

Berg, E., D. M. Benson, et al. (1996). "High prevalence of sexually transmitted diseases in women with urinary infections." Acad Emerg Med 3(11): 1030-4.

OBJECTIVE: To determine the prevalence and factors associated with unrecognized sexually transmitted diseases (STDs) in women who had pelvic examinations and were subsequently released from the ED with a sole diagnosis of urinary tract infection (UTI). METHODS: A 3-month retrospective chart review was performed in an urban teaching hospital ED (> 70,000 visits/year). Women aged 12-45 years who had pelvic examinations and were released from the ED with a sole diagnosis of UTI were included. Patient complaints, physical findings, and laboratory results were reviewed. Laboratory evaluations included the complete blood count, urinalysis, urine pregnancy test, and cervical cultures for *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, and *Trichomonas*. RESULTS: Of the 94 women who met study criteria, 53% had proven STDs (19% *N. gonorrhoeae*, 22% *C. trachomatis*, 33% *Trichomonas*). There was no difference between the patients with positive and negative tests for STDs with regard to complaints, physical findings, and laboratory results (all  $p > 0.05$ ). CONCLUSIONS: Women undergoing pelvic examinations who are subsequently released from this urban ED with the diagnosis of UTI have a high (> 50%) prevalence of occult STDs. No complaint, physical finding, or laboratory result reviewed was associated with the risk of an STD. Consideration should be given to empirical antibiotic therapy in similar urban populations.

Bowden, F. J. and G. P. Garnett (2000). "Trichomonas vaginalis epidemiology: parameterising and analysing a model of treatment interventions." Sex Transm Infect 76(4): 248-56.

BACKGROUND: *Trichomonas vaginalis*, which affects at least 170 million individuals globally, may increase the risk of transmission of HIV and predispose pregnant women to premature rupture of membranes and early labour. OBJECTIVE: To more clearly define the epidemiology of trichomoniasis and to develop a mathematical model of disease transmission dynamics in order to explore various treatment strategies. DESIGN: A deterministic model of trichomoniasis was constructed. Parameter values were set to fit the model to known endemic prevalence levels of *Trichomonas vaginalis*. Two treatment interventions ("screening" and "syndromic management") were simulated. RESULTS: The age specific prevalence of the disease was seen to differ from other STDs in a number of studies. Parameter fitting indicates that the average duration of infection in women is at least 3-5 years and approximately 4 months for men. "Syndromic management" (that is, treating only those with symptoms of disease) had minimal effect upon the endemic prevalence of disease even at high levels of coverage. "Screening" (that is, identification of individuals with both symptomatic and asymptomatic infection) was shown to be the most efficient method of control, but was sensitive to the screening interval. CONCLUSIONS: The control of trichomoniasis seems to have been a success in developed countries because of the regular access to health care, whereas it has remained endemic in many developing countries where control may only be possible by regular screening and treatment. However, without a large investment in services, success in controlling trichomoniasis is likely to be transitory.

Bowie, W. R. (1995). "Drug therapies for sexually transmitted diseases. Clinical and economic considerations." *Drugs* **49**(4): 496-515.

