



Infectious diseases. *Tuberculosis. Syphilis*

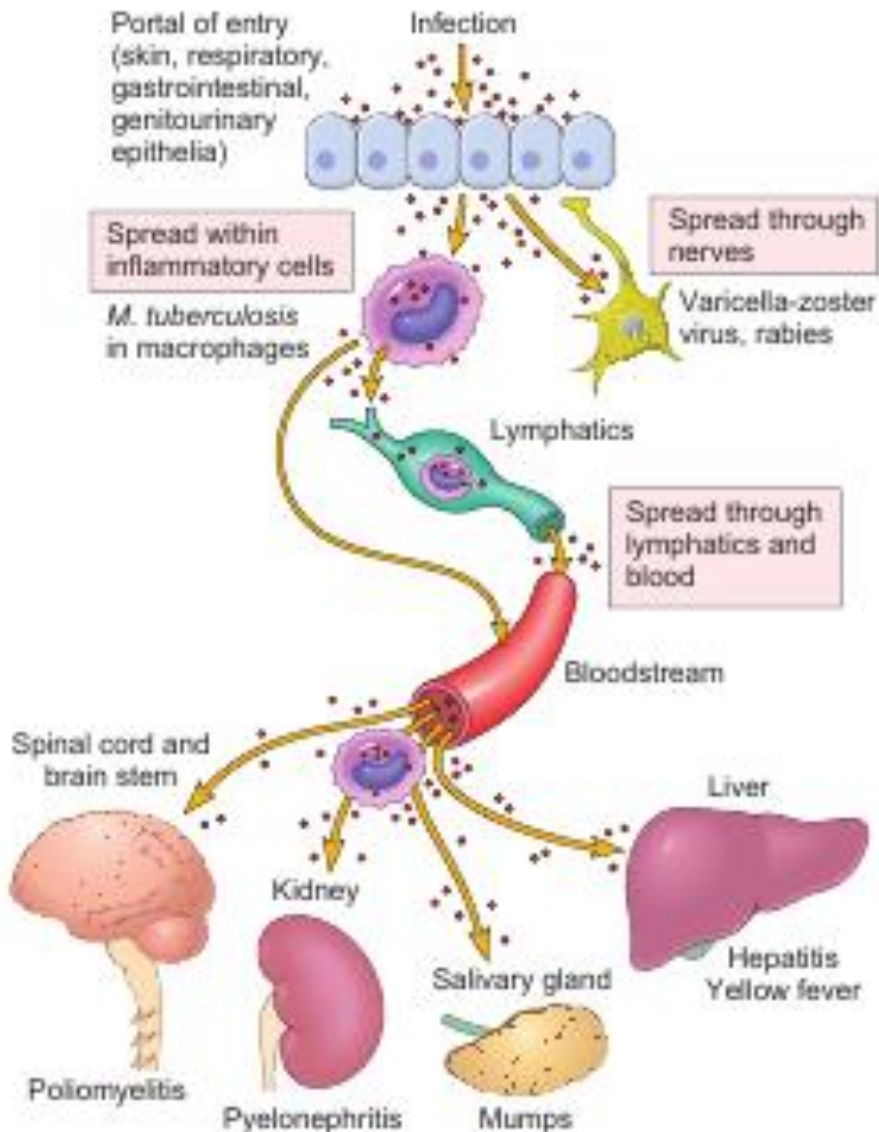
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Classification of infectious agents

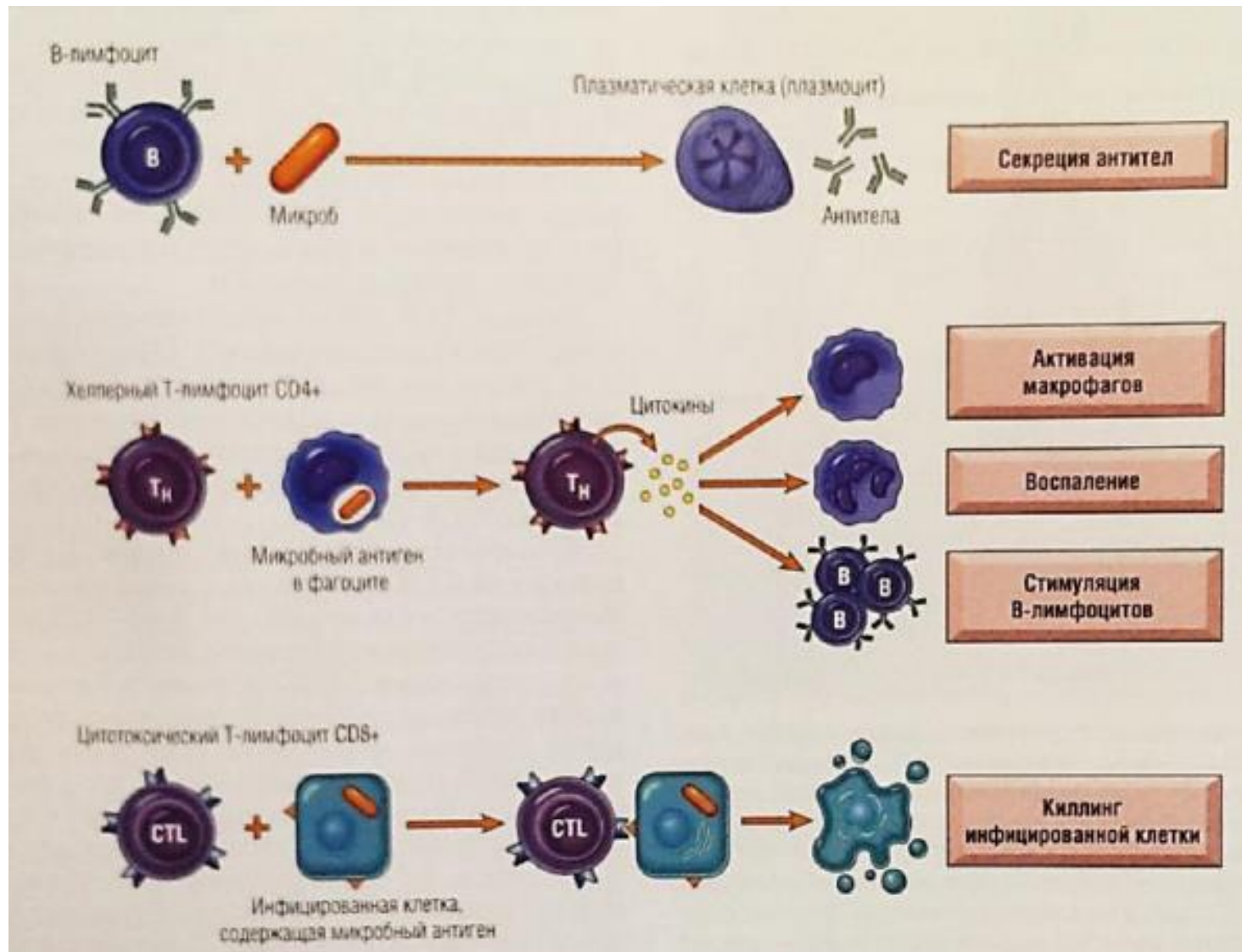
#	Taxon	Example	Disease	Localization	Size
1	Prions	Prionic proteins	Kreuzfeld-Jakob disease	Intracellular	30-50 kDa
2	Viruses	HIV	HIV/AIDS	Obligate intracellular	20-300 nm
3	Bacteria	Chlamidia, Streptococcus, mycobacterium	Trachoma, pneumonia, tuberculosis	Intra- and extracellular	0,2-15 mkm
4	Fungi	Candida	Candidosis	Intra- and extracellular	2-200 mkm
5	Protozoa	Trypanosoma, Entamoeba	Tripanosomosis, entamoebiasis	Intra- and extracellular	1-50 mkm
6	Helminths	Trichinella	Trichinellosis	Intra- and extracellular	3 mm – 10 m

Entry and dissemination

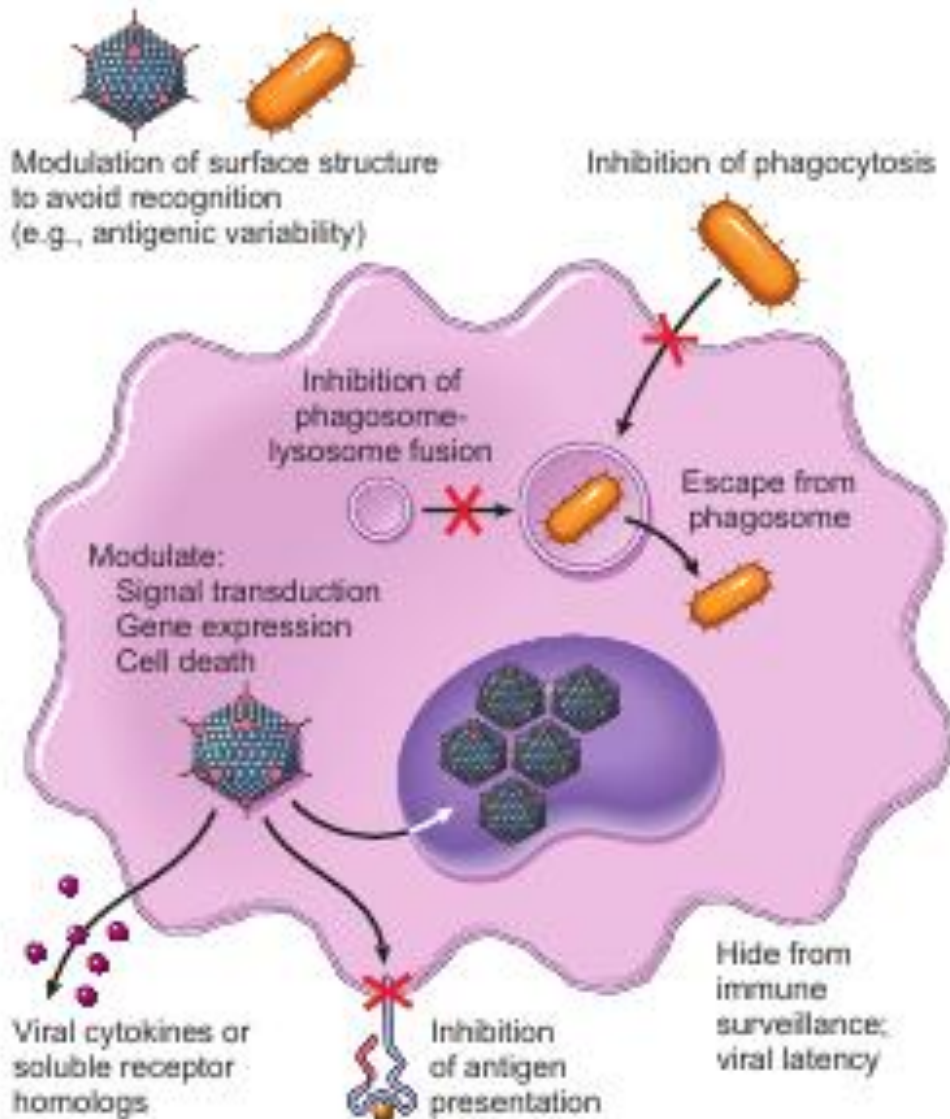


Site	Major Local Defense(s)	Basis for Failure of Local Defense
Skin	Epidermal barrier	Mechanical defects (punctures, burns, ulcers) Needle sticks Arthropod and animal bites Direct penetration
GI Tract	Epithelial barrier Acidic secretions Bile and pancreatic enzymes Normal protective flora	Attachment and local proliferation of microbes Attachment and local invasion of microbes Uptake through M cells Acid-resistant cysts and eggs Resistant microbial external coats Broad spectrum antibiotic use
Respiratory Tract	Mucociliary clearance Resident alveolar macrophages	Attachment and local proliferation of microbes Ciliary paralysis by toxins Resistance to killing by phagocytes
Urogenital Tract	Urination Normal vaginal flora Intact epidermal/epithelial barrier	Obstruction, microbial attachment and local proliferation Antibiotic use Microbial attachment and local proliferation Direct infection/local invasion Local trauma

Mechanisms of defense



Strategies to evade host defense



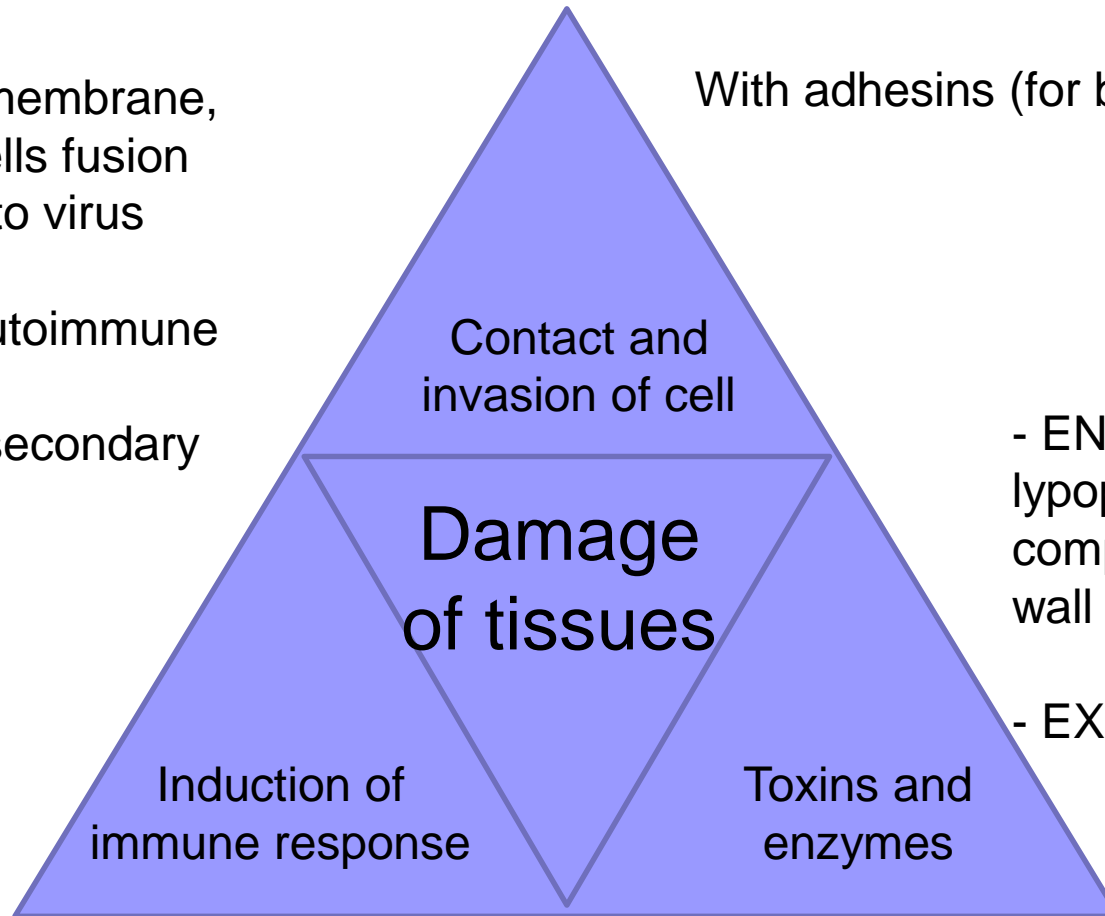
- Antigenic variation
- Inactivating antibodies or complement
- Resisting phagocytosis, e.g. by producing a capsule
- Suppressing the host adaptive immune response, e.g. by interfering with cytokines or inhibiting MHC expression and antigen presentation.
- Establishing latency, during which viruses survive in a silent state in infected cells.

