

## m i c r o t o p i c s

## CHLAMYDIA TRACHOMATIS INFECTIONS IN AFRICA

Johan Goeman, MD and Marie Laga, MD

**C**hlamydia trachomatis has been recognized since early in this century as the causative agent of two disease syndromes, most notably trachoma, in endemic areas. In the 1960s and 70s, it gradually became apparent that this organism was responsible for sexually transmitted infections in many parts of the world, including the industrialized West.

In the early 1980s, advances in diagnostics technology permitted for the first time the widespread screening for and accurate diagnosis of chlamydial infection. Only then did medical and public health professionals in both the industrialized and the developing world begin to realize that most cases of what had been called "nonspecific" or "nongonococcal" sexually transmitted infections were, in fact, chlamydial infections.

Chlamydial infections are now recognized as among the most prevalent communicable diseases afflicting humankind.

In the article below, Drs. Johan Goeman and Marie Laga of the Institute of Tropical Medicine in Antwerp, Belgium tell of the situation in Africa where they have worked for many years in the field of infectious diseases. — EDITOR

Chlamydia trachomatis infections are an extremely serious public health problem in many parts of Africa. Three dis-

eases are now known to be caused by this organism: trachoma, a blinding eye disease that is hyperendemic in certain areas; lymphogranuloma venereum (LGV), a relatively rare disease confined mainly to clearly defined geographical areas in Southern Africa; and genital tract infections, the high prevalence of which became clear only in the past decade, when diagnostic facilities became available in this part of the world. Each of these diseases is associated with different serovars of *C. trachomatis*, although the specificity is not complete. See Table 1.

**Trachoma**

Trachoma is a chronic inflammation of the conjunctiva, the delicate membrane that lines the eyelid. It was first described by the ancient Egyptians, and was also the disease from which the intracytoplasmic chlamydiae were first demonstrated in 1907. The number of infections is estimated at around half a billion worldwide. Up to 9 mil-

lion people are reported to be blind from this condition (1), making it the most common preventable cause of blindness in developing countries (2).

Trachoma is caused by *C. trachomatis* serovars A, B, Ba, and C. The first signs of trachoma (watering eyes, mucopurulent discharge, ptosis) may be self-limited and go unnoticed. Repeated infections, which unfortunately are the norm in endemic areas, cause a delayed-type hypersensitivity reaction to the chlamydial antigen. Further complicat-



ing matters in endemic areas are secondary bacterial infections, which fuel the inflammatory process and prevent healing.

Chronic inflammation of the conjunctiva eventually leads to scarring and distortion of the connective tissue underlying the eyelid. Shrinkage of the scar tissue may gradually pull the eyelid inward so that the lashes irritate the cornea and cause corneal ulcers. In extreme cases and over a long period of time—perhaps decades—the cornea becomes completely opaque and the patient becomes blind.

The stubbornness of trachoma in certain areas is directly related to poor hygiene, especially lack of adequate water supply for personal washing, and to poor housing. Flies can also transmit infected ocular secretions.

Most often, the disease is spread from person to person, especially among children. In one study of an endemic region in Egypt, investigators isolated *C. trachomatis* from the eyes of 28% of randomly selected children between the ages of one month and two years (3). Children under 10 years of age with active eye disease constitute the reservoir of infection in endemic areas, spreading it to their older family members. That trachoma is a family disease is borne out by studies showing the same immunotype of *C. trachomatis* shared among family members (3).

Trachoma is a public health problem in many rural areas of developing countries, but most of the endemic areas are in regions with a hot and dry climate. There is a so-called "trachoma belt" stretching from Saharan Africa through the Middle East to some areas of Asia.

**TABLE 1. INFECTIONS DUE TO *CHLAMYDIA TRACHOMATIS***

<b>Serovars</b>	<b>Clinical syndromes</b>
A - C	Trachoma
D - K	Males: Urethritis, epididymitis, orchi-epididymitis, urethral stricture, sterility.  Females: Cervicitis, pelvic inflammatory disease and its sequelae (chronic abdominal pain, ectopic pregnancy, infertility), Bartholinitis, perihepatitis.  Both genders: Proctitis, pharyngitis, Reiter's syndrome.  Infants: Neonatal conjunctivitis, neonatal pneumonia.
L1 - L3	Lymphogranuloma venereum.

