RICKETTSIOSES

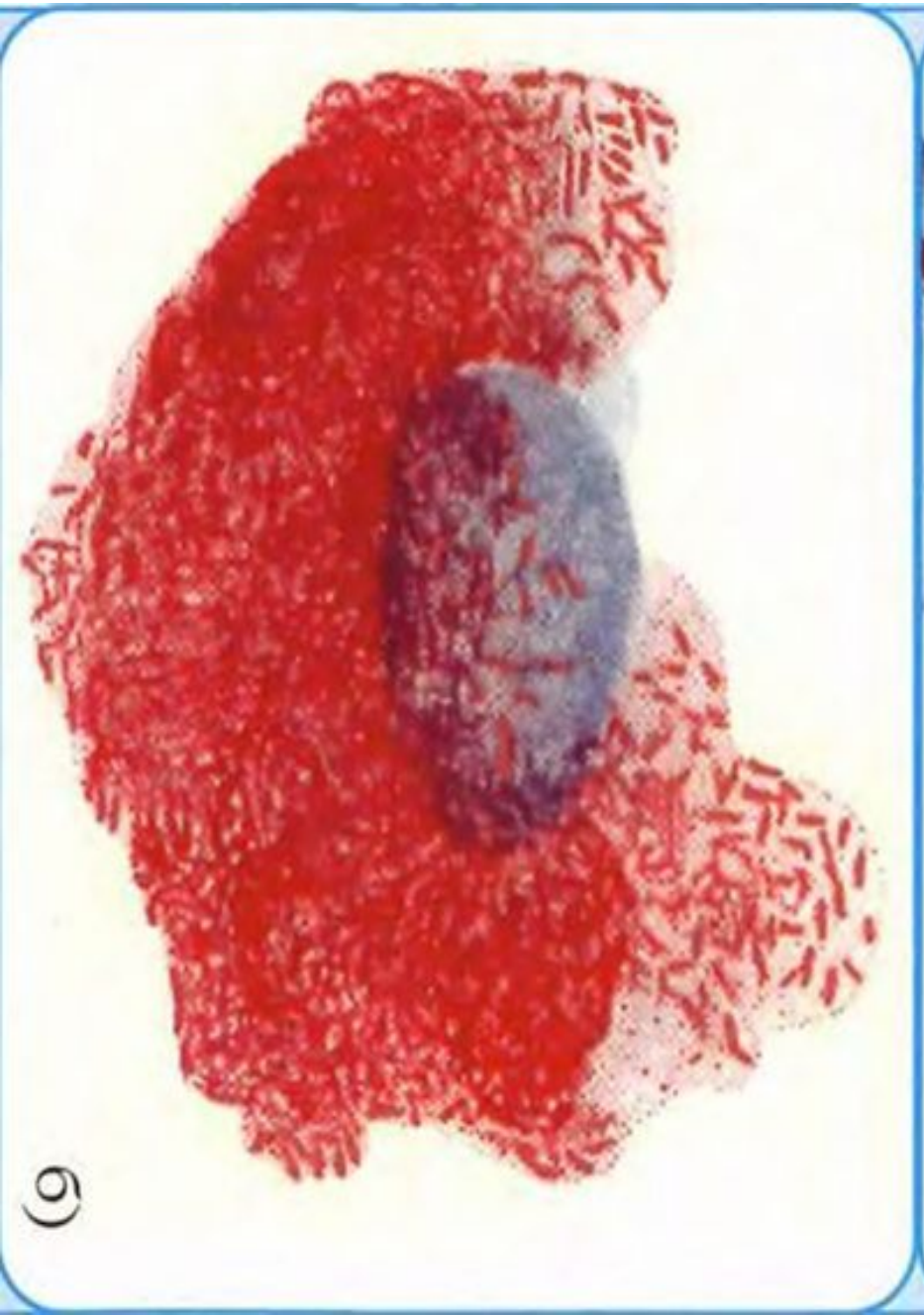
Identification. It`s the group of acute transmissible illnesses of the man caused by the rickettssia and characterized by the expressed intoxication and generalized panvasculitis, which result is the lesion of the CNS, internal bodies and spotty-papular exanthema at majority of them.

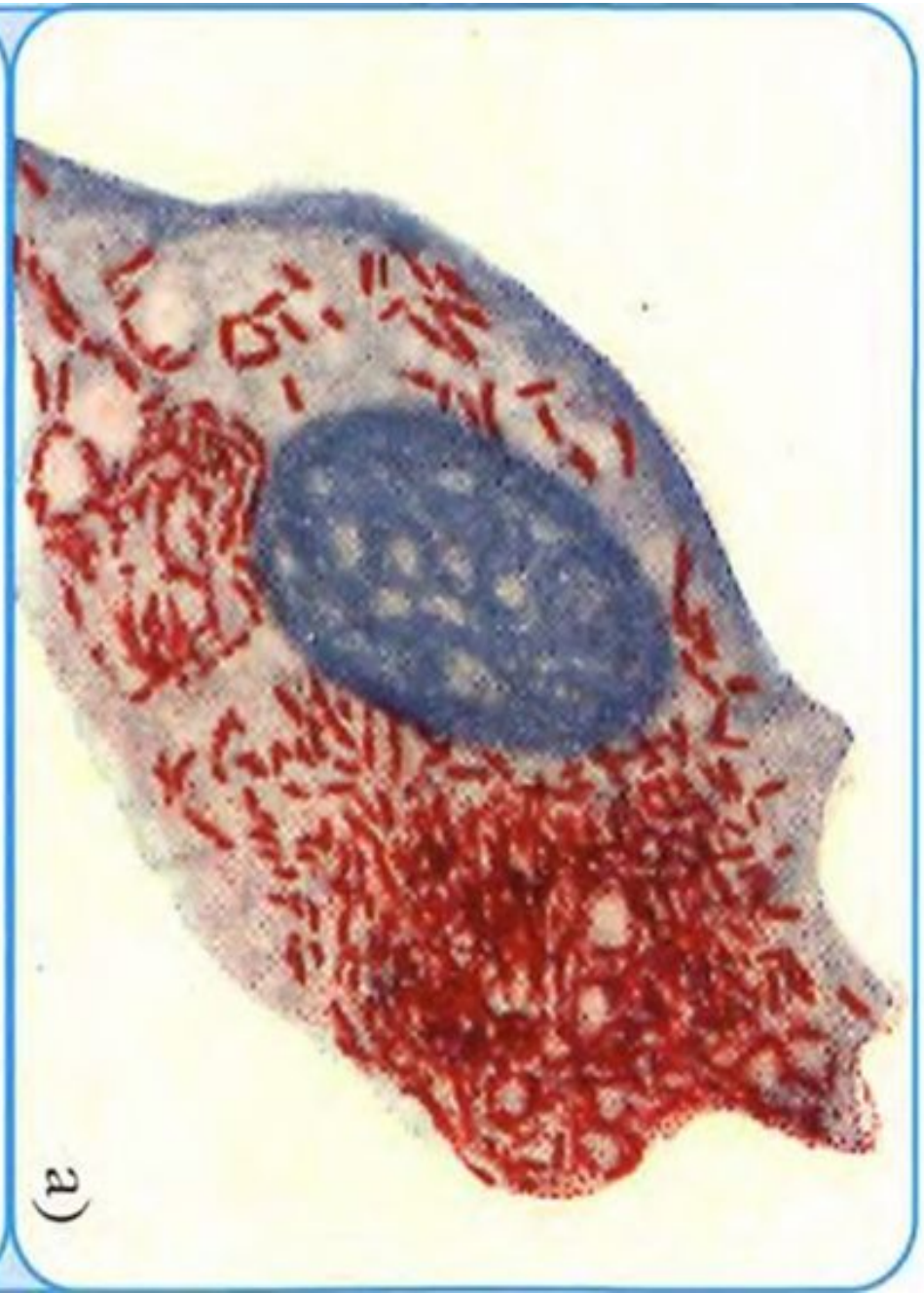
Rickettsia (F. Rickettsiacae.) They were divided on three kinds: Rickettsia, Coxiella, Rochalimea.