Mechanisms of host damage

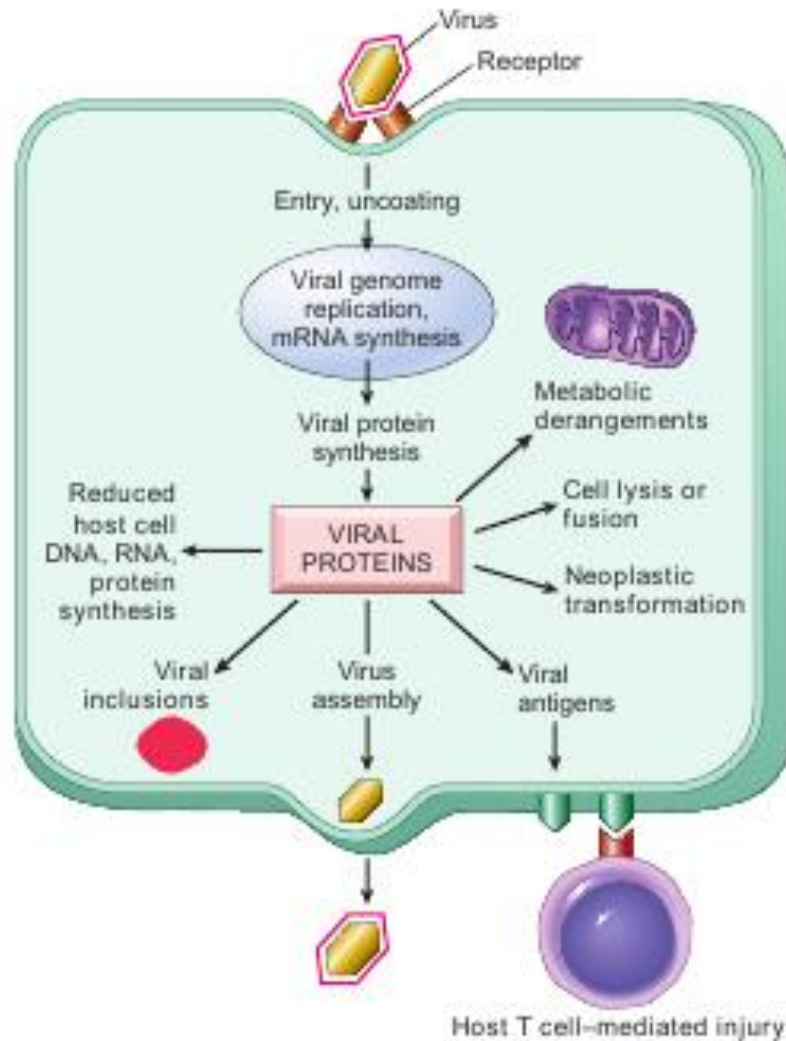
With receptors (viruses)

1. Inhibition of DNA/RNA synthesis
2. Invasion into membrane, induction of cells fusion
3. Cell lysis due to virus reduplication
4. Induction of autoimmune aggression
5. Accession of secondary infection
6. Oncogenesis

With adhesins (for bacteria)



Mechanisms of host damage

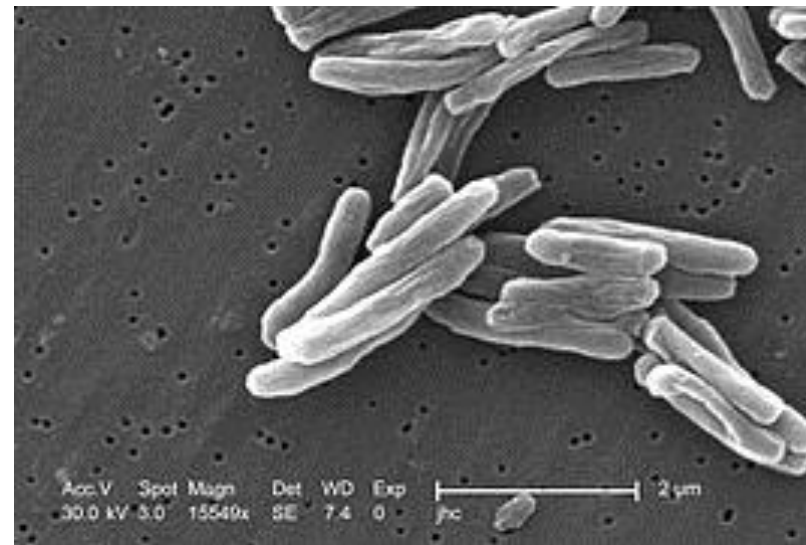


Inflammatory response to infection

- Purulent inflammation (most bacteria)
- Granulomatous inflammation (persisting antigens)
- Cytopathic-cytoproliferative reactions (viruses -> necrosis+proliferation -> neoplasia)
- Tissue necrosis (bacterial toxins, lytic viruses)
- Chronic inflammation/scarring
- No reaction (immune deficiency)

Tuberculosis (TB)

- **Tuberculosis (TB)** - from the Latin “tuberculum” - is an infectious disease of humans and animals with predominant lung involvement caused by mycobacteria of tuberculosis (MBT) and characterized by the development of a specific inflammation with a tendency to a chronic recurrent course.
- The disease often leads to the development of cachexia, hence its name "consumption" and "phthisis" (from the Greek phthisis - exhaustion, destruction).



Features of TB

- widespread distribution,
- chronic wavy course,
- change of tissue reactions,
- a wide variety of clinical and morphological manifestations,
- depending on the state of immunity, TB can be both a manifestation of infection, and disease.

Epidemiology of TB

- About 1/3 of the world's population is infected with a MBT.
- Among the infected 8 - 10% are ill, including 8 - 10 million people annually.
- In the social structure of newly diagnosed patients 30-40% are people without certain occupations, alcoholics, prisoners.
- In the overall structure of deaths, TB accounts for 7% of all cases.

TB Etiology

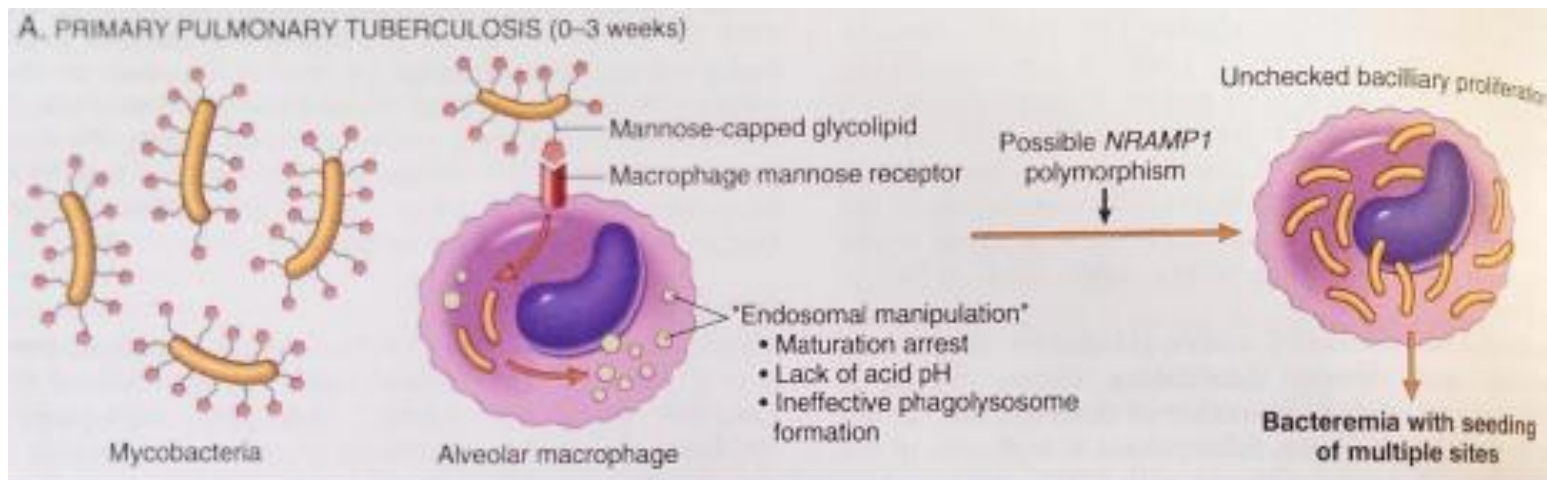
- TB usually causes 2 strains:
 - *Mycobacterium tuberculosis* (human type) is found in 95 - 98% of patients,
 - *Mycobacterium bovis* (bovine type) is the causative agent of bovine TB.
- The infection of *M. tuberculosis* occurs by an aerogenic mechanism, by airborne droplets (inhalation of infected saliva secreted by coughing and sneezing by a sick person).
- *M. bovis* are transmitted with the milk of infected animals, and changes develop in the tonsils and intestines.

TB Etiology

- In addition, contact and transplacental pathways of *M. tuberculosis* and *M. bovis* are possible.
- In recent years, *Micobacterium avium* (avian type) has often been isolated from patients.
- *Mycobacterium intracellulare* is normally non-virulent, but can cause disseminated infection in patients with HIV infection.

TB pathogenesis

- MBT does not emit any exotoxins, endotoxins or histolytic enzymes.
- Their pathogenicity is associated with the ability to avoid destruction by their macrophages and induce delayed (IV) type hypersensitivity.
- This ability is given to it by some substances located in the cell membrane (cord-factor, sulfatides, highly immunogenic mycobacterial protein of temperature shock).
- They act in different ways: they interfere with the phagosomes of macrophages with lysosomes, inhibit the activation of macrophages by γ -interferon, or induce the secretion of macrophages by $\text{TNF-}\alpha$, which causes fever, weight loss and tissue damage.



TB pathogenesis

- The primary phase of infection begins, as a rule, with the inhalation of MBT.
- The minimum number of microbes required for human infection is unknown.
- Since MBT does not have enzymes to dissolve mucus, the microorganism must be small enough to penetrate into the zone of the alveoli, where there is no mucin.
- Microorganisms are phagocytosed by macrophages. Resident alveolar macrophages are not activated and can not complete phagocytosis.
- New arriving monocytes can not phagocytose intracellularly located microorganisms.
- MBT multiply within macrophages, the number of them rapidly increases.

TB pathogenesis

- It is believed that with TB apoptosis of infected macrophages has a protective value, since it limits the growth of MBT.
- It can not be ruled out that apoptosis, by reducing the number of immune defense cells, can promote the development of secondary immunodeficiency in patients with TB.
- According to the type of tissue reaction in TB, inflammation can be alterative, exudative and proliferative.
- The type of tissue reaction depends on the factors listed above.

The alterative type of tissue reaction

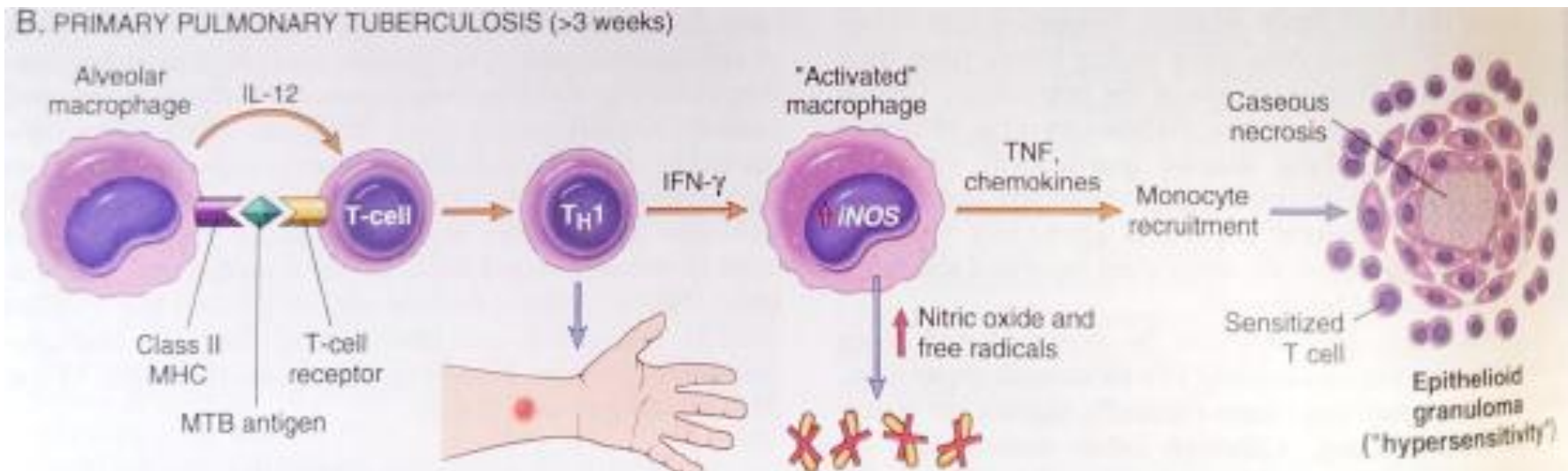
- It is characterized by the development of caseous necrosis, while other components of inflammation are poorly expressed.
- This is a very serious form of inflammation, which indicates the hypo- or anergy of the body.
- It occurs in newborns, old people or at any age in depleted patients (for example, in patients with cancer cachexia).
- This form usually ends with the death of the patient.

Exudative type of tissue reaction

- It is characterized by the formation of a specific exudate.
- Exudate features:
 - consists mainly of lymphocytes,
 - exudate cells are prone to caseous necrosis.
- Exudative type of tissue reaction occurs in people who first come into contact with a MBT and do not have immunity, or in patients with a decrease in the general protective forces of the body.

Proliferative type of tissue reaction

- It is evidence of a relatively favorable course of the process - this is the beginning of the development of immune responses of the body.
- This form is characterized by the development of granulomatous inflammation in the tissues and is designated as a tuberculous tubercle.



