Lesson 19

Microbiological diagnosis of obligate intracellular bacterial infection (Chlamydia and Rickettsia)

Chlamydia

- Chlamydiae are in the order Chlamydiales, family Chlamydaceae, genus Chlamydia.
- There are three types of chlamydia - C.trachomatis, C.psittaci, C.pneumoniae - causing disease in humans.
- According to the latest classification, the Chlamydaceae family is divided into two genera: Chlamydia and Chlamidophila. The genus Chlamydia is represented by the species C.trachomatis, the genus Chlamidophila includes the species C.psittaci and C.pneumoniae

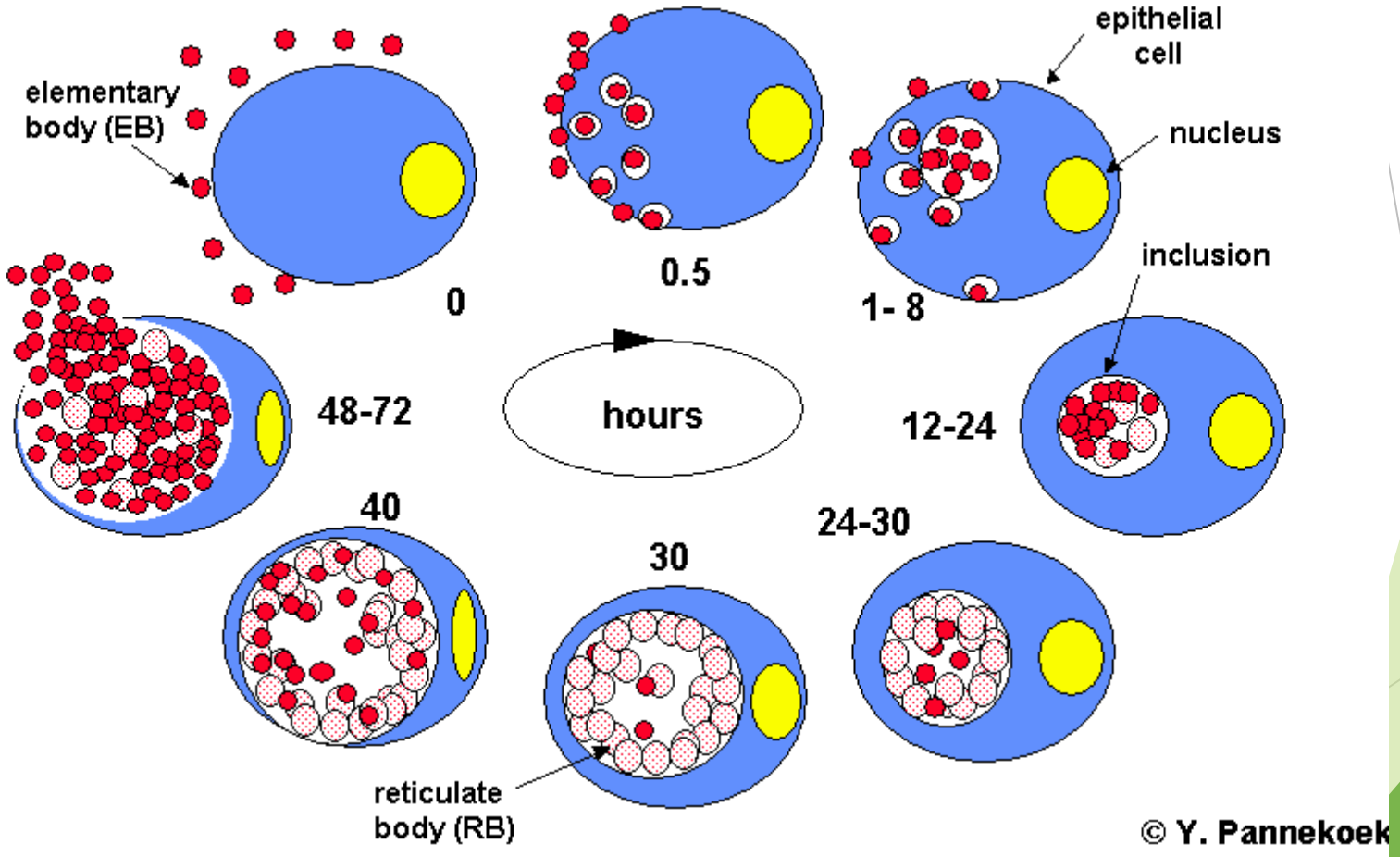
Morpho-biological properties

- Chlamydia got its name from the Greek. chlamyda is a mantle, since in the host cell, passing through a unique development cycle, they form intracellular inclusions surrounded by a shell resembling a mantle. The life cycle of chlamydia development is characterized by the alternation of morphologically different forms of existence - elementary and reticular bodies.

Reproduction of chlamydia

- Reproduction of chlamydia occurs in cells, mainly epithelial. Elementary bodies enter target cells by endocytosis.
- Reproduction ends with the transformation of elementary bodies into reticular ones. Reticular bodies are a vegetative form of chlamydia, they can be ovoid, crescent-shaped and larger than elementary bodies (0.3x1.5 μm). They are located intracellularly near the nucleus and stain blue or purple according to Romanovsky-Giemsa.
- Reticular bodies repeatedly divide by binary fission, then turn into elementary bodies. The development cycle of chlamydia lasts 1-2 days, ends with the death of the host cell and the release of elementary bodies.

Life cycle of chlamydia in the host cell



Characteristics of chlamydia

	C. trachomatis	*C. pneumoniae*	*C. psittaci*
host	humans, mice	humans	rarely in humans, birds, mammals,
clinical disease	see page 34	pneumonia, asthma, endocarditis, arthritis	pneumonia
folate biosynthesis	yes	no	no
inclusion staining	idodine+	iodine-	iodine-
inclusion morphology	oval, granular, vacuolar	oval, dense	variable, dense, lucent
elementary body shape	coccoid	pear-shaped	coccoid
DNA homology	10	100	10

Cultivation

- Since chlamydiae are obligate intracellular parasites, they can only propagate in living cells.
- Chlamydia are cultivated in the yolk sac of developing chicken embryos, sensitive animals and in cell culture at a temperature of 350C
- The most used cell culture is McCoy. C.pneumoniae reproduces better in Hep-2 cell culture.

Antigenic structure

- Chlamydia have a genus-specific thermostable antigen, lipopolysaccharide, located in the cell wall of chlamydia.
- Species-specific or serovar-specific antigen - the main protein of the outer membrane
- According to their antigenic structure, some types of chlamydia are divided into serovars.

Pathogenicity factors

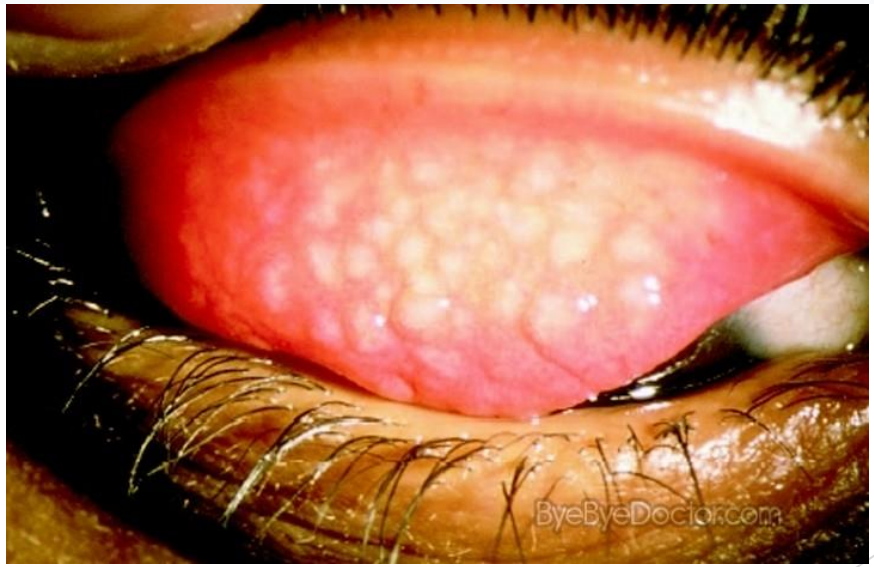
- Chlamydia pathogenicity factors are associated with outer membrane proteins that have adhesive properties. These adhesins are found only in elementary bodies.
- Proteins of the outer membrane have antiphagocytic properties, as they are able to suppress the fusion of the phagosome with the lysosome.
- Endotoxins are represented by Chlamydia lipopolysaccharide

Chlamydia trachomatis

- Currently, 15 C.trachomatis serovars are known - A, B, Ba, C, D-K, L (L1, L2, L3), which cause different nosological forms.
- Serovars A, B, Ba and C cause trachoma;
- Serovars D-K cause urogenital chlamydia
- Serovars L1, L2, L3 cause lymphogranuloma venereum.

