistic regression was used to control for the effects of race, gravidity, smoking, Dalkon Shield use, douching, number of sexual partners and history of additional sexually transmitted diseases. The risk of tubal pregnancy in women who reported a history of gonorrhea, relative to that in other women, was 5.1. As compared to controls, women with tubal pregnancy more often reported a history of genital herpes and a history of trichomoniasis.

Sherman, K. J., J. R. Daling, et al. (1987). "Sexually transmitted diseases and tubal infertility." Sex Transm Dis **14**(1): 12-6.

To evaluate the association of genital herpes, genital warts, gonorrhea, and trichomoniasis with the occurrence of subsequent tubal infertility, 321 women who had tubal infertility were interviewed concerning their history of these sexually transmitted diseases (STD). The responses were compared to those of women who conceived children during the period the infertile women began trying to become pregnant. By a multivariate analysis, the comparisons were controlled for several confounding variables (e.g., use of an intrauterine device, cigarette smoking, number of prior pregnancies, number of sexual partners, and a history of the other STD). The risk of tubal infertility in women who reported at least one episode of gonorrhea after their last pregnancy, relative to that among other women, was 2.8 (95% confidence interval = 1.3-5.7). The relative risk of tubal infertility was also higher among women who reported a history of trichomoniasis (relative risk = 1.4; 95% confidence interval = 1.0-2.5) or genital warts (relative risk = 1.9; 95% confidence interval = 1.0-3.6).

Shuter, J., D. Bell, et al. (1998). "Rates of and risk factors for trichomoniasis among pregnant inmates in New York City." Sex Transm Dis **25**(6): 303-7.

BACKGROUND: *Trichomonas vaginalis* is a common pathogen that is associated with adverse pregnancy outcomes and may serve as a cofactor in human immunodeficiency virus (HIV) transmission. GOAL: To define the epidemiology of trichomoniasis in a population of newly

incarcerated pregnant women in New York City. **STUDY DESIGN:** Prospective study of 213 pregnant prisoners attending prenatal clinic. Patients participated in an interview regarding sexual and drug-related behaviors, and underwent direct culture for *T. vaginalis* in addition to routine testing for syphilis, gonorrhea, and chlamydia. **RESULTS:** The prevalence of trichomoniasis was 46.9%. On univariate analysis, there was a significant association between trichomoniasis and older age, crack use, prostitution, known HIV infection, and positive serological test for syphilis. Multivariate analysis showed a significant association of trichomoniasis with crack use and positive serological test for syphilis. **CONCLUSION:** Trichomoniasis is highly prevalent in pregnant prisoners in New York City. The extent of disease observed may justify a formal program of testing and treatment and emphasizes the urgent need for harm reduction education and expanded HIV counseling and testing services in this high-risk population.

Sutton, M. Y., M. Sternberg, et al. (1999). "Trichomoniasis in pregnant human immunodeficiency virus-infected and human immunodeficiency virus-uninfected Congolese women: prevalence, risk factors, and association with low birth weight." *Am J Obstet Gynecol* **181**(3): 656-62.

OBJECTIVE: We sought to assess the prevalence of and risk factors for vaginal trichomoniasis in human immunodeficiency virus-infected and human immunodeficiency virus-uninfected pregnant Congolese women and its relationship to pregnancy outcomes. **STUDY DESIGN:** We performed a nested case-control study of 215 infected and 206 uninfected mothers who responded to questionnaires, underwent sexually transmitted disease testing (including culture for trichomoniasis shortly after delivery), and underwent assessment of infant outcomes. Maternal variables and birth outcomes were assessed according to presence or absence of trichomoniasis and human immunodeficiency virus. **RESULTS:** Trichomoniasis was present in 18.6% of human immunodeficiency virus-positive and 10.2% of human immunodeficiency virus-negative women, respectively (odds ratio, 2.0; 95% confidence interval, 1.1-3.6), and was significantly associated with low birth weight (odds ratio, 2.4; 95% confidence interval, 1.2-4.5). In multivariate analyses trichomoniasis remained associated with low birth weight, and adjustments were made for other risk factors associated with low birth weight. **CONCLUSION:** These findings suggest an association between trichomoniasis and low birth weight independent of human immunodeficiency virus infection and other risk factors. Further studies are needed to assess the impact of antenatal screening and treatment for trichomoniasis on pregnancy outcomes.