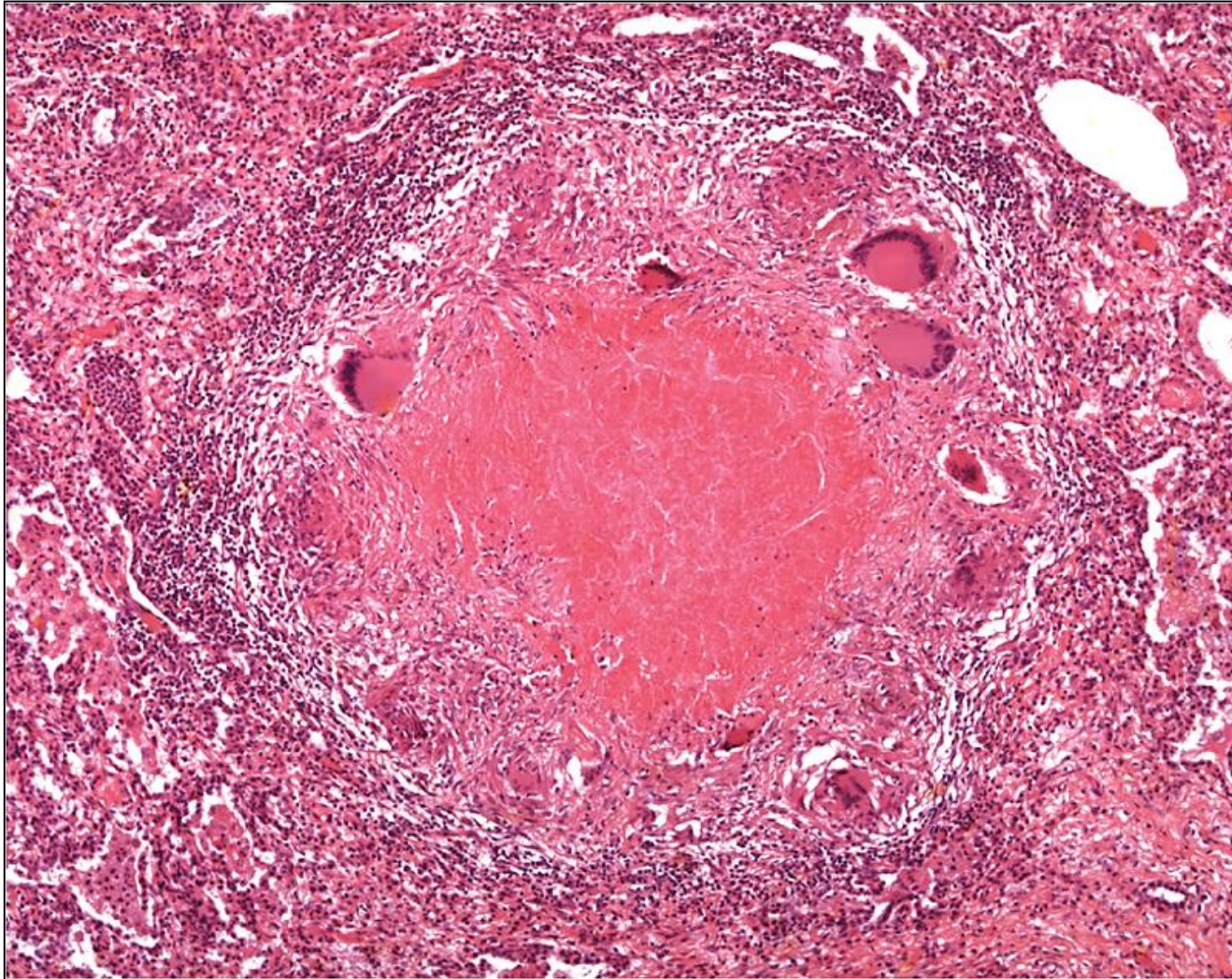
Tuberculous tubercle

- In a typical tuberculous tubercle in the center there is a foci of caseous necrosis, which is surrounded by a rim from epithelioid cells and single giant multinucleated cells of Langhans, and peripherally there are lymphocytes.
- There are no vessels and a connective tissue capsule in the tubercle.

Tuberculous tubercle

- The size of the tubercles is:
 - Submilliary - up to 1 mm,
 - miliary - from. lat. milium, millet - up to 2 - 3 mm,
 - Solitary - up to several cm in diameter.
- Outcome of tubercles:
 - scarification, further - petrification (with a favorable course),
 - colliquation, i.e. dilution of caseous masses (unfavorable outcome).

Tuberculous tubercle



Clinical and morphological classification of TB (according to A. I. Strukov)

- **1. Primary TB**
- **Primary pulmonary and intestinal tuberculosis complex:**
 - **Without progression**
 - **With progression:**
 - **hematogenous generalization (miliary and large-focal),**
 - **lymphogenous generalization,**
 - **the growth of primary affect,**
 - **mixed generalization.**
 - **Chronic**

Clinical and morphological classification of TB (according to A. I. Strukov)

2. Hematogenous TB

■ Generalized hematogenous TB

- acutest tuberculous sepsis**
- acute common miliary TB**
- acute common large-focal TB**

■ Hematogenous TB with predominant lung involvement

- Acute miliary pulmonary TB**
- chronic miliary pulmonary TB**
- chronic large-scale pulmonary TB (hematogenous disseminated)**

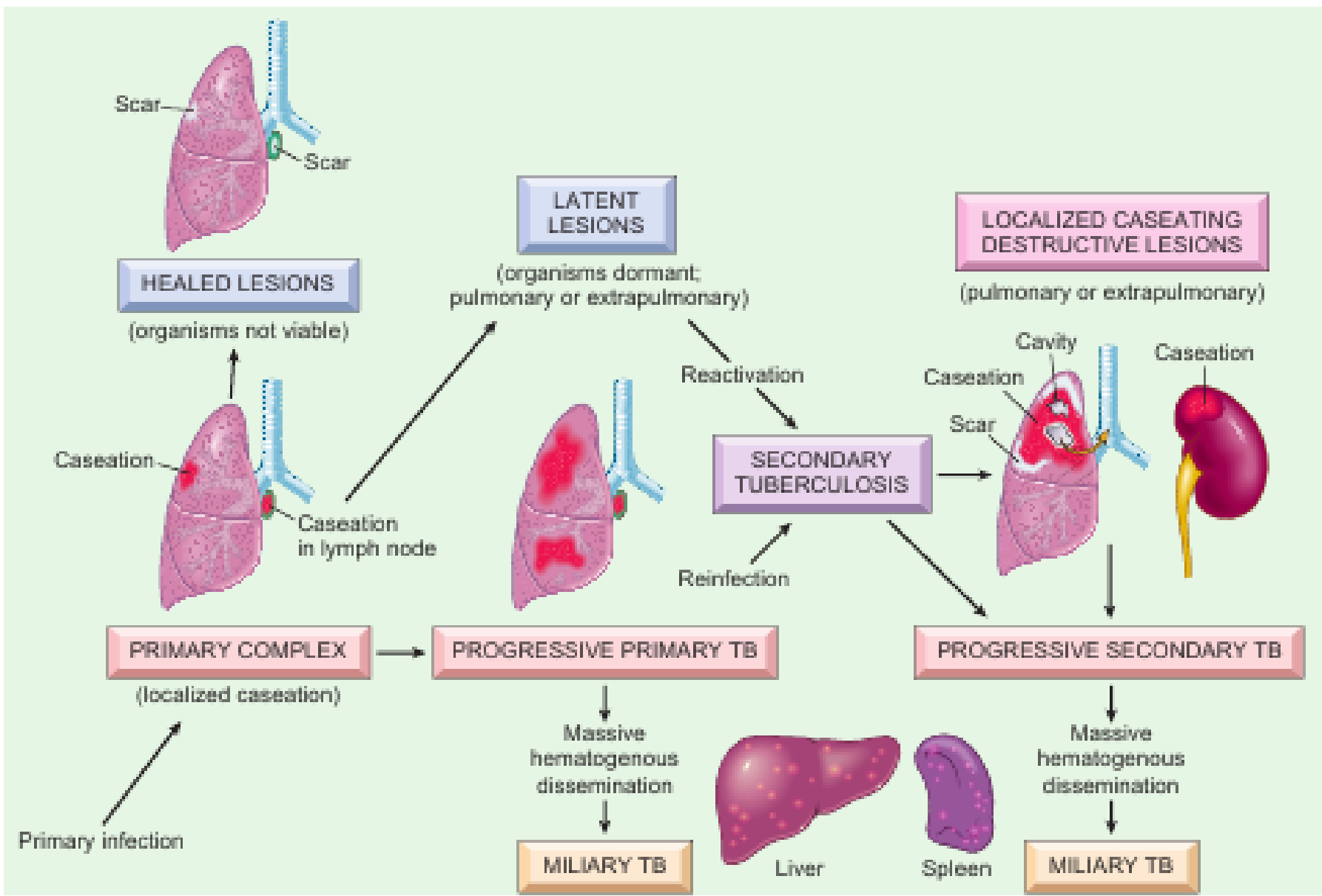
Clinical and morphological classification of TB (according to A. I. Strukov)

2. Hematogenous TB (continuation)

- Hematogenous TB with predominant extrapulmonary (organ) manifestations (TB of bones and joints, kidney and urinary tract, genital organs, nervous system, serous membranes, skin, sensory organs, etc.):
 - acute focal TB
 - chronic focal TB
 - acute and chronic destructive (cavernous, ulcerative) TB

Clinical and morphological classification of TB (according to A. I. Strukov)

- **3. Secondary TB (pulmonary TB with intracanalicular spread)**
 - Acute focal lung TB
 - Fibrous-focal TB of the lungs
 - Infiltrative pulmonary TB
 - Tuberculoma of the lungs
 - Caseous pneumonia
 - Acute cavernous pulmonary TB
 - Fibrous-cavernous pulmonary TB
 - Cirrhotic pulmonary TB



Primary tuberculosis

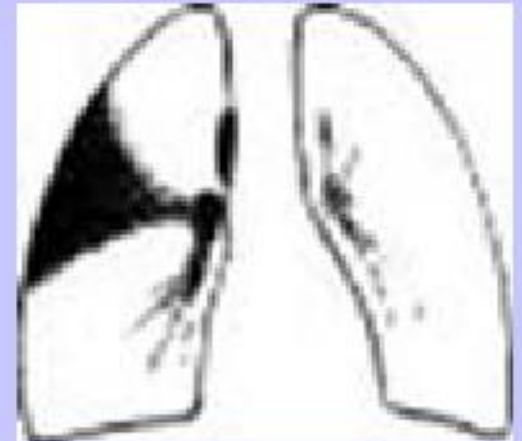
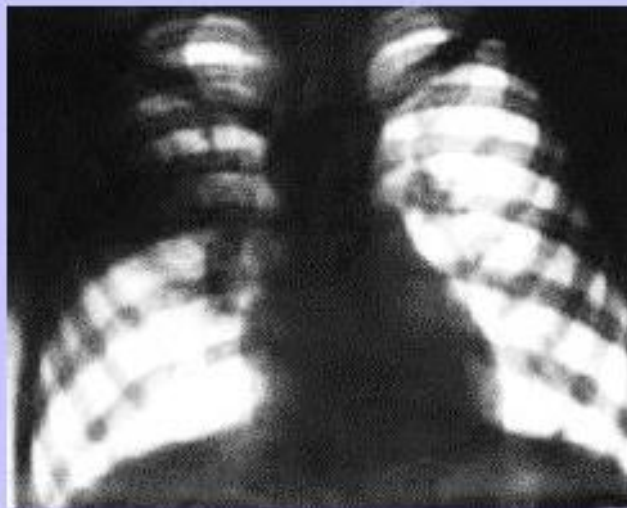
- Includes:
 - the defeat that occurs in the area of primary infection,
 - all forms of TB, developing as a result of generalization in the period of existence of an active primary focus.

Features of primary TB

- Develops in the period of infection, i.e., when the body first meets with an infection.
- Children, teenagers are more often ill, but now meets also at the elderly.
- It is characterized by sensitization and allergy, by reactions of IHR.
- Exudative-necrotic changes predominate.
- There is a tendency to hematogenous and lymphogenous generalization.
- Paraspecific reactions develop.

Primary tuberculosis

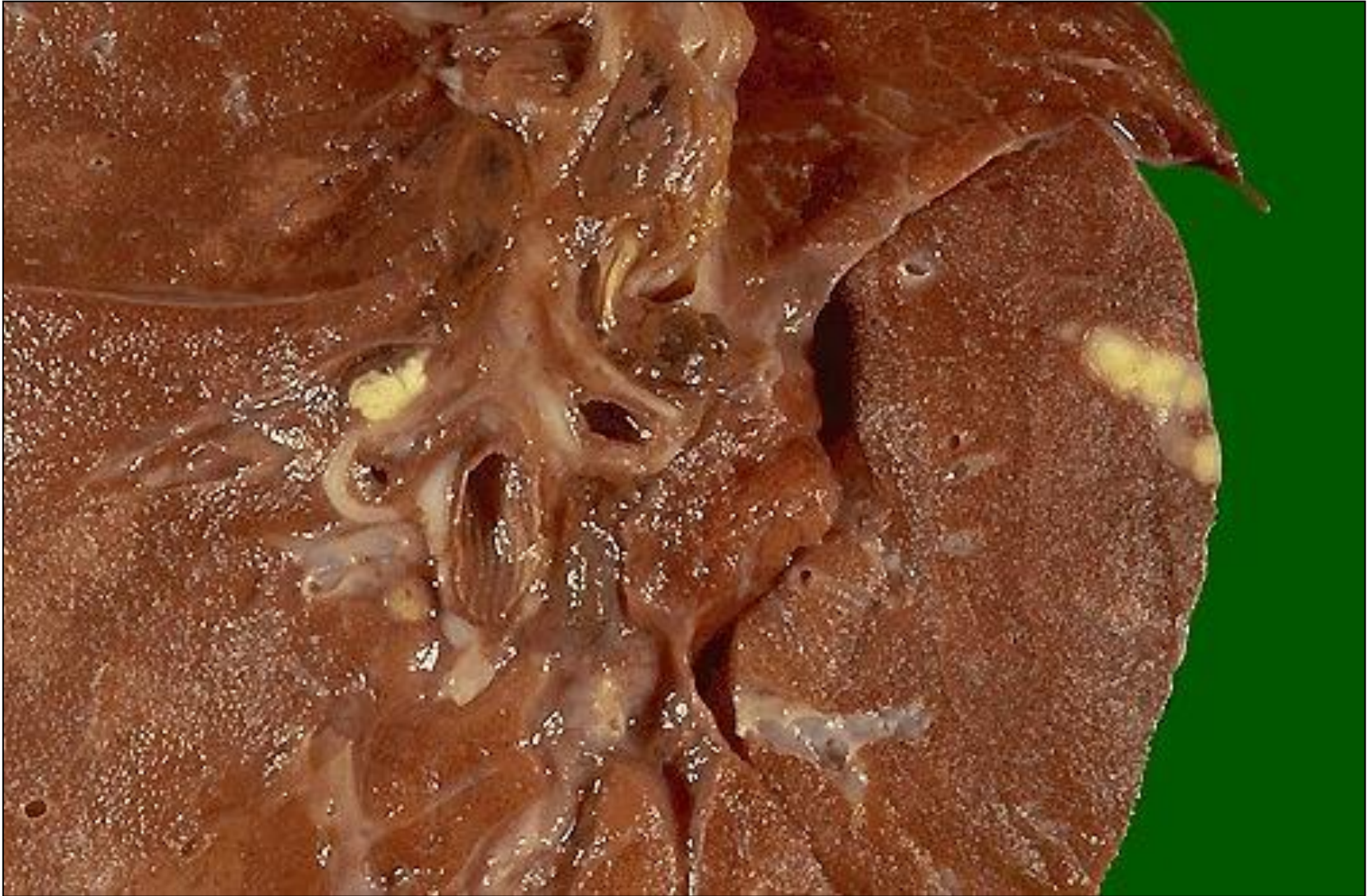
- The morphological expression of primary TB is the primary tuberculosis complex (PTC).
- The PTC is a triad consisting of:
 - primary affect,
 - lymphangitis,
 - lymphadenitis.



PTC: primary affect

- Primary affect - inflammation that occurs at the site of the pathogen implantation.
- Most often, the PTC is localized in the lungs (with the aerogenic route of infection) and in the intestine (with the alimentary pathway of infection).