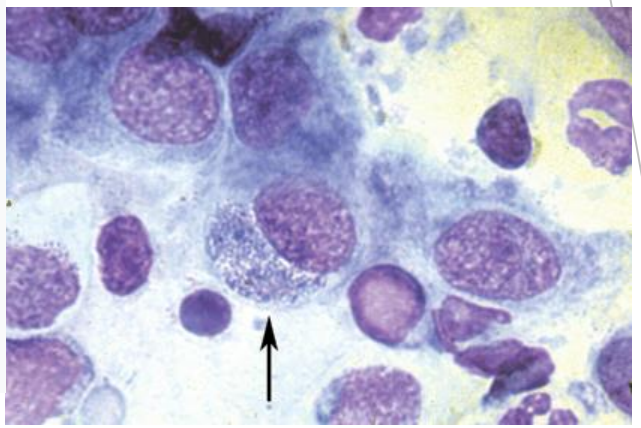
Trachoma

Chronic infectious disease characterized by inflammation of the conjunctiva and cornea, and leading to the formation of rough scars. The disease is caused by C.trachomatis serovars A, B, Ba, and C. The pathogen penetrates the epithelium of the conjunctiva and cornea, where it multiplies, destroying cells. Follicular keratoconjunctivitis develops. In advanced cases, the entire conjunctiva of the diseased eye is dotted with grains closely adjacent to each other, which resembles "frog spawn." The name of this disease is translated from Greek. "trachys" means "rough, uneven".

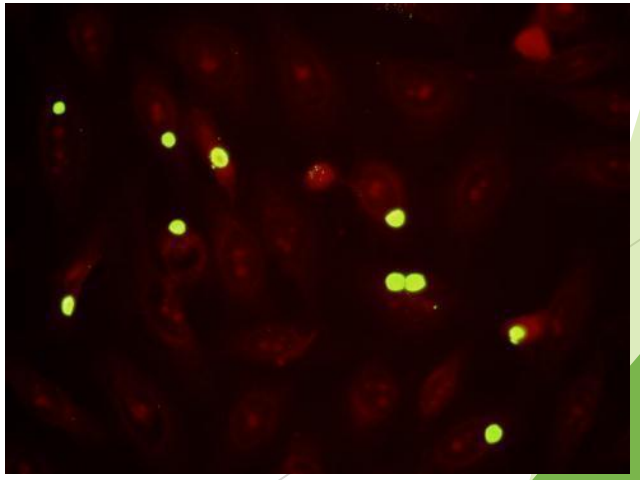


Microbiological diagnosis of trachoma

- Examine scrapings from the conjunctiva. The preparations are stained according to Romanovsky-Giemsa, where microscopy reveals purple cytoplasmic inclusions with a red center located near the nucleus - the Halberstedter-Prowacek body.



- RIF is used to detect specific chlamydial antigen in affected cells.



Urogenital chlamydia

- One of the most common diseases caused by C. trachomatis serovars D-K. The disease is accompanied by damage to the genitourinary system, sexually transmitted. In men with urogenital chlamydia, the epithelium of the urethra is affected and is clinically manifested by the development of urethritis. Urogenital chlamydia is often referred to as "nongonococcal urethritis" because patients have gonorrhea-like symptoms: itching, discharge, and pain when urinating.

- In women with urogenital chlamydia, the cervix is initially affected, leading to cervicitis. Ascending infection is clinically manifested by the development of urethritis, endometritis, salpingitis. The inflammatory process in the pelvic organs leads to the formation of adhesions and scars, resulting in the development of obstruction of the fallopian tubes in women and infertility.

Urogenital chlamydia (Reiter's syndrome)

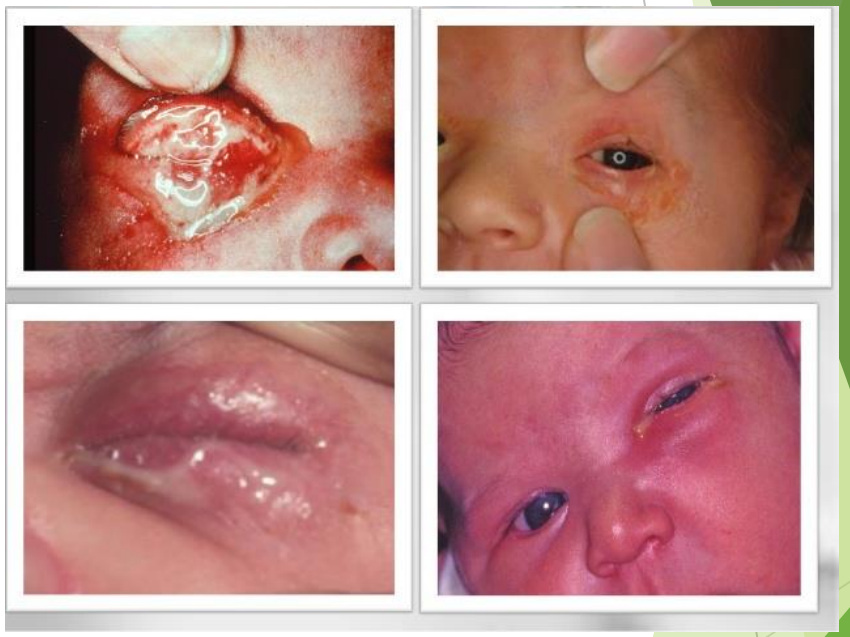
In some cases, urogenital chlamydia may be complicated by the development of Reiter's syndrome. Reiter's syndrome combines a triad of successive features: urethritis, conjunctivitis (iridocyclitis or uveitis), and reactive arthritis. Eye damage in urogenital chlamydia occurs after 1-4 weeks. The pathogenesis of Reiter's syndrome is based on an autoimmune mechanism caused by the "heat shock protein" of chlamydia, which is similar in its amino acid composition to the human one. Accumulating in the human body, this protein can trigger autoimmune processes leading to the development of reactive arthritis, urethritis and conjunctivitis.

"Pools conjunctivitis"

- The causative agents of urogenital chlamydia can get on the mucous membrane of the eyes of healthy individuals when swimming in non-chlorinated pools, resulting in the development of keratoconjunctivitis ("pool conjunctivitis")
- Chlamydial conjunctivitis can also develop as a result of autoinfection (inoculation of urethral secretions into the conjunctiva).
- Chlamydial conjunctivitis is usually unilateral and is referred to as paratrachoma or inclusion conjunctivitis.

