Lymphogranuloma Venereum: Old Pathogen, New Story

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Lymphogranuloma venerum (LGV), an ulcerative sexually transmitted infection caused by the L serovars of *Chlamydia trachomatis*, has gained recent attention as a cause of hemorrhagic proctitis among men who have sex with men in North America, the United Kingdom, and Europe. It has been a rare diagnosis, and likely has not been included in the routine differential diagnosis for proctocolitis. The lack of a specific diagnostic test has complicated LGV case ascertainment. In the absence of laboratory confirmation of L serovars, physicians are advised to treat possible cases presumptively for LGV and provide medical management of sexual partners. The appearance of an ulcerative infection in sexual networks with high rates of HIV coinfection may forewarn of increased HIV transmission; interruption of disease transmission remains a priority for medical providers and the public health community.

Introduction

Lymphogranuloma venereum (LGV) has gained recent attention as a cause of hemorrhagic proctitis due to an increased number of infections reported among men who have sex with men in the United States and Europe [1•,2–6]. Establishing a diagnosis for these rectal infections has presented a clinical challenge, because most present as hemorrhagic proctocolitis. In addition, even when the diagnosis of LGV is considered in the differential diagnosis, few specific confirmatory laboratory tests exist. This review describes inguinal and rectal clinical manifestations of LGV infection, outlines the current diagnostic methods available, provides recommendations for treatment, and details the gaps in knowledge highlighted by these recently recognized cases.

Overview

Lymphogranuloma venereum is a sexually transmitted infection (STI) caused by serovars L1, L2, and L3 of the obligate intracellular bacterium *Chlamydia trachomatis*. The L serovars of *C. trachomatis*, which are transmitted less commonly than serovars A to K, are biologically distinct in that they invade beyond mucosal tissue, infecting phagocytic cells and frequently reaching lymph nodes that drain the site of initial infection. In contrast, serovars A to K primarily infect the columnar epithelial surfaces of the eye and the genital tract and cause mild (even asymptomatic) ocular and urogenital infections.

LGV has long been recognized to be endemic in many tropical countries, including parts of Africa, South America, Asia, and the Caribbean. As early as 1798, a female case of what is now thought to be LGV-related genital elephantiasis was reported in Egypt [7]. LGV is classified as a genital ulcer disease, and it is estimated that LGV accounts for 1% to 10% of genital ulcer disease in tropical countries [8]. It is likely that the prevalence of the ulcerative stage of LGV is underestimated. An ulcer is found in only 3% to 53% of patients at the time of physical examination [9]. When ulcers are present, disease may be misclassified, due to a similar presentation with other genital ulcer diseases, such as genital herpes, the primary stage of syphilis, or chancroid. Additionally, a history of ulcers may not be noted by the patient due to the painless or minimally painful nature of ulcers due to LGV.

The classic presentation of LGV follows the ulcer stage, and consists of unilateral inguinal and/or femoral lymphadenopathy, which includes the formation of buboes (enlarged, tender, painful glands in the groin). This classic manifestation may include a "groove sign"—a groove-like depression formed by the inguinal ligament as it passes between enlarged inguinal and femoral lymph nodes.

The clinical course of LGV infection may be divided into three stages (Table 1). The primary stage is characterized by transient papules or ulcers at the site of inoculation. The secondary stage is characterized by inguinal lymphadenopathy. An anorectal presentation of LGV is also considered a secondary stage of infection and has been recognized among persons engaging in anal intercourse. Chronic untreated LGV can lead to the tertiary stage,