Diagnosis of trachoma is usually based on clinical signs and symptoms. Microbiological diagnosis of trachoma is possible but is done only rarely because of the cost and the complexity of the laboratory methods needed.

Effective treatment of trachoma requires systemic antibiotics, usually tetracycline, doxycycline, or erythromycin. Topical antibiotics can be useful in treating bacterial superinfections but their effects on the chlamydial component itself are short-lived; this is probably due to the high rate of extraocular chlamydial infection (eg, nasopharynx) found in endemic areas.

Trachoma can be prevented by reducing the frequency of exposure. As for many of the diseases limited to developing countries, sanitation and good personal hygiene are the most important measures.

#### **Lymphogranuloma venereum (LGV)**

Caused by serovars L1, L2, and L3, LGV is considered one of the "tropical" or "minor" STDs and is grouped together

with syphilis, chancroid, genital herpes, and donovanosis in the genital ulcer complex. However, the primary lesion is often painless and of short duration, so most patients seek medical attention only after enlargement of the regional lymph nodes.

LGV is limited to the developing countries and is particularly prevalent in Southern Africa. Cases of LGV in industrialized countries are of the import variety. Most cases of LGV are reported from southern Africa with the majority of patients infected in particular geographical areas, suggesting the existence of a well defined reservoir (4).

#### **Genital Infections**

Genital chlamydial infections have particularly deleterious effects on mother and child health in Africa. The syndromes presented in Table 1 include the sequelae of chlamydial cervicitis.

Recognition of *C. trachomatis* as a genital pathogen came late to Africa and other developing countries. Only in the 1980s did the burden of these infections become apparent. The data in Table 2 show the scope of the problem and indicate that genital chlamydial infections are at least as important in developing countries as they are in the industrialized world.

The spectrum of clinical diseases caused by *C. trachomatis* serovars D to K (though serovars A to C have also been isolated from the genital tract) is similar to the spectrum of syndromes caused by *Neisseria gonorrhoeae*. However, the clinical manifestations of chlamydial infections are relatively mild in comparison to gonococcal infections. Chlamydial diseases therefore tend to be more insidious, more chronic, and also more likely to cause complications.

Even complications like pelvic inflammatory disease, caused by an ascending infection from the cervix, may develop unperceived, causing further damage to the health of many women. Eight to twenty percent of women with chlamydial cervicitis develop PID (5). PID is the most frequent reason for admission in gynecology wards in developing countries (6) and both *C. trachomatis* and *N. gonorrhoeae* are important causes of PID in the developing world. A study in Kenya showed involvement of *C. trachomatis* in one-third of postpartum PID (7).

In about 20% of cases, one or more episodes of PID is followed by chronic abdominal pain, incapacitating a woman's ability to perform in her society.



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If the tubes are partially damaged after a PID episode, the risk of ectopic pregnancy increases. Ectopic pregnancy is up to three times more frequent in some developing countries than it is in the industrialized world. It is an important cause of maternal mortality since critical care facilities are rarely available in the third world (4).

If chronic inflammation totally obstructs the fallopian tubes, infertility occurs. One worldwide study of infertile

women showed that previous tubal infection was more common in African women than in women on other continents (8). Another study focusing on women in Zimbabwe documented the contribution of chlamydial infections to this high rate of tubal damage by showing significantly higher levels of chlamydial antibodies among women with ectopic pregnancy and infertility than among pregnant controls (9). See Table 3. Infertility rates in Africa generally correspond with high STD prevalences and a lack of health services (4), conditions that are at their most extreme in a wide swath of Africa known as "the infertility belt" spreading from Cameroon in the west to the southern regions of the Sudan.

Further complications of genital *C. trachomatis* infections may occur during pregnancy and in the postpartum period. Chlamydial cervicitis during pregnancy, for example, has been purported to cause chorioamnionitis and subsequent premature birth and low birth weight (4). In the postpartum period, *C. trachomatis* is an important cause of endometritis. One study in Nairobi found *C. trachomatis* in the cervix of 33% of women with postpartum upper genital tract infections (10).