Sexually transmitted diseases (STDs) are common, and result in immense social and economic costs. In some countries they have a major demographic impact. Because many STDs facilitate the transmission of HIV, the consequences of STDs are further increasing. At the same time, this association between STDs and HIV provides one of the ways in which drug therapy should be very cost effective. The perspective taken in this article is a societal one, and broader issues than those directly related to drug costs and benefits are discussed. However, it is the availability of drugs that has the potential to most quickly and most reliably make a major difference to overall health sector and societal costs as they relate to STDs. For those STDs for which curative therapy is available (particularly *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, *Treponema pallidum*, and *Trichomonas vaginalis*) there have been large decreases in prevalence in many parts of the world. In contrast, those STDs for which curative therapy is not available (particularly HIV, genital herpes and genital human papillomavirus infection) have had stable or increasing prevalence. For these latter infections, each new case increases the overall prevalence. Numerous features of STDs make clinical and economic evaluation difficult. These include the sensitive nature of the topic, the changing epidemiology and drug susceptibility of individual STDs, the fact that a large proportion of those infected are asymptomatic, difficulties in making specific diagnoses, the fact that often consequences are recognised late, sexual re-exposure and reinfection, and inadequate data on which to do clinical and economic evaluations. Furthermore, risk of acquiring an STD roughly correlates inversely with socioeconomic status, and countries or places with the highest rates of STDs may have the least ability to deal effectively with their diagnosis and management. Most of the direct and indirect costs are incurred by women, since they experience the vast majority of the complications of STDs. Many of these only become apparent years later, which makes it very hard to attribute costs and benefits to a specific episode of infection, and to its treatment. The late and indirect costs, plus the costs of prevention, are hard to quantify. That the major burden of STDs is in adolescents and young adults, socioeconomically disadvantaged groups and women has important implications, including for pharmaco-economic studies. (ABSTRACT TRUNCATED AT 400 WORDS).

Joyner, J. L., J. M. Douglas, Jr., et al. (2000). "Comparative prevalence of infection with *Trichomonas vaginalis* among men attending a sexually transmitted diseases clinic." *Sex Transm Dis* **27**(4): 236-40.

OBJECTIVE: Although established in women as a common cause of vaginal discharge, the prevalence of *Trichomonas vaginalis* (TV) in men compared with other classic urethral pathogens has not been well characterized. To assess this issue, the authors compared the prevalence of *Neisseria gonorrhoeae* (GC), *Chlamydia trachomatis* (CT), and TV in consecutive men attending a sexually transmitted diseases (STD) clinic. METHODS: From June 1, 1998 to July 27, 1998, 454 consecutive men presenting to the Denver Metro Health Clinic with a new problem were tested for GC by urethral swab culture, for CT by polymerase chain reaction of urine, and for TV by urine sediment culture. RESULTS: GC, CT, and TV were detected in 23 (5.1%), 34 (7.5%), and 13 (2.8%) of men, respectively. There were significant differences by age for both CT (11.3% in men younger than 30 years versus 3.3% in men 30 years and older,  $P < 0.05$ ) and TV (0.8% in men younger than 30 years versus 5.1% in men 30 years and older,  $P < 0.05$ ). In 50 men 30 years or older with symptoms of urethral discharge, TV prevalence (12.0%) rivalled that of GC (12.0%) and CT (14.0%). In 45 men 30 years and older with nongonococcal urethritis, the prevalence of TV and

CT were each 13.3%. Multivariate logistical regression analysis showed the presence of discharge and nongonococcal urethritis in men 30 years and older to be an independent predictor of TV. CONCLUSIONS: TV is common in men attending sexually transmitted disease clinics, especially in those 30 years or older, in whom it may account for as much urethritis as GC or CT. These findings suggest that in older men with nongonococcal urethritis, diagnostic evaluation, empiric treatment, and partner management should include the possibility of TV infection.

Krowchuk, D. P. (1998). "Sexually transmitted diseases in adolescents: what's new?" South Med J **91**(2): 124-31.

BACKGROUND: Sexually transmitted diseases (STDs) are an important cause of morbidity and, potentially, mortality for adolescents in the United States. Each year, 2.5 million teenagers in this country will contract an STD. An understanding of recent advances in risk factors, epidemiology, diagnosis, and treatment of these important infections is vital for clinicians providing care for adolescents. METHODS: To identify topics for review, a MEDLINE search for the years 1993 to 1997 was conducted, using the general term sexually transmitted diseases. Separate searches were performed for individual infections, including chlamydia, gonorrhea, herpes simplex virus (HSV), human papillomavirus (HPV), human immunodeficiency virus (HIV), and *Trichomonas vaginalis*. Relevant publications addressing risk factors for STD acquisition, as well as the epidemiology, diagnosis, and treatment of these infections were reviewed. RESULTS: Information derived from the search that was considered relevant and important for the care of adolescents is presented. Risk factors for STD acquisition, including sexual activity, condom use, and substance use are discussed. Recent information about the epidemiology of bacterial (eg, chlamydia, gonorrhea), viral (eg, HSV, HPV, HIV), and protozoal (*T vaginalis*) infections is presented. Novel diagnostic techniques and advances in treatment of specific infections are reviewed. CONCLUSIONS: Sexually transmitted diseases represent a significant health problem for adolescents in the United States. Recent advances in the area of diagnosis likely will lead to enhanced recognition of infected individuals, particularly those who lack symptoms. In addition, new drugs and novel approaches to therapy have simplified treatment and may lead to enhanced compliance.