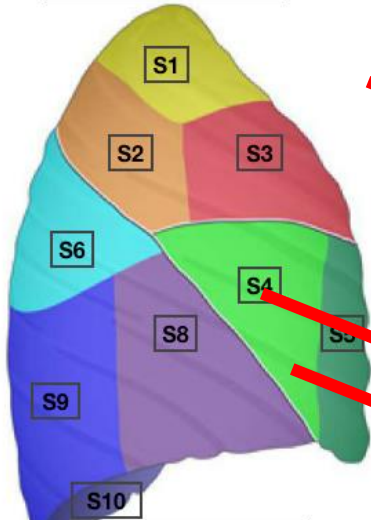
PTC



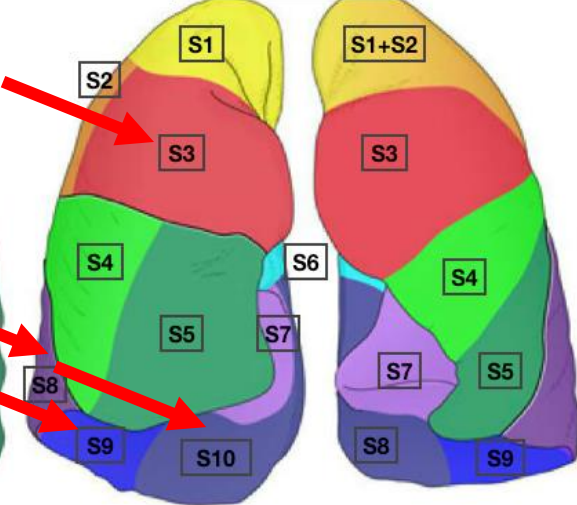
Primary pulmonary affect

- Primary pulmonary affect is first represented by a focus of exudative inflammation.
- Then the focus rapidly undergoes necrosis, the focus of caseous pneumonia is formed, surrounded by a zone of perifocal serous inflammation.
- The pleura is involved in the process with the development of fibrinous or serous-fibrinous pleuritis.
- The focus size is from the alveolitis to the segment located subpleural in III (more often), VIII, IX and X segments (more often on the right).

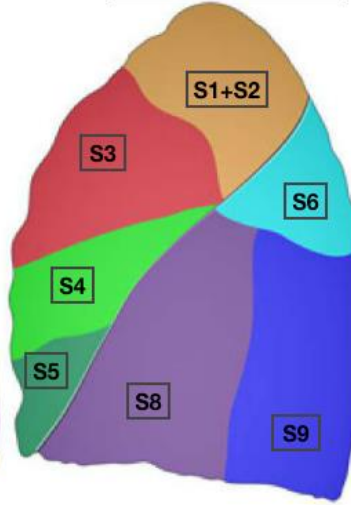
Правое легкое - вид сбоку



Легкие вид спереди



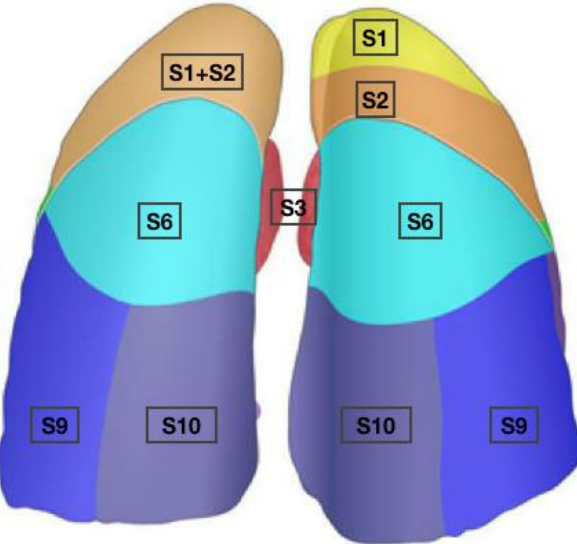
Левое легкое - вид сбоку



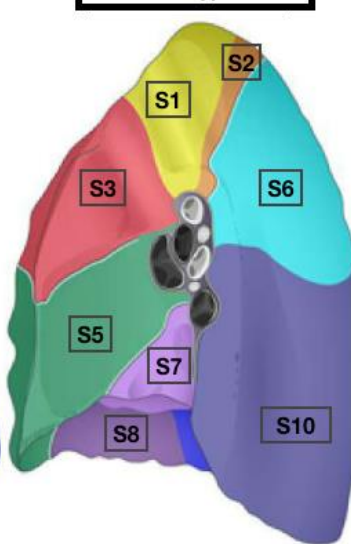
Левое легкое - медиальный вид



Легкие вид сзади



Правое легкое - медиальный вид



PTC: lymphangitis

- Lymphostasis and tuberculous tubercles in edematous tissue along the lymphatic vessels that divert lymph to regional lymph nodes.

PTC: lymphadenitis

- Characterized at first by the phenomena of hyperplasia with the presence of leukocytes in the sinuses, then there is caseous necrosis, which engulfs the entire lymph node.
- Localization: broncho-pulmonary, peribronchial and bifurcation lymph nodes with pulmonary PTC.
- Localization: mesenteric lymph nodes, regional to affect with intestinal PTC.

Healing of PTC

- In pulmonary PTC, the healing process begins with a primary affect.
- In this case, perifocal inflammation around it disappears, the exudative tissue reaction is replaced by a productive one, epithelioid cell tubercles are formed, which are being sclerosed; there is a petrification of caseous masses, and with time, ossification occurs.
- Such a healed primary focus is called the focus of the Ghon, after the name of the Czech pathologist who described it.
- The process of healing the primary affect takes 2 - 3 months.

Healing of PTC

- On the place of lymphangitis the formation of fibrous strand occurs.
- The healing process in the lymph nodes occurs in the same way as in the affect and includes dehydration of foci of caseous necrosis, capsule hyalinosi, lime deposition, bone formation.
- In case there are clear ossification in the place of primary affect and lymphadenitis, the Ghon complex forms.

Healing of PTC

- This outcome is not complete healing, as pettifacts often contain MBT.
- Under adverse conditions, especially in cases of uneven calcification, the focus can become a source of exacerbation of the disease.
- In most cases there is a smooth, uncomplicated course of primary TB with the outcome of complete resorption or the formation of minimal residual changes (minor fibrosis, small and single calcifications).

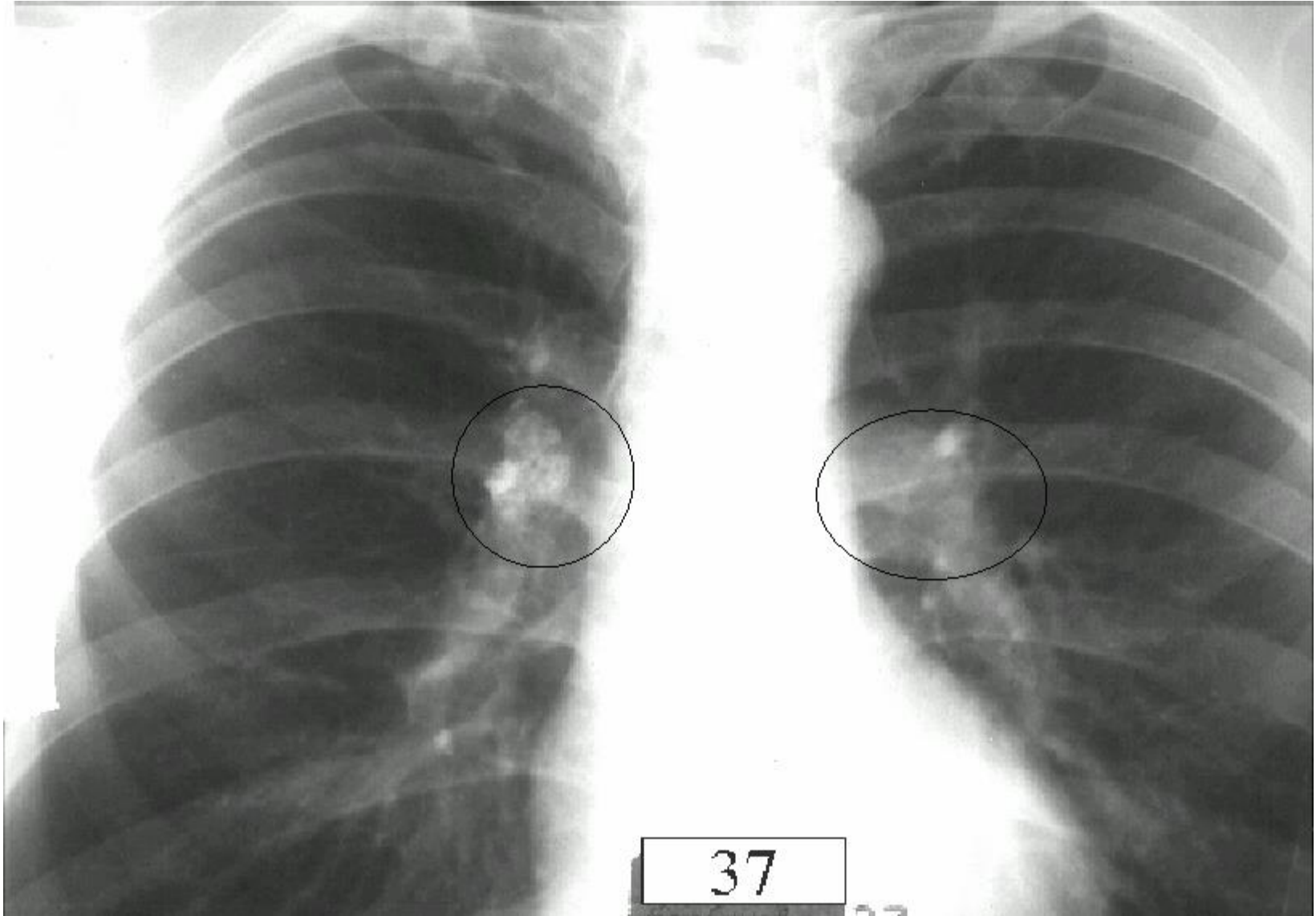
Progression of primary TB

- Progression can take place in 4 forms:
 - lymphogenous progression,
 - hematogenous progression,
 - the growth of primary affect,
 - mixed progression.

Lymphogenous progression

- Characterized by involvement in the tuberculosis process in addition to regional lymph nodes other: with pulmonary PTC - paratracheal, cervical, submandibular, etc., with intestinal PTC - many lymph nodes of the mesentery.
- In this case, the lymph nodes increase to 1 - 5 cm in diameter.
- Caseous foci occupy part of the lymph node, with total lesion the process involves 1-2 lymph nodes.
- In the clinical classification, the variant of primary tuberculosis, when primary affect in the lungs is not detected or very small, and lymph node involvement dominates, is separated into an independent form: intrathoracic lymph nodes TB (tuberculous bronchoadenitis)

TB of intrathoracic lymph nodes



Hematogenous progression

- Occurs in connection with the entry of MBT into the blood from the primary affect or lymph nodes in the state of caseous necrosis.
- It can occur in two forms:
 - early large focal,
 - later miliary.

Hematogenous progression

- *With early large-focal progression* in the presence of untreated PTC in the lungs and many other organs, a large number of foci of caseous necrosis up to a large pea are formed.
- *Generalization can be limited* - there are foci-seedings in individual organs (in the tops of the lungs - the foci of Simon).

Hematogenous progression

- *Late miliary hematogenous generalization* is characterized by the presence of a small and almost healed PTC.
- It may be common (all organs) or limited only to the lungs.
- In this case, in the lungs there is a dense arrangement of tubercles on both sides, especially in the upper parts.
- Productive miliary TB is productive tubercles located interstitially or with more or less involvement of pulmonary alveoli.
- Hematogenic foci-seedings after years can give rise to the development of the tuberculosis process.

Miliary lung TB



Growth of primary affect

- With this form of progression, the zone of perifocal serous inflammation around the primary focus is exposed to necrosis, which extends to the surrounding tissues.
- The growth of pulmonary affect is characterized by bronchogenic spread of infection, development of primary caseous pneumonia (including lobar), up to the formation of acute thin-walled cavities - caverns (*primary pulmonary cavern*).
- With the development of lobar caseous pneumonia, the patient's death can quickly occur, that is why this condition is called "*fulminant pulmonary tuberculosis*".
- When the primary one or several caverns are formed, the disease takes on a chronic course (*primary pulmonary consumption*).

Mixed progression

- Combination of two or three variants of progression.
- It is observed in weakened patients.

Chronic course of primary TB

- The transition of primary TB into a chronic form is characterized by a long wave-like course with lymph node involvement and paraspecific changes.
- Paraspecific (nonspecific) reactions - is a manifestation of tissue reactions of immunity in the body.

Paraspecific reactions

- 1) Diffuse macrophagic infiltration, observed in capsules and interstitium of many internal organs.
 - It is believed that this type of tissue reaction is an expression of immunological changes and indicates a high reactive readiness of the organism and at the same time of instability of cellular immunity.
- 2) Nodal macrophagic reaction. In the primary localization of the process - the myocardium - macrophage-lymphoid granulomas resembling rheumatic are formed.

Paraspecific reactions

- 3) Nonspecific vasculitis - perivascular cell infiltrates, mainly of lymphoid and plasmacytic type (heart, fat tissue, mediastinum).
 - 4) Fibrinoid necrosis - can occur at a distance from the foci of TB.
- 1 and 2 types of reactions are a manifestation of DTH, 3 - mixed, 4 - IHR.

Paraspecific reactions

- Paraspecific reactions are the morphological equivalent of the clinical concept of "masks".
- A.I. Strukov identified 4 main groups of TB "masks":
 - neurodystrophic,
 - cardiovascular,
 - hematopoietic,
 - polyserositis.
- Paraspecific "masks" are usually the cause of unrecognized TB; such patients receive immunosuppressive therapy, which leads to endogenous reactivation of latently flowing TB.
- A typical example of "masks" is the defeat of the joints, known as "rheumatism Ponce".

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Hematogenous tuberculosis

- Is postprimary.
- It occurs in people who have recovered from primary TB, but have remained highly sensitive to tuberculin.
- It develops from foci of seedings, which are entered into this or that organ by hematogenous way in the period of primary infection.
- Exacerbation occurs under the influence of any adverse factors (reduced immunity, starvation) in the presence of increased reactivity.
- The productive tissue reaction (granuloma) predominates.
- Expressed a tendency to hematogenous generalization, which leads to the defeat of various organs and tissues.

Generalized hematogenous TB: acutest TB sepsis

- It begins acutely, with a high body temperature, dyspeptic disorders, proceeds violently, at times with lightning speed and ends with the death of the patient within 10-20 days.
- At the same time, small foci of caseous necrosis with a large number of MBT in them and with weak participation of vessels and mesenchymal elements (necrotic TB, the form of the Landusi - typhobacillosis) are found in all organs.

Generalized hematogenous TB: acute common miliary

TB

- It is characterized by the lesions in the lungs and other organs of numerous miliary (diameter 1 - 2 mm) tubercles, usually symmetrically located.
- Microscopically, the tubercles have a productive or productive-necrotic structure.
- In productive granulomas are more often MBT with a weakened virulence and altered MBT (mainly L-forms).
- Often this form ends with meningitis.