Rickettsia are Gram (-), rod-shaped, spherical or pleo-morphic organisms smaller than bacteria and have a size from 0.3 – 0.5 up to 3 - 4 microns.

They occupy the intermediate position between viruses and bacteria.

Cells contain rickettsia as inclusions Mooser





PROPERTIES RICKETTSIA SIMILAR to BACTERIA:

- one-type stucture of the cells – they have: core, cytoplasma, membrane, one-type chemical composition, metabolism, set enzymes

- have simultaneously both DNA and RNA

- ability to derivate toxic substances

- reproduction by binary division

- sensitivity to antibiotics

PROPERTIES RICKETTSIA SIMILAR to VIRUSES:

- ability to endocellular parasite
- impossibility reproduction on the synthetic mediums
- ability to derivate the filtering forms
- poor colouring by the aniline stains

COMMON PROPERTIES of RICKETTSIOSES:

- transmissible mode of transmission (via of the lice, fleas, ticks, mites)
- acute cyclic current (except for the Q-fever)
- endemicity for the majority of them
- community of antigenic structure (except for R. tsutsu-gamushi), that results in creation of cross immunity and errors at carrying out of immunological reactions

Rickettsia in the environment are not enough steady:

- at warming up to 60 d. C – are survived some minutes

- at boiling - are perished instantly

- formalinum 0.5 %, phenolum 5 %, alcohol and aether - fast inactivate their

- at temperature is lower - 20 d.C or quick desiccation are survived from 1 to 3 years

- the rickettssia form a toxic substance with properties both exotoxin and endotoxin wich is extremely unstable and nonseparable from a cell envelope

The rickettssia have two antigenes:

- the thermostable species no specific antigene (the lipo-polysaccharid-protein complex) - has high immunogenic activity

- the thermolabile species specific antigene. It is disposition in a cell more deeply thermostable of the antigene

- both the antigenes induce formation antitoxins, precipitins, hemagglutinins, complement- fixation of the antibodies and opsonins

COMMON PATHOGENESIS of RICKETTSIOSES

1. The infiltration into the organism is more often at the sting of the insects and intensive reproduction in endothelia of hypodermic or submucous capillaries from 7 to 10 days (incubation interval)

2.The primary affect as the infiltrate with scab or without can be shaped in a place of implantation of the rickettsia.

3.A hematogenic dissimination of the rickettsia from the primary center with lesion of the endothelium of the larger vessels with development vasculitis and perivascular mononuclear infiltrates occur through 7 - 10 days.

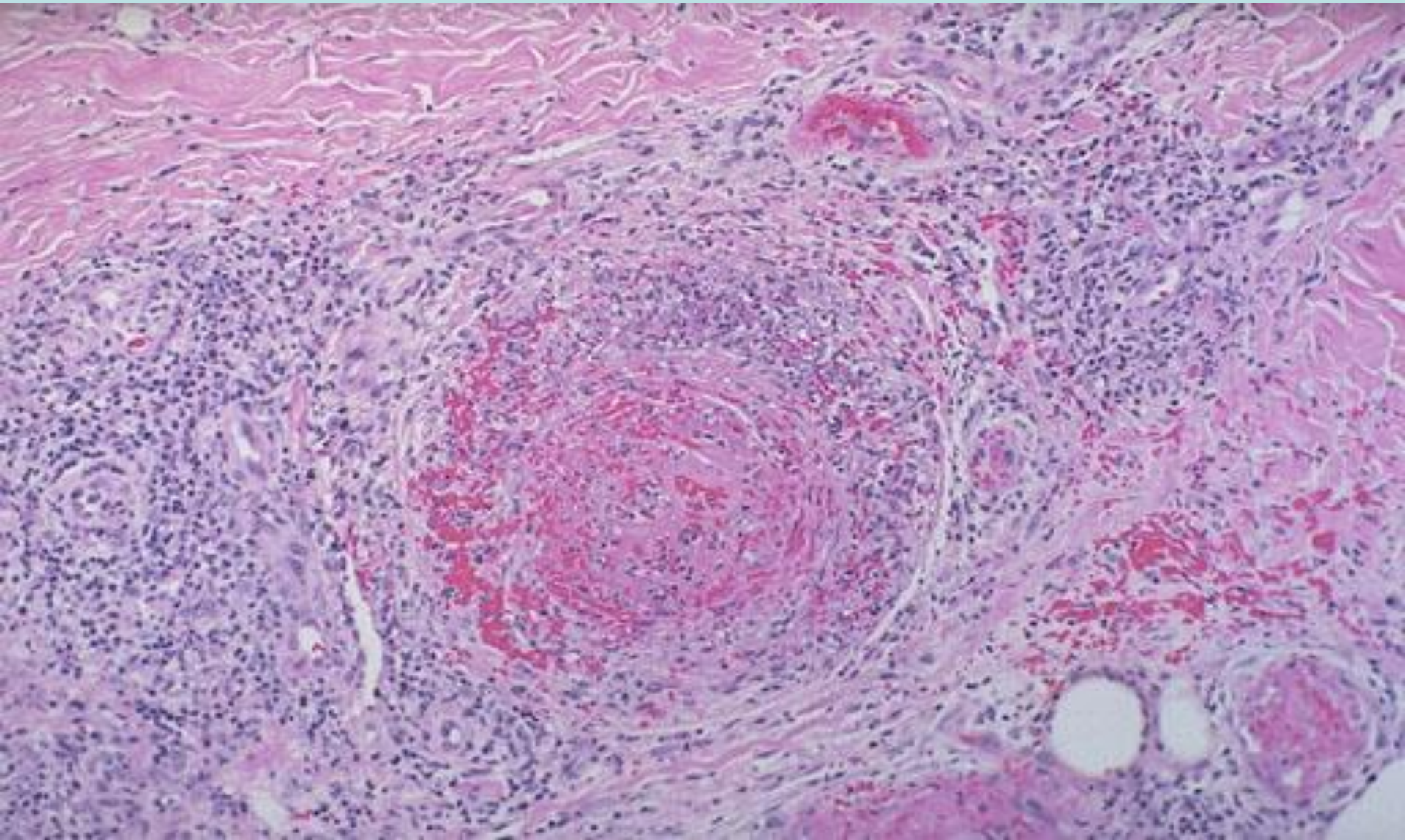
Affected cells may contain rickettsia as inclusions Mooser (e.g. Epidemic typhus)

4. At repeated dissiminations of the rickettsia, the lesion of vessels become generalized and it shows clinical:

- enanthema and spotty-papular exanthema
- wide-spread thrombosis with both the ischemia and necrosises in perivascular tissues in many bodies

Vasculitis and edema involving medium-sized artery in the subcutaneous fat

The vasculitis shown here demonstrates the destruction that can accompany the acute inflammatory process and the interplay with the coagulation mechanism. The arterial wall is undergoing necrosis, and there is thrombus formation in the lumen.