Krowchuk, D. P., T. M. Anglin, et al. (1989). "Rapid diagnosis of common sexually transmitted diseases in adolescents: a review." Pediatr Dermatol **6**(4): 275-88.

Sexually transmitted diseases (STDs) represent a significant health problem for adolescents in the United States. As a result, clinicians from a number of disciplines, among them pediatrics and dermatology, may be called on to evaluate teenage patients with these infections. Traditionally, the diagnosis of many STDs has relied on isolation of the causative organisms in culture. While such procedures typically offer optimal diagnostic accuracy, they are often time consuming and expensive, and may not be widely available. In an attempt to remedy this, culture-independent techniques have been developed to permit more rapid and economical diagnosis of these important pathogens. The strengths and limitations of these methods must be understood, however, for the tests to be used effectively.

Lawing, L. F., S. R. Hedges, et al. (2000). "Detection of trichomonosis in vaginal and urine specimens from women by culture and PCR." J Clin Microbiol **38**(10): 3585-8.

Vaginal trichomonosis is a highly prevalent infection which has been associated with human immunodeficiency virus acquisition and preterm birth. Culture is the current "gold standard" for diagnosis. As urine-based testing using DNA amplification techniques becomes more widely used for other sexually transmitted diseases (STDs) such as gonorrhea and chlamydia, a similar technique for trichomonosis would be highly desirable. Women attending an STD clinic for a new complaint were screened for *Trichomonas vaginalis* by wet-preparation (wet-prep) microscopy and culture and for the presence of *T. vaginalis* DNA by specific PCR of vaginal and urine specimens. The presence of trichomonosis was defined as the detection of *T. vaginalis* by direct microscopy and/or culture from either vaginal samples or urine. The overall prevalence of trichomonosis in the population was 28% (53 of 190). The sensitivity and specificity of PCR using vaginal samples were 89 and 97%, respectively. Seventy-four percent (38 of 51) of women who had a vaginal wet prep or vaginal culture positive for trichomonads had microscopic and/or culture evidence of the organisms in the urine. Two women were positive for trichomonads by wet prep or culture only in the urine. The sensitivity and specificity of PCR using urine specimens were 64 and 100%, respectively. **These results indicate that the exclusive use of urine-based detection of *T. vaginalis* is not appropriate in women.** PCR-based detection of *T. vaginalis* using vaginal specimens may provide an alternative to culture.

Mason, P. R. (1980). "Trichomoniasis. New ideas on an old disease." S Afr Med J **58**(21): 857-9.

**Trichomoniasis is probably the most widespread sexually transmitted disease of man.** The causative organism, *Trichomonas vaginalis*, can normally be found on microscopic examination of vaginal exudate, although serological diagnostic techniques have recently been described. The organism has now been recognized as a pathogen, and, although infection has been associated with cervical cancer, a causative link has not been established. Despite both humoral and cellular immune responses, protective immunity has not been demonstrated in man. Treatment schedules with metronidazole and other 5-nitro-imidazoles have been revised, many authors recommending short courses with large doses. The suspected carcinogenic properties of metronidazole have not been proved, although caution is still advised in the treatment of pregnant patients. **Recognition of trichomoniasis as a sexually transmitted disease means that treatment of sexual partners is essential to prevent reinfection.**

Moldwin, R. M. (1992). "Sexually transmitted protozoal infections. *Trichomonas vaginalis*, *Entamoeba histolytica*, and *Giardia lamblia*." Urol Clin North Am **19**(1): 93-101.