Generalized hematogenous TB: Acute general large-focal TB

- Characterized by the formation in different organs of large (up to 1 cm in diameter) tuberculosis foci

Hematogenous TB with predominant lung involvement

- Characterized by lung damage, while in other organs the tubercles are single or absent.

Hematogenous TB with predominant lung involvement:

Acute miliary lung TB

- Characterized by the symmetrical lesions of the miliary tubercles, which are always denser packed in the upper lobes than in the lower lobes.
- Microscopically, the tubercles have the same structure, associated with various reactivity of the organism: mainly productive, productive-necrotic, exudative-necrotic.
- The possibility of revealing all variants of tubercles from productive to alterations with the development of caseous pneumonia and acute caverns is not excluded in the same observation.
- In the lungs develop acute microcirculatory disorders, dystrophic changes and acute emphysema, it is possible to form "spectacled" caverns.

Hematogenous TB with predominant lung involvement:

Chronic miliary lung TB

- Similar to the previous form.
- However, with chronic course it is possible to find scarring tubercles, development of emphysema, which increases the load on the heart.
- There is hypertrophy of the myocardium of the right ventricle - a pulmonary heart is formed.

Hematogenous TB with predominant lung involvement: Chronic large-focus pulmonary TB

- (syn: hematogenous disseminated TB) is a 2-sided focal lympho-hematogenous dissemination with a predominant lesion of subcortical parts of lungs.
- The distinctive features of this form of TB are:
 - mainly cortico-pleural localization of foci,
 - bilateral focal dissemination with symmetrical location of the foci,
 - productive tissue reaction,
 - "Spectacled" character of caverns,
 - development of mesh and focal pneumosclerosis,
 - formation of the pulmonary heart.

Hematogenous TB with predominant lung involvement: Chronic large-focus pulmonary TB

- In conditions of reduced immunity, disseminated TB can acquire an acute progressive course with the development of focuses of caseous pneumonia, often with the disintegration and formation of caverns in both lungs.
- Hematogenous generalization and seedings to other organs develop, which, with sluggish progression, have the structure of productive tuberculous tubercles, and with acute progression, with the presence of extensive foci of caseous necrosis in the tubercles.

Hematogenic TB with predominant extrapulmonary (organ) manifestations

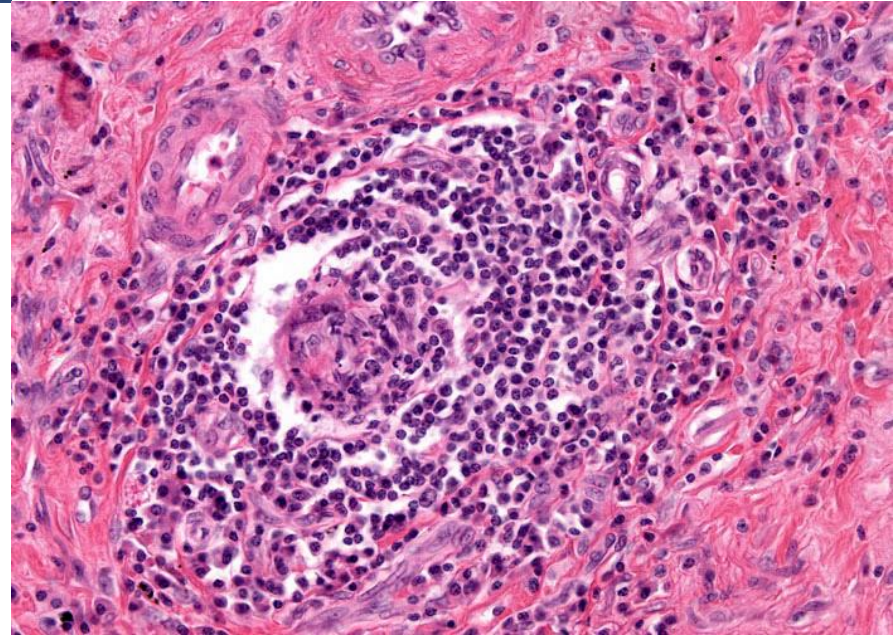
- All organs and systems of the body are affected, except hair and nails.
- Distinguished:
 - focal TB,
 - destructive (cavernous, ulcerative) TB.

Hematogenic TB with predominant extrapulmonary (organ) manifestations

■ *Kidney TB :*

- Usually one-sided.
- It often occurs in young people during puberty, as well as in old age.
- Early foci appear in the cortical layer, with progression they appear in the papillae of the pyramids.
- Outside of the caverns the interstitium of the renal tissue is infiltrated by lymphocytes, histiocytes with an admixture of epithelioid cells (chronic interstitial nephritis).
- Closure of the lumen of the ureter by caseous masses leads to the development of pionic nephrosis.

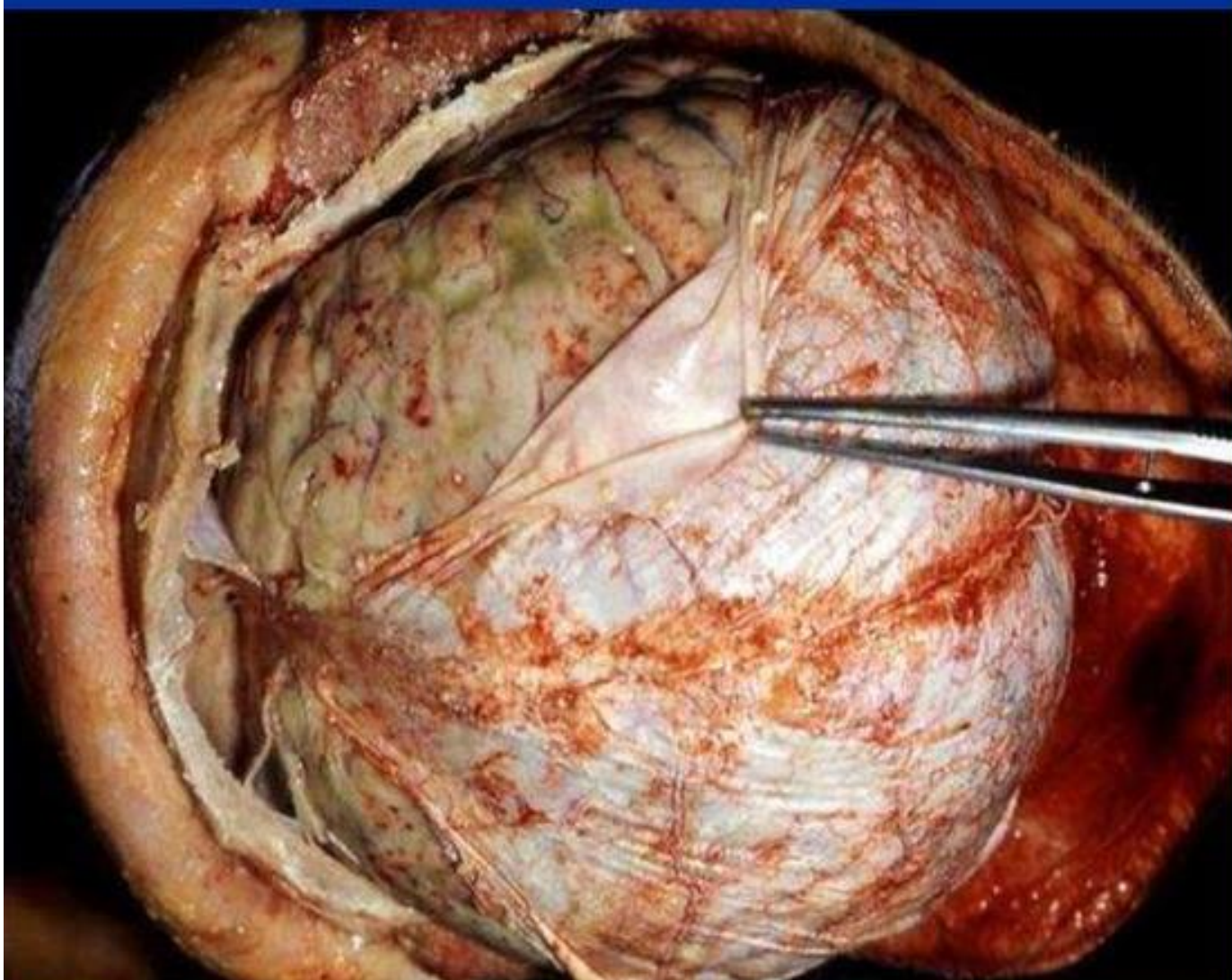
Kidney TB



Hematogenic TB with predominant extrapulmonary (organ) manifestations

- *TB of the meninges and central nervous system:*
 - There are 3 main forms of meningitis: basilar, meningoencephalitis, spinal.
 - Solitary tuberculosis foci in various parts of the brain are designated as tuberculomas.
 - Severe complication of meningitis - hydrocephalia - is accompanied by a decrease in cognitive function, developmental disorders, vision, hearing, motor disorders, etc.

TB meningoencephalitis



Hematogenous TB with predominant extrapulmonary (organ) manifestations

■ *TB of bones and joints:*

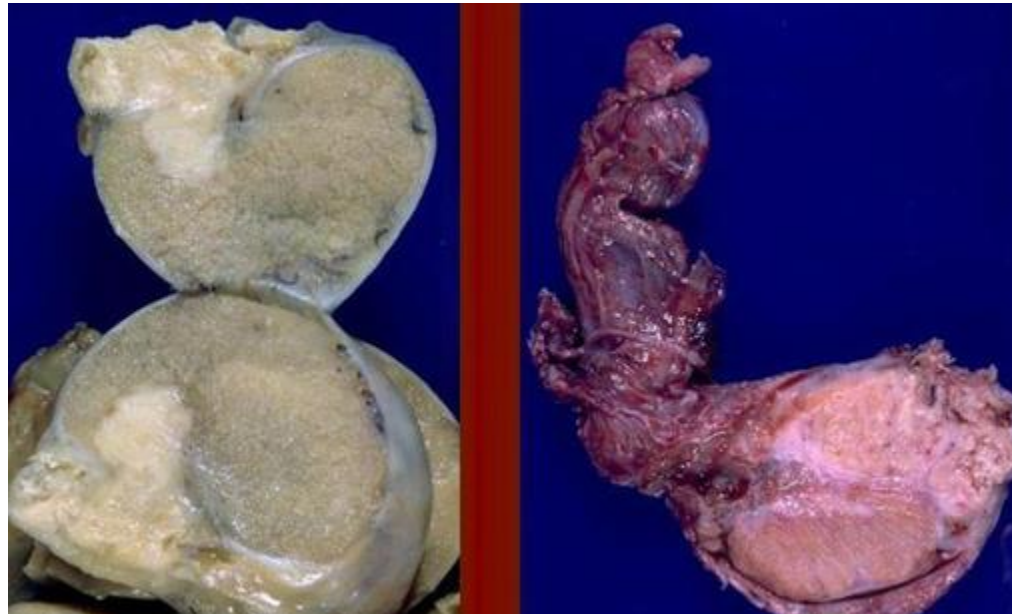
- The most frequent localizations of the process are vertebral bodies (tuberculous spondylitis), epiphyses of bones forming the knee and hip joints, with the development of gonitis and coxitis.
- A characteristic feature of topography is the defeat of two vertebrae.
- Most commonly, 3 to 4 to 5 lumbar, 9 to 12 thoracic vertebrae are affected.



Hematogenic TB with predominant extrapulmonary (organ) manifestations

■ *TB of male genital organs:*

- May be affected: prostate gland, seminal vesicles, epididymis, vas deferens.
- The lesion develops as hematogenous, and contact and intracanalicular ways as well.

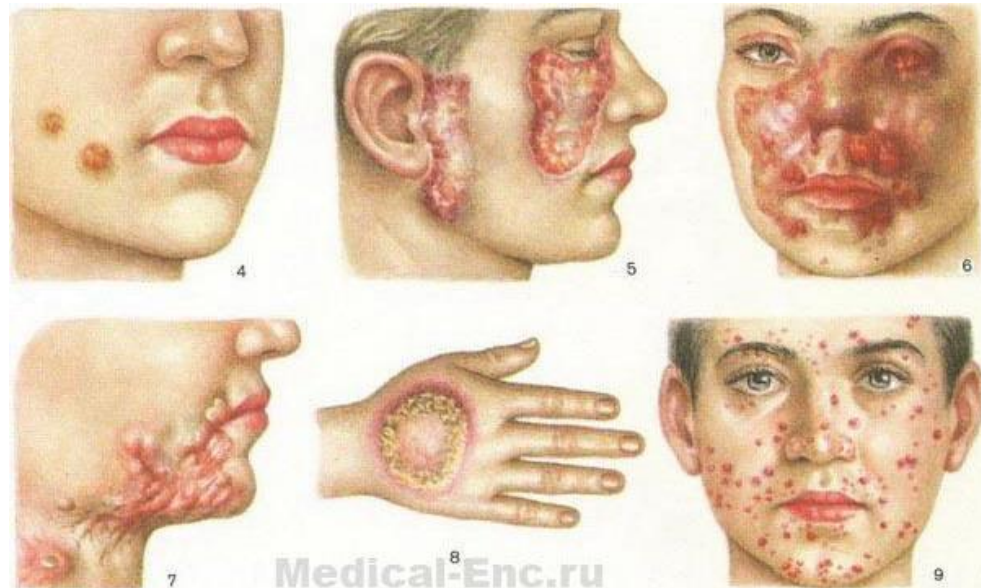


Hematogenic TB with predominant extrapulmonary (organ) manifestations

- *TB of female genital organs:*
 - It is most often associated with the defeat of the fallopian tubes (miliary, focal TB, endo- and mesoendometritis).
 - Less often, tuberculosis inflammation involves the ovaries, cervix, vagina, vulva.

Hematogenous TB with predominant extrapulmonary (organ) manifestations

- *TB of skin and subcutaneous tissue:*
 - In primary TB is often observed caseous focal skin TB (scrofuloderma), as well as disseminated (papulonecrotic TB, enthickened erythema, lichenoid skin TB - "lichen scrofulous").
 - To secondary skin TB tuberculous lupus, warty and miliary ulcer TB are refered.



Clinical and morphological classification of TB (according to A. I. Strukov)

- **3. Secondary TB (pulmonary TB with intracanalicular spread)**
 - **Acute focal lung TB**
 - **Fibrous-focal TB of the lungs**
 - **Infiltrative pulmonary TB**
 - **Tuberculoma of the lungs**
 - **Caseous pneumonia**
 - **Acute cavernous pulmonary TB**
 - **Fibrous-cavernous pulmonary TB**
 - **Cirrhotic pulmonary TB**

Secondary TB

- It develops in the body of an adult who has undergone a previous primary infection, which provided him with relative immunity, but did not protect against the possibility of a recurrent disease (re-infectious tuberculosis).
- There are two theories of the origin of secondary TB:
 - exogenous origin, ie, a new infection,
 - endogenous origin (the emergence of TB is associated with activation of infection in seedings, for example, the foci of Simon).

Features of secondary TB

- Selective pulmonary localization of the process.
- Contact and intracanalicular (bronchi, gastrointestinal) spread.
- There is a step-wise change in clinical and morphological forms.
- The forms are simultaneously phases of the development of the tuberculous process in the lungs (each represents a further development of the preceding form).
- The outcome of any form: healing or progression.