5. The generalized lesion of the endothelium results to a hyperpermeability of vessels with escaping them of water and electrolytes (appearance of edemas) and erythrocytes (appearance hemorrhage) with development of the hypo-volemic shock in severe cases.

6. The lesion of the endothelium results in activation of the coagulating system of blood with possible outcome in DIC (disseminated intravascular coagulopathy)

7. Main causes of death at rickettsioses - acute heart failure, the lesion a CNS or circulatory disturbance indirect resulting in heart failure, hypovolemic shock, DIC.

BASIC GROUPS of RICKETTSIOSES:

	Organisms	Vectors
1.Group of a typhus:		
- epidemic typhus and illness Brill	R. Prowazekii -	Human body louse
- endemic (murine) typhus	R. Mooseri	Rat flea
2. Group of spotty fevers:		
- Fever of rocky mountains	R. Rickettsii	Hard tick
- Marseilles fever(African tick typhus)	R. Conori	Hard tick
- North-Asian typhus	R.sibirica	Hard tick
- North-Australian typhus	R. Australis	Hard tick
- Varioliform rickettsiosis (Ricketsial pox)	R. Akari	Mite
3. Group tsutsugamushi (scrub typhus)	R. Tsutsugamusi	Trombiculid larval mite
4. Group of the Q-fever - Q-fever	Coxiella burnetti	Hard tick
5. Group paroxysmal of rickettsioses:	Rochalimaea	
- trench fever (volynian fever)	quintana	Human body louse

All rickettsioses are subdivided on 2 groups:

Anthroponoses rickettsioses:

- epidemic typhus.
- trench fever

Cycle of circulation of the rickettsia:

the sick man > human body louse > next the man

All other rickettsioses – zoonozes

Cycle of circulation of the rickettsia:

the sick animal >lice, fleas, ticks >next animal or the man

(Louse- borne typhus, Epidemic typhus)

EPIDEMIOGY

The source and reservoir – sick man, who becomes infected before 2- 3 days prior to the beginning of illness + feverish period + 7 - 8 days convalence)

The mode of infection - transmissible through damaged a skin (stings and scratching) or mucous

Vector – Lice: (Pediculus vestimenti) Human body louse (main) and (Pediculus capitis) Head louse (seldom)

Louse infects by a blood of ill. It becomes infected after bloodsucking in 4-5 days secreting rickettsia with feces up to the death (through 7 - 12 days).

Rickettsia get on a skin with feces of lice, and after that at scratching will penetrate through bite wounds into an organism of the man.

A - head louse (male)

B- head louse (female)

C -nit of the head louse

1- egg of the nit

2- cover of the egg

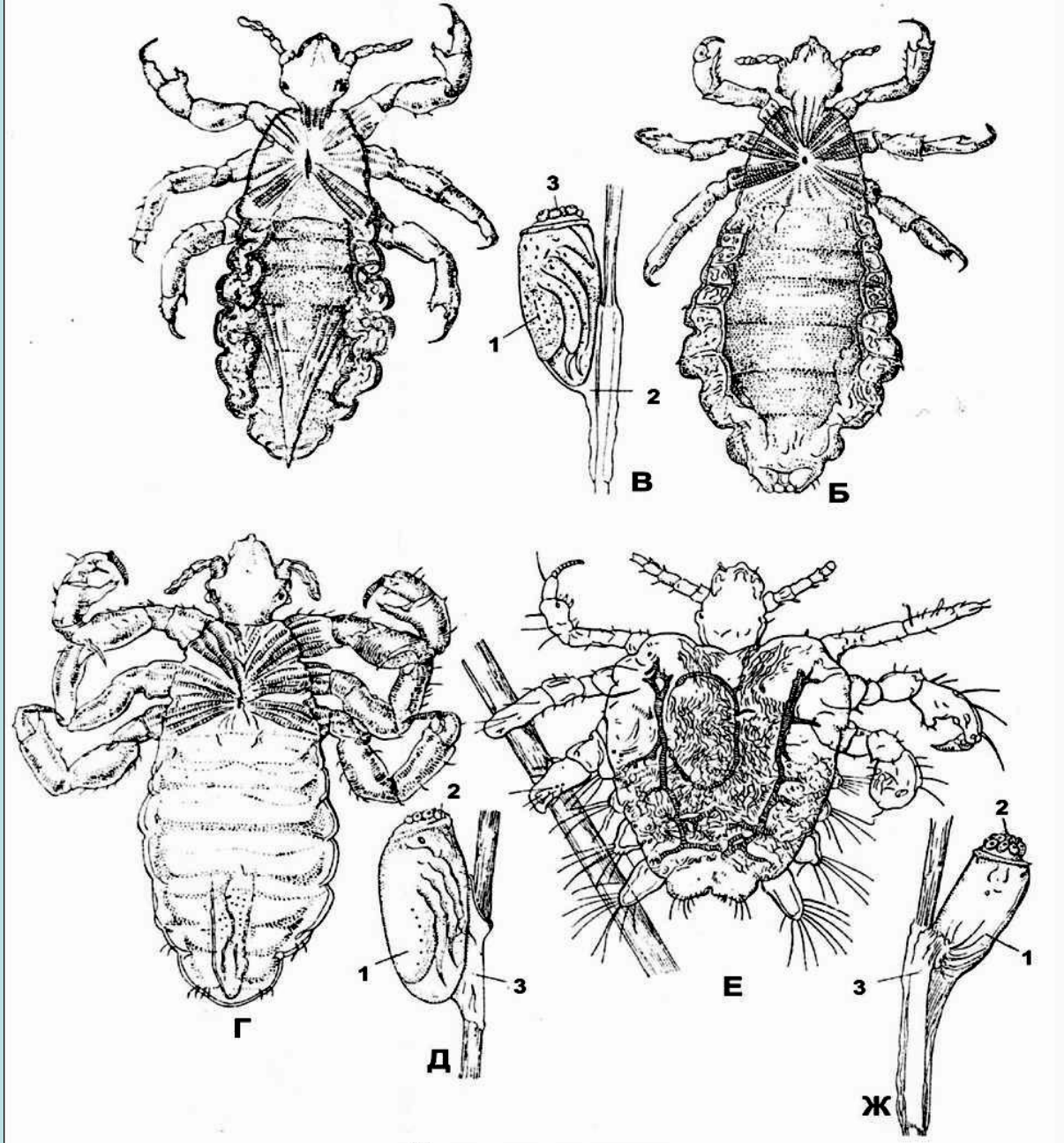
3- stickly substance

D - body louse (male)

E - nit of the body louse

F - pubic louse (female)