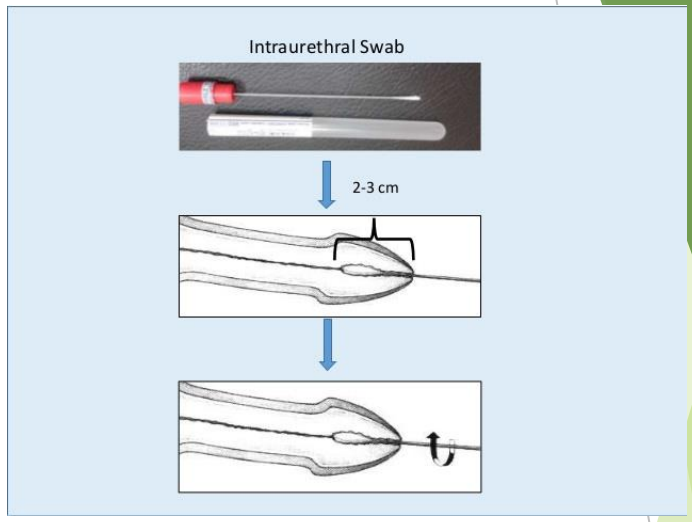
Infectious diseases of newborns caused by C. trachomatis

- Newborns can become infected from a sick mother when passing through the birth canal. In infants, 3 months after birth, atypical pneumonia of chlamydial etiology may develop. C.trachomatis enters the conjunctiva of newborns from a sick mother. After 7-12 days, the disease proceeds with the phenomena of purulent-mucous conjunctivitis - neonatal conjunctivitis with intracellular inclusions.



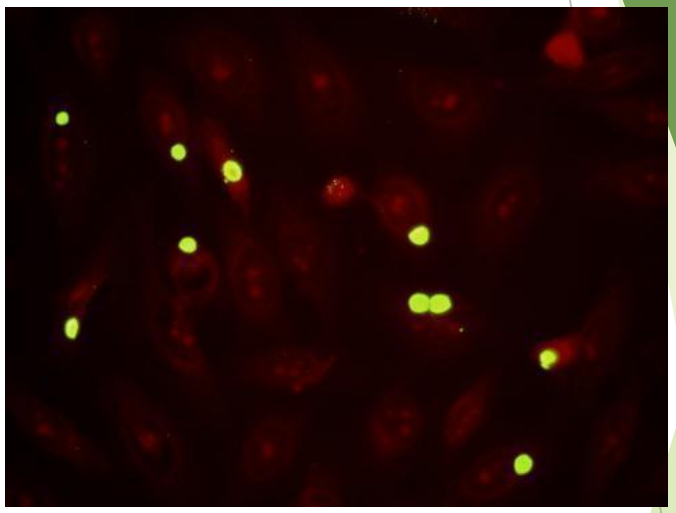
Diagnosis of urogenital chlamydia (research materials)

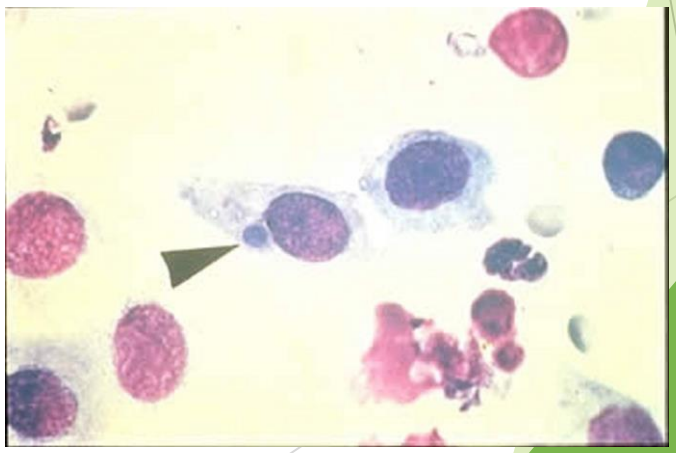
- The material for the study is scrapings from the epithelium of the urethra (in men), the vagina, the cervix, which are taken with the help of special "brushes", as well as with the help of Dacron or cotton swabs.
- With conjunctivitis, scrapings from the epithelium of the conjunctiva are examined.
- The main condition for taking a scraping is the presence of a large number of epithelial cells in it, since chlamydia is mainly detected inside the cell.



Diagnosis of urogenital chlamydia

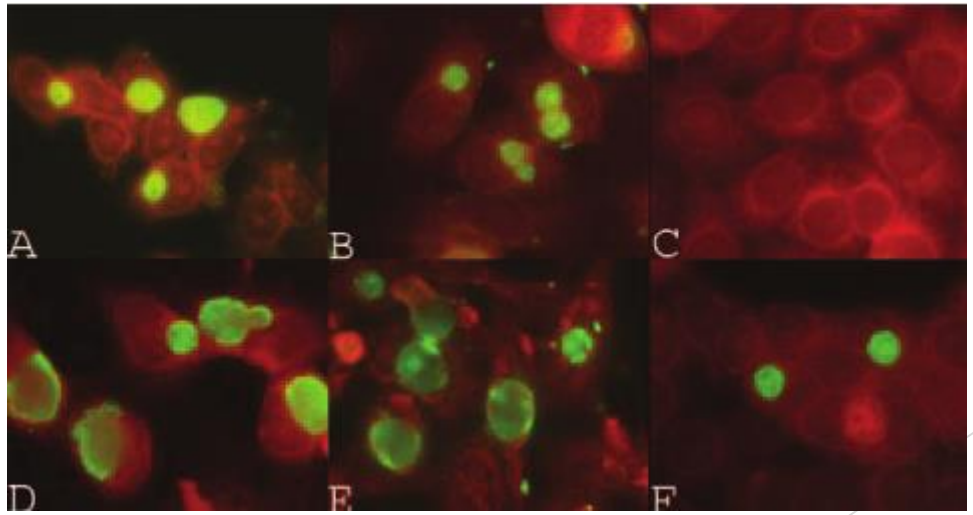
- RIF used in the diagnosis of urogenital chlamydia can detect chlamydia antigens in the epithelium of the conjunctiva and genitourinary tract.
- For this purpose, monoclonal antibodies are used to determine the species-specific antigens of chlamydia (outer membrane proteins). The sensitivity of the method is 80-90%, the specificity approaches approximately 100%.
- It is extremely rare to detect chlamydia in preparations stained according to Romanovsky-Giemsa.





Diagnosis of urogenital chlamydia

RIF allows you to determine intracellular inclusions in single-layer cell cultures infected with pathological material after 2-3 days of incubation at a temperature of 35-37C. The most commonly used cell cultures are of the McCoy type. Antibodies in the patient's blood serum can be detected using ELISA. However, specific antibodies remain in the serum of recovered people for a long time. This research method can be used to detect İgM against C. trachomatis in the diagnosis of neonatal pneumonia. The most commonly used is PCR.

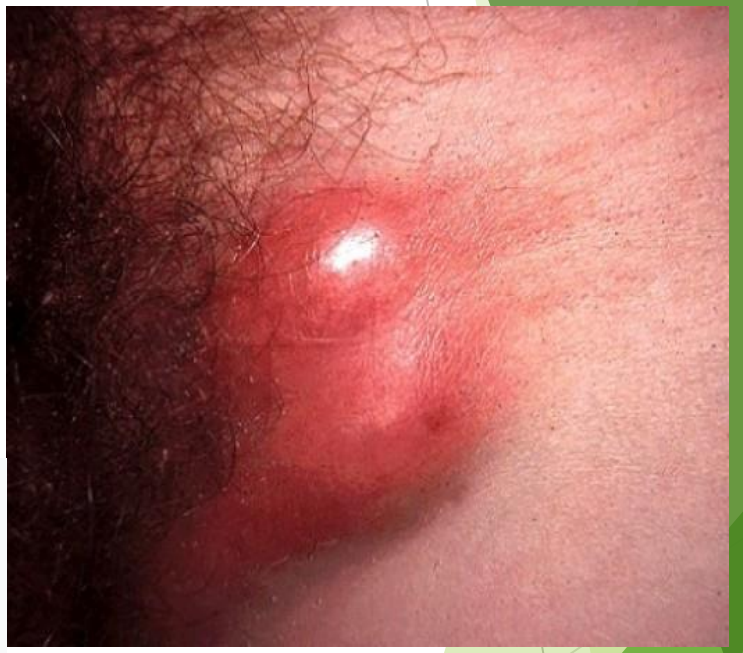


Treatment of urogenital chlamydia

- Apply tetracycline or doxycycline. The most effective is azithromycin.
- Simultaneous treatment of sexual partners is an important condition for therapy.
- Treatment of conjunctivitis of chlamydial etiology (mainly local) is carried out with antibiotics (tetracycline, erythromycin).