Table 1. Clinical features of lymphogranuloma venereum infection

Signs	Special considerations
Primary stage (average 3–30 days after infection)	
Transient genital or rectal papule, ulcer, or erosion at the site of inoculation.	Lesions may emulate genital herpes, primary syphilis, or chancroid.
Usually a single, nonindurated, herpetiform ulcer: with or without pain, heals rapidly, and leaves no scar.	If inoculation occurs during anal intercourse, primary lesions may be missed due to their occult placement and painless nature.
Secondary stage (average 2–6 weeks after primary stage)	
Inguinal syndrome	
Painful regional lymphadenopathy (usually unilateral) located near the site of the primary lesion.	In female infection, inguinal/femoral lymphadenopathy is less common than in men, as primary involvement is the rectum, vagina, cervix, or posterior urethra, which drains to the deep iliac or perirectal nodes.
Usually involves inguinal nodes; femoral nodes may also be affected.	In female infection, lympadenopathy may mimic pelvic inflammatory disease, appendicitis, or tuboovarian abscess.
Characteristic "groove sign" caused by femoral and inguinal node enlargement above and below the inguinal ligament occurs in approximately one third of patients.	
Inguinal buboes may suppurate and rupture, causing discharge and easing pain; the majority involute to form a hard, indurated, nonsuppurative inguinal mass.	
Possible accompanying systemic symptoms: fever, chills, malaise, anorexia, weight loss, myalgia, and althralgia.	
Anorectal syndrome	
Hemorrhagic or nonhemorrhagic proctitis/proctocolitis with purulent, mucous, or bloody anal discharge, rectal pain/spasms, tenesmus, or constipation.	Clinical and histologic findings of early lymphogranuloma venereum proctocolitis can be similar to those of inflammatory bowel disease.
Ulcerative proctitis is confined to the distal 10 cm of the anorectal canal.	
Digital examination reveals granular rectal mucosa and movable enlarged lymph nodes immediately under the bowel wall.	
Possible accompanying systemic symptoms: fever, chills, malaise, anorexia, weight loss, myalgia, and althralgia.	
Tertiary stage (average years after infection)	
Fibrosis leading to lymphatic obstruction, esthiomene (elephantiasis of the female genitalia characterized by fibrotic labial thickening) in women, or elephantiasis and deformation of genitalia in men.	
Elephantiasis is usually medically irreversible and requires surgical intervention.	
Rectal scarring leads to formation of strictures and fistulae.	

(*Data adapted from* Perine and Stamm [9], Mabey and Peeling [26], and Bushnell [31].)

which can include fibrosis that leads to lymphatic obstruction, causing genital elephantiasis. For infections with rectal involvement, early disease stages may be missed or confused with other etiologies; end-stage pathology may involve the formation of strictures and fistulae.

Although cases of both inguinal and anorectal LGV have been documented in the United States, case reports have been uncommon, and national estimates of the disease burden have not been available. LGV is not a nationally notifiable condition.

Recent Recognition of LGV

In 2003, a cluster of anorectal LGV cases of the L2 serovar appeared among men who have sex with men (MSM) presenting with intestinal symptoms (mucopurulent

discharge and constipation) in Rotterdam, Netherlands [1•]. Soon thereafter, reports emerged of similar clusters of men presenting with symptoms of proctocolitis in large cities in Europe, the United Kingdom, the United States, and Canada [2–6]. In the Netherlands, 92 cases were confirmed over a period of 17 months. Early case investigations suggested that the Netherlands outbreak had been concentrated in sexual networks of MSM and was associated with attendance at sex parties and with high-risk sexual behaviors such as unprotected anal intercourse or other forms of anal penetration (eg, fisting, use of sex toys). Of cases with known HIV status, the majority (77%) was found to be HIV-positive. In a subsequent epidemiologic study of 17 HIV-positive MSM in the LGV cluster, seven were found to have had recent hepatitis C infections. The investigators suggest that these infections may have been facilitated by concurrent LGV infection, and could be attributed to sexual behavior such as unprotected fisting rather than to parenteral transmission [10].

News of the European experience was rapidly disseminated via several means, including international electronic networks of infectious disease practitioners and communications between public health authorities in different countries [11,12]. The appearance of LGV was concerning to the public health community for several reasons. First, the number of cases reported in industrialized countries was likely a minimum estimate of disease occurrence; until that time, LGV was a rare diagnosis in Europe, the United Kingdom, and North America, and it was unlikely to be included on the differential diagnosis for proctocolitis. Second, in the absence of reliable baseline surveillance data, it was difficult to know whether disease rates were increasing or simply being recognized more commonly. Third, the absence of a specific diagnostic test for LGV made case ascertainment problematic and impeded rapid diagnosis and provision of appropriate treatment regimens (recommended treatment duration is longer for the L serovars than for the non-LGV chlamydia). Finally, the appearance of an ulcerative STI in a sexual network of MSM with high rates of HIV coinfection could herald increased transmission of HIV among MSM due to the association of genital ulcer disease with increased risk of transmission and acquisition of HIV [13,14].