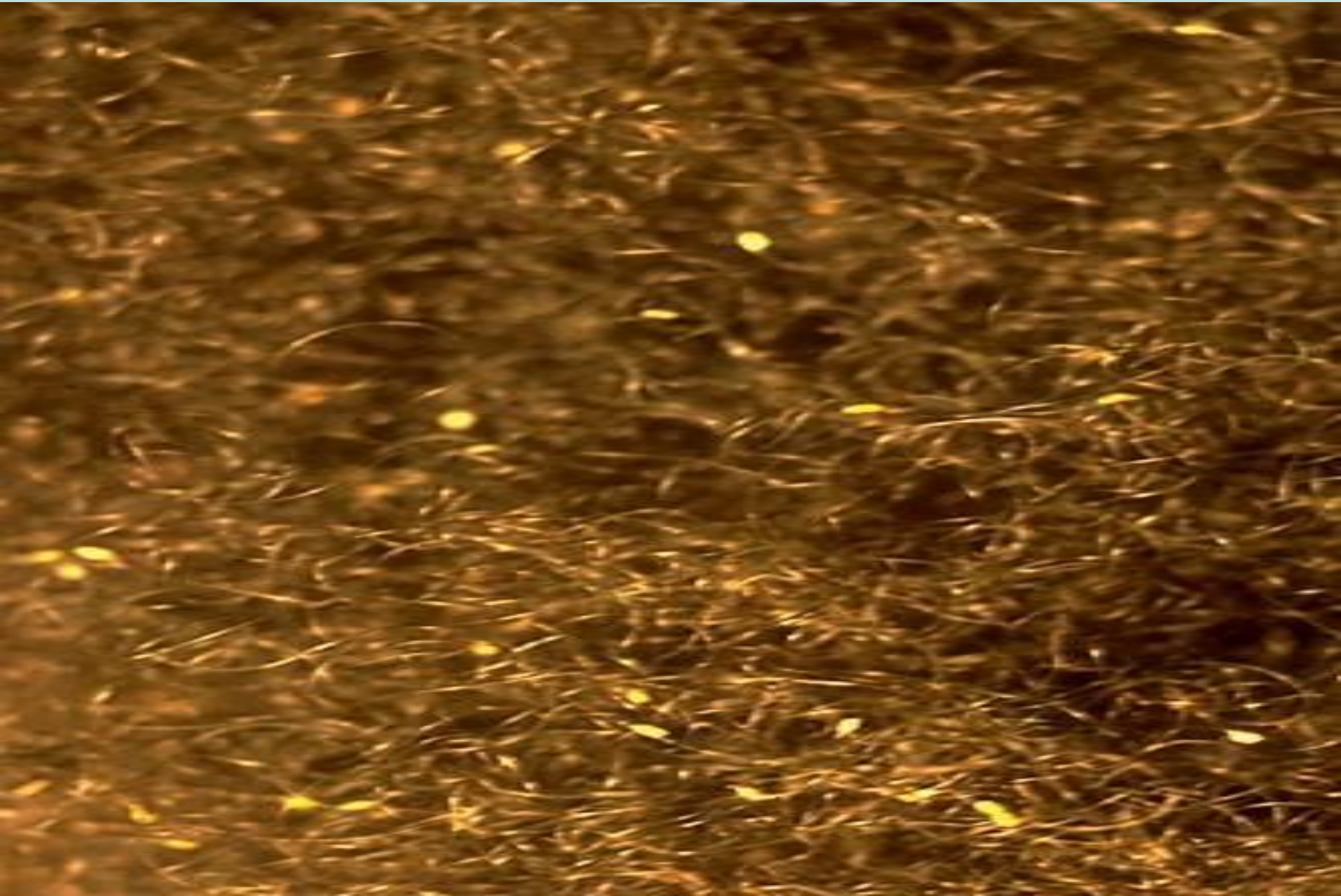
G - nit of the pubis louse



Вши человека:

А—головная вошь (самец); Б—головная вошь (самка); В—гнида головной вши; Г—платяная вошь (самец); Д—гнида платяной вши; Е—лобковая вошь; Ж—гнида лобковой вши; 1—яйцо; 2—крышечка;3—приклеивающее вещество (по Е. Н. Павловскому)

They are nits of the Human head lice



The Human head louse, *Pediculus humanus capitis,* has an elongated body and narrow anterior mouthparts. Human body louse look similar but lay their eggs (nits) on clothing fibers instead of hair fibers.

Aerborne mode of transmission is possible - as in dry feces of the lice rickettsia can survive about 1 year!

The patient without lice is not dangerous for contact , though for him in a blood rickettsia are present!

Susceptibility general !

The case rate is enlarged in January - March

Has no true endemic of the centers (as against other rickettsioses), but more often meets in the countries in the South and North of Africa, central and South America

Wars and the disasters - rise a case rate

Outside of epidemics - the sporadic case rate supports for the endemic illness Brill- Zinsser.

The mortality in cases, nontreated by antibiotics, makes 10 - 60 %!!!

CLINIC

Can proceed typically : as mild, middle-severe, severe and fulminant forms.

But can proceed atypically: as asymptomatically, abortical, the erased forms

Periods of illness:

Incubation - 12 - 14 days (from 6 to 23 days)

Initial (4 - 5 days) - from a beginning of a fever - up to the exanthema

Peak (4 - 10 days)- from an exanthema - up to normal temperature

Convalescence - 2 - 3 weeks

Initial period:

- acute beginning with fast rise of the temperature up to 39-40 d.C
- obstinate headache, myalgia, arthralgia, insomnia

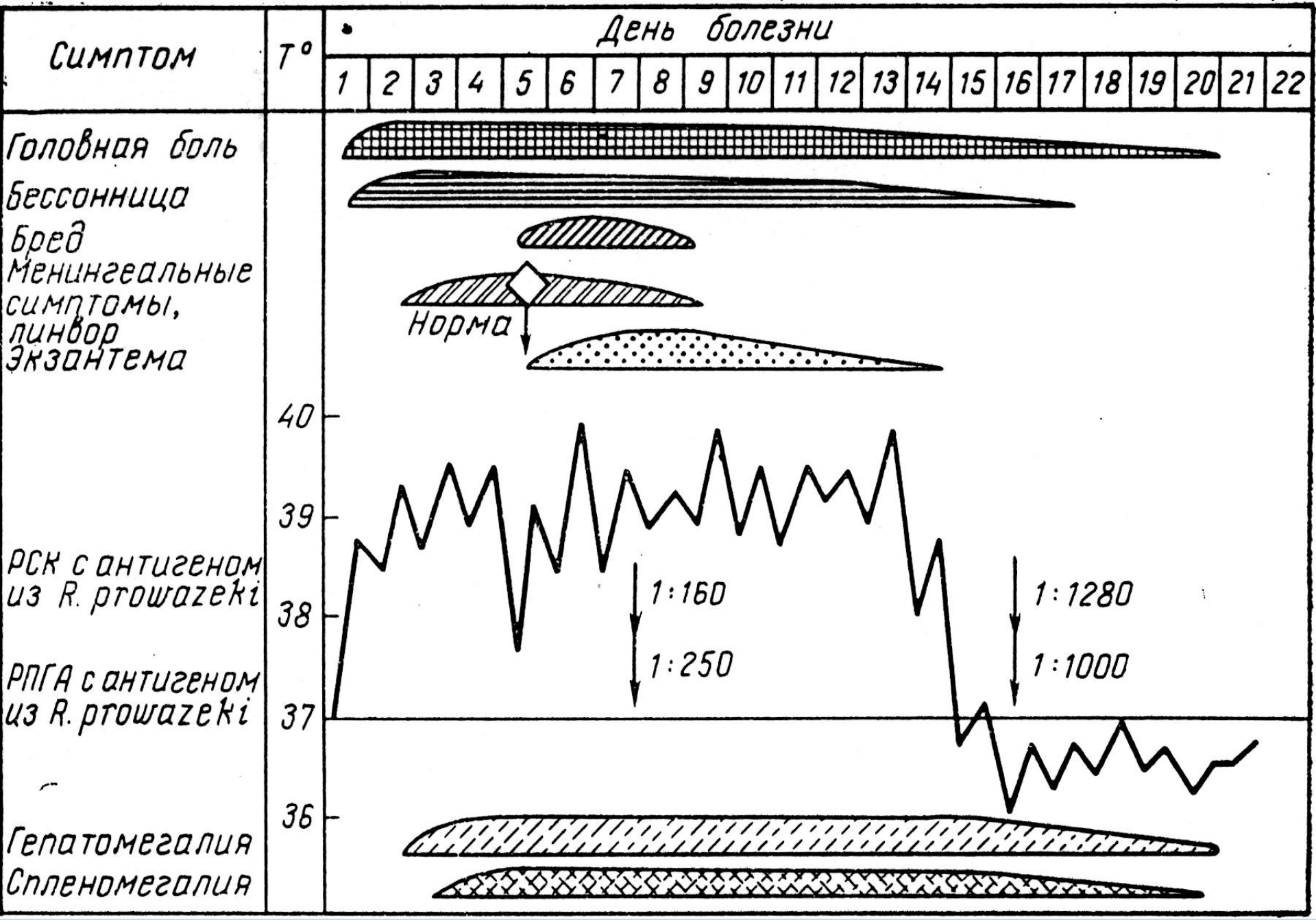
- thirst, anorexia, weakness, giddiness
- common anxiety, euphoria, irritability, the verbiage
- acoustical, visual, tactile hypersensivite