Venereal lymphogranuloma (Lymphogranuloma venereum)

- The sexually transmitted disease is characterized by the development of purulent lymphadenitis in the inguinal region and sometimes symptoms of generalization of infection. Lymphogranuloma venereum is caused by C. trachomatis serovars L (L1, L2, L3). The disease occurs mainly in countries with a tropical climate - in Southeast Asia, Central and South America.



- The entrance gate of infection is the mucous membrane of the genital organs. In the external genitalia, rectum, anus, small papules, erosions, sores are formed, healing after a few days.

- After 2-6 weeks, inflammation of the lymph nodes (lymphadenitis) develops with characteristic lesions of the inguinal, pelvic and femoral lymph nodes and is manifested by an increase in lymph nodes, muscle pain. The adjacent connective tissue is involved in the inflammatory process, dense knots (buboes) are formed, soldered to the surrounding tissue. Soon the buboes open, forming fistulas that do not heal for a long time with a yellowish-green discharge.

Venereal lymphogranuloma (microbiological diagnostics)

- Obtaining a culture of the pathogen, as well as its morphological and serological identification, can be carried out by culturing the bubonic contents, as well as pus, in a McCoy cell culture.
- Detection of antibodies in the patient's blood serum is carried out in the RSK from the 2nd-4th week of the disease (diagnostic titer - 1:64).
- An intradermal test with chlamydia allergen during this period gives a positive result (Frey's reaction).

Clamydia psittaci

- C.psittaci is the causative agent of ornithosis. In humans, it causes severe pneumonia with hemorrhagic manifestations.
- The disease was described in 1875 by T. Jurgens and named "psittacosis" (from the Greek psittakos - parrot), as it arose after contact with parrots.
- Later it was noticed that infection is possible not only from parrots, but also from other birds. Therefore, it was called "ornithosis" (from the Greek ornis - bird).

Ornithosis
(source of infection and route of infection)

- The disease is transmitted by airborne droplets and airborne dust. Infection can sometimes occur in the alimentary way - when eating poultry meat that is not well thermally processed. It is also possible to transmit the pathogen through dirty hands - the contact route of transmission of infection.
- Epidemic outbreaks of ornithosis are more common among poultry and livestock breeders.
- The disease is rarely transmitted from person to person, since the amount of pathogen excreted by patients is very small, but still, it proceeds in a more severe form if the source of infection is a person.

Pathogenesis and clinical manifestations of ornithosis

- Pathogens enter the body through the mucous membranes of the upper respiratory tract, penetrate into the epithelium of the bronchi, bronchioles and alveoli, where they multiply. Inflammation develops. Chlamydia enter the bloodstream (bacteremia), spread throughout the body, affecting parenchymal organs (liver, spleen). Accompanied by necrotic granulomatous lesions with multiple hemorrhages in the lungs and lymph nodes.

- The incubation period is about 10 days. The disease begins acutely - fever, signs of intoxication. After 8-12 days, pneumonia develops, the lesion covers the lower lobes of the lungs, in particular the right one. Ornithosis sometimes resembles influenza, mycoplasma or viral pneumonia.

Microbiological diagnostics

- The main method for diagnosing ornithosis is the serological method (RSK, ELISA) for the determination of specific antibodies in the patient's blood serum.
- Of diagnostic value is an increase of at least four times the antibody titer in blood serum taken at weekly intervals, as well as the detection of high titers of IgM in it.
- Detection of the pathogen in sputum, blood, as well as in tissues by PCR is characterized by a relatively high sensitivity compared to cultural and serological methods.

Chlamydia pneumoniae

- C.pneumoniae causes respiratory disease in humans. The route of transmission is airborne.
- With a tropism for the epithelium of the respiratory tract, these bacteria cause inflammation of the upper respiratory tract and lungs. Invading the lung tissue and multiplying, chlamydia causes cell death and severe inflammation of the lungs.
- Infections caused by C.pneumoniae manifest as pharyngitis, sinusitis, otitis media, and atypical pneumonia. Chlamydial pneumonias are clinically indistinguishable from lung lesions caused by Mycoplasma pneumoniae.
- The causative agent of pneumonia at a young age in about 5-20% is assumed to be C.pneumoniae.

Microbiological diagnosis of infections caused by C.pneumoniae

- To detect intracellular inclusions in the throat material, it is treated with cycloheximide and cultured in McCoy cell culture at 35-37°C for 3 days. Further, using RIF using monoclonal antibodies labeled with fluorochrome to detect intracellular inclusions formed by C.pneumoniae.
- The most sensitive method for detecting specific antibodies in the blood serum of patients is ELISA. During primary infection, IgM is detected after about 3 weeks, and IgG after 6-8 weeks.
- Chlamydia can also be detected in pathological materials using PCR.

Rickettsia

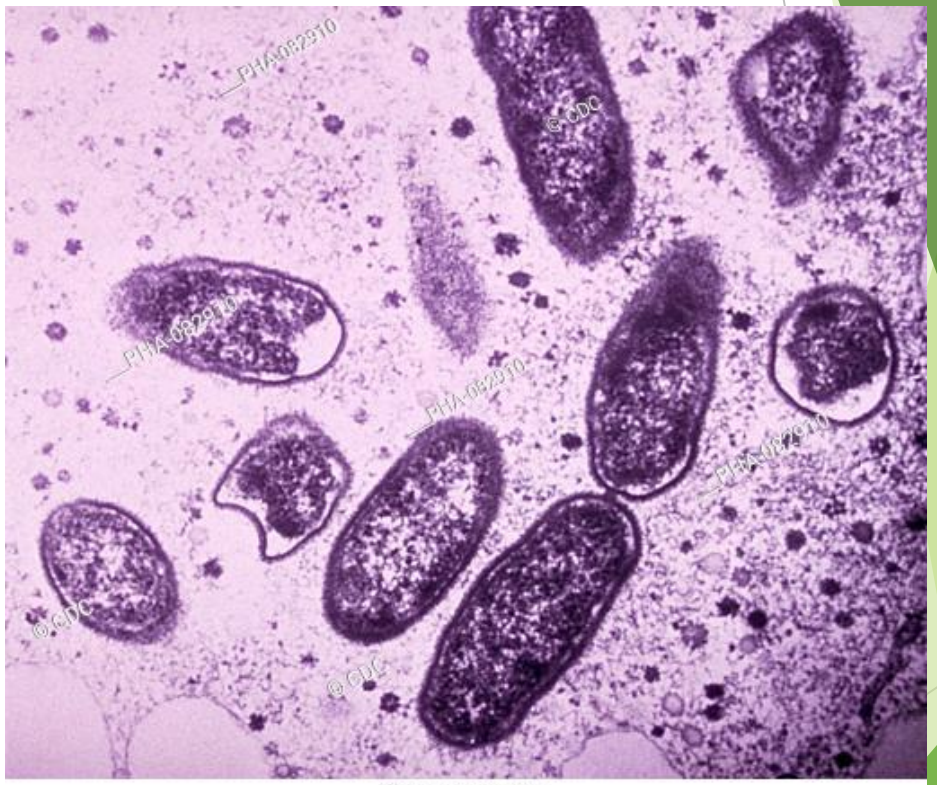
- In the modern classification, all rickettsiae are included in the Rickettsiaceae family. According to their morphological and many biological features, rickettsia-like microorganisms are included in the Bartonellaceae family.
- The family Rickettsiaceae includes small gram-negative bacteria of the genus Rickettsia, Orientia, Ehrlichia and Coxiella. With the exception of the causative agent of Q-fever, all rickettsiae are obligate intracellular parasites that infect humans through arthropod bites. They cause a disease in humans called rickettsiosis.

