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A Trich-y Question: Should *Trichomonas vaginalis* Infection be Reportable?

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Trichomonas vaginalis (*TV*) infection is the most common curable sexually transmitted infection (STI).[1] In the United States, a population-based survey of females aged 14 to 49 years in 2001 to 2004 estimated that there were 2.3 million women with prevalent *TV* infections.[2] Most infections are asymptomatic.[3] In those with symptoms of disease, or trichomoniasis, the most common symptoms are vaginitis in women and urethritis in men.[3] *T. vaginalis* infection is not currently reportable in any US state.

Recently, interest in making *TV* infection reportable has increased.[4] Potential reasons for doing so include monitoring epidemiologic trends and stimulating public health research. The introduction of highly sensitive and specific nucleic acid amplification tests offers new options for making the diagnosis. In addition, researchers have cited associations of *TV* infection with adverse health events such as HIV acquisition, as reasons to make it reportable.

In the United States, the Council of State and Territorial Epidemiologists (CSTE) determines which conditions should be nationally notifiable by states to the Centers for Disease Control and Prevention. However, the authority to require reporting of cases of certain conditions resides in the states. Neither CSTE nor individual states have a published set of criteria to determine whether a condition should be reportable, although there are public health surveillance principles that are used by states and CSTE.

Our objective was to consider systematically whether *TV* infections should be reportable. Specifically, we considered the public health importance of *TV* infections and, if made reportable, whether case reports would be useful and inform public health action.

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To consider whether *TV* infections should be reportable, we used criteria from the "Updated Guidelines for Evaluating Public Health Surveillance Systems," published in the *Morbidity and Mortality Weekly Report* in 2001, and "Planning a Public Health Surveillance System," published in the *Pan American Health Organization Epidemiological Bulletin* in 1995.[5,6] These guidelines include lists of criteria for public health importance that a disease or condition should meet for surveillance to be recommended.

There are 7 criteria for public health importance described in the guidelines: indices of frequency, indices of severity, disparities or inequities associated with the health-related event, costs associated with the health-related event, preventability, communicability, and public interest.[5,6]

PUBLIC HEALTH IMPORTANCE OF *TV* INFECTION

Indices of Frequency

T. vaginalis infection is highly prevalent among sexually active women. A nationally representative sample of US females between the ages of 14 and 49 years were tested for *TV* by polymerase chain reaction in the National Health and Nutrition Examination Survey (NHANES) in 2001 to 2004. The overall prevalence of *TV* infection was 3.1%, corresponding to an estimated 2.3 million females aged 14 to 49 years infected nationally.[2] In 2005 to 2012, NHANES participants were not tested for *TV* infection.

Prevalence studies have also been done in select populations. In studies of persons attending sexually transmitted disease (STD) clinics, prevalence of *TV* infection has ranged from 13% to 34% in women[7] and from 3% to 17% in men.[8,9] In studies of incarcerated women, prevalence has been as high as 47%.[10] *T. vaginalis* infection is also the most commonly diagnosed STI among HIV-infected women receiving care, with reported prevalences of 6% to 53%.[11–13]

Therefore, *TV* infection clearly meets the frequency criterion.

Indices of Severity

T. vaginalis infection is associated with several adverse health events. In women, *TV* can cause a range of symptoms including mild to severe vaginitis, and symptomatic *TV* infection may increase the risk of adverse pregnancy outcomes including preterm delivery and delivery of a low-birth-weight infant.[14,15] In men, *TV* infection can cause nongonococcal urethritis, which may result in complications such as prostatitis.[16] Multiple observational studies suggest that there may be an increased risk of HIV acquisition in women with *TV* infection.[17–19] Studies of the impact of *TV* infection on genital HIV shedding have reported mixed results, so it is unclear whether *TV* in HIV-infected individuals increases the risk of HIV transmission to uninfected partners.[20–22]

However, although symptomatic *TV* infections are associated with several adverse health outcomes, up to 70% of *TV* infections may be asymptomatic.[23] Untreated, the duration of infection is unknown but thought to be in the range of a few months to a few years.[3,16] Ultimately, in most infections in men or nonpregnant women at low risk for HIV infection,

severe or disabling outcomes are uncommon. Because of this, indices of severity such as hospitalization rate, disability rate, and case-fatality rate are likely low for *TV* infections.

Therefore, it is unclear whether *TV* infection meets the severity criterion.

Disparities or Inequities Associated With the Health-Related Event

Notable health disparities by race and age have been described for *TV* infections. Among women tested for *TV* in NHANES in 2001 to 2004, the prevalence of *TV* infection among non-Hispanic black women was 10 times the prevalence among non-Hispanic white women (13.1% compared with 1.3%).[2] *T. vaginalis* prevalence also varied by age in the NHANES data, increasing from 2.1% in women aged 14 to 19 years to 4.0% in women aged 30–39 years.[2]

Therefore, *TV* infection clearly meets the associated disparities criterion.

Costs Associated With the Health-Related Event

Estimating the direct and indirect medical costs due to *TV* infection is difficult because so many infections are asymptomatic and because recent national data on incidence and prevalence are limited. In a study of insurance claims for trichomoniasis among women with employer-sponsored private insurance in 2001 to 2005, the average direct medical cost per episode was $101.[24] This study estimated that the annual economic burden of trichomoniasis nationally was $6.8 million among women with private insurance and $18.9 million among all women in the United States. Assuming that the costs of asymptomatic *TV* infection are negligible, these are relatively low costs compared with those of other common STIs such as chlamydia or herpes simplex virus 2, both of which have annual direct costs of more than $500 million in the United States.[25] However, the estimated direct medical costs of *TV* infections do not include costs of sequelae associated with infection, such as HIV infection or preterm birth, or indirect costs such as time lost at work. The cost of implementing case reporting and control for *TV* infections, though, could easily exceed the estimated direct medical costs.