The recognition of anorectal LGV in Europe and the United States caused public health investigators to speculate about whether it was a newly emergent infection or simply a newly recognized infection. Anorectal LGV had been detected among MSM in the 1980s. In 1981, LGV was isolated from ulcerative lesions in the intestinal tract of homosexual men with proctitis in Seattle, WA [15]. Furthermore, a retrospective study of approximately 100 stored rectal swabs submitted between 1981 and 1985 by physicians in the San Francisco, CA area revealed *C. trachomatis* in 19% of specimens, with 67% identified as the LGV biovar [16]. Additionally, the L2 strain detected most recently in Amsterdam has been determined to be the exact strain present in the San Francisco patients in the 1980s and in stored samples from Amsterdam STI clinic patients in 2000 [17]. Some have concluded that the epidemiologic pattern observed with LGV constitutes a slowly evolving epidemic of cases that are being increasingly detected due to new technologies [17].

Diagnostic Testing

Several laboratory methods had been used to identify LGV, including culture, serology, and nucleic acid amplification testing; however, each of these methods has significant disadvantages. Culture is time-consuming to perform and the sensitivity varies between laboratories. Few laboratories have the capacity to culture *C. trachomatis* from clinical specimens [18], and *C. trachomatis* isolates would need further testing for serovar classification. Serologic testing performed using the complement fixation test does not reliably distinguish between antibodies to different chlamydial species (ie, *C. trachomatis* vs *Chlamydia pneumoniae*). Interpretation of serologic test results have not been standardized for LGV infection nor validated in the context of the clinical presentation of proctitis. The microimmunofluorescence (MIF) test can differentiate serologic reactivity to different chlamydial species, and a MIF titer of greater than 1:128 strongly suggests LGV. However, MIF is not routinely used, as it requires a fluorescent microscope, a trained technician, and serovar-specific antigens.

Nucleic acid amplification test (NAAT) technology lends itself well to detecting pathogens in multiple specimen types and can often be performed without stringent specimen transport requirements. However, most LGV cases recognized in the United States have presented with anorectal symptoms, and no tests are currently cleared by the US Food and Drug Administration for detection of *C. trachomatis* using anorectal specimens. Data from studies initiated by the US Centers for Disease Control and Prevention (CDC) may be useful to support a submission for US Food and Drug Administration review for clearance of such a test. This would alleviate the burden on individual laboratories for verifying (under Clinical Laboratory Improvement Amendments regulations) the test to use on rectal samples.

At present, molecular detection of L serovars are available on a more limited basis than *C. trachomatis* NAATs. Shortly after the detection of LGV among MSM in Europe, Dutch researchers developed an LGV-specific reverse-transcriptase polymerase chain reaction (PCR) test [19], and investigators at the New York State-Wadsworth Center developed a multiplex PCR assay capable of differentiation of L serovars [20]. The CDC recently developed a real-time assay to detect LGV and differentiate infections mixed with LGV and non-LGV *C. trachomatis* serotypes [21]. The performance of the CDC assay is currently under evaluation with clinical specimens (J. Papp, personal communication). These assays may be useful in develop-

ing local capacity for LGV molecular detection, but until available, the CDC accepts specimens from local public health departments for reference sequencing. Currently, sequencing is strictly for epidemiologic purposes, because the time to result is too long for patient management.

Unless or until a commercially available NAAT for LGV becomes available, sensitive and specific LGV diagnostic testing will likely remain limited. However, increasing the number of laboratories with anorectal *C. trachomatis* NAAT capacity will increase the detection and treatment of anorectal *C. trachomatis*, some proportion of which could be LGV. *C. trachomatis* detection in anorectal samples is desirable regardless of subsequent LGV infection status; a study in San Francisco, using a commercially available NAAT that was verified for anorectal specimens, found a 7.9% prevalence of rectal chlamydia among MSM patients attending an STI clinic and a gay men's community health center. Most (85%) rectal infections were asymptomatic, suggesting the need for routine screening [22••] and supporting the existing CDC recommendations [23••].