Characteristics of rickettsiosis

	Agent	Disease/Dominant Symptoms	Vector/Reservoir Host	Geographic Distribution
Typhus fevers	*Rickettsia prowazekii*	Epidemic typhus	Human body louse/humans	Africa, Asia, America
		Sylvatic typhus	Flea and louse/flying squirrels	United States (only)
	Rickettsia typhi	Murine (endemic) typhus	Rodent and cat fleas/rats, mice, opossums (United States)	Worldwide
Transitional Group	*Rickettsia akari*	Rickettsial pox	Mite/house mice	Worldwide
	Rickettsia felis	Cat flea rickettsiosis	Fleas/domestic cats, opossums (United States)	Worldwide
	Rickettsia australis	Queensland tick typhus	Tick/rodents	Australia, Tasmania
Tick-transmitted spotted fevers	*Rickettsia rickettsii*	Rocky Mountain spotted fever	Tick/rodents, rabbits	North, Central and South America
	Rickettsia parkeri	Mild spotted fever	Tick/rodents?	United States, Brazil, Uruguay
	Rickettsia conorii	Mediterranean spotted fever	Tick/rodents, hedgehogs	Europe, Asia, Africa
	Rickettsia sibirica	North Asian tick typhus, Siberian tick typhus	Tick/rodents	Russia, China, Mongolia, Europe
	Rickettsia africae	African tick-bite fever	Tick/rodents	Sub-Saharan Africa, Caribbean
	Rickettsia japonica	Oriental spotted fever	Tick/?	Japan
	Rickettsia slovaca	Necrosis, erythema	Tick/rodents and lagomorphs	Europe
	Rickettsia helvetica	Aneruptive fever	Tick/rodents	Old World
	Rickettsia honei	Finders Island spotted fever, Thai tick typhus	Ticks/?	Australia, Thailand
Scrub typhus	*Orientia tsutsugamushi*	Scrub typhus	Mites/rodents	Indian subcontinent, Asia, Australia

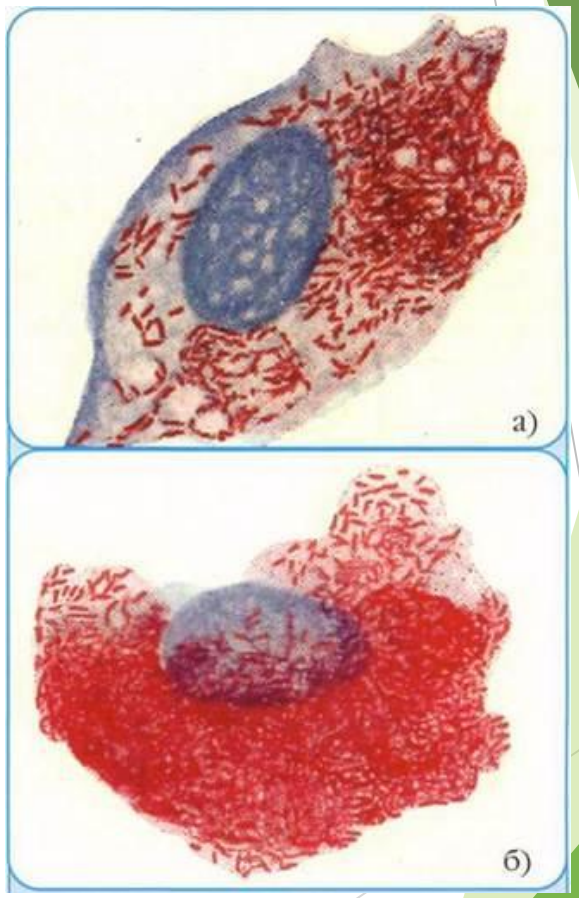
Rickettsia

Morpho-biological features. Rickettsia are rod-shaped or cocci-shaped microorganisms 0.3x1-2 microns in size. Rickettsiae are characterized by dense and slimy microcapsules. They are immobile, do not form spores, have fimbriae and pili. All morphological forms of rickettsia have a triple cell wall, cytoplasmic membrane, cytoplasmic inclusions, vacuoles and nucleoids. Nucleoid consists of 1-4 particles. The cell wall contains peptidoglycan, muramine, and diaminopimelic acids.



Rickettsia

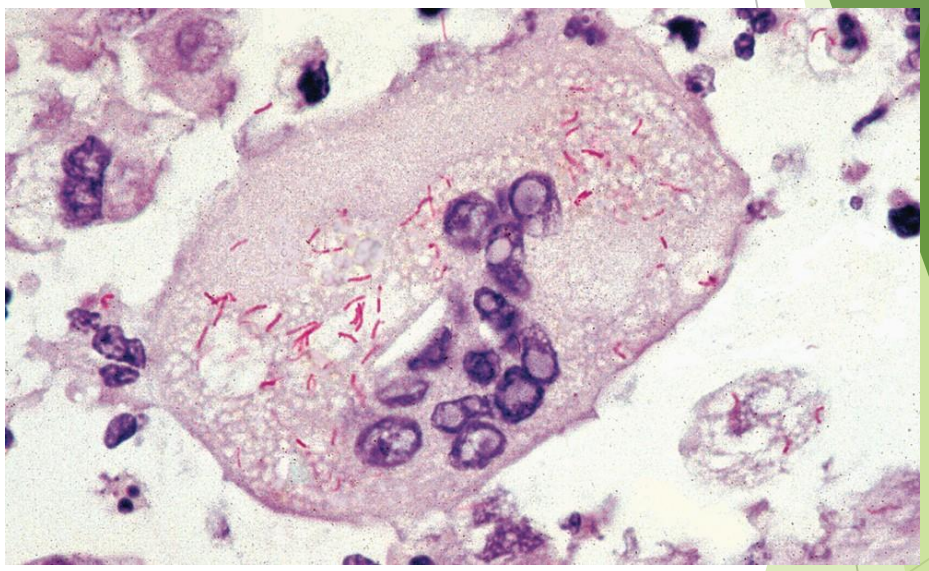
- Rickettsia typhus and spotted fever have lipopolysaccharide (LPS). Surface proteins of the cell wall - Omp-proteins (in English, outer membrane protein) induce a humoral immune response, based on these proteins, rickettsia are divided into serotypes.
- The structure of the cell wall of rickettsiae is similar to that of gram-negative bacteria, they stain well according to the method of Giemsa and Zdrodovsky, as well as acridine orange. When stained by the Giemsa method, they take the form of purple-blue granules located in the protoplasm of cells. When stained according to the Zdrodovsky method, they look like light red granules on a blue background.



Rickettsia

- Rickettsia reproduce by simple division and do not grow on artificial nutrient media.

- For their cultivation, developing chick embryos, cell cultures, arthropods or sensitive laboratory animals are used.



Rickettsia

- Antigenic structure. Glycoproteins and LPS, which are part of the cell wall, provide the antigenicity of rickettsiae. Cell wall surface proteins - Omp-proteins determine the antigenic specificity of rickettsiae, on the basis of which rickettsiae are divided into serotypes.

- LPS of some rickettsiae (for example, the causative agent of epidemic typhus - Rickettsia Provachek), are similar to Proteus. E. Weil and A. Felix determined that the blood serum of patients with typhus gives an agglutination reaction with strains of Proteus vulgaris OX19. This reaction, called the Weil-Felix reaction, has been used for a long time for diagnostic purposes. Researchers mistakenly believed that this bacterium was the cause of typhus. Later it was found that the Weil-Felix reaction was not specific for typhus, it was positive, since Provachek's rickettsia had antigens similar to Proteas.

Rickettsia

- Resistance to external environmental factors. Most rickettsia outside the host and vector (carrier) can persist for a short time. They are unstable to high temperatures, ultraviolet rays and germicidal chemical agents. However, in the dried state, they can remain for months in the body of the vector (mites, lice), as well as in their secretions.
- The causative agent of Q-fever (Coxiella burnetii) is more resistant to environmental factors. Survives after 30 minutes pasteurization at 600C, also persists in milk for several months. This resistance is explained by the ability of Coxiella burnetii to form endospore-like structures.