OBJECTIVE:

- the red, edematic face, scleritis – s-m Kjary - Aucyne
- enanthema on a soft palate, tongue – s- m of Rosenberg

- raised fragility of capillaries
- tachycardia (more than 130 -140 in minutes - poor forecast!!)
- dull of cardiac sounds, hypotonia

- tongue dry, impose by white fur
- the temperature curve has of the constant type



Temperature sheet of ill (Epidemic typhus)

PEAK PERIOD of ILLNESS:

- short-term lowering of temperature (on some clocks) for the 4^{th} – 5^{th} days of illness (appearance of the exanthema) and on the 9^{th} – 10^{th} day (disappearance of the exanthema)

- appearance plentiful, roseolous or petechial of the exanthema on a skin of a breast, back, abdomen, thighs, arms. Exanthema appearance only once, does not rise above the level of the skin
- intensifying of the headache and intoxication, transition from a stage of exitation in "the typhous status " (6 - 8 days of illness) with appearance of hallucinations frightening character and development of a psychosis

- tachycardia, arrhythmia, falling B/P (70/40 mm Hg.)

- signs of a meningocephalitis, s- ms: Kerniga, Govorov-Godejae, dysarthria, dysphagia, convulsive seizures - have been revealed. CSF- clear, with normal dynamics and chemical constituens Coma and muscular rigidity may occur.

The lesion peripheral NS – as neuritises, neuralgia, polyradiculoneurites, plexites with subsequent by violation of the trophicity of the tissues as necrosises and ulcers of the skin and the mucous

The lesion ANS (autonomic nervous system) appears by change: hyperemia of the face on his paleness, tachy-cardia on a bradycardia, red dermographism on white etc.

The lesion of kidneys - glomerulonephritis, ischuria paradoxa, involuntary emiction, oliguria, anuria, azotemia (commonly occurs in the sireously or criticaly ill patients)

- May be enlarged of the spleen and the liver (since 4-6 days of illness), but jaundice is unusual, the hypoproteinemia with reduction in the albumin fraction.

- violation in a liver keratin of exchange (appearance icterus only of the skin of palms and soles - s-m of Filippovich)

Respiratory tract:

- rhinites, laryngitises, tracheites, localized pneumonitis.

The fever has of a constant type is replaced on remittent and since 12- 14 days is reduced critically or lytic

STAGE of CONVALESCENCE:

- temperature is normalized during 2 - 3 weeks
- the intoxication and signs of the lesion NS disappears
- the liver and lien diminution
- the hypotension and asthenic syndrome is durably saved
- the mental activity is normalized after all

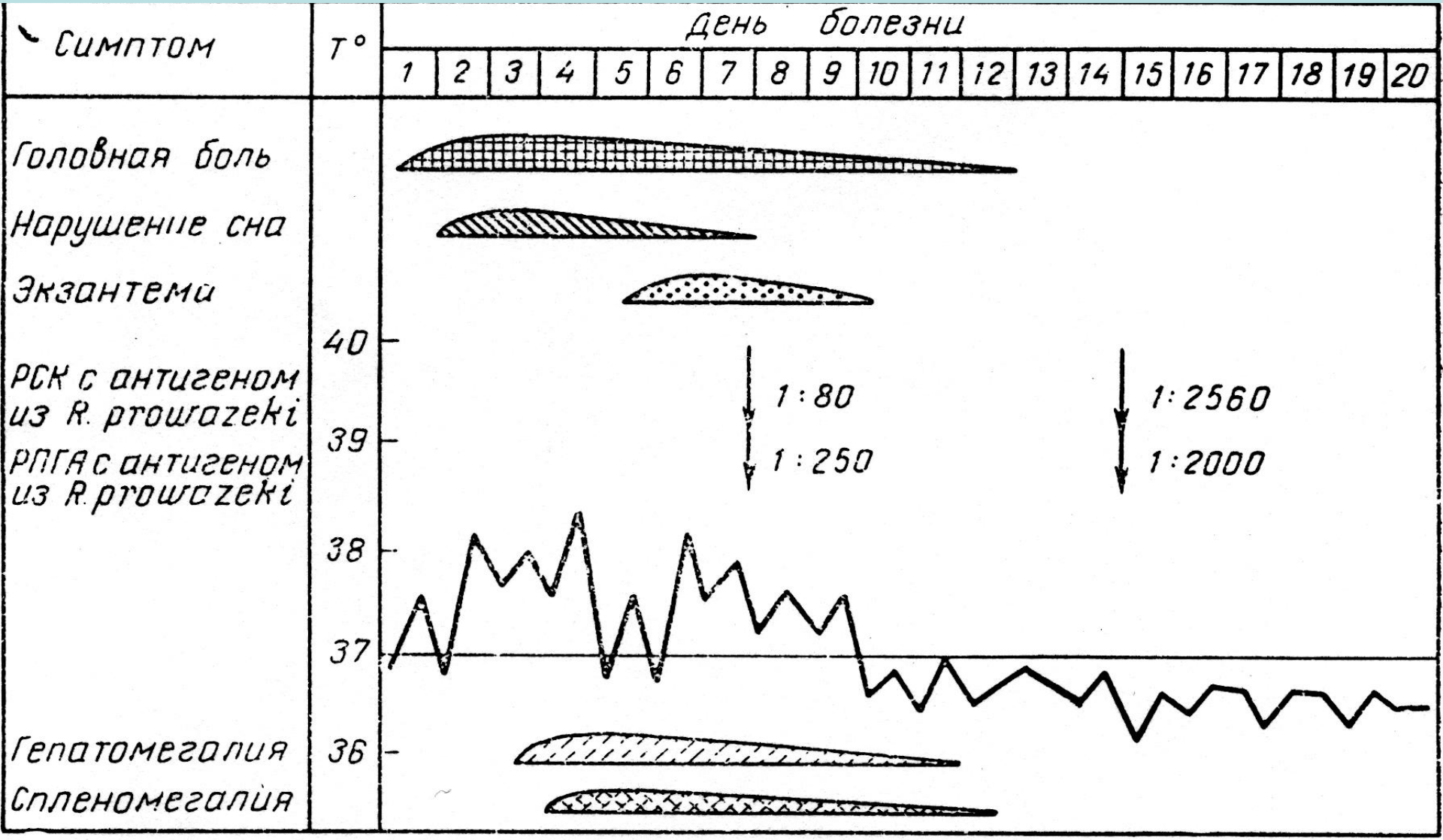
Complications of a louse- born typhus:

- cardiovascular unsufficiency, myocardites, endocardites, myocardiosclerosis
- tromboses, thromboembolism, thrombophlebites
- pneumonia, otites, mumps, stomatites
- decubituses, gangrene of the extremities, phlegmon hypodermic fats etc.

ILLNESS Brill- Zinsser (Recurrent typhus fever)

- the absence of lice in clothes and hair of ill patient
- senior age of the patients, which have transferred earlier louse-born typhus !!
- less expressed fever (in limits 38 - 39 гр. С) and intoxication
- enanthema only for 20 % of the patients
- scanty exanthema for 60 - 90 % of the patients
- Increase of a liver and spleen - nonconstant s-m!!
- damage NS corresponds mild or middle severe forms of the louse-born typhus
- Complication - thromboses of surface veins, pneumonia

Temperature sheet of ill (Endemic typhus - ILLNESS Brill)



Б

Схема температурной кривой и развития основных симптомов у больного эпидемическим сыпным тифом (*А*) и болезнью Брилла—Цинссера (*Б*)

SPECIFIC DIAGNOSIS:

- CFT (+) with 5 -7 days of illness for 40 - 50 % of the patients, but over 2-3 weeks of illness for 100 % diagnostic titer 1:160)
  (In a titer 1:10 - 1:20 many years can be saved!!

- HAT (+) with 5-7 days for the majority of the patients, and about 2 weeks for 100 % (diagnostic titer 1:40 - 1:80)
- PHAT(+) with 3 - 4 days of illness (diagnostic titer 1:1000 1:2000)

- IFA - at a louse-born typhus at once occur in a blood IgM, and at Brill in a blood it are found out IgG and IgM, and the titer CFT raises up to considerable values (1: 10240)

- Weil-Felix reaction with an antigene Proteus OX-19, but it occurs only since the second week, gives a decussation of response with other rickettsioses.

DIFFERENTIAL DIAGNOSIS:

In initial period - influenza and ARVD, pneumonia, meningacoccal infection, hemorrhagic fevers

In peak of disease - other typhoids and rickettsioses, measles, ornithosis, mononucleosis, sepsis, trichinosis, canicola fever, a phlebotomus fever, medicinal Illness, lues

TREATMENT:

Hospitalization after a disinfestation (except for Brill)

Diet, bed rest regimen, maintenance behind a skin and mucous

Anti-infectious therapy- the primary drugs:

tetracyclini	5 - 8 mg/kg	PO in q6h
doxycyclini	1,5 mg/kg	PO in q12h
metacyclini	4 - 8 mg/kg	PO in q12h
oletetrini	5 – 8 mg/kg	PO in q4h

The alternative drugs –laevomycetin, erythromicin, ciprofloxacin, rifampicin but they are less effective!!

Duration of treatment - all period of a fever + 2 - 3 days!

- Desintoxication
- Antiferment drugs
- Anticoagulants
- Antioxidants
- Glucocorticoids
- Cardiac glycosides, antipyretics
- Sedative etc.

PROPHYLAXIS:

- Isolation both disinfestation of the patient and his clothes
- Overseeing by the center 71 days (at Brill 25 days)
- Revealing and hospitalization in the center all patients with the fever by duration more than 5 days
- Vaccination under the special indications (dry « chemical» a vaccine in a dose 0,5 mls)

THE MARSEILLES FEVER

(Mediterranean fever, African tick typhus, spotty fever) :

Acute transmissible disease with good-quality current appearing by a primary dermal affect, by regional the lymphadenitis and by the maculopapular eruption

The infectious agent - R. conori

Carrier and source – dog tick (Rhipicephalus sanguineus) with transphase and transovarial transmission of the infectious agent

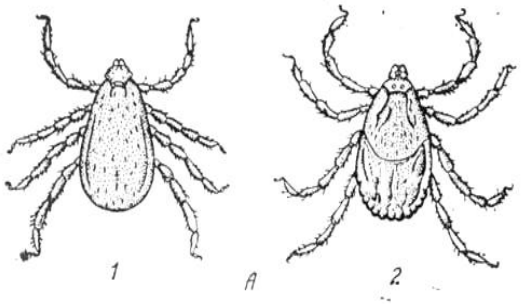
The mechanism of infection - sting tick or rubbing in of its hemolymph through broken of a skin or mucosas

Season uprise - May - October
Susceptibility - general, more often meets in seaside cities of the Black and Mediterranean seas

Clinic

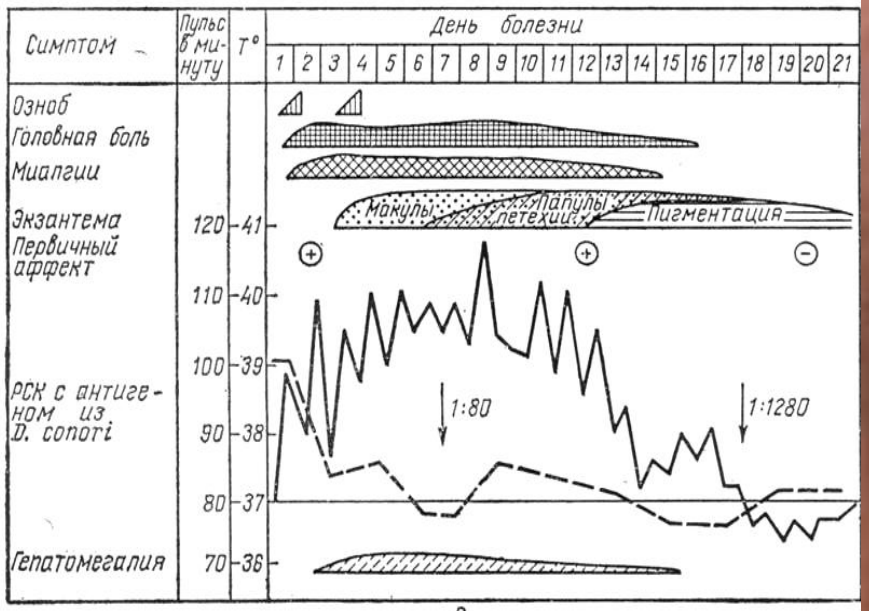
- incubation interval 3 - 7 days
- Acute beginning with chill and fever 38 - 39 d.C
- Strong headache, but meningocephalitis and the typhous status does not develop
- Arthralgia and myalgia, insomnia, weakness
- Appearance of a primary affect from 3 to 10 mm with necrosis and crust in a place of a sting tick, (but without subjective sensations)- prior to a fever 5-7 days!!!