**Collectively, protozoa account for the largest number of STDs worldwide.** Although these organisms can be eradicated effectively in the individual patient, their high asymptomatic carriage rate appears to have a significant influence on their continued transmission. The best hope for eradication of these organisms lies in a high index of suspicion in high-risk populations and the careful evaluation and treatment of sexual partners of infected persons.

Oh, M. K., R. A. Feinstein, et al. (1988). "Sexually transmitted diseases and sexual behavior in urban adolescent females attending a family planning clinic." J Adolesc Health Care **9**(1): 67-71.

Specimens from the lower genital tract of 102 sexually active urban adolescent females were tested for the common sexually transmitted diseases (STDs). The results were correlated with concomitant clinical, demographic, and historic data. Forty-one percent (42/102) were infected with one or more of the following organisms: Chlamydia trachomatis (26/102), Trichomonas vaginalis (13/102), Neisseria gonorrhoeae (10/102), yeast (6/102), condyloma (5/102), and herpes simplex virus (1/44). Mixed infections were found in 13%. Fifty-nine percent were negative for any infectious agents. The presence of genitourinary symptoms were of no value in predicting an STD. The rate of positive physical findings was significantly higher in the STD-positive group than in the negative group ( $p = 0.03$ ), but 28% of the STD-negative group had positive physical findings, and 50% of the STD-positive group had normal physical findings. A history of genitourinary complaints or presence of physical findings was not predictive of a positive STD culture. Oral contraceptive use of more than six months appears to be a risk factor for an STD. No other factors, including the number of sexual partners, were significantly correlated with the presence of an STD. This study supports the need for routine screening of sexually active urban adolescent girls for an STD.

Petrin, D., K. Delgaty, et al. (1998). "Clinical and microbiological aspects of Trichomonas vaginalis." Clin Microbiol Rev **11**(2): 300-17.

Trichomonas vaginalis, a parasitic protozoan, is the etiologic agent of trichomoniasis, a sexually transmitted disease (STD) of worldwide importance. Trichomoniasis is the most common nonviral STD, and it is associated with many perinatal complications, male and female genitourinary tract infections, and an increased incidence of HIV transmission. Diagnosis is difficult, since the symptoms of trichomoniasis mimic those of other STDs and detection methods lack precision. Although current treatment protocols involving nitroimidazoles are curative, metronidazole resistance is on the rise, outlining the need for research into alternative antibiotics. Vaccine development has been limited by a lack of understanding of the role of the host immune response to T. vaginalis infection. The lack of a good animal model has made it difficult to conduct standardized studies in drug and vaccine development and pathogenesis. Current work on pathogenesis has focused on the host-parasite relationship, in particular the initial events required to establish infection. These studies have illustrated that the pathogenesis of T. vaginalis is indeed very complex and involves adhesion, hemolysis, and soluble factors such as cysteine proteinases and cell-detaching factor. T. vaginalis interaction with the members of the resident vaginal flora, an advanced immune evasion strategy, and certain stress responses enable the organism to survive in its changing environment. Clearly, further research and collaboration will help elucidate these pathogenic mechanisms, and with better knowledge will come improved disease control.

Schneider, H., D. J. Coetzee, et al. (1998). "Screening for sexually transmitted diseases in rural South African women." Sex Transm Infect **74 Suppl 1**: S147-52.