Rickettsia pathogenicity factors

- The pathogenicity of rickettsia is provided mainly by their cellular structures - pili, proteins of the outer membrane (cell wall) - Omp-proteins and LPS.
- Rickettsia Provachek and Ricketts contain phospholipase A2, which plays an important role in cell infection. Rickettsia do not produce exotoxins.

Pathogenesis of rickettsiosis

- Rickettsia entering the body attach to target cells with the help of pili and Omp proteins, and then, with the help of phospholipase A2, act on the lipids of the outer membrane of the host cell and enter the cell through the formed defects.

- In host cells, a phagosome (vacuole) with rickettsia is formed. Here, rickettsia actively multiply, and after the rupture of the vacuole, the released rickettsia enter the lymph and blood and, thus, spread throughout the body.

Pathogenesis of rickettsiosis

- The process and mechanism of damage to individual types of target cells infected with rickettsia in the human body are different. Damage to the vascular endothelium by rickettsia is very characteristic. With the exception of C. burnetii, rickettsiae proliferate in the endothelium of small blood vessels and cause vasculitis.
- These cells swell and necrosis, blockage of blood vessels by blood clots leads to tissue necrosis. Although the development of vasculitis mainly manifests itself on the skin, it is also observed in many internal organs, which is accompanied by circulatory disorders, disseminated intravascular coagulation syndrome and vascular occlusion.
- As a result of aggregation of lymphocytes, polymorphonuclear leukocytes and macrophages on the walls of the blood vessels of the gray matter of the brain, meningoencephalitis develops with the formation of typhoid nodes. Typhoid nodes can also form in the internal organs - on the heart vessels and the thyroid gland.

Pathogenesis of rickettsiosis

In some cases, after a disease, rickettsia can persist (persist) in the body for a long time without causing a pathological process. This ability is provided by the transition of rickettsia into L-forms, by antigenic mimicry, or by shielding with immunoglobulins. For example, the pathogenesis of Brill-Zinsser disease - relapse of typhus is associated with long-term persistence of the pathogen in the lymph nodes.

The causative agent of epidemic typhus and Brill-Zinsser disease (Rickettsia prowazekii)

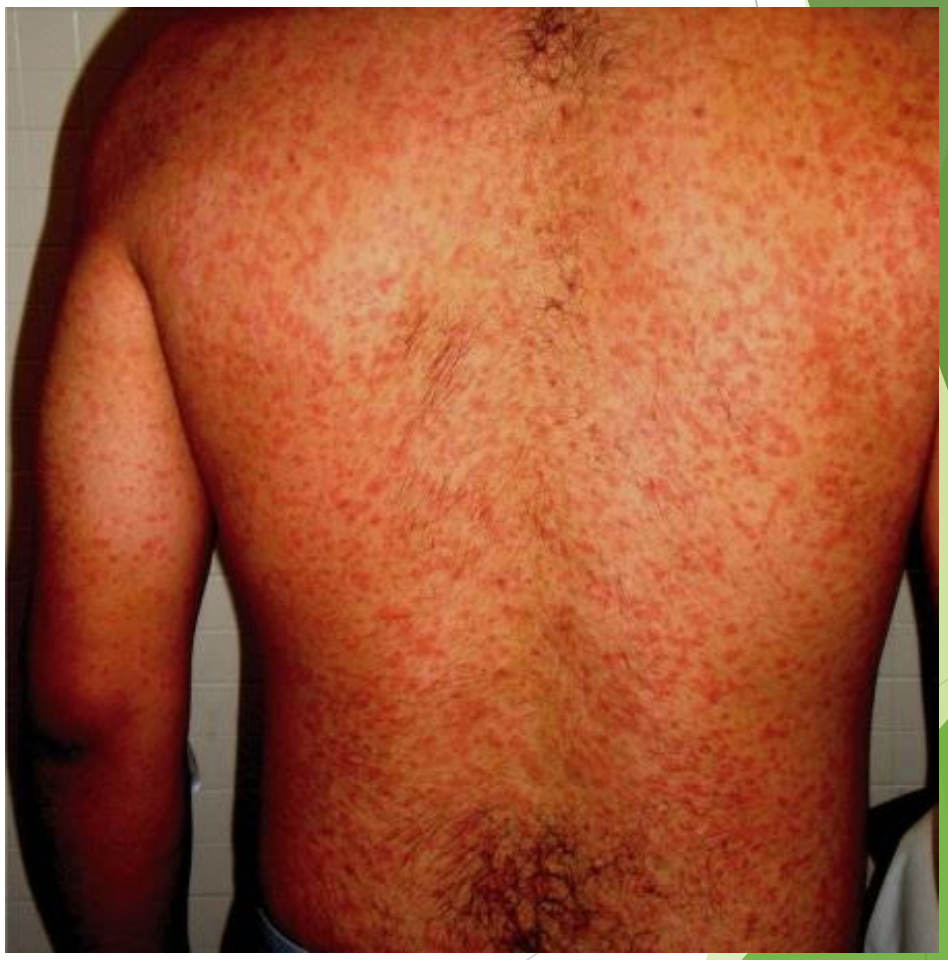
- Epidemic or lousy typhus is an acute anthroponotic disease. The causative agent of the disease - R.prowazekii belongs to the genus Rickettsia of the Rickettsiaceae family.
- R.provazekii is easily cultivated in the body of lice, in tissue cultures, in the yolk sacs of developing chicken embryos. It multiplies in the cytoplasm of sensitive cells.

Source of infection and mechanisms of infection of epidemic typhus

The source of infection is sick people, the disease is transmitted from lice. Lice become contagious 4-5 days after bloodsucking in a sick person. During this time, rickettsia multiply in the intestinal epithelium of the lice. After the destruction of epithelial cells, rickettsia enter the intestinal cavity and are excreted with lice secretions. Itching develops at the site of the bite and bloodsucking. Infection occurs as a result of rubbing the feces of infected lice while scratching the skin. Infection can also occur as a result of inhalation of dust aerosols containing dried feces of infected lice.

Clinical manifestations of epidemic typhus

The incubation period averages 1-2 weeks. Epidemic typhus is manifested by fever, damage to the endothelium of the blood vessels of vital organs (brain, heart, kidneys), roseolous-petechial rash. Mortality without treatment - up to 20%.



Microbiological diagnosis of epidemic typhus

- The diagnosis is made on the basis of clinical and epidemiological data.
- The diagnosis is clarified by a laboratory test for specific antibodies using RSK, RNGA, ELISA, etc.

Epidemic typhus

- Treatment. Etiotropic treatment is carried out by taking doxycycline and tetracycline drugs.
- Non-specific prophylaxis is carried out by a set of measures, including isolation of lice-ridden patients, disinsection and disinfection in the outbreak.
- For specific prophylaxis, a chemical vaccine has been developed from a soluble antigen of the cell wall of Rickettsia Provachek.

Brill-Zinsser disease

Brill-Zinsser disease is a relapse of a previous epidemic typhus. The disease was named after the New York doctor N. Brill, who first described this type of rickettsiosis, later Zinsser studied the same rickettsiosis. Previously, epidemic typhus occurred in areas where the epidemic occurred. Brill-Zinsser disease is associated with prolonged persistence in the lymph nodes of the pathogen - R.prowazekii. It manifests itself against the background of a weakening of the body's resistance 10-30 years after the disease. It is clinically manifested by a mild or moderate degree of epidemic typhus.

Distinguishing Brill-Zinsser disease from primary epidemic typhus

- To differentiate Brill-Zinsser disease from primary epidemic typhus, IgM and IgG antibodies to the pathogen are examined.
- In epidemic typhus, mainly IgM appear, in Brill-Zinsser disease, IgG antibodies are mainly detected. The IgG titer peaks during the first ten days of illness.

The causative agent of endemic (rat) typhus (Rickettsia typhi)

- Belongs to the genus Rickettsia of the family Rickettsiaceae
- Like all rickettsiae, they are intracellular parasites.
- Morphological, tinctorial and other characteristics are identical to those of the causative agent of epidemic typhus.