- regional lymphadenitis and maculopapular eruption on to all body and palms and soles with 2 - 4 days for 100 % the patients!!!



Марсельская лихорадка.

А — Rhipicephalus sanquineus: самец (*1*) и самка (*2*) (по Б. И. Померанцеву и М. В. Поспеловой-Штром); *Б* — локализация сыпи на коже больной: под лопаткой справа виден первичный аффект (по К. В. Бунину); *В* — схема температурной кривой и развития основных симптомов у больного марсельской лихорадкой.



- Increase of a liver and spleen
- Extension of boundaries of heart, dull of its tones, bradycardia
- Leukopenia, lymphomonocytosis, rise moderate ESR

Complications - thrombophlebites, bronchites, broncho-pneumonias is (rare)

Laboratory diagnosis –CFT with 5 - 7 days of illness in titer (1:46 - 1:60) or PHAT in titer (1:800 - 1:3200)

Treatment - as at the mild forms of a louse-born typhus

Prophylaxis – antitick processing of dogs

- disinfestation in the centers and microcenters (box dog)
- isolation of vagrant dogs
- preventing an attack ticks on the people!!!

FEVER Q (Q- fever)

Zoonotic rickettsiosis with acute good-quality current, fever, intoxication and polymorphism of clinical manifestations.

The infectious agent - **Coxiella burnetii-** is well saved in the external environment: at 4 (+) d.C survives about one year, in meat - more than month, warming up to 90 гр. C maintain about one hour, but at boiling perishes in 10 minutes.

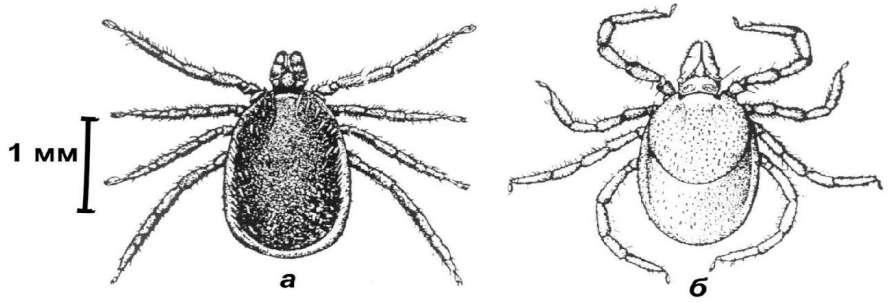
The source - numerous animals and birds, infected which reaches from 10 up to 33 %!!

Ways of transmission - aerogenic, contact, nutritional and transmissible (70 sorts of ticks)

The infectious agent circulates in natural and urban the centers

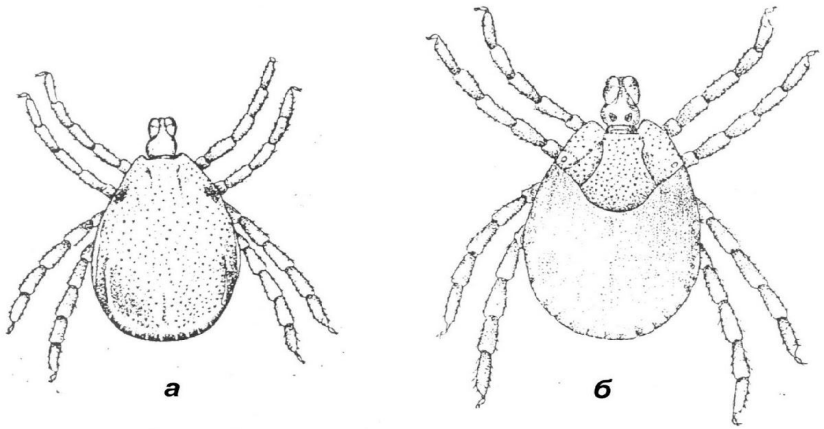
Dermacentor pictus, самец:

а- вид со спинной стороны; б- вид с брюшной стороны (по Б. И. Померанцеву)



Ixodes ricinus:

а- самец, б- самка (по Б. И. Померанцеву)



***Hyalomma plumbeum.* Вид со спинной стороны:**

а- самец, б- самка (по Г, С. Первомайскому)

Ixodes ricinus

Susceptibility general, but a cattle-breeders are sick in spring-year's period (lambing, superactivity ticks) more

Incubation interval 12 - 19 days (3 - 32 days)

The clinical forms of disease:

- **Acute** for 75 - 80 % of the patients, (duration 2 - 3 weeks),
- **Subacute** for 15 - 20 % of the patients (more than 4 weeks)
- **Chronic** for 2-5 % of the patients (about one year),

Initial period of disease:

- Acute beginning, ferver up to 39 – 40 d.C, headache, weakness, sweating, anorexia
- Arthralgia, myalgia, pain in all body
- The fever can be remittent, continued, intermittent duration up to 2 weeks with lowering for the type **crisis - lisis**

Peak of illness:

- All manifestations of illness amplify, can be encephalitis with delirium and hallucinations
- Maculo-papular eruption for 6-8 days for 3- 4 % the patients
- Bradycardia or tachycardia, dull cardiac sounds
- The pneumonias for 12 % (are more often on the right) tracheitis, bronchitis
- hepatolienmegaly for 65 - 85 % of the patients
- Duration of illness 10 - 13 days
- The relapses arise for 3 - 7 % of the patients, no more than 3 times!!
- Diagnostics - CFT (diagnostic titer 1:8 - 1:16)
- Treatment as at a exantomatic typhus
- Prophylaxis - common sanitary measures, vaccination on epidemiological indication