The New York City Experience

Healthcare providers diagnosing LGV and clinical laboratories detecting LGV infection are required to report the infections to the New York City Department of Health and Mental Hygiene (NYC DOHMH). After several years without a single LGV case report in NYC, there were 10 cases reported in 2003, followed by three cases in 2004. These cases were predominantly reported by private-sector providers and diagnosed based on clinical findings, as valid and reliable diagnostic laboratory tests were not readily available. In 2005, aware of reports of LGV in Europe and anticipating imported disease or disease acquired during overseas travel, the NYC DOHMH implemented an enhanced LGV surveillance system. In February 2005, after the CDC confirmed LGV infection in anorectal swabs from two NYC residents using DNA sequencing methods, the NYC DOHMH issued a provider health alert and press release. Both swabs were from MSM, and the LGV strain identified was L2, the same strain detected in Europe.

The NYC DOHMH health alert urged medical providers to consider LGV in the differential diagnosis of proctitis, and it requested that providers submit specimens from patients presenting with proctitis, genital ulcer, or lymphadenopathy, or from asymptomatic patients who were sex partners to a confirmed or suspected LGV case. With no local capacity for confirmation of the L serovars as the etiologic agents, NYC and numerous other cities and states relied on the CDC for their specialized testing capacity. Within 2 months of dissemination of the provider health alert, approximately 80 specimens (about 90% of which were anorectal) had been submitted from NYC, and seven cases had been laboratory confirmed as LGV at the CDC. Initial cases included persons who had symptoms of several months duration and who had been incorrectly diagnosed or remained undiagnosed at the time of specimen collection. As NYC providers continued to identify more suspect cases, the need for local laboratory capacity for anorectal *C. trachomatis* testing and LGV detection grew.

Diagnostic test development by the New York State Department of Health

In response to the need for the ability to detect *C. trachomatis* on anorectal swab specimens and L-serovar detection if *C. trachomatis* was present, the New York State Department of Health-Wadsworth Center verified the performance of a real-time *C. trachomatis* NAAT on anorectal specimens and developed a multiplex assay, which targeted the *omp1* gene of chlamydia and was able to confirm a *C. trachomatis*–positive sample as serovar L2 in a single reaction [20]. The assay was rapid, identifying the presence of the L2 serovar in a few hours. In May 2005, Wadsworth Center began accepting two types of specimens for LGV testing: *C. trachomatis*–positive nonrectal specimens from suspected LGV patients, as well as anorectal specimens for both *C. trachomatis* and LGV detection. The more rapid turnaround time for test results, clinical information received from providers, and epidemiologic information gleaned from case interviews enabled the NYC DOHMH to implement targeted disease intervention activities by interviewing only laboratory-confirmed cases for elicitation of sex partner and sexual behavior information, notifying sex partners exposed to confirmed cases, and advising on appropriate duration of patient treatment. Information gathered through this process enabled the construction of a detailed epidemiologic profile of suspected and confirmed LGV cases.

Through April 2006, 92% of submitted specimens were from men, the majority of whom sought medical attention from private-sector providers after experiencing rectal symptoms. Of 168 male anorectal swab samples tested, 47 (28%) were positive for chlamydia. Of the *C. trachomatis*–positive anorectal swab specimens for which a serovar could be determined, 81% (31/38) were L2, and the remaining were *C. trachomatis* serovars D, E, G, J, and K.

Among laboratory-confirmed LGV cases, 97% (30/31) reported sex with other men. The median age of cases was 33 years, and cases were distributed across all racial and ethnic groups. All but one case-patient presented with symptoms of rectal inflammation and bleeding. Most MSM reported unprotected anal intercourse in the 6 months prior to symptoms. As in Europe and the United Kingdom, the majority (84%) of cases reported coinfection with HIV. More than half of LGV cases had a prior documented STI, most commonly syphilis.

Because a large proportion of LGV cases had had prior syphilis and in order to help develop LGV prevention

Table 2. Treatment regimens for lymphogranuloma venereum and *Chlamydia trachomatis* infections

	Recommended regimen	Alternative regimen
Lymphogranuloma venereum	Doxycycline, 100 mg, orally twice a day for 21 days.	Erythromycin base, 500 mg, orally four times a day for 21 days.
Chlamydia trachomatis	Azithromycin, 1 g, orally in a single dose; or doxycycline, 100 mg, orally twice a day for 7 days.	Erythromycin base, 500 mg, orally four times a day for 7 days; erythromycin ethylsuccinate, 800 mg, orally four times a day for 7 days; ofloxacin, 300 mg, orally twice a day for 7 days; or levofloxacin, 500 mg, orally once daily for 7 days.

