



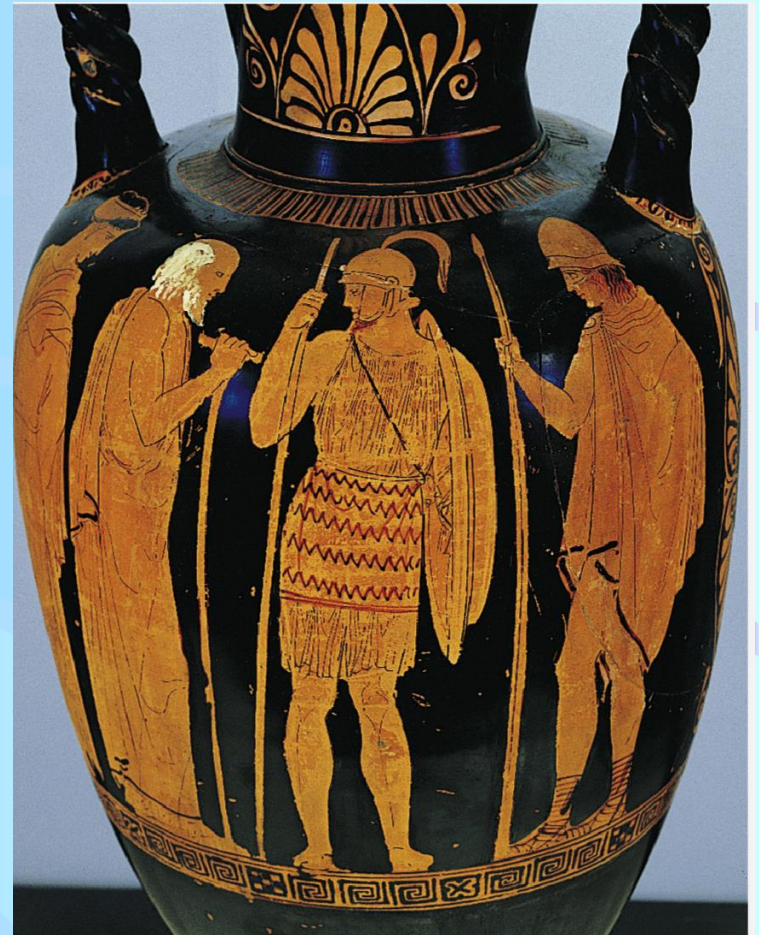
MEDICAL UNIVERSITY – PLEVEN
FACULTY OF MEDICINE
**DEPARTMENT OF INFECTIOUS DISEASES, EPIDEMIOLOGY,
PARASITOLOGY AND TROPICAL MEDICINE**

Lecture № 1

**INFECTION,
INFECTIOUS PROCESS,
INFECTIOUS DISEASE**

Assoc. Prof. Galya Gancheva, MD, PhD

In ancient centuries (2 300 y. B. C.)



Here this firebrand, rabid Hector, leads the charge.
Homer, *The Iliad*,

In contemporary time



**15-years old girl after successfully treated rabies,
appeared by bat bating**

2001 – *letters contaminated with anthrax spores*

BREAKING NEWS



(AP PHOTO)

Police officers gather outside the New York Times offices Friday as they investigate a letter containing a powdery substance sent to a reporter.

Anthrax confirmed in NYC

- Ashcroft to public: Do not open suspicious mail; instead, leave area and call authorities
- NBC employee tests positive for skin anthrax infection; expected to recover
- FBI says it has no evidence of connection between New York and Florida cases
- Health secretary: 'No proof whatsoever' of link to terrorism
- Anthrax found in Kazakhstan lab in routine U.S. Defense Department inspection

Six D.C. postal workers treated for suspected anthrax

October 24, 2001 Posted: 12:16 p.m. EDT (1616 GMT)



(AP PHOTO)

James Manley, press secretary for Sen. Edward Kennedy, arrives at work on Capitol Hill at the Russell Senate office building, which reopened Wednesday after being shut down for a search for anthrax contamination.

(CNN) -- Six U.S. Postal Service employees of the Brentwood mail processing center, the same Washington facility where two workers died of anthrax earlier this week, were being treated at area hospitals Wednesday for suspected anthrax, hospital officials said.