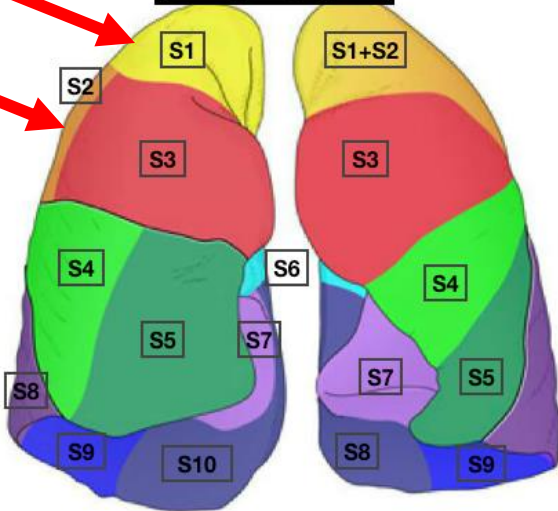
Acute focal TB

- Morphological manifestation is Abrikosov's focus-reinfection:
 - localized in the I and/or II segment (more often on the right),
 - less than 3 cm,
 - the age of the patients is 20 years and older.
- It begins with lesions of the intra-lobular bronchus (specific endo-, meso-, panbronchitis).
- Then develops acinous or lobular caseous bronchopneumonia. Around the foci, a rapidly forming epithelioid cells rim with an admixture of lymphoid and giant cells of Langhans.
- When healing (during treatment or spontaneously) occurs encapsulation and petrification of the foci - Aschoff-Puhl foci are formed.

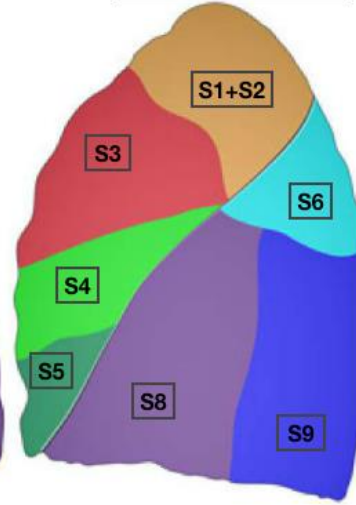
Правое легкое - вид сбоку



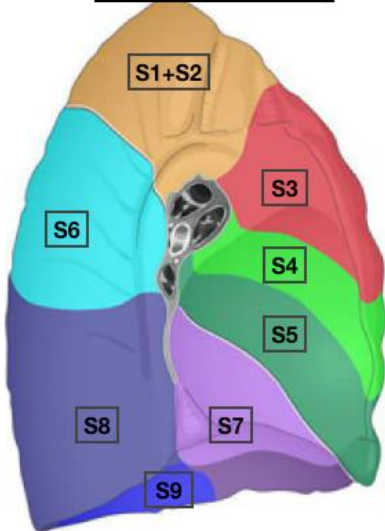
Легкие вид спереди



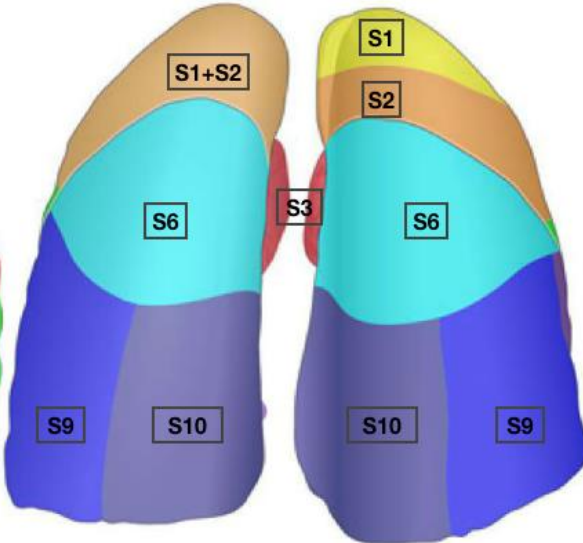
Левое легкое - вид сбоку



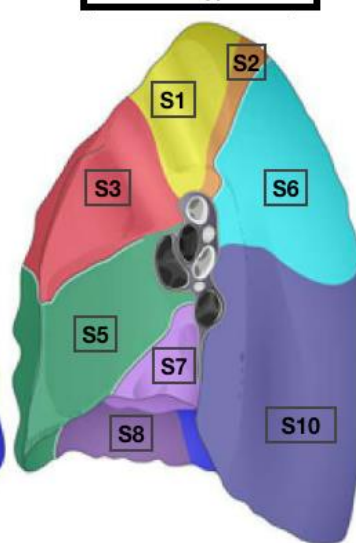
Левое легкое - медиальный вид



Легкие вид сзади

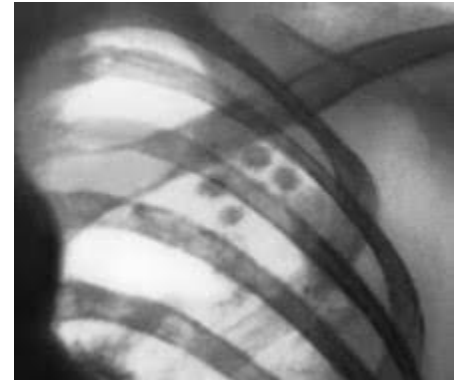
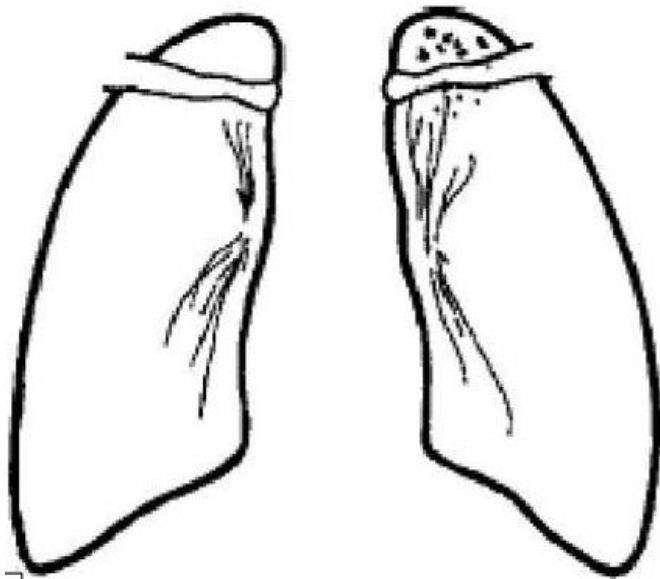


Правое легкое - медиальный вид



Acute focal TB

- If acute focal TB occurs in a young person, it must be differentiated with primary affect, since primary TB is currently found not only in childhood.



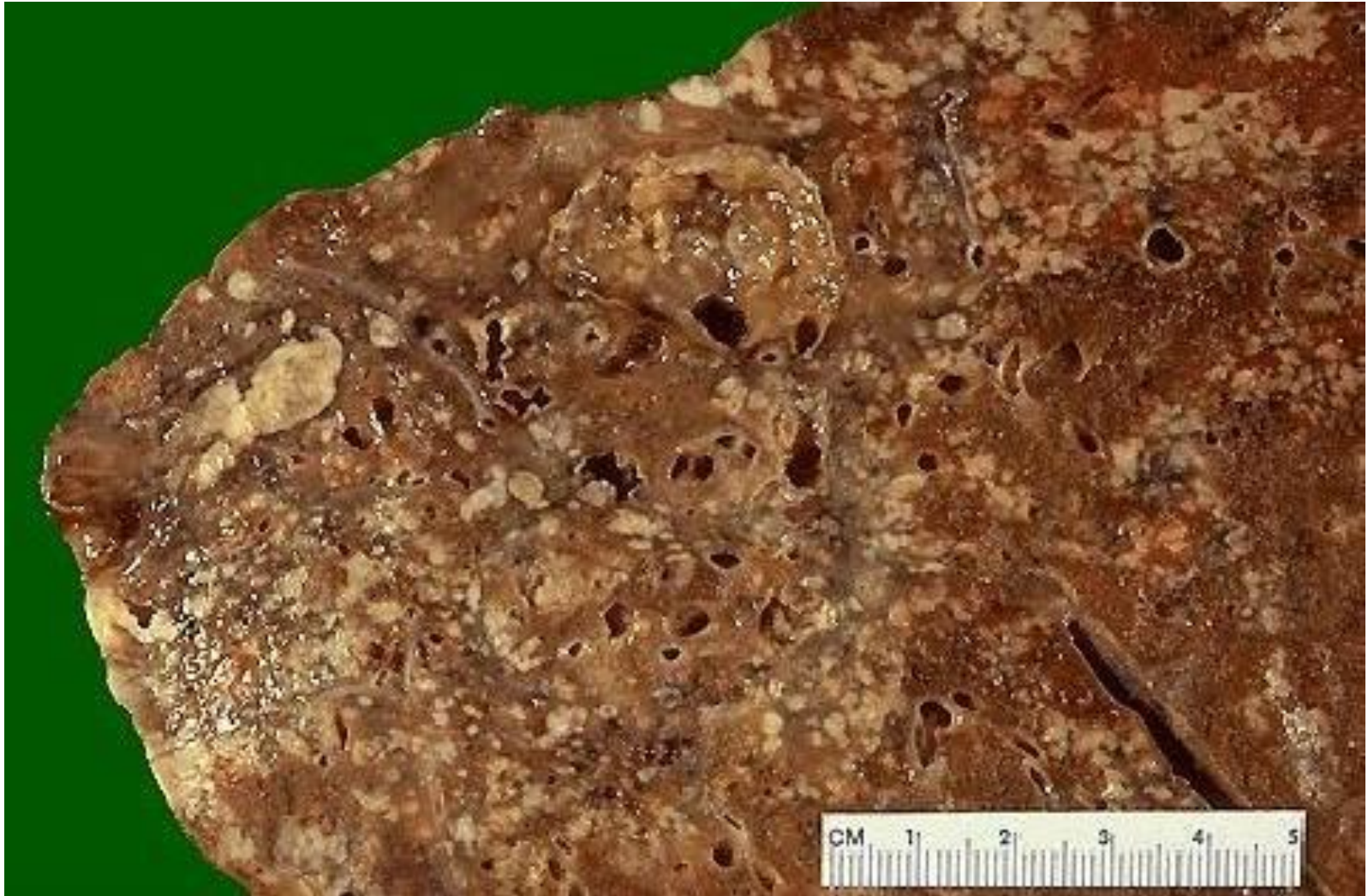
Morphological differences of the primary affect from the focus of Abrikosov

Focus	Localization	Regional lymph nodes	The nature of the healing of foci
Primary affect	In III (more often), VIII, IX and X segments (more often on the right), under pleura, from alveolite to segment	Caseous lymphadenitis	Petrification and ossification
Focus of Abrikosov	In the I or II segments in the depth of the parenchyma	Is not accompanied by caseous lymphadenitis	Petrification, bone tissue is not formed

Fibrous-focal TB

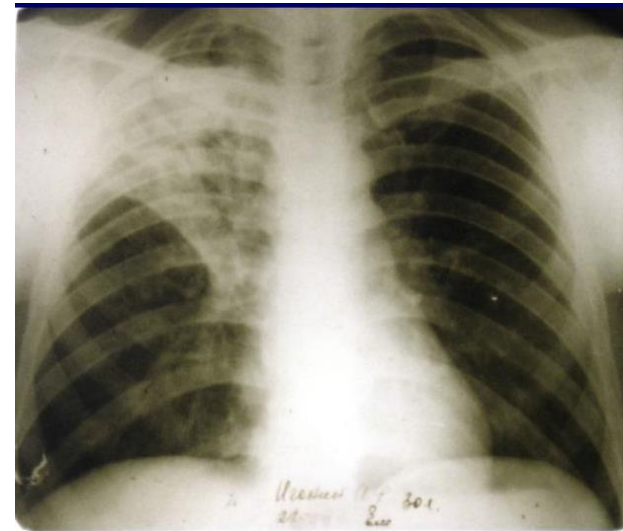
- It is characterized by a repeated flare-up of the tuberculosis process after the healing of Abrikosov's foci.
- In this case, the formed foci of different long standing, surrounded by a well-expressed capsule, are surrounded by foci of caseous pneumonia.
- Then these foci are encapsulated and partially petrified (foci of Ashot-Puhl).

Fibrous-focal TB



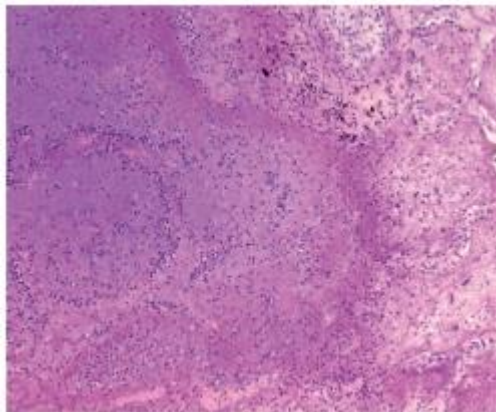
Infiltrative TB

- Occurs with the progression of acute focal or exacerbation of fibro-focal.
- Morphologically it is represented by the Asmann-Redeker focus:
 - formation of a wide zone of perifocal exudative inflammation (infiltration) in the circumference of a centrally located small (up to 1 cm) focus of caseous necrosis.
- The process extends beyond the lobule and segment (2 - 5 cm).
- It develops more often with the progression of focal TB, as well as during exacerbation of the latent focal process that has healed.