Therefore, it is unclear whether *TV* infection meets the costs criterion for public health importance.

Preventability

Primary prevention of *TV* infection may be possible on an individual level through consistent and correct use of latex condoms.[26] Currently, there is no control program for *TV* infection beyond clinical management of individuals diagnosed as having *TV* infection and treatment of their sexual partners. In most cases, *TV* infection is easily treated with a single dose of metronidazole or tinidazole.[27]

On a population level, a reduction in prevalence would likely require widespread screening in combination with timely treatment of patients and their partners, which would be costly and burdensome for STD programs due to the high prevalence of infection. Furthermore, it is unclear whether a control program would be successful in reducing the prevalence of *TV* infection. Chlamydia, another curable STI that is usually asymptomatic, has been reportable

in all 50 states since 2000, with national screening recommendations targeting adolescent and young adult women.[27] Even so, bringing screening recommendations to scale and ensuring partner treatment for chlamydia are ongoing challenges. The continued high prevalence of chlamydia among young women despite reporting and screening efforts suggests that prospects for reducing the prevalence of *TV* infection through these approaches would be challenging, as well.

Therefore, it is unclear whether *TV* infection meets the preventability criterion for public health importance.

Communicability

T. vaginalis infection has a high transmission rate to sexual partners. Among women with *TV* infection, 14% to 60% of their male sexual partners are also infected, and among men with *TV* infection, 67% to 100% of their female partners are also infected.[16,28] Data on transmissibility of *TV* infection between sex partners of the same sex are limited.

Therefore, *TV* infection meets the communicability criterion.

Public Interest

Public interest regarding *TV* infection is low. In a 1996 survey of Americans aged 18 to 64 years, only 2% were able to name trichomoniasis (or “trich”) when asked to list STDs.[29] There are no current data on *TV* knowledge and awareness, but it is not expected to be considerably higher because there have been no major media or social marketing campaigns for *TV* like those for chlamydia or other STIs. Making *TV* infection reportable could increase public interest, but at a large financial cost to the public health and medical care systems.

T. vaginalis infection does not meet the public interest criterion.

In summary, at this time, *TV* infection clearly meets only 3 of 7 criteria for a condition of public health importance that warrants recommended surveillance (Table 1).

CASE REPORT DATA

Finally, it is important to consider exactly what would be measured by potential case reports of *TV* infection. The Centers for Disease Control and Prevention recommends that HIV-infected women should be screened annually for *TV* infection, but screening recommendations are lacking for other asymptomatic individuals.[27] Owing to this lack of national screening recommendations and because most cases of *TV* infection are asymptomatic, data from case reports would measure diagnostic testing trends, rather than true incidence. Thus, case reports would underestimate the true burden of infection. Therefore, case report data are not expected to be useful in monitoring trends in *TV* infection or targeting prevention and control efforts.

CONCLUSIONS AND FUTURE DIRECTIONS

T. vaginalis infection should not be reportable at this time. *T. vaginalis* infection clearly meets only 3 of 7 criteria for conditions of public health importance that warrant surveillance (frequency, associated disparities, and communicability). Furthermore, it is unclear whether effective public health interventions could be implemented if *TV* infections were made reportable. Even if made reportable, potential case report data would be difficult to interpret because case reports would not represent the true incidence of *TV* infection.

Effective surveillance systems exist apart from case reporting, and the burden of *TV* infection can be monitored through a less costly, yet valid system. Prevalence estimates from national population-based surveys such as NHANES can provide estimates of disease prevalence that are not biased by screening coverage. In addition, sentinel surveillance can provide useful information on emerging issues, such as recent data from the STD Surveillance Network on *TV* antimicrobial drug resistance.[30] Cross-sectional surveys of select populations, particularly those at high risk for HIV infection, may be another more cost-effective surveillance system for monitoring local trends in *TV* infection.

Further studies are needed to develop the evidence base for *TV* infection to be considered an STI of higher public health priority. These should include studies of (1) the current epidemiology of *TV* infection and symptomatic trichomoniasis, (2) the true burden of disease and public health impact of infection (e.g., nucleic acid amplification test tests could be used to confirm or refute results from earlier studies suggesting an association between *TV* infection and preterm birth or other adverse outcomes), and (3) treatment options and alternatives in case of nitroimidazole allergy or antimicrobial drug-resistant trichomoniasis. In addition, studies of the effectiveness of public health interventions conducted at the population level are needed to inform future *TV* control efforts.

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TABLE 1

Public Health Importance Criteria[5,6]

Characteristic	Description	Does *TV* Infection Meet the Criterion?
Indices of frequency	What are the incidence and prevalence?	Yes
Indices of severity	What is the case-fatality ratio, hospitalization rate, or disability rate?	Unclear
Disparities or inequities associated with the health-related event	Does prevalence vary across populations?	Yes
Costs associated with the health-related event	What is the socioeconomic burden of the event?	Unclear
Preventability	Can public health interventions prevent or control the disease?	Unclear
Communicability	What is the infectiousness of incident cases?	Yes
Public interest	What is the current level of concern in the population about the disease?	No