

# Trachoma

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**Trachoma**, also called **granular conjunctivitis**, **Egyptian ophthalmia**,<sup>[1]</sup> and **blinding trachoma**, is an infectious disease caused by bacterium *Chlamydia trachomatis*. The infection causes a roughening of the inner surface of the eyelids. This roughening can lead to pain in the eyes, breakdown of the outer surface or cornea of the eyes, and eventual blindness. Untreated, repeated trachoma infections can result in a form of permanent blindness when the eyelids turn inward.<sup>[2]</sup>

The bacteria that cause the disease can be spread by both direct and indirect contact with an affected person's eyes or nose. Indirect contact includes through clothing or flies that have come into contact with an affected person's eyes or nose. Children spread the disease more often than adults. Poor sanitation, crowded living conditions, and not enough clean water and toilets also increase spread.<sup>[2]</sup>

Efforts to prevent the disease include improving access to clean water and decreasing the number of people infected by treatment with antibiotics.<sup>[2]</sup> This may include treating, all at once, whole groups of people in whom the disease is known to be common.<sup>[3]</sup> Washing by itself is not enough

## Trachoma



Surgical repair of in-turned eyelid and eyelashes resulting from trachoma

### Classification and external resources

<b>Specialty</b>	infectious disease
<b>ICD-10</b>	A71 ( <a href="http://apps.who.int/classifications/icd10/browse/2016/en#/A71">http://apps.who.int/classifications/icd10/browse/2016/en#/A71</a> )
<b>ICD-9-CM</b>	076 ( <a href="http://www.icd9data.com/getICD9Code.aspx?icd9=076">http://www.icd9data.com/getICD9Code.aspx?icd9=076</a> )
<b>DiseasesDB</b>	29100 ( <a href="http://www.diseasesdatabase.com/ddb29100.htm">http://www.diseasesdatabase.com/ddb29100.htm</a> )
<b>MedlinePlus</b>	001486 ( <a href="https://medlineplus.gov/ency/article/001486.htm">https://medlineplus.gov/ency/article/001486.htm</a> )
<b>eMedicine</b>	oph/118 ( <a href="http://www.emedicine.com/oph/topic118.htm">http://www.emedicine.com/oph/topic118.htm</a> )
<b>Patient UK</b>	Trachoma ( <a href="http://patient.info/doctor/Trachoma">http://patient.info/doctor/Trachoma</a> )
<b>MeSH</b>	D014141 ( <a href="https://www.nlm.nih.gov/cgi/mesh/2017/MB_cgi?field=uid&amp;term=D014141">https://www.nlm.nih.gov/cgi/mesh/2017/MB_cgi?field=uid&amp;term=D014141</a> )

to prevent disease but may be useful with other measures.<sup>[4]</sup> Treatment options include oral azithromycin and topical tetracycline.<sup>[3]</sup> Azithromycin is preferred because it can be used as a single oral dose.<sup>[5]</sup> After scarring of the eyelid has occurred, surgery may be required to correct the position of the eyelashes and prevent blindness.<sup>[2]</sup>

Globally, about 80 million people have an active infection.<sup>[6]</sup> In some areas infections may be present in as many as 60–90% of children and it more commonly affects women than men likely due to their closer contact with children.<sup>[2]</sup> The disease is the cause of decreased vision in 2.2 million people of whom 1.2 million are completely blind.<sup>[2]</sup> It commonly occurs in 53 countries of Africa, Asia, Central and South America with about 230 million people at risk.<sup>[2]</sup> It results in US\$8 billion of economic losses a year.<sup>[2]</sup> It belongs to a group of diseases known as neglected tropical diseases.<sup>[6]</sup>

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## Signs and symptoms

The bacterium has an incubation period of 5 to 12 days, after which the affected individual experiences symptoms of conjunctivitis, or irritation similar to "pink eye." Blinding endemic trachoma results from multiple episodes of reinfection that maintains the intense inflammation in the conjunctiva. Without reinfection, the inflammation will gradually subside.<sup>[7]</sup>

The conjunctival inflammation is called “active trachoma” and usually is seen in children, especially pre-school children. It is characterized by white lumps in the undersurface of the upper eyelid (conjunctival follicles or lymphoid germinal centres) and by non-specific inflammation and thickening often associated with papillae. Follicles may also appear at the junction of the cornea and the sclera (limbal follicles). Active trachoma will often be irritating and have a watery discharge. Bacterial secondary infection may occur and cause a purulent discharge.

The later structural changes of trachoma are referred to as “cicatricial trachoma”. These include scarring in the eyelid (tarsal conjunctiva) that leads to distortion of the eyelid with buckling of the lid (tarsus) so the lashes rub on the eye (trichiasis). These lashes will lead to corneal opacities and scarring and then to blindness. Linear scar present in the Sulcus subtarsalis is called Arlt's line (named after Carl Ferdinand von Arlt). In addition, blood vessels and scar tissue can invade the upper cornea (pannus). Resolved limbal follicles may leave small gaps in pannus (Herbert's Pits).