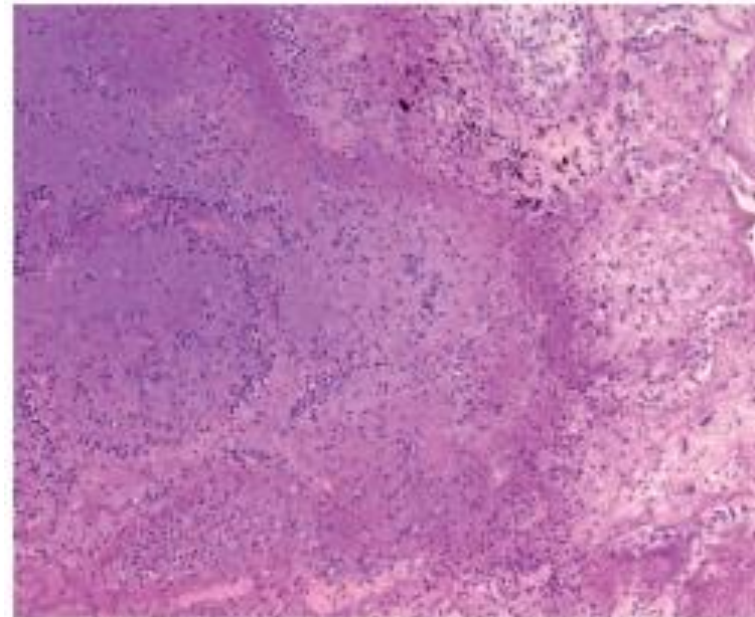
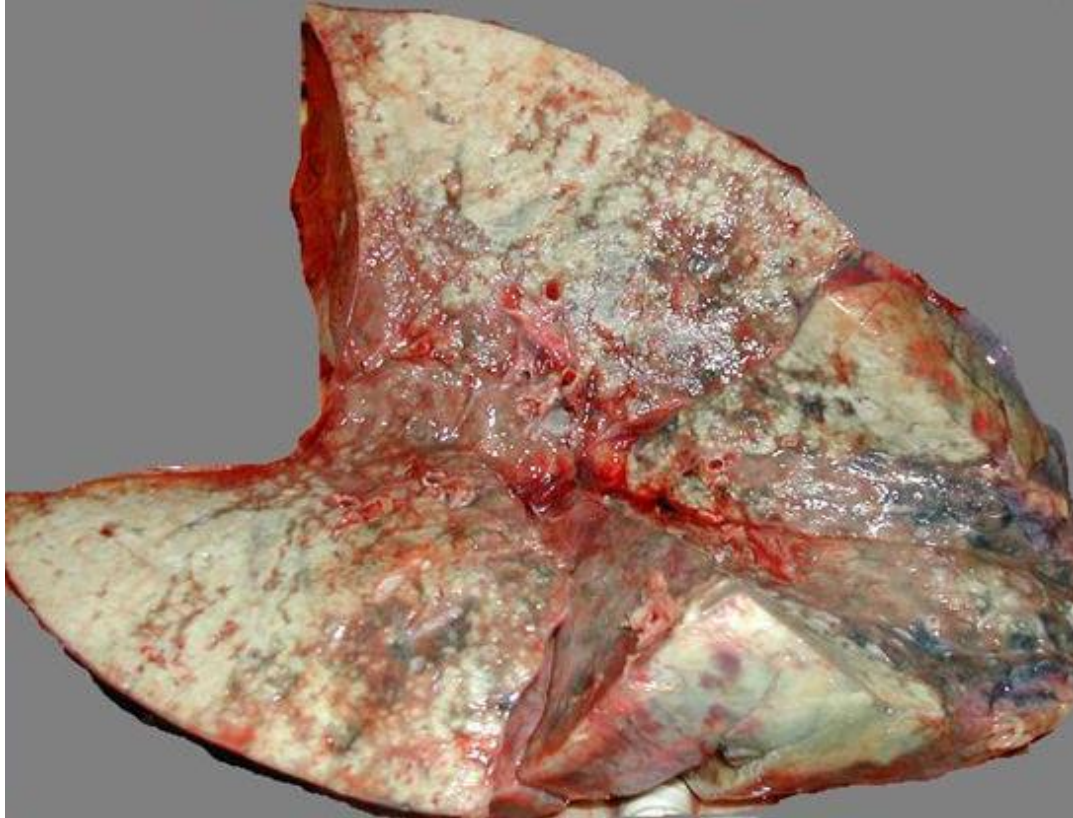


Caseous pneumonia

- Tuberculosis pneumonia with predominance of exudative-alterative and alterative types of tissue reaction.
- Characteristically acute progressive course.
- High speed of the process.
- Early decay with the formation of pneumoniagenous caverns.
- *Patients with caseous pneumonia are epidemiologically dangerous, since they are massive bacteriosters of multidrug-resistant MBT and nonspecific microbial flora.*



Caseous pneumonia



Tuberculoma

- Infectious-allergic pathogenesis.
- The rounded, encapsulated focus of caseous necrosis is about 1 cm in diameter, more often located in the I - II segments.
- Radiographically simulates peripheral lung cancer.
- Healing of tuberculoma occurs by compacting the caseous masses and reducing the size of the formation, the germination of the focus by the strands of connective tissue from the side of the capsule with the complete replacement of the caseous masses.

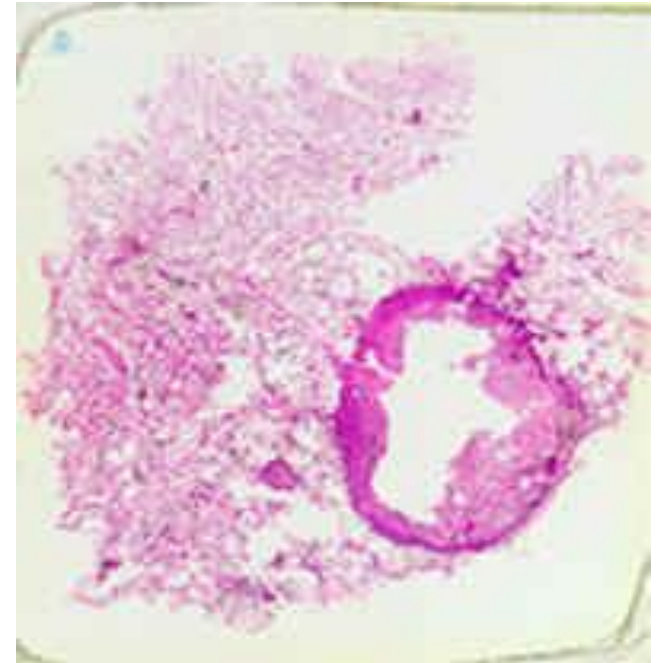
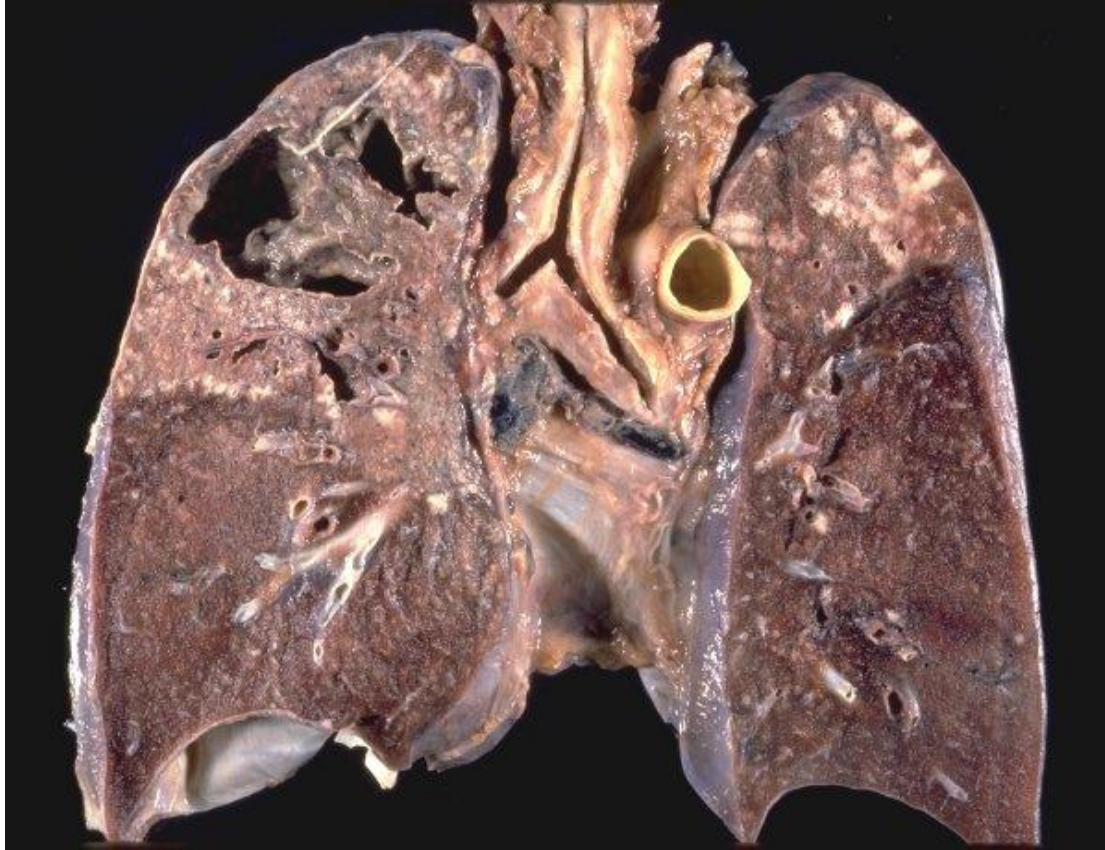
Tuberculoma



Acute cavernous TB

- The presence of an isolated formed cavern with thin walls.
- The inner layer is caseo-necrotic, the outer layer is granulation.
- Most often located in I - III or VI segments corticopleurally.
- When healing, the inner wall of the cavity is cleared from the caseo-necrotic masses and the tubercular inflammation is gradually replaced by a connective tissue with the formation of connective tissue scar.
- Pleurocortical caverns, as a rule, heal not with a scar, but with a cyst-like cavity.

Acute cavernous TB



Fibrous-cavernous TB

- It is the result of the progression of most forms of TB in the primary or secondary periods.
- The lethality from FCTB takes first place among all forms of TB (69.4%).
- The length of the process varies - from monosegmentary to double-sided polycavernous.
- In the lungs, one or more caverns with a broad fibrous layer form on the background of widespread focal sclerosis and foci of seeding of various genesis.
- Caverns may be small in size (up to 2 cm in diameter), medium (2-4 cm), large (4-7 cm), giant (more than 7 cm).

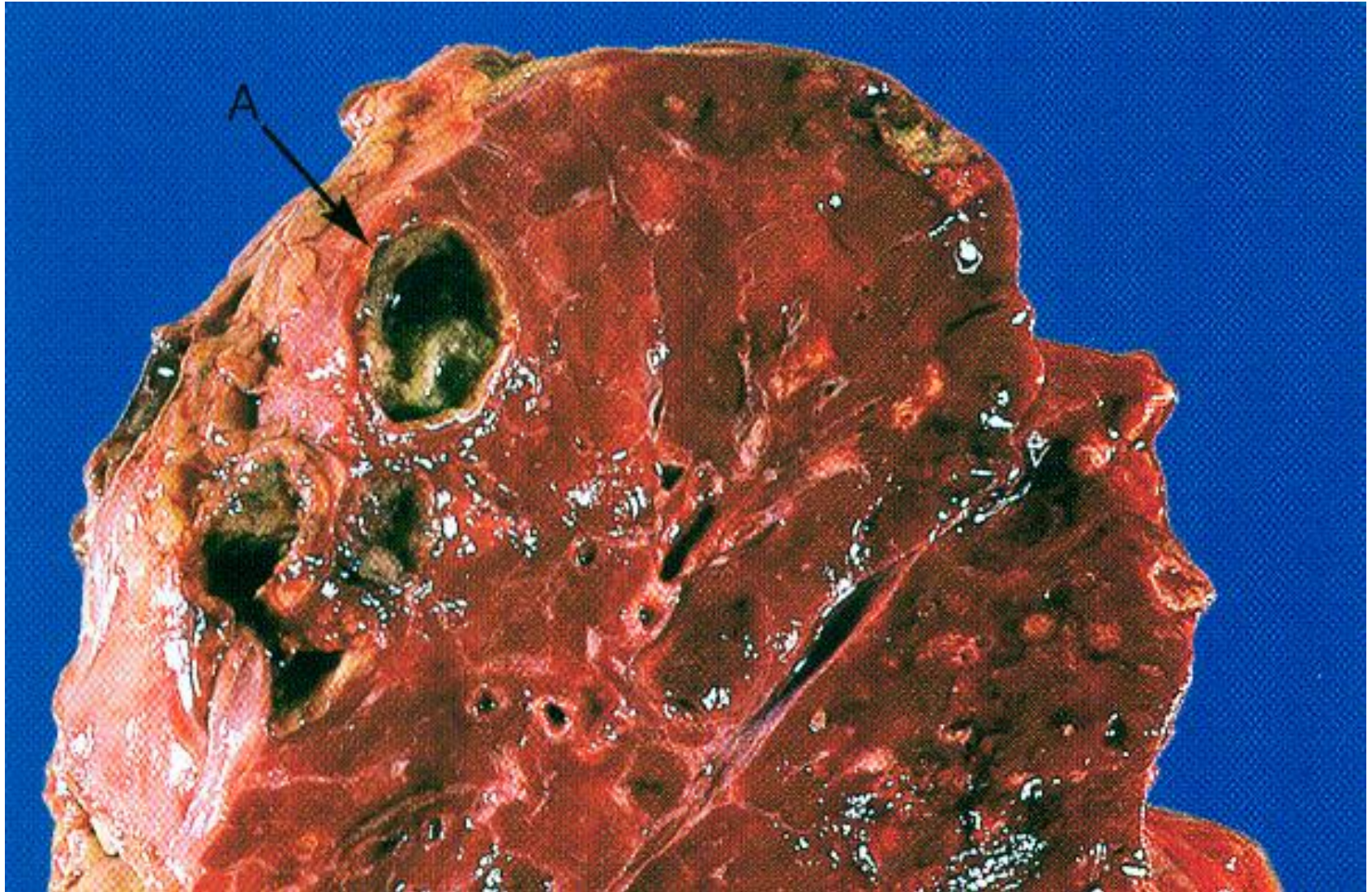
Fibrous-cavernous TB

- The wall of the chronic caverna consists of 3 layers:
 - caseous-necrotic,
 - granulation,
 - fibrous.
- The inner surface of the caverns is uneven, with yellowish overlays, sometimes with beams.
- There may be whitish gray formations up to 2-4 mm in size, so-called Koch lenses, which are clusters of colonies of MBT TB.

Fibrous-cavernous TB

- In the pericavernous zone there is a variegated gamma of various types of changes of varying degrees:
 - perbronchial and perivascular sclerosis,
 - obliteration of blood vessels and bronchi,
 - bronchitis, bronchiectasis and atelectasis,
 - pneumosclerosis and emphysema,
 - progressing and healing foci-seedings.
- The pleura in the zones of cavern localization has fibrous adhesions, hyalinized, shiny, cartilaginous density.
- Complications: pleuritis, pneumothorax, amyloidosis, cachexia, pulmonary heart, bleeding, pneumonia, meningitis.

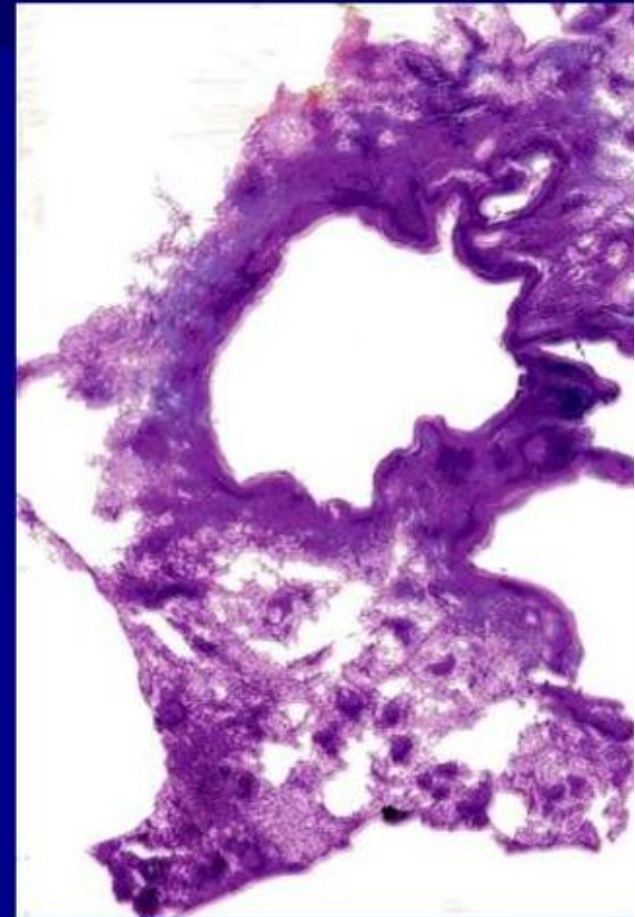
Fibrous-cavernous TB



Fibrous-cavernous TB



Материал ФПАЦ г. Москвы



Cirrhotic TB

- It is characterized by proliferation of dense irregular connective tissue in the lung and pleura.
- Coarse deforming cirrhosis (the lung is riddled with coarse fibrous strands) is combined with bronchiectasis, emphysema, caverns without signs of progression and organized caseous foci.
- Pleura is thickened, cartilaginous consistency, covers the lung in the form of "shell", with a thickness of up to 3 cm and more, especially in the region of the apex of the lung.