Source of infection and mechanism of infection of epidemic typhus

- Endemic typhus - a zoonotic disease The main source of the pathogen in nature are rats and mice, which are infected by fleas, lice, and possibly ticks.
- The pathogen enters the human body through the bites of vectors (fleas, lice, ticks), alimentary or contact transmission is possible.
- This is a natural focal endemic disease, a person is not a source of infection.

Microbiological diagnosis of endemic typhus

- The diagnosis is established on the basis of clinical and epidemiological data, supported by a study of the patient's blood serum in serological reactions (RSK, RNGA, RIF, ELISA, etc.)
- For differentiation with epidemic typhus, male guinea pigs are infected with the blood of patients. R.typhi in guinea pigs causes inflammation of the testis - rickettsial periorchitis (scrotal phenomenon). R.prowazekii causes only fever in guinea pigs.
- Differentiation from epidemic typhus is based on the difference (2-4 times) in antibody titers when reacting with corpuscular antigens of both pathogens: R.typhi and R.prowazekii

Treatment and prevention of endemic typhus

- Treatment is with tetracycline antibiotics.
- Non-specific prevention is carried out by a complex of deratization and pest control measures in the outbreaks.
- Specific prophylaxis in endemic foci is carried out with a killed vaccine.

The causative agent of Q fever (Coxiella burnetii)

- The disease was named Q fever from the initial letter of the English word "query", meaning unclear, indefinite.

- The genus and species were named after the explorers Cox and Burnett

Coxiella burnetii

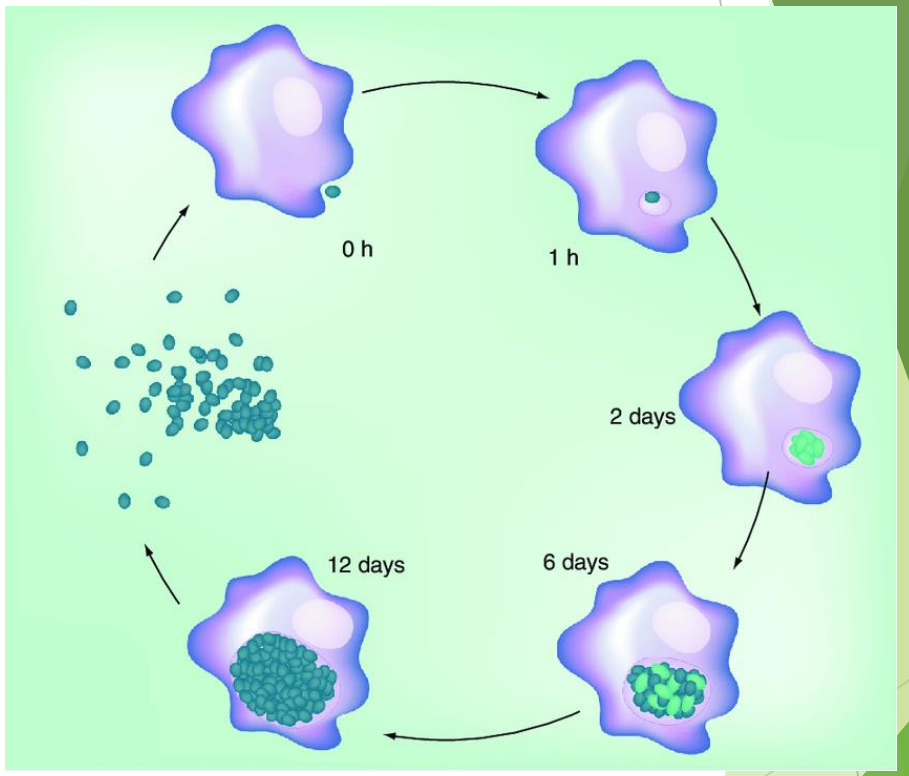
- C.burnetii are small, polymorphic lanceolate microorganisms 0.2-0.4x0.4-1 μm in size, they can be in the form of sticks or coccobacilli. Can form filterable forms. They are stained red according to Zdrodovsky and Romanovsky–Giemsa.

- Like bacteria, they have R-S dissociations. corresponding, has variability. Pathogens that form phase I under natural conditions, as a result of long passages in tissue cultures and chicken embryos, pass into phase II. Phase I differs from phase II in the presence of structural lipopolysaccharides in the cell wall.

Coxiella burnetii

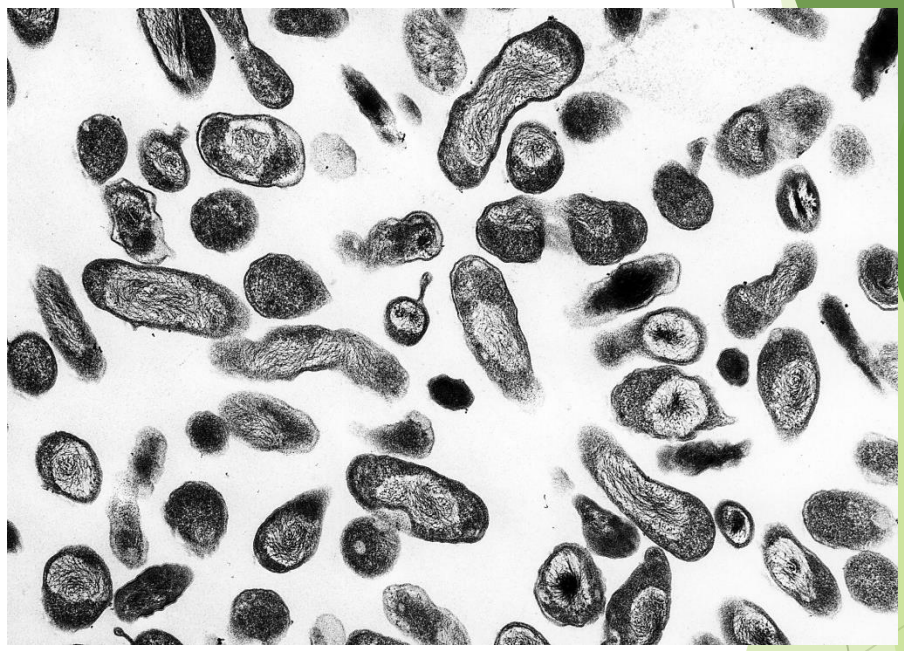
- C.burnetii are obligate intracellular parasites. Coxiella reproduce predominantly in vacuoles and phagolysosomes of host cells.

- Cultivated in the yolk sac of the chick embryo at 35°C



Coxiella burnetii

- Resistant to environmental factors, in particular drying and high temperatures, at a temperature of 80-900C for 30 minutes. maintain viability.
- Pasteurization of milk at a temperature of 600C for 30 minutes. coxiell does not kill. They are preserved in cottage cheese, kefir and other dairy products.
- Resistant to the action of gastric juice, do not die in a 5% formalin solution and in a 1% phenol solution.
- They form spore-like forms that provide high resistance to environmental factors.