(*Data adapted from* [23••].)

strategies, we compared our LGV- and syphilis-affected subpopulations, using data from case interviews about their disease referent periods. Although the number of LGV cases available for comparison were relatively few, the age, race/ethnicity, and percent of men reporting sex with men among NYC's LGV cases were quite similar to those for male primary and secondary syphilis cases diagnosed in NYC. Both subpopulations reported a high prevalence of sex with anonymous sex partners (40% of LGV cases, 60% of syphilis cases), and about one-quarter of each group reported never discussing HIV status before initiating sex, despite the fact that 84% of LGV and 77% of syphilis cases were HIV positive by self-report. Approximately 40% of both LGV and syphilis groups reported meeting sex partners on the internet. Efforts to probe recent international travel and venues where sex partners were sought revealed no apparent links to cases in Europe, and no evidence of visits to high-risk venues such as bathhouses. Given the apparent similarity of the populations of men diagnosed with LGV and primary and secondary syphilis in NYC, messages for interrupting the spread of LGV have been targeted to the same groups of men targeted by existing syphilis prevention activities. LGV-related health promotion activities were easily piggybacked onto the syphilis prevention activities of community-based organizations and other partners in health promotion for the MSM community.

Treatment

Table 2 shows recommended treatment regimens for LGV and for uncomplicated urogenital *C. trachomatis* infection. The recommended duration of antibiotic treatment is longer for LGV than it is for chlamydial proctitis due to serovars B to K [23••]. It is difficult to clinically distinguish LGV from chlamydial proctitis due to other *C. trachomatis* serovars, and so laboratory confirmation of LGV is critical to appropriate medical management. Although a recent case-control study showed that proctitis detected on proctoscopic examination (> 10 white blood cells in a gram-stained anorectal smear) and HIV seropositivity could be used to identify MSM who were more likely to have anorectal LGV [24•] than non–L serovar *C. trachomatis* proctitis, this level of evaluation may not be readily available in many clinicians' offices. In our NYC sample of possible case patients through April 2006, we found that compared to LGV patients, rectal *C. trachomatis*–positive patients with non-LGV serovars were less likely to have HIV coinfection (58% vs 84%) and less likely to present with symptoms of proctitis, but the prevalence of proctitis among patients with anorectal infection with non–L serovars was still substantial (62%). The absence of a readily available test to detect LGV and the difficulty in clinically distinguishing LGV from chlamydial proctitis requires that healthcare providers presumptively treat suspected cases for LGV infection with the 3-week treatment regimen.

Unresolved Issues

Important information regarding the clinical presentation and epidemiology of LGV has been obtained from the recent cases reported from urban centers such as NYC; San Francisco; and Atlanta, GA [25], yet numerous questions remain to be answered.

STIs affecting MSM would be expected to manifest in persons engaging in either insertive or anal receptive intercourse, yet the paucity of reported penile lesions and inguinal lymphadenopathy suggests disease only in receptive partners. The absence of penile lesions and inguinal lymphadenopathy among MSM may highlight gaps in our knowledge of the pathogenesis of LGV. Alternatively, ulcerative or papular disease in the insertive partner may be mistaken for the genital ulcers of herpes or syphilis and not reported as LGV. Also, urethral infections caused by the L serovars could be misclassified as "garden variety" chlamydia that causes urethritis and cervicitis. To date, infection has been thought to manifest at the site of inoculation [26], and anorectal LGV symptoms have been considered a part of the secondary stage of the disease that may follow an anorectal ulcer or papule undetected in the anorectum. However, there may not be clear distinction between the primary and secondary stages following rectal LGV infections, and the natural history of LGV infection may be different depending on the anatomic site exposed.

Table 3. CDC screening recommendations for sexually active men who have sex with men

1. HIV serology, if HIV negative or not tested within the previous year.
2. Syphilis serology.
3. Test for urethral infection with *Neisseria gonorrhoeae* and *Chlamydia trachomatis* in men who have had insertive intercourse during the preceding year, regardless of condom use history.
4. Test for rectal infection with *N. gonorrhoeae* and *C. trachomatis* in men who have had receptive anal intercourse during the preceding year (regardless of condom use history) using culture, FDA-approved tests, or locally-verified tests in compliance with Clinical Laboratory Improvement Amendments.
5. Test for pharyngeal infection with *N. gonorrhoeae* in men who have acknowledged participation in receptive oral intercourse during the preceding year (regardless of condom use history) using culture, FDA-approved tests, or locally-verified tests in compliance with Clinical Laboratory Improvement Amendments.
6. Hepatitis A and B vaccination for all men in whom previous infection or immunization cannot be documented *(recommended)*.
7. Type-specific serologic tests for herpes simplex virus type 2 if infection status is unknown (*recommended*).
8. Test for antibodies to hepatitis C *(for HIV-positive persons)*.