At birth, during passage through an infected birth canal, the eyes of the infant may become infected by *C. trachomatis*. Without preventive measures, mother-to-child transmission will occur in 20 to 40% of births. During a prospective study in Nairobi, *C. trachomatis* was isolated from 34% of cases of ophthalmia neonatorum; *N. gonorrhoeae* was

**Table 2. Prevalence of chlamydial cervicitis in selected populations in Africa (4).**

Population	Country	Year	N	Prevalence (%)
Pregnant women:	Gabon	1988	5998	8.3
	Gambia	1984	100	6.9
	Kenya	1988	2732	8.9
	Zaire	1990	701	6.3
Prostitutes:	Kenya	1985	418	26.0
	Tanzania	1989	106	21.0
	Zaire	1988	1233	13.0

**Table 3.**

	History of PID (%)	Antichlamydial Ab titers 1/64 (%)
<b>Consequences and sequelae of pelvic inflammatory disease (PID) in Zimbabwe (9).</b>		
Pregnant women (n=104)	13	7
PID (n=66)	77	26
Ectopic pregnancy		
▪ normal tubae (n=21)	6	5
▪ tubal pathology (n=39)	87	26
Infertility		
▪ normal tubae (n=92)	30	5
▪ tubal pathology (n=135)	84	38

involved in 15% (11). *C. trachomatis* is therefore probably the most frequent cause of ophthalmia neonatorum in the tropics. In most cases, the onset of the resulting neonatal conjunctivitis is later than in gonococcal conjunctivitis and the clinical picture is more benign. However, because of its relatively benign character, many cases never receive medical attention.

Eye prophylaxis at birth with either silver nitrate or tetracycline can reduce the transmission of *N. gonorrhoeae*, but it does not have much effect on the transmission of *C. trachomatis*.

Chlamydial neonatal pneumonia occurs at about 3 months of age. It is a self-limiting disorder but contributes

significantly to infant morbidity both in developing and industrialized countries; and may even be the cause of respiratory disorders at an older age (4).

Screening for chlamydial cervicitis during pregnancy and subsequent treatment could diminish the incidence of neonatal chlamydial disease. In developing countries, however, this is not realistic because of the cost and complexity of diagnosis.

#### **Social and Behavioral Conditions Behind the Problem**

Certainly the asymptomatic nature of genital chlamydial infections contributes to the current public health problem raging in Africa. But other reasons, societal and behavioral, also keep up the high rates of infection and complication. These include:

- the absence of prevention programs (sex education and health information)
- the lack of a well-structured health service
- the increasing urbanization of the population and consequent loosening of traditional restraints on sexual activity
- the frequently negative attitude of health care staff towards sexually transmitted disease
- the low level of health-seeking behavior in the population and the stigma attached to seeking care
- the lack of an affordable and efficacious diagnostic method.

More recently, studies have shown that genital chlamydial infection may be an important cofactor in facilitating the heterosexual transmission of HIV in Africa (12).

#### **Conclusion**

*C. trachomatis* is an important pathogen. Trachoma and the genital chlamydial infections are among the most prevalent infectious diseases in the third world.

But most of all, it is their serious consequences and sequelae that make chlamydial infections a major health problem in developing countries.

#### About the authors

**Johan Goeman, MD** is Assistant in the Department of Microbiology at the Institute of Tropical Medicine in Antwerp, Belgium. His areas of expertise include the study of sexually transmitted diseases and HIV infection in developing countries.

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**About the Institute of Tropical Medicine**  
The Prince Leopold Institute of Tropical Medicine (ITM) was founded in 1931 under the high protection of H. M. the King. It is situated in the city of Antwerp, Belgium. This institute was founded on a university model and has a triple purpose: education in tropical medicine, scientific research in the field of health sciences in tropical regions, and the medical care of patients who have contracted diseases in tropical countries. Dr. M. Laga and Dr. J. Goeman belong to the Department of Microbiology, directed by Prof. P. Piot. The Department specializes in the study of sexually transmitted diseases, particularly the impact of STDs on public health in developing countries.

## GLOSSARY

**Conjunctivitis:** inflammation of the thin membrane that lines the eyelids

**Donovanosis:** granuloma inguinale, caused by *Calymmatobacterium granulomatis*, which is observed intracellularly (in macrophages in the lesion) as Donovan bodies

**Endemic:** present in a community at all times

**Endometritis:** inflammation of the endometrium (not endometriosis)

**Postpartum:** occurring after childbirth

**Ptosis:** drooping of the eyelid

**Prophylaxis:** preventive treatment

**Reservoir:** source in a population, frequently asymptomatic, of pathogenic organisms

**Serovars:** taxonomic subdivisions of organisms based on the types of antigens present on the cell

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