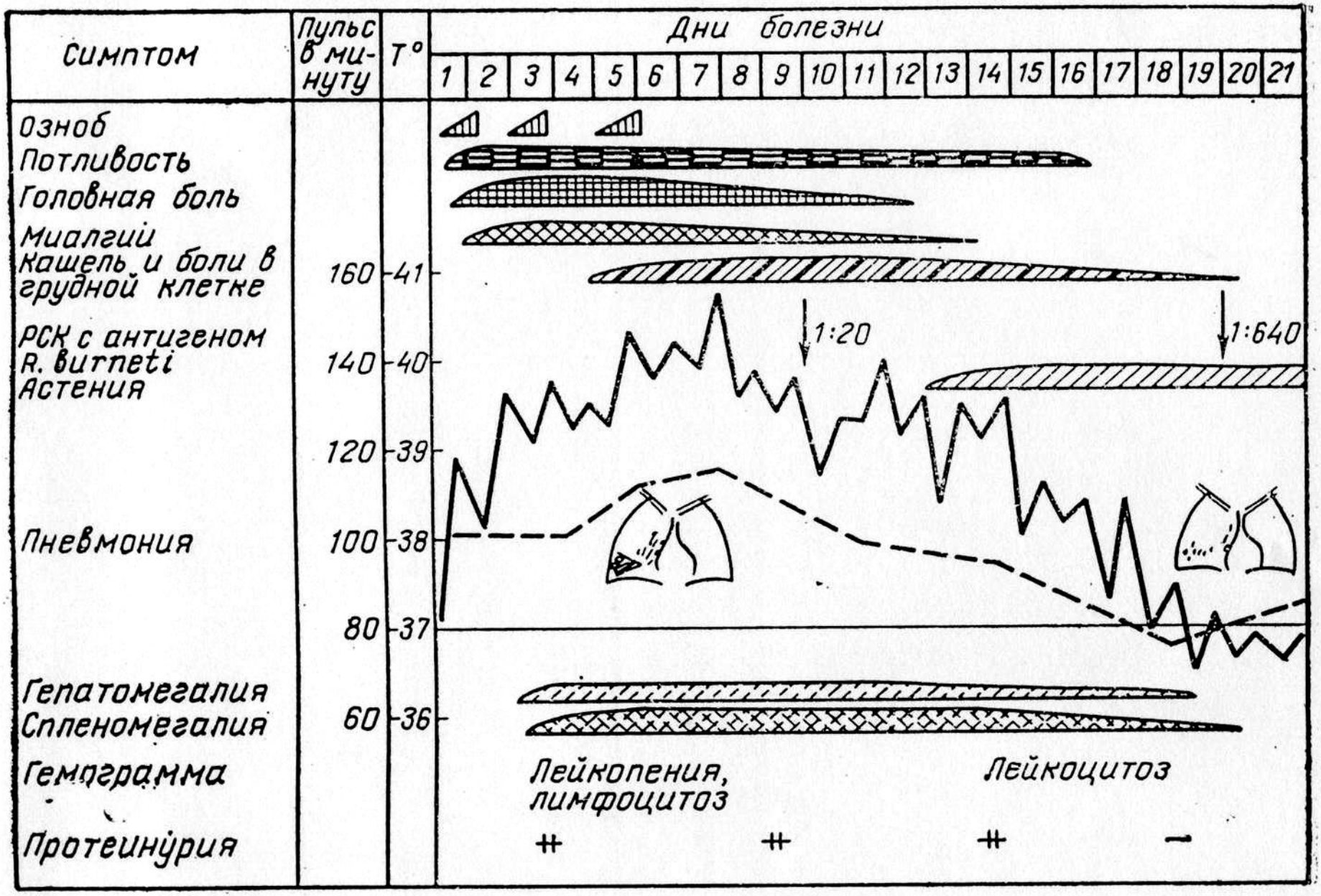


Схема температурной кривой и развития основных симптомов у больного лихорадкой Ку.

SCRUB TYPHUS

dentification. Acute zoonotic rickettsiosis described by the high fever, the intoxication, formation of primary affect in the place of introduction of the infected mite, occurrence spotty–papular exanthema, general panvasculitis, interfering activity CN and cardiovascular systems. For the first time it is described in 1810 in Japan.

The endemic countries : Japan, Korea, China, Burma, Vietnam, New Guinea, Australia, Sri Lanka, Malaysia, Pakistan, Tadjikistan, the Far East Russia.

The infectious agent - Rikettsia tsutsugamushi (orientalis).

Epidemiology

- the natural reservoir- rodents (mice, rats, hares, etc.) and them ectoparasites (mites of family Trimbiculidae)

Mode of transmission- only infected larvae mites. Adult mites and nymphs - do not feed on the vertebrate hosts

Susceptibility high in all age groups, but the agricultural workers and visitors is more often are ill. Biotype of the centers are valleys of the rivers

Seasonal prevalence depends on climatic conditions, but always coincides with a maximum of number infected larvae mites.

Vector rickettsia tsutsugamushi - Trombiculid mite

Pathogenesis and Pathomorphology:

- the primary affect is formed on the skin in a place of introduction of the agent. The specific intoxication leads to to damage of a fine vascular network as panvasculitis as well as at the typhus but less expressed.
- at pathomorphologic research attributes myocarditis, glomerulonephritis, interstitial pneumonias, meningo-encephalitis, hemorrhagic a syndrome are found out

Clinic

incubation period from 7 to 20 days (on the average 10 - 12 days)

Disease begins abrupt:

- fever, myalgia, intensive headache, insomnia
- the temperature to the 3th - to the 4^{th} day reaches 39- 40 dg.C. It is kept 14-16 days (sometimes 3 weeks and more) and comes to the end accelerated lysis

Objectively:

- hyperemia and edema of the face, conjuctival injection, profuse sweating, relative bradycardia
- primary affect on the skin of a trunk or extremities as: macula of 0,3- 2 sm > vesicula > ulcer > black scab + regional lymphadenitis

- macular rash on the skin about 5^{th} -8^{th} day of illness (the breast, abdomen, extremities (except for palms and soles) In some days turns in maculo-papular and disappears

- the period of occurrence of the rash is accompanied by amplification of the intoxication - intensive headache, insomnia, delirium, hyperkinesis, meningeal syndrome.

CV system - hypotonia, tachycardia, expansion of borders of heart and dullness of its tones, pancarditis (less often)

Lungs- bronchites, the **interstitial pneumonia**

Moderate splenomegaly

Kidney - attributes of "toxic kidney" or glomerulonephritis

The general analysis of blood – has **nonspecific** changes

Variants of current – from severe (**in Japan** and among **visitors** in endemic areas) - to easy and erased

Lethality - without antibiotic therapy from **1 %** (islands Peskadorskie) up to **60 %** (Japan and Taiwan)

Complications: myocarditis, meningoencephalitis, glomerulonephritis acute cardiovascular insufficiency

Diagnosis:

- Luminescent method and biological (infection of mice)

- HA with antigene Proteus OXK about 2-nd weeks of disease
- Complement-fixation test
- Specific diagnosis is complicated because of an antigenic variety strains the infectious agent
- Differential diagnosis - others rikettsiosises, a fever dengue, medicinal and infectious erythema

Treatment - as at a typhus

Preventive maintenance:

- processing place in endemic areas acariasides
- carrying of special clothes
- use of mite repellents

Active immunization by the weakened vaccines (seldom) - no currently available vaccine is effective

The isolation, the current disinfection, quarantine, immunization and inspection contact are not carried out

Clinic of a epidemic typhus (H. Fracastoro, 1546 г)

… At first illness is expressed weakly, … but soon there are malignant signs, because, though the high temperature on a nature of these fevers and is not felt by the patient, some is noted inside disorder, breakdown in all body, as at fatigue.

Decubituses on a back, the head grow heavy, sensivity is killed also consciousness, more by a part, after 4-7 days is blacked out, the patient speaks many words (delirates)

The eyes have reddened. Pulse infrequent and weak. The urine, is usual in the beginning paleish, but dense, then soon becomes reddish and turbid, similar on pomegranate wine. A feces corrupt, mephitic.

About 4 - 7 days on arms back and breast break out red, frequently and purple spots, similar to stings fleas, quite often and greater size reminding lentil.

Sleepiness, sometimes insomnia, sometimes alternately that and another sometimes prevails. The similar state keeps in other cases about 7 days, in others up to 14, in others and is longer

Sometimes there is an ischuria, that is very poor sign ….

queensland tick typhus

rickettsia tsutsugamushi

Ixodes ricinus

Rocky mountain wood tick

Rocky mountain wood tick, rocky mountain spotted fever

The head louse, *Pediculus humanus capitis,* has an elongated body and narrow anterior mouthparts. Body lice look similar but lay their eggs (nits) on clothing fibers instead of hair fibers.