Most commonly children with active trachoma will not present with any symptoms as the low-grade irritation and ocular discharge is just accepted as normal. However, further symptoms may include:

- Eye discharge
- Swollen eyelids
- Trichiasis (turned-in eyelashes)
- Swelling of lymph nodes in front of the ears
- Sensitivity to bright lights
- Increased heart rate
- Further ear, nose and throat complications.

The major complication or the most important one is corneal ulcer occurring due to rubbing by concentrations, or trichiasis with superimposed bacterial infection.

## Cause

Trachoma is caused by *Chlamydia trachomatis*, serotypes (serovars) A, B, and C.<sup>[8]</sup> It is spread by direct contact with eye, nose, and throat secretions from affected individuals, or contact with fomites<sup>[9]</sup> (inanimate objects that carry infectious agents), such as towels and/or washcloths, that have had similar contact with these secretions. Flies can also be a route of mechanical transmission.<sup>[9]</sup> Untreated, repeated trachoma infections result in entropion—a painful form of permanent blindness when the eyelids turn inward, causing the eyelashes to scratch the cornea. Children are the most susceptible to infection due to their tendency to easily get dirty, but the blinding effects or more severe symptoms are often not felt until adulthood.

Blinding endemic trachoma occurs in areas with poor personal and family hygiene. Many factors are indirectly linked to the presence of trachoma including lack of water, absence of latrines or toilets, poverty in general, flies, close proximity to cattle, crowding, and so forth.<sup>[7][10]</sup> However, the final common pathway seems to be the presence of dirty faces in children that facilitates the frequent exchange of infected ocular discharge from one child's face to another. Most transmission of trachoma occurs within the family.<sup>[7]</sup>

## Diagnosis

### McCallan's classification

McCallan in 1908 divided the clinical course of trachoma into 4 stages

Stage 1 (Incipient trachoma)	Stage 2 (Established trachoma)	Stage 3 (Cicatrising trachoma)	Stage 4 (Healed trachoma)
Hyperaemia of palpebral conjunctiva	Appearance of mature follicle & papillae	Scarring of palpebral conjunctiva	Disease is cured or is not markable
Immature follicle	Progressive corneal pannus	Scars are easily visible as white bands	Sequelae to cicatrisation cause symptoms

### WHO classification

The World Health Organization recommends a simplified grading system for trachoma.<sup>[11]</sup> The Simplified WHO Grading System is summarized below:

Trachomatous inflammation, follicular (TF)—Five or more follicles of >0.5 mm on the upper tarsal conjunctiva

Trachomatous inflammation, intense (TI)—Papillary hypertrophy and inflammatory thickening of the upper tarsal conjunctiva obscuring more than half the deep tarsal vessels

Trachomatous scarring (TS)—Presence of scarring in tarsal conjunctiva.

Trachomatous trichiasis (TT)—At least one ingrown eyelash touching the globe, or evidence of epilation (eyelash removal)

Corneal opacity (CO)—Corneal opacity blurring part of the pupil margin

## Prevention

Although trachoma was eliminated from much of the developed world in the 20th century, this disease persists in many parts of the developing world, particularly in communities without adequate access to water and sanitation.<sup>[12]</sup>

## Environmental measures

Environmental improvement: Modifications in water use, fly control, latrine use, health education, and proximity to domesticated animals have all been proposed to reduce transmission of *C. trachomatis*. These changes pose numerous challenges for implementation. It seems likely that these environmental changes ultimately impact on the transmission of ocular infection by means of lack of facial cleanliness.<sup>[7]</sup> Particular attention is required for environmental factors that limit clean faces.

A systematic review examining the effectiveness of environmental sanitary measures on the prevalence of active trachoma in endemic areas showed that usage of insecticide spray resulted in significant reductions of trachoma and fly density in some studies.<sup>[13]</sup> Health education also resulted in reductions of active trachoma when implemented.<sup>[13]</sup> Improved water supply did not result in a reduction of trachoma incidence.<sup>[13]</sup>

## Antibiotics

Antibiotic therapy: WHO Guidelines recommend that a region should receive community-based, mass antibiotic treatment when the prevalence of active trachoma among one- to nine-year-old children is greater than 10 percent.<sup>[14]</sup> Subsequent annual treatment should be administered for three years, at which time the prevalence should be reassessed. Annual treatment should continue until the prevalence drops below five percent. At lower prevalences, antibiotic treatment should be family-based.