The patients' complaints included respiratory problems and flu-like symptoms. They were being treated with the antibiotic ciprofloxacin, hospital officials said. Results from anthrax tests on the six workers were expected over the next few days. ([Full story](#))

Ernesto Blanco, a Florida man who was diagnosed with inhalation anthrax on October 15, was released from a Miami hospital, his family said Wednesday. He

The dispersion of 50 kg anthrax spores upon area with population of 5 million people would lead to 100 hundreds deaths. In 2001 in USA had 11 cases of respiratory anthrax, 5 of them with lethal outcome.

2001 – *letters contaminated with anthrax spores*

Anthrax found at offsite White House mail facility

October 23, 2001 Posted: 10:08 PM EDT (0208 GMT)



"I don't have anthrax," President Bush said Tuesday.

WASHINGTON (CNN) -- President Bush said Tuesday he is "confident when I come to work tomorrow that I'll be safe," despite the detection of anthrax at an offsite mail facility that screens White House mail.

Asked by reporters whether he had been tested for anthrax and whether he was taking antibiotics, Bush said only, "I don't have anthrax."

"Our government is responding very quickly. We're working hard to find out who's doing this and bring them to justice. We're also working to develop measures necessary to protect American citizens and postal workers,"

he said.

[SAVE THIS](#) [EMAIL THIS](#)
[PRINT THIS](#) [MOST POPULAR](#)

Anthrax confirmed in elderly Connecticut patient

November 21, 2001 Posted: 7:08 AM EST (1208 GMT)



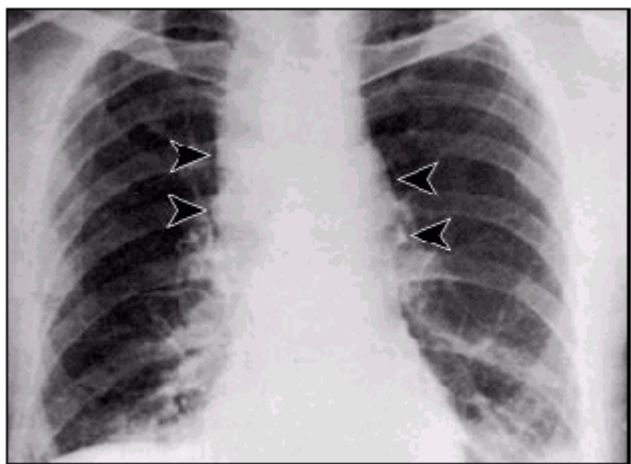
Emergency workers stand outside the ill woman's house in Oxford, Connecticut.

OXFORD, Connecticut (CNN) -- A 94-year-old woman who lives alone in a small Connecticut town is in critical condition with inhalation anthrax, according to Gov. John Rowland and a spokeswoman at the hospital where the woman is being treated.

The woman had limited activity, didn't travel much and had no apparent connection with U.S. Postal Service or government facilities, which are tied to most of the previous anthrax cases, Rowland said at a news conference Tuesday. He described the anthrax case as an "anomaly."

[SAVE THIS](#) [EMAIL THIS](#)
[PRINT THIS](#) [MOST POPULAR](#)

*Respiratory anthrax – widened mediastinum
and pleural effusion on X-ray*



INFECTION

- **Definition:**
- **Historically based**
- **complex biological interrelation**
- **between microorganisms (agents) and hosts (human)**
- **under environmental impact.**

FORMS OF INFECTIONS

- **Manifested** – with clinical manifestations and changes in laboratory parameters at interrelation between agents and hosts.
- **Asymptomatic (inapparent)** – without clinical manifestations and changes in laboratory parameters. Only immune response presents.
Examples: acute viral hepatitis A, B, C, poliomyelitis, other enteroviral infections, rubella, hemorrhagic fevers etc.

FORMS OF INFECTIONS

- **Latent** – after primary infection agent enters into the cells and multiplies (replicates) without provocation of clinical, laboratory and immunological changes. When unfavorable for human impact appears, agent activates in latent foci and provoke unique disease.

Examples: Herpes simplex, Varicella-zoster, Cytomegalovirus infections, Tuberculosis, Typhoid fever etc.

FORMS OF INFECTIONS

- “Sleepy” – agent enters into the human body but **does not multiply and does not provoke any changes.**

Example: Tetanus.

- **Slow (persistent)** – the genome of agent integrates into the genome of host cells and multiplies simultaneously. Months or years later appears characteristic disease.

Examples: Subacute sclerosing panencephalitis, spongious encephalopathy, curu, some neoplasms.

*“Opisthotonus” – by Sir Charles Bell
(1809)*



Neonatal tetanus – generalized muscles' rigidity



FORMS OF INFECTIONS

- **Coinfection**
- **Superinfection**
- **Endogenous**
- **Opportunistic**
- **Nosocomial**

INFECTIOUS PROCESS

- **Definition –**
- **all** dynamically appeared immunological, pathophysiological, clinical manifestations in the host
- from contamination with agent to the full recovery.
- That process is complex and variable. The variability of infectious process provokes different forms of infection (seen above).

INFECTIOUS PROCESS

- **Types –**
- **First type – focal**
- **Second type – intermediate (interstitial)**
- **Third type – generalized**

INFECTIOUS PROCESS:

Role of participants – agents:

- **First group agents – pathogenic agents:**
 - ❖ pathogenecity and virulence, infective dose of agent, portal of entry;
 - ❖ adaptive mechanisms – spores, capsules, movements;
 - ❖ enzymes – streptokinase, hyaluronidase, neuraminidase, haemolysins, fibrinolysins etc.
 - ❖ exotoxins – against concrete systems – central and vegetative nervous system, cardiovascular, renal, adrenal, endocrine etc.
 - ❖ endotoxins – general intoxication, disturbance in thermoregulation, inflammatory reaction, endotoxic shock, disseminated intravascular coagulation (DIK).

Examples: Staphylococci, Streptococci, Gram negative diplococci, Diphtheroides, Actinomyces

INFECTIOUS PROCESS:

Role of participants – agents:

- **Second group agents – resident agents:**
 - ❖ Normally exist in the human body;
 - ❖ relative adaptation;
 - ❖ antagonism between the resident and the pathogenic microorganisms exists;
 - ❖ slowly multiplying – 1-2 times for 24 hours (the pathogenic microorganisms – for 30 minutes);
 - ❖ they grow in 37 °C;
 - ❖ cause minimal immune reaction.

Examples: Non fermentative, Gram negative enteral bacteria, Bacteroides, Vibrio, Fusiform bacteria, Spirochaeta, Saccharomyces

INFECTIOUS PROCESS:

Role of participants – agents:

- **Third group agents – opportunistic:**
 - ❖ Exist in the environment
 - ❖ Cause pathologic processes in immunocompromised organisms
 - ❖ Their contact with macroorganism is incidental.
 - ❖ The incidence of opportunistic infectious increases.

Examples: Aeromonas, Pseudomonas, Alcaligenes, Sarcina, Arizona, Seratia, Sporogenic aerobic bacilli, Aspergillus, Hafnia, Vibrio, Chromobacter, Legionella, Citrobacter, Nocardia, Pasteurella

INFECTIOUS PROCESS:

Role of participants – agents:

- **Fourth group agents – viruses:**
 - ❖ RNA-viruses – RNA-polymerase activity
 - ❖ DNA-viruses – DNA-polymerase activity
 - ❖ Retroviruses – reversible transcriptase
- Infectious properties of the viruses depend of:
 - ❖ nucleic acids
 - ❖ nucleocapside
 - ❖ enzymes.

INFECTIOUS PROCESS:

Role of participants – host:

- The host possesses natural resistance, provided by:
 - ❖ Cell-mediated immune response – provided by T-lymphocytes (each T-Ly makes complete tour of the human body within 24 hours) and genetically encoded specific for each antigen receptors – specific immune response.
 - ❖ Humoral immune response:
 - ❖ *Immunoglobulin M (IgM)* – marker for current or recent infection – most often against Gram-negative agents – isoagglutinins, leucoagglutinins, antinuclear opsonising, cytotoxic, complement fixing antibodies, Rheumafactor, properdins, macroglobulins.
 - ❖ *Immunoglobulin G (IgG)* – classical antibacterial and antiviral antibodies – marker for past infection.
 - ❖ *Immunoglobulin A (IgA)* – secretory component in gastrointestinal tract and respiratory system (realizes local cell immunity) and serum component.
 - ❖ *Immunoglobulin D (IgD)* – increased synthesis in autoimmune diseases and myeloma.
 - ❖ *Immunoglobulin E (IgE)* – in allergic diseases.

INFECTIOUS PROCESS:

Role of environmental factors:

- Sudden changes in the climate
- ultra-violet rays
- radiation
- intensive physical work
- incorrect and poor feeding – especially protein deficit.

INFECTIOUS PROCESS

depends of:

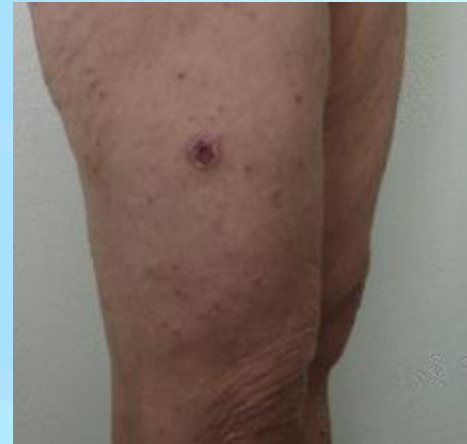
- **Portal of entry and transmission of infection**

Portal of entry – place of penetration – adaptation of the agent in the host.

Tropism – preferable site of penetration:

- ❖ Neurotropism
- ❖ Pneumotropism
- ❖ Pantropism
- ❖ **Primary affect** – pathognomonical sign (specific, very suggestive for diagnosis) for concrete disease – e.g. “tache noire” (“**black spot**”) in boutonneuse fever (Mediterranean Spotted Fever)

*“Tache noire” (“black spot”) in
boutonneuse fever*



INFECTIOUS PROCESS

depends of:

- **Routs of penetration:**
 - ❖ skin and mucous membranes
 - ❖ transmissible – blood transmission
 - ❖ lympho-haematogenic
 - ❖ neural

INFECTIOUS DISEASE

- **Definition – Infections disease is a nosologically determined infectious process that has:**
 - ❖ Unique etiological agent
 - ❖ Characteristic incubation period
 - ❖ Periodic and cyclic evolution
 - ❖ Creating of specific immunity
 - ❖ Contagiousness.

Exceptions:

- The erysipelas (infectious disease) is caused by β -hemolytic streptococcus. The same agent causes scarlet fever (infectious disease), tonsillitis, otitis, pneumonia (non infectious diseases).
- In subclinical forms there are not periods.
- Some of infectious diseases are not infective (it does not transmit from human to human) – e.g. tetanus, botulism, leptospirosis, rickettsioses.
- Some diseases of the throat, respiratory tract, urinary tract, that are caused by different agents, are infective but are not infectious diseases.

INFECTIOUS DISEASE – periods:

- **Incubation period** – without symptoms
- **Prodromal** – is not of obligation
- **Period of manifested clinical symptoms** – three stages:
 - ❖ First – increasing of symptoms
 - ❖ Second – plateau
 - ❖ Third – decreasing of symptoms
- **Convalescent period**
- **Residual period.**

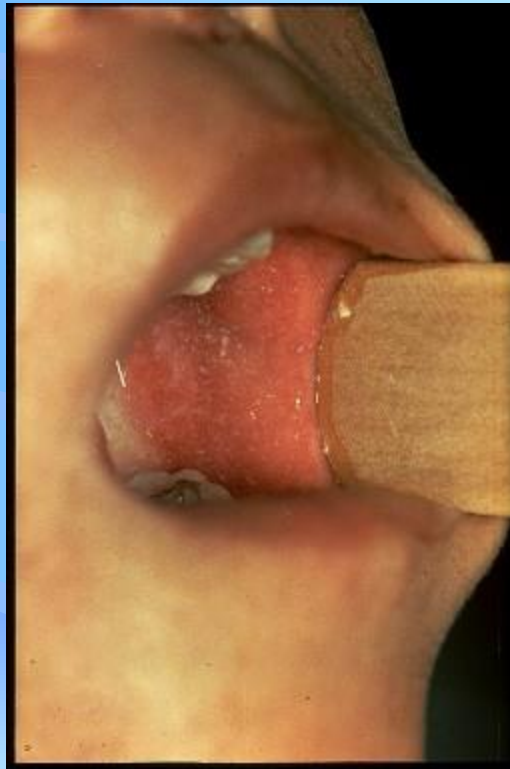
INFECTIOUS DISEASE – incubation period:

- **The time from penetration of the agent into human to appearing of first symptom/ s.** There are not clinical signs but between agent and host have relations that provoke changes in both.
- **The agent** is adapting into the host, multiplies, produces toxic substances, gets over the barriers of host defense.
- **The host** mobilizes all specific and non specific mechanisms of defense following by changes in the blood – number and type of the blood cells, biochemical profile, activates phagocytosis, appear antibodies etc.
- The incubation period varies in different cases – there are **minimal, moderate (most often) and maximal**. The variability depends of different serotype, different virulence, infective dose, portal of entry, host immunity etc.

INFECTIOUS DISEASE – prodromal period:

- It is not of obligation.
- Includes non specific symptoms – weakness, fatigue, mild shivering, headache, myalgia, arthralgia. The diagnosis is difficult.
- Exclusion: Koplik's spots in measles – patognomonical (very suggestive diagnosis).

Koplik's spots in measles



INFECTIOUS DISEASE – period of manifested clinical symptoms:

- The characteristic for concrete disease symptoms appear. There are **three stages** with different duration:
- **Initial stage** – fast increasing of performance of the symptoms
- **Top stage** – all symptoms exist
- **Last stage** – gradually decreasing of severity to full resolving of the symptoms

INFECTIOUS DISEASE –

period of manifested clinical symptoms:

- **Three groups of symptoms** in this period exist:
- **Symptoms of intoxication** – increased body temperature, headache, weakness, malaise, fatigue, myalgia, arthralgia, nausea, vomiting etc. – non suggestive diagnosis.
- **Major symptoms** – specific for concrete disease – suggestive diagnosis.
- **Pathognomonical symptoms** – unique for concrete disease – greatest diagnostic significance – **Koplik's spots** in measles; **trismus** (“lockjaw” – masseter rigidity) and **risus sardonicus** (increased tone in the orbicularis oris) in tetanus; **erythema migrans** in Lyme borreliosis etc.

Early localized Lyme borreliosis – erythema migrans



*Early localized Lyme borreliosis –
erythema migrans*



Risus sardonicus – tetanus



Risus sardonicus – tetanus



INFECTIOUS DISEASE –

period of manifested clinical symptoms:

- When the physician notices the symptoms it is necessary to group that in syndromes.
- **The syndrome is a group of symptoms with same pathogenesis and characteristic for concrete disease.**
Example: jaundice – yellow color on the sclera, skin, mucous membranes, dark urine, clay colored stool, increased serum bilirubin.
- The syndrome is with great diagnostic significance.

INFECTIOUS DISEASES – syndromes:

- **Syndrome of intoxication**
- **Syndrome of cranial hyperemia and conjunctiva' injection**
- **Soar throat**
- **Rash – exanthema and enanthema**
- **Lymphonodular (lymphadenomegaly)**
- **Hepato(spleno)megaly**

Measles – rash



Mumps (epidemic parotitis)



INFECTIOUS DISEASES – syndromes:

- **Jaundice (Icter)**
- **Gastrointestinal syndrome**
- **Dehydration**
- **Hemorrhagic syndrome**
- **Meningitis**
- **Encephalitis**
- **Paralysis**
- **Acute renal failure**
- **Acute liver failure**
- **Acute respiratory failure**
- **Acute cardiovascular failure**
- **Shock (endotoxic, hypovolemic etc.)**

INFECTIOUS DISEASES – clinical forms:

- **Criteria:**
 - ❖ **Characteristic of clinical manifestations** – typical, atypical, inapparent
 - ❖ **Severity** – mild, moderate, severe, fulminant
 - ❖ **Duration** – acute (up to 45 days), protracted (up to 90 days), subacute (up to 180 days), chronic (more than 180 days)
 - ❖ **Course** – uncomplicated, complicated, with relapse, with relapse
 - ❖ **Outcome** – full recovery, chronification, residual sequelae, death

**THANK YOU
FOR YOUR
ATTENTION!**