Causes of death in TB

- Pulmonary heart failure,
- pulmonary hemorrhage,
- amyloidosis,
- complications of the postoperative period in patients with severe cavernous process,
- hematogenous generalization with a decrease in the protective forces of the body,
- tuberculous meningitis (in children).

Pathomorphosis of tuberculosis

- *Pathomorphosis* - a change in epidemiological, clinical and pathologic anatomical features of the disease in modern conditions.
- The epidemiological situation of TB has become critical in recent years and is estimated as an epidemic.
- Since 1991, the increase in the incidence among children and adolescents, the increase in cases of severe forms, similar to the pre-vaccination period with disintegration, bacterial isolation and extrapulmonary localization.
- Primary TB develops not only in children, but also in adults.
- Growth of acute, destructive and common forms.

Pathomorphosis of tuberculosis

- Decreased effectiveness of therapy, increased drug resistance (up to 40% of patients).
- Increase of pathogenetic significance of exogenous infection.
- Prevalence among tissue reactions of exudative and necrotic, taking place on the background of IHR.
- The inadequacy of reparative processes, as a rule, on the background of secondary immunodeficiency.
- Increase in the epidemiological significance of risk groups for TB disease (prisoners, people without certain occupations, alcoholics, children living in the outbreaks of tuberculosis infection, etc.).
- The shift in mortality to younger age groups (30 to 50 years).

Syphilis

- The causative agent of syphilis is *Treponema pallidum*.
- The main feature of the microbe is a weak resistance outside the human body.
- Source of infection: sick person.
- The causative agent is contained in:
 - saliva,
 - urine,
 - blood,
 - semen,
 - breast milk.



Syphilis

- Ways of infection:
 - direct contact:
 - sexual,
 - Non-sexual (kiss, bite, examination of the patient),
 - Less frequent - indirect contact:
 - household (dishes common with the sick person, hygiene items, public facilities: toilets, saunas and baths, cafes and restaurants).
- Pathogenesis: infection occurs only in the presence of microtrauma on the skin and mucous membranes.

Classification of syphilis

- There are 5 forms of syphilis:
 - Primary syphilis
 - Secondary syphilis
 - Tertiary syphilis
 - Neurosyphilis
 - Congenital syphilis.

Primary syphilis

- The incubation period is about 3 weeks.
- There is a primary syphilitic complex (PSC):
 - primary affect,
 - lymphangitis,
 - lymphadenitis (syphilitic bubo).

PSC: Primary affect

- Localization: the place of treponema invasion.
- Process dynamics:
 - spot - node - induration - necrosis in the center - erosion - ulcer.
- As a result, a solid chancre (ulcus durum) forms.

Ulcus durum

- Ulcus durum is the primary syphiloma.
- Morphology: painless round ulcer up to 2 cm in diameter with raised dense edges, smooth shiny (lacquered) copper-red bottom.
- There are 3 forms of ulcus durum:
 - Solid chancre with a gray-yellow coating (the color of spoiled fat).
 - solid chancre in the form of dark red petechia.
 - giant solid chancre with localization on the pubis and abdominal wall.

Ulcus durum

- Ulcers are not painful and are not prone to decay.
- More often the solid chancre is single, rarely plural.
- There are typical and atypical localization of a solid chancre.

Ulcus durum

- Typical localizations are the genitals:
 - preputial fold, coronary groove, glans penis, scrotum, pubis, urethra in men.
 - small and large labia, clitoris, hips, cervix, vagina in women.
- Atypical localizations are extragenital:
 - lips, mouth (tongue, gums, tonsils, palate, cheeks), chin after oral-genital contacts,
 - Perianal area after anal-genital contacts,
 - mammary gland,
 - palms and fingers of the upper limb.

Ulcus durum

- Microscopic picture:
 - nonspecific inflammatory infiltrate,
 - productive vasculitis,
 - accumulation of lymphocytes, plasmocytes, neutrophils along the vessels and nerves,
 - an abundance of pale spirochaetes.

Ulcus durum

- Outcomes:
 - favorable: healing with the phenomena of depigmentation and fibrosis.
 - unfavorable : secondary infection.
- Manifestations of secondary infection:
 - edema of the foreskin and infringement of the glans penis,
 - Fusospirochetosis and gangrenous inflammation,
 - rejection of the glans penis, spread of gangrenous inflammation to the abdomen, thighs and deep layers of the skin.

Ulcus durum

- In case of secondary infection, the solid chancre is called *ulcus durum gangrenosum* - a dense gangrenous ulcer.
- This is a very dangerous variant of the disease, which often leads to the death of the patient.
- The contributing factors are alcoholism and avitaminosis
- In the Middle Ages, during the epidemic of syphilis, many patients died from this form of syphilis (the sexual plague).

Ulcus durum



Ulcus durum



PSC: lymphangitis

- This is a nonspecific inflammation of the lymphatic vessels between solid chancre and syphilitic bubo.
- Usually, lymphangitis disappears after healing of the primary affect (solid chancre).

PSC : lymphadenitis

- Nonspecific inflammation of the regional lymph nodes.
- At sexual localization usually inguinal lymph nodes are affected.
- With extra-sexual, everything depends on the localization of the process.
- Inflamed lymph nodes are enlarged in size and painless.
- Syphilitic bubo remains for a very long time.

Secondary syphilis

- It develops 1.5 - 2 months after the primary syphilis.
- It is characterized by a generalization of the process, which is manifested by the damage to the skin and mucous membranes.
- On the skin appear inflammation foci - secondary syphilis.

Secondary syphilis

- The disease is undulating.
- The periods of fading alternate with new exacerbations with the appearance of secondary syphilis on the skin.
- With each new exacerbation, the number of syphilides decreases.
- Secondary syphilis is very dangerous for others.

Secondary syphilides

- Secondary syphilides are areas of skin inflammation that contain a lot of treponemes.
- Secondary syphilides can be localized on any areas of the skin, including on the palmar and plantar surfaces.
- Types of secondary syphilides:
 - roseola,
 - papule,
 - pustule.

Secondary syphilides

- Roseola is a pink spot 4-5 mm round in shape, disappears when pressed. Appears at the first attacks of the disease. Are located in large quantities on the trunk, extremities. Dynamics of reverse development: pink spot - blanching - disappearance without consequences after 3 - 4 weeks.
- Papula is a reddish spot of oval shape measuring 5-3 mm, which does not disappear when pressed; The surface is smooth, in the center there is peeling and soreness. It often occurs with repeated rashes.
- Pustules are purulent vesicles of various sizes. Malignant syphilide. The clinic corresponds to sepsis in the phase of septicopyemia.

Secondary syphilides on the skin



Syphilitic leukoderma

- This is a residual phenomenon of secondary syphilis, when the depigmented areas appear on the skin and forever remain as evidence of the disease.
- They can be localized around the neck (the "necklace of Venus"), on the forehead ("crown of Venus") and on other parts of the body.

"Necklace of Venus"



Secondary syphilis

- Secondary syphilis lasts 2 - 3 years, is contagious, but it does not affect internal organs.
- With the activation of immunity, self-healing may occur.
- But in 30% of patients in the absence of appropriate treatment the disease passes into the next period.

Tertiary syphilis

- It develops in about 5 years from the onset of infection.
- It is characterized by the following manifestations:
 - the small number of syphilides,
 - depth and severity of destructive processes in places of syphilis,
 - defeat of internal organs and nervous system,
 - non-contagious,
 - specific granulomatous nature of inflammation.

Tertiary syphilides

- There are 4 types of tertiary syphilis:
 - tubercular,
 - gummy,
 - gummous infiltrate,
 - tertiary roseola.

Tertiary syphilides

- The tubercular syphilide has the appearance of node with the size of a pea, localized on the skin, located singly and in groups.
- Gummy syphilide is a node of the size of a hazelnut, localized on the face, trunk, shin, in the region of the joints.
 - Dynamics: dense node - decay - ulcer with glutinous masses - fusion of nodes - severe destruction of organs (nose, eyes) - a coarse scar is formed during healing.
- Gummous infiltrate is a diffuse specific inflammation.
- Tertiary roseola - redness on the skin of a bizarre shape in the form of rings, garlands, arcs; remains for a long time as a cosmetic defect.

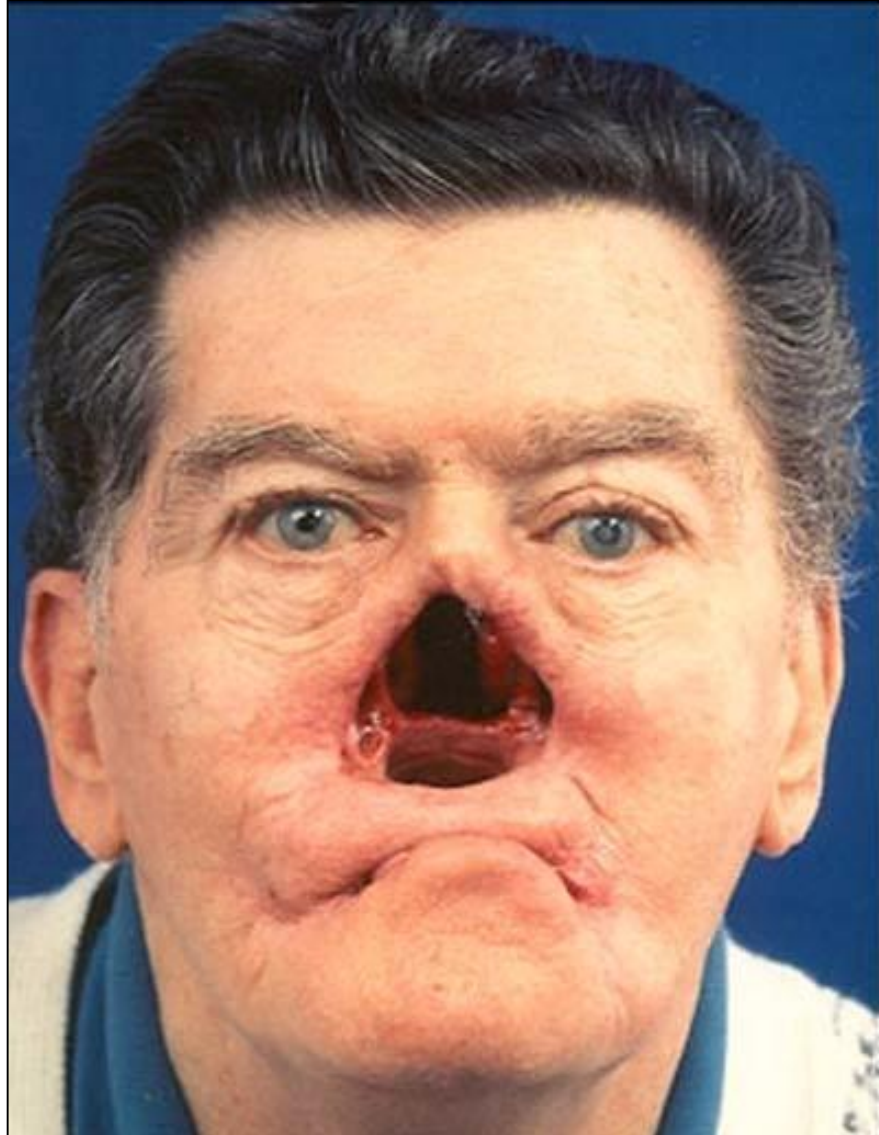
Tertiary syphilis

- Pathomorphological changes in organs and systems in tertiary syphilis are very diverse:
 - rough scarificating processes on the skin of the face and legs,
 - destruction and deformation of the nose ("saddle nose"),
 - perforation of the hard palate,
 - scarry narrowing of the pharynx, esophagus,
 - fibrosis, deformation, shortening of the tongue,
 - destruction and deformation of bones of different localizations,
 - syphilitic mesaortitis of the initial aortic parts,
 - syphilitic aneurysm and aortic rupture,
 - syphilitic coronary and myocardial infarction,

Tertiary syphilis

- focal gummy, diffuse miliary, chronic interstitial hepatitis with outcome in cirrhosis of the liver,
- gummas, ulcers, deformity and stenosis in the stomach,
- gummous nodules, miliary gummas, interstitial inflammation in the lungs, diffuse pneumosclerosis,
- Lipoid and amyloid nephrosis, gummous nephritis,
- hgummous orchitis and oophoritis,
- gummous inflammation and destruction of the adrenal glands, pituitary gland, thyroid gland.

Saddle-nose



Neurosyphilis

- There are two forms of neurosyphilis:
 - early - develops in the first 5 years of the disease,
 - late - develops in the period from 5 to 15 years of the disease.

Early neurosyphilis

- It is manifested by various lesions of the nervous system:
 - acute syphilitic meningitis (serous meningitis),
 - chronic syphilitic meningitis (meningoencephalitis, the presence of small gummas in the basal parts of the brain),
 - gummas of the brain and spinal cord (imitate tumor processes),
 - syphilitic vasculitis of the brain (inflammation of the middle and large arteries, focal and diffuse ischemic and hemorrhagic strokes),
 - defeat of peripheral nerves (neuritis and polyneuritis).

Late neurosyphilis

- More often manifests in two forms:
 - Tabes dorsalis:
 - dystrophy, necrosis, atrophy of the posterior columns and roots of the spinal cord,
 - pain, trophic ulcers, paralysis of the lower extremities.
 - progressive paralysis:
 - inflammation of the pia mater of the frontal and temporal lobes,
 - the death of a large number of nerve cells and the destruction of the cerebral cortex,
 - proliferation of neuroglia,
 - severe mental disorders, exhaustion, death.

Congenital syphilis

- Ways of infection: the placenta - a child by the umbilical vein and lymphatic vessels.
- In the early stages of syphilis the possibility of infection of the child is higher than in the later stages.

Congenital syphilis

- There are 4 variants of congenital syphilis:
 - syphilis of the fetus,
 - syphilis of infancy,
 - early childhood syphilis (age from 1 to 4 years),
 - late congenital syphilis (age 4 to 17 years).

Syphilis of the fetus

- Manifestations:
 - infection of the fetus at 7th months of pregnancy,
 - diffuse productive inflammation,
 - interstitial hepatitis, miliary hepatitis ("flint liver"),
 - "White pneumonia" (total inflammatory lesion of the lungs),
 - inflammatory processes in the bones, central nervous system, on the skin.

Late congenital syphilis

■ Manifestations:

- chronic inflammation, gummas, dystrophy of all organs and systems,
- characteristic of the “Hutchinson triad”:
 - neuritis of the auditory nerve (deafness),
 - parenchymal keratitis (blindness),
 - characteristic changes in the upper incisors: a large gap between the teeth, barrel-shaped, notch on the incisal surface (“Hutchinson's teeth”).

Hutchinson's teeth