OBJECTIVE: This paper reports on a study undertaken in a rural area of South Africa, to develop a non-laboratory tool to screen for sexually transmitted diseases (STDs) among family planning clients. METHODS: A cross sectional study was performed of 249 consecutive women attending a family planning service between November and December 1994. A questionnaire was

administered, and a clinical examination and laboratory tests conducted. Sociodemographic, clinical, and other non-laboratory variables that were significantly associated with laboratory evidence of infection were combined to produce non-hierarchical scoring systems for three "syndromes": gonococcal and/or chlamydial cervical infection, trichomoniasis, and cervical infection and/or trichomoniasis combined. The sensitivity, specificity, and predictive values of the scoring systems as a screening tool were assessed against the gold standard of laboratory tests. RESULTS: The prevalence of reproductive tract infections among the study participants was as follows: Chlamydia trachomatis 12%, Neisseria gonorrhoeae 3%, Trichomonas vaginalis 18%, and bacterial vaginosis 29%. Although vaginal discharge and other symptoms were frequently reported, symptoms bore no relation to the presence of infection. The following independent associations with gonococcal/chlamydial cervical infection were found: age less than 25 years and cervical mucopus and/or friability. Abnormal discharge on examination, visible inflammatory changes of the cervix (increased redness), no recent travel, and unemployment were associated with trichomoniasis. The combination of trichomonas and/or cervical infection ("STD syndrome") was associated with cervical mucopus/friability, unemployment, lack of financial support, and increased redness of the cervix. Of the three scoring systems developed on the basis of these associations, that of the "STD syndrome" achieved the best performance characteristics as a screening tool, with a sensitivity of 62%, specificity of 74%, and positive predictive value of 48%. CONCLUSION: STDs are common in a population of rural, sexually active women attending a family planning service. In resource poor settings, non-laboratory screening tools could play some role in identifying and treating infections in these women, especially since the majority would not otherwise have been reached. However, such screening tools cannot be viewed as the only way to identify STDs and should be considered as part of an overall strategy of STD control that includes, for example, good management of symptomatic individuals and their partners.

Upcroft, P. and J. A. Upcroft (2001). "Drug targets and mechanisms of resistance in the anaerobic protozoa." Clin Microbiol Rev **14**(1): 150-64.

The anaerobic protozoa *Giardia duodenalis*, *Trichomonas vaginalis*, and *Entamoeba histolytica* infect up to a billion people each year. *G. duodenalis* and *E. histolytica* are primarily pathogens of the intestinal tract, although *E. histolytica* can form abscesses and invade other organs, where it can be fatal if left untreated. *T. vaginalis* infection is a sexually transmitted infection causing vaginitis and acute inflammatory disease of the genital mucosa. *T. vaginalis* has also been reported in the urinary tract, fallopian tubes, and pelvis and can cause pneumonia, bronchitis, and oral lesions. Respiratory infections can be acquired perinatally. *T. vaginalis* infections have been associated with preterm delivery, low birth weight, and increased mortality as well as predisposing to human immunodeficiency virus infection, AIDS, and cervical cancer. All three organisms lack mitochondria and are susceptible to the nitroimidazole metronidazole because of similar low-redox-potential anaerobic metabolic pathways. Resistance to metronidazole and other drugs has been observed clinically and in the laboratory. Laboratory studies have identified the enzyme that activates metronidazole, pyruvate:ferredoxin oxidoreductase, to its nitroso form and distinct mechanisms of decreasing drug susceptibility that are induced in each organism. Although the nitroimidazoles have been the drug family of choice for treating the anaerobic protozoa, *G. duodenalis* is less susceptible to other antiparasitic drugs, such as furazolidone, albendazole, and quinacrine. Resistance has been demonstrated for each agent, and the mechanism of resistance has been investigated. Metronidazole resistance in *T. vaginalis* is well documented, and the principal mechanisms have been defined. Bypass metabolism, such as alternative oxidoreductases, have been discovered in both organisms. Aerobic versus anaerobic resistance in *T. vaginalis* is discussed. Mechanisms of metronidazole resistance in *E. histolytica* have recently been investigated using laboratory-induced resistant isolates. Instead of downregulation of the pyruvate:ferredoxin

oxidoreductase and ferredoxin pathway as seen in *G. duodenalis* and *T. vaginalis*, *E. histolytica* induces oxidative stress mechanisms, including superoxide dismutase and peroxiredoxin. The review examines the value of investigating both clinical and laboratory-induced syngeneic drug-resistant isolates and dissection of the complementary data obtained. Comparison of resistance mechanisms in anaerobic bacteria and the parasitic protozoa is discussed as well as the value of studies of the epidemiology of resistance.