## Management

### Antibiotics

Antibiotic selection: Azithromycin (single oral dose of 20 mg/kg) or topical tetracycline (one percent eye ointment twice a day for six weeks). Azithromycin is preferred because it is used as a single oral dose. Although it is expensive, it is generally used as part of the international donation program organized by Pfizer through the International Trachoma Initiative.<sup>[5]</sup> Azithromycin can be used in children from the age of six months and in pregnancy.<sup>[7]</sup> As a community-based antibiotic treatment, some evidence suggests that oral azithromycin was more effective than topical tetracycline; however, there was no consistent evidence that supported oral or topical antibiotics as being more effective.<sup>[3]</sup> Antibiotic treatment reduces the risk of active trachoma in individuals infected with *chlamydia trachomatis*.<sup>[3]</sup>

## Surgery

Surgery: For individuals with trichiasis, a bilamellar tarsal rotation procedure is warranted to direct the lashes away from the globe.<sup>[15]</sup> Evidence suggests that usage of a lid clamp and absorbable sutures would result in reduced lid contour abnormalities and granuloma formation post-surgery.<sup>[16]</sup> Early intervention is beneficial as the rate of recurrence is higher in more advanced disease.<sup>[17]</sup>

## Lifestyle measures

Facial cleanliness: Children with grossly visible nasal discharge, ocular discharge, or flies on their faces are at least twice as likely to have active trachoma as children with clean faces.<sup>[7]</sup> Intensive community-based health education programs to promote face-washing can significantly reduce the prevalence of active trachoma, especially intense trachoma (TI). If an individual is already infected washing one's face is strongly encouraged, especially a child, in order to prevent re-infection.<sup>[18]</sup> Some evidence exists that washing the face combined with topical tetracycline might be more effective in reducing severe trachoma compared to topical tetracycline alone.<sup>[4]</sup> The same trial found no statistically significant benefit of eye washing alone or in combination with tetracycline eye drops in reducing follicular trachoma amongst children.<sup>[4]</sup>

National governments in collaboration with numerous non-profit organizations implement trachoma control programs using the WHO-recommended SAFE strategy, which includes:

- Surgery to correct advanced stages of the disease;
- Antibiotics to treat active infection, using azithromycin
- Facial cleanliness to reduce disease transmission;
- Environmental change to increase access to clean water and improved sanitation.

## Prognosis

If not treated properly with oral antibiotics, the symptoms may escalate and cause blindness, which is the result of ulceration and consequent scarring of the cornea. Surgery may also be necessary to fix eyelid deformities.

Without intervention, trachoma keeps families shackled within a cycle of poverty, as the disease and its long-term effects are passed from one generation to the next.

## Epidemiology

As of 2008, between 40–80 million people are infected,<sup>[6]</sup> and between 1.3 million and 8 million have permanent blindness due to trachoma.<sup>[19][20]</sup> It is common in more than 50 countries worldwide.<sup>[19]</sup> In many of these communities, women are three times more likely than men to be

blinded by the disease, due to their roles as caregivers in the family.

<sup>[21]</sup> About 110 million people live in endemic areas and need treatment. An additional 210 million live where trachoma is suspected endemic.

Ghana, Mexico, Saudi Arabia, Iran, Morocco and Oman report that the disease nationally eliminated.<sup>[22]</sup> Australia is the only developed country to still have endemic blinding trachoma.<sup>[23]</sup> In 2008, trachoma was found in half of Australia's very remote communities at endemic levels.<sup>[23]</sup>

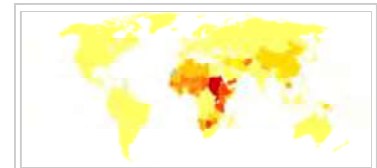
The WHO has set a target to eliminate trachoma as a public health problem by 2020.<sup>[24]</sup> The International Coalition for Trachoma Control (ICTC) has produced a strategic plan called 2020 INSight that lays out actions and milestones to achieve global elimination of blinding trachoma by the year 2020.<sup>[25]</sup> “We can make this disease history, and this document lays out a plan to do so,” said Dr. Paul Emerson, program director of the International Trachoma Initiative (ITI) and former director of the Carter Center's Trachoma Control Program. “There is an urgent need for action to avoid additional suffering and unnecessary blindness for hundreds of thousands of people.” The International Trachoma Initiative (ITI) coordinated the publication of 2020 INSight, which was produced with input from a diverse set of stakeholders.