CDC—US Centers for Disease Control and Prevention; FDA—US Food and Drug Administration.
(*Data adapted from* [23••].)

Several important questions remain regarding duration of treatment. A case report of early LGV infection in an HIV-infected patient suspected at first of having a chancroid infection suggested that a single 1-g dose of azithromycin could effectively treat early LGV [27]. Would a week of doxycyline or a single dose of azithromycin be adequate treatment for rectal LGV? Treatment trials with azithromycin are needed, and trials of shorter treatment regimens have not been conducted. And what effect, if any, does severity of symptoms or underlying disease conditions (eg, HIV) have on treatment efficacy? A South African study examined ulcer healing and found that the presence of HIV infection did not have an impact on the LGV treatment response in patients presenting with ulcers [28]. Additional studies are needed to confirm this finding. Furthermore, studies are needed to determine if there is differential treatment response among HIV-infected and non–HIV-infected persons with anorectal LGV.

Conclusions

Transmission of STIs in the MSM community is affected by shifts in sexual mores and social contexts (eg, locating sexual partners using the internet, increased foreign travel), and the current era is characterized by a growing prevalent pool of HIV-positive persons. LGV joins the list of other STIs (eg, syphilis, fluoroquinolone-resistant *Neisseria gonorrhoeae*) documented as having a higher incidence among MSM [29,30]. Current CDC treatment guidelines call for clinicians to assess the risks of STIs for all male patients and to routinely inquire about the gender of patients' sex partners. Clinicians should ask sexually active MSM about symptoms consistent with common STIs, including urethral discharge, dysuria, genital and perianal ulcers, regional lymphadenopathy, skin rash, and anorectal symptoms consistent with proctitis. Clinicians should maintain a low threshold for diagnostic testing, and screen sexually active MSM annually (Table 3); MSM reporting multiple or anonymous sex partners or drug use with sex should undergo more frequent screening [23••]. LGV should be considered in the differential diagnosis for MSM presenting with signs or symptoms of proctitis.

Three percent of the first 250 specimens submitted for LGV PCR in NYC were from female patients, yet there were no laboratory-confirmed female cases of LGV. Although LGV is currently concentrated among MSM, public health authorities and medical providers should be aware about the possibility of male-to-female LGV transmission.

As specific diagnostic testing for LGV is still of limited availability and may not be timely, treating suspected LGV infections with longer courses of antibiotics should be considered until other treatment regimens have been tested. Clinicians can contact their local public health departments to inquire about arrangements they may have for sending specimens to the CDC for LGV testing. The CDC accepts specimens from local public health departments for reference sequencing; however, sequencing is strictly for epidemiologic purposes, as time to result is too long for patient management. Patients presenting with signs and symptoms of LGV, as well as their sex partners (even if asymptomatic), should be treated presumptively for LGV infection.

Reducing the incidence of LGV entails not only treatment of cases, but notification and testing of sexual partners, and education regarding risk reduction. Public health departments conduct partner notification for a variety of STIs. The process involves public health staff identifying and locating the partners of a diagnosed person to notify them of their exposure to an infection and to convince them to seek evaluation and treatment. Collaboration between the medical community and public health authorities for the purpose of interrupting transmission of diseases such as LGV is of utmost importance.

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The authors describe the investigation of the first Netherlands cases of LGV. Contact tracing performed for three index patients presenting to an STI clinic resulted in the identification of a large sexual network of MSM, of which 15 men underwent STI testing and epidemiologic and clinical evaluation. Almost all men included in the study had LGV infection, and most LGV-positive cases were seropositive for HIV.

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The authors evaluated the prevalence of rectal, urethral, and pharyngeal chlamydial and gonococcal infections among MSM seen at a municipal STI clinic and gay men's community health center. They determined the proportion of asymptomatic rectal infections, described the patterns of single and multiple anatomic sites of infection, and evaluated the proportion of chlamydial infections that would be missed and not treated if MSM were not routinely tested for chlamydia.

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