Wiese, W., S. R. Patel, et al. (2000). "A meta-analysis of the Papanicolaou smear and wet mount for the diagnosis of vaginal trichomoniasis." Am J Med **108**(4): 301-8.

**PURPOSE:** To obtain reliable estimates of the sensitivity and specificity of the cervical Papanicolaou (Pap) smear and wet mount to diagnose vaginal trichomoniasis. **METHODS:** Articles indexed in MEDLINE (1976-1998) about diagnostic tests for trichomoniasis and their listed references were retrieved. Thirty studies (9,501 patients) that used trichomonas culture as a gold standard were selected. Studies were defined as level I if they fulfilled at least two of the following three criteria: consecutive patients were evaluated prospectively, the decision to culture was not influenced by test results, and there was independent and blind comparison with culture. Studies were classified as level II if one criterion was fulfilled, and as level III otherwise. **RESULTS:** The pooled sensitivity of the Pap smear for the diagnosis of trichomoniasis among level I studies was 57% (95% confidence interval [CI]: 51% to 63%) and the pooled specificity was 97% (95% CI: 93% to 100%). The likelihood ratio for a positive Pap smear was 19 among level I studies (range: 8 to 62). The pooled sensitivity of the wet mount among level I studies was 58% (95% CI: 51% to 66%); among level II studies, the sensitivity was 72% (95% CI: 62% to 81%), and among level III studies, the sensitivity was 82% (95% CI: 67% to 97%). The overall specificity of the wet mount was 99.8%. **CONCLUSIONS:** A positive Pap smear for trichomonads in settings in which trichomoniasis is common (prevalence > or =20%) requires treatment. A positive Pap smear is indeterminate when the prevalence of trichomoniasis is about 10%; thus, clinicians should either confirm the diagnosis by culture or treat all such patients, recognizing that some patients will be treated unnecessarily. A culture should be obtained in women with a positive Pap smear who are unlikely to have trichomoniasis (prevalence < or =1%). **While a positive wet mount is diagnostic, a negative wet mount does not exclude trichomoniasis.**

Wilkinson, D., S. S. Abdool Karim, et al. (1999). "Unrecognized sexually transmitted infections in rural South African women: a hidden epidemic." Bull World Health Organ **77**(1): 22-8.

**Sexually transmitted infections (STIs) are of major public health concern in developing countries, not least because they facilitate transmission of human immunodeficiency virus (HIV).** The present article presents estimates of the prevalence, on any given day, of STIs among women in rural South Africa and the proportion who are asymptomatic, symptomatic but not seeking care, and symptomatic and seeking care. The following data sources from Hlabisa district were used: clinical surveillance for STI syndromes treated in health facilities, microbiological studies among women attending antenatal and family planning clinics, and a community survey. Population census provided denominator data. Adequacy of drug treatment was determined through quality of care surveys. **Of 55,974 women aged 15-49 years, a total of 13,943 (24.9%) were infected on any given day with at least one of *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, or *Treponema pallidum*. Of the women investigated, 6697 (48%) were asymptomatic, 6994 (50%) were symptomatic but not seeking care, 238 (1.7%) were symptomatic and would seek care, and 14 (0.3%) were seeking care on that day. Only 9 of the 14 women (65%) were adequately treated. STIs**

remained untreated because either women were asymptomatic or the symptoms were not recognized and acted upon. Improved case management alone is therefore unlikely to have a major public health impact. Improving partner treatment and women's awareness of symptoms is essential, while the potential of mass STI treatment needs to be explored.