The Trachoma Atlas is an open-access resource on the geographical distribution of trachoma. It features maps that show the prevalence of trachoma. The maps are free to use and download.<sup>[26]</sup>

## History

The disease is one of the earliest known eye afflictions, having been identified in Egypt as early as 15 B.C.<sup>[7]</sup>

Its presence was also recorded in ancient China and Mesopotamia. Trachoma became a problem as people moved into crowded settlements or towns where hygiene was poor. It became a particular problem in Europe in the 19th century. After the Egyptian Campaign (1798–1802) and the Napoleonic Wars (1798–1815), trachoma was rampant in the army barracks of Europe and spread to those living in towns as troops returned home. Stringent control measures were introduced and by the early 20th century, trachoma was essentially controlled in Europe, although cases were reported up until the 1950s.<sup>[7]</sup> Today, most victims of trachoma live in underdeveloped and poverty-stricken countries in Africa, the Middle East, and Asia.



Disability-adjusted life year  
for trachoma per

100,000 inhabitants in 2004

<span style="display: inline-block; width: 15px; height: 15px; background-color: #f0f0f0; border: 1px solid #ccc;"></span> no data	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ffffcc; border: 1px solid #ccc;"></span> 100–200
<span style="display: inline-block; width: 15px; height: 15px; background-color: #e0e0e0; border: 1px solid #ccc;"></span> ≤10	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ffcc99; border: 1px solid #ccc;"></span> 200–300
<span style="display: inline-block; width: 15px; height: 15px; background-color: #d0d0d0; border: 1px solid #ccc;"></span> 10–20	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ff9966; border: 1px solid #ccc;"></span> 300–400
<span style="display: inline-block; width: 15px; height: 15px; background-color: #c0c0c0; border: 1px solid #ccc;"></span> 20–40	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ff6633; border: 1px solid #ccc;"></span> 400–500
<span style="display: inline-block; width: 15px; height: 15px; background-color: #b0b0b0; border: 1px solid #ccc;"></span> 40–60	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ff3300; border: 1px solid #ccc;"></span> 500–600
<span style="display: inline-block; width: 15px; height: 15px; background-color: #a0a0a0; border: 1px solid #ccc;"></span> 60–80	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ff0000; border: 1px solid #ccc;"></span> ≥600
<span style="display: inline-block; width: 15px; height: 15px; background-color: #909090; border: 1px solid #ccc;"></span> 80–100	

In the United States, the Centers for Disease Control says "No national or international surveillance [for trachoma] exists. Blindness due to trachoma has been eliminated from the United States. The last cases were found among Native American populations and in Appalachia, and those in the boxing, wrestling, and sawmill industries (prolonged exposure to combinations of sweat and sawdust often lead to the disease). In the late 19th century and early 20th century, trachoma was the main reason for an immigrant coming through Ellis Island to be deported."<sup>[27][28]</sup>

In 1913, President Woodrow Wilson signed an act designating funds for the eradication of the disease.<sup>[29][30]</sup> Immigrants who attempted to enter the U.S. through Ellis Island, New York had to be checked for trachoma.<sup>[27]</sup> During this time treatment for the disease was by topical application of copper sulfate. By the late 1930s, a number of ophthalmologists reported success in treating trachoma with sulfonamide antibiotics.<sup>[31]</sup> In 1948, Vincent Tabone (who was later to become the President of Malta) was entrusted with the supervision of a campaign in Malta to treat trachoma using sulfonamide tablets and drops.<sup>[32]</sup>

Thanks to improved sanitation and overall living conditions, trachoma virtually disappeared from the industrialized world by the 1950s. However, it continues to plague the developing world to this day. Epidemiological studies were conducted in 1956-63 by the Trachoma Control Pilot Project in India under the Indian Council for Medical Research.<sup>[33]</sup> This potentially blinding disease remains endemic in the poorest regions of Africa, Asia, and the Middle East and in some parts of Latin America and Australia. Currently, 8 million people are visually impaired as a result of trachoma, and 41 million suffer from active infection.

Of the 54 countries that WHO cited as still having blinding trachoma occurring, Australia is the only developed country - Australian Aboriginal people who live in remote communities with inadequate sanitation are still blinded by this infectious eye disease.<sup>[34]</sup>

## Etymology

The term is derived from New Latin *trāchōma*, from Greek *τράχωμα* *trākhōma*, from *τραχύς* *trākhus* "rough."<sup>[35]</sup>

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## External links

- CDC Disease Info *trachoma* (<http://www.cdc.gov/nczved/divisions/dfbmd/diseases/trachoma>)
- New York Times article *Preventable Disease Blinds Poor in Third World* Published: March 31, 2006 (<http://www.nytimes.com/2006/03/31/world/africa/31blind.html?pagewanted=2&ei=5094&en=52c33a8daed4b843&hp&ex=1143867600&partner=homepage>)
- Photographs of trachoma patients (<http://webeye.ophth.uiowa.edu/eyeforum/atlassearch1.htm?appSession=65715523547772>)

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Categories: Blindness | Diseases of the eye and adnexa | Neglected diseases | Tropical diseases | Chlamydia infections | Infectious diseases with eradication efforts

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