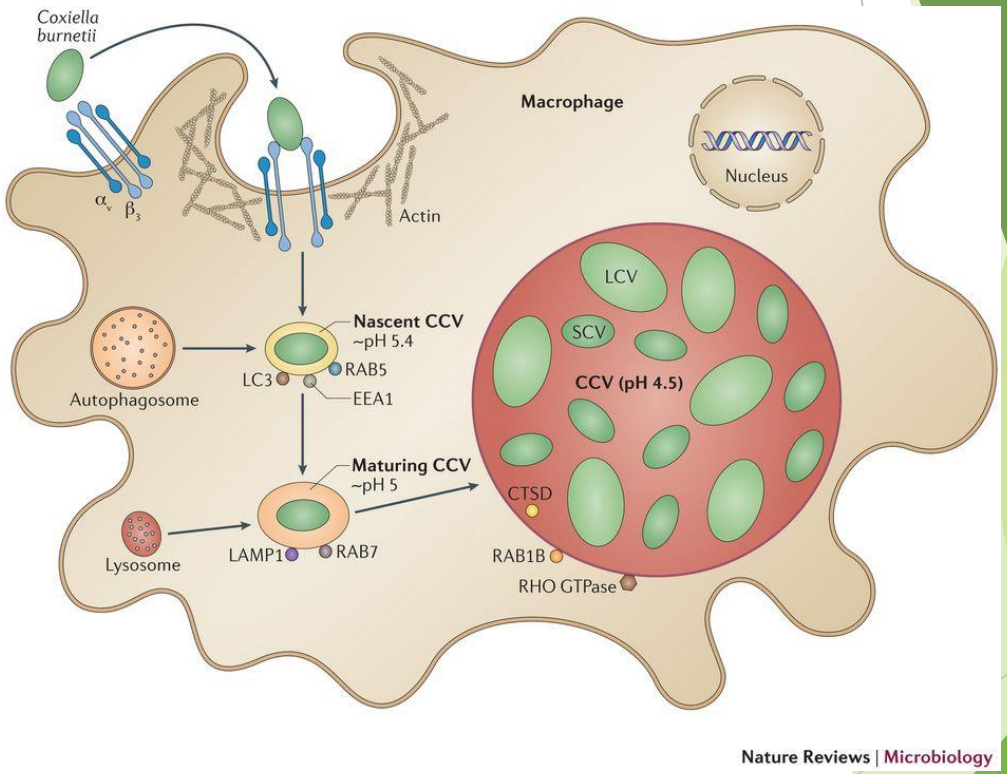


Source of infection and mechanisms of infection

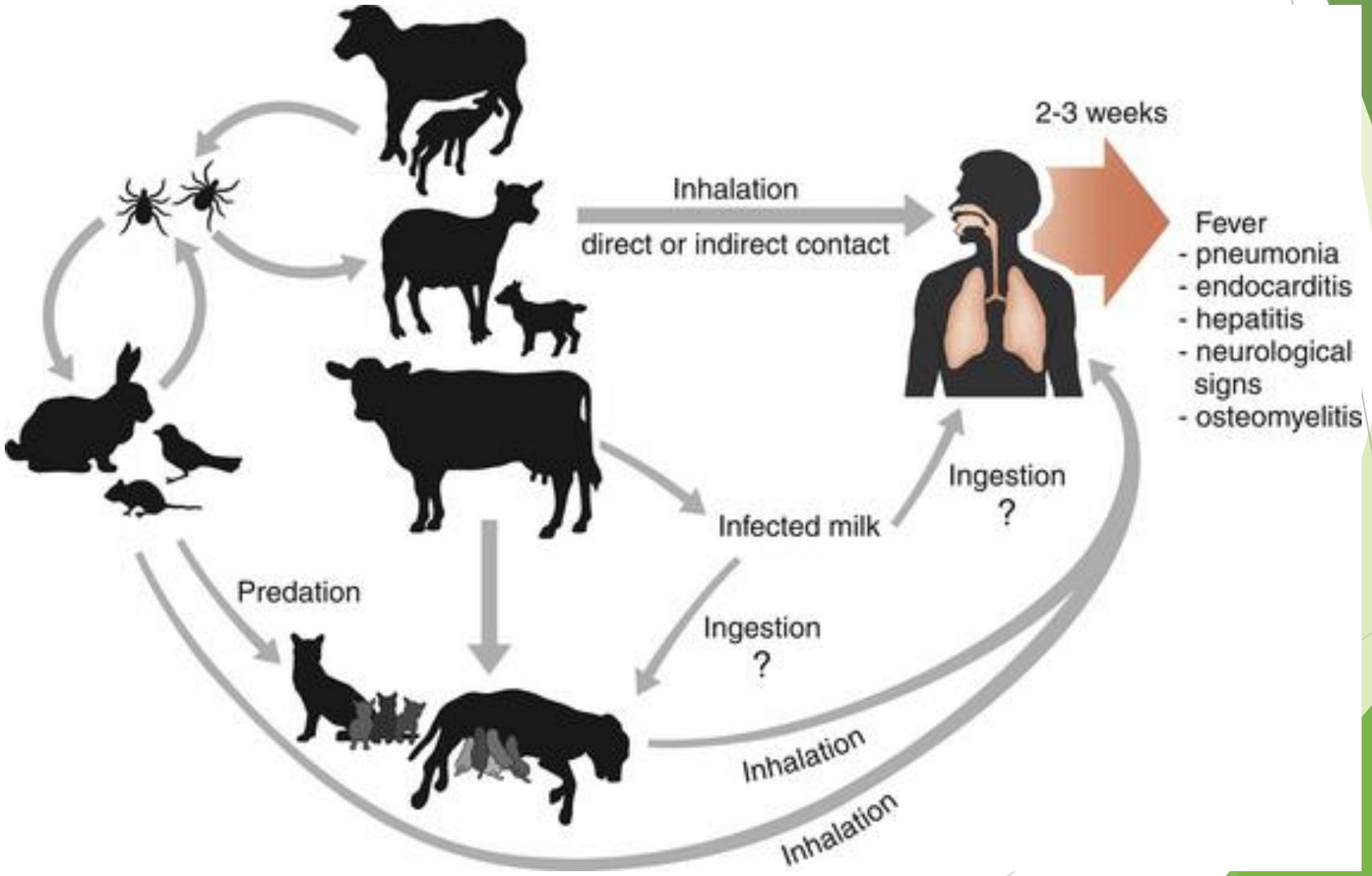
Animals are the source of infection. There are several ways to infect a person: - aerogenic infection - as a result of inhalation of aerosols containing the pathogen - oral infection - when eating meat and dairy products of sick animals -possible transmissible transmission through tick bites. C.burnetii in natural conditions cause chronic diseases in cattle and small cattle, horses, dogs, rodents, and birds. Rickettsiae are excreted from sick animals in milk, urine and secretions, as well as in amniotic fluid during calving.

Q fever pathogenesis

The pathogenesis of Q fever differs from that of rickettsiosis. The causative agent, when penetrating into the human body, is introduced into the blood and lymph, and then into the cells of tissues and organs. Phagocytosed C.burnetii are not lysed - due to incomplete phagocytosis they multiply in leukocytes. Coxiella affect the endothelial cells of blood vessels and cause the development of perivasculitis, but not panvasculitis, unlike other rickettsiae.



Q fever


2-3 weeks
Inhalation
direct or indirect contact
Fever
- pneumonia
- endocarditis
- hepatitis
- neurological signs
- osteomyelitis
Ingestion
?
Infected milk
Predation
Ingestion
?
Inhalation
Inhalation

Clinical manifestations of Q fever

The incubation period is 1-3 weeks. Q fever is characterized by polymorphism of clinical manifestations. The disease is characterized by fever with damage to the respiratory system (pneumonia), hepatolienal syndrome (hepatitis) or encephalopathy. The rash is rare, in 5-25% of patients in the form of roseopapules. Fever, which is a permanent clinical sign, begins on the 2nd or 3rd day of illness and lasts about 3 weeks.

Microbiological diagnostics

- Antibodies are detected in serological tests (RSK, RNIF, ELISA) using antigens of I and II phases of coxiella.
- Serological tests are made with phases I and II antigens. A positive reaction with phase II antigen indicates the presence of the disease in the present, a positive reaction with phase I and II antigens indicates a previous disease.
- Detection in a patient of lgG to phase I antigens in a titer of 1:800 is observed in the chronic course of the disease.

Q fever

Treatment with tetracycline and quinolone drugs. Treatment of chronic forms and complications requires long-term use (several months) of antibiotics - tetracycline. Non-specific prophylaxis is reduced to constant epidemiological and sanitary and veterinary surveillance of coxiellosis in endemic areas, followed by the culling of sick farm animals. It is recommended to pasteurize milk at 71.50C for 15 seconds. specific prophylaxis. Vaccinate laboratory staff working with C.burnetii.