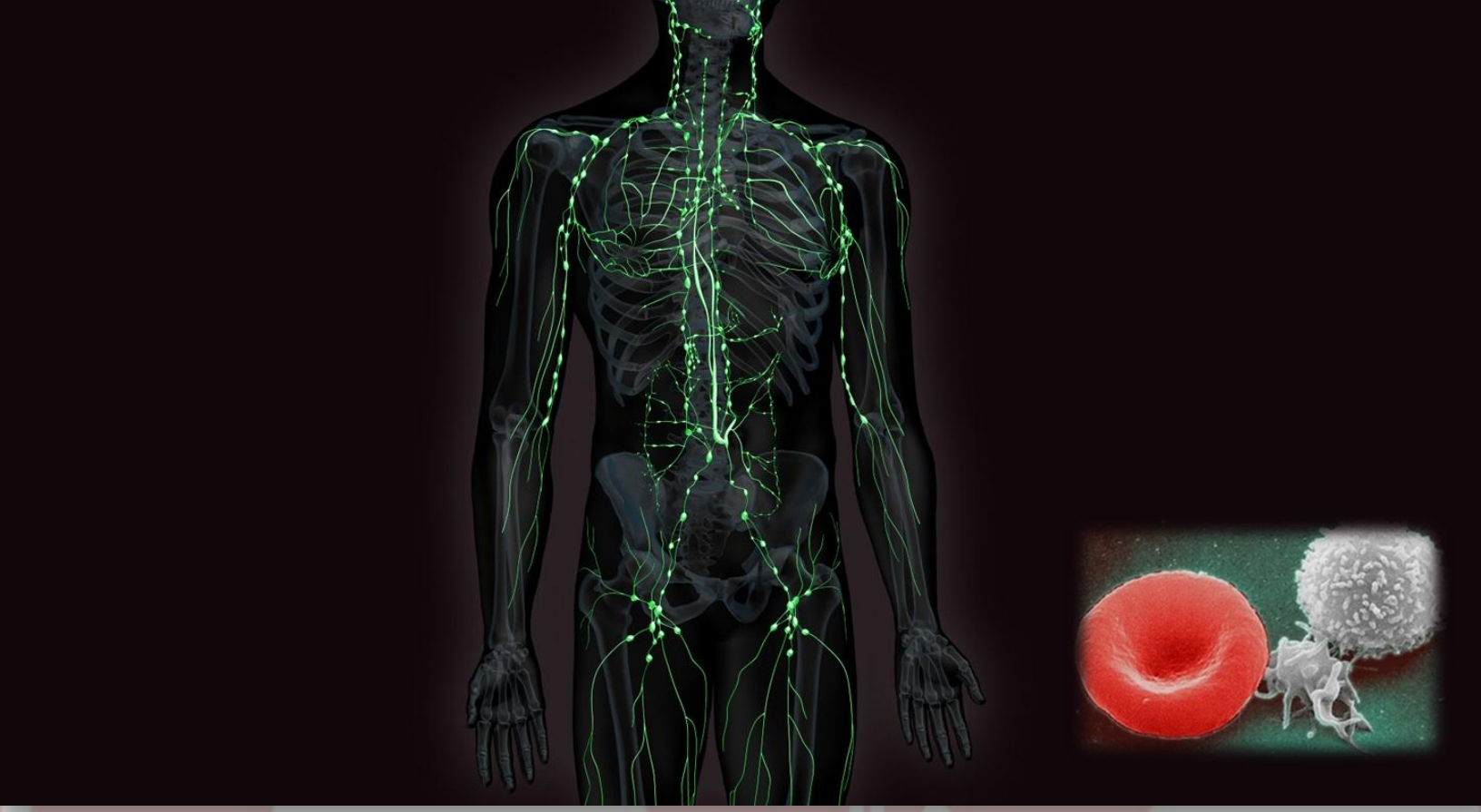


Hemolymphatic system

Microbiology

Lecture 3 part 1: the plague

Done By:

Ali Al-Omari

Yersinia and plague:

General Characteristics:

- The most important species is *Y.pestis* which cause plague
- Gram-negative bacillus with a tendency toward pleomorphism

We say gram –ve so it has endotoxins

- Nonmotile
- Non-spore-forming
- It is a member of the Enterobacteriaceae family

Epidemiology:

- The term plague is often used generically to describe any explosive pandemic disease with high mortality
- Medically, it refers only to infection caused by *Y.pestis*

بشكل عام لما نقول طاعون كلمة طاعون الناس اعتادو يحكوها لأي وباء الو معدل وفاة عالي
بس طبيًا بشكل دقيق الطاعون "أو الطاعون الأسود" هو المرض اللي صار من ورا *Y.pestis* وكان منتشر بكثرة بالعصور الوسطى

- *Y. pestis* was the cause of the most virulent epidemic plague of recorded human history, the Black Death of the Middle Ages

يعتقد انه تقريبا قضى على ثلث البشرية في ذلك الوقت

- Plague is a disease of rodents transmitted by the bite of rat fleas (*Xenopsylla cheopis*)
- It exists in two interrelated epidemiologic cycles:
    1. The sylvatic: endemic transmission among wild rodents

وهاي الcycle هي السبب انه الطاعون ما زال موجود, بكميات قليلة ببعض الrodent الموجودة بالغابات وبالصحرا

    2. The urban: when infected rodents enter a city
- Humans can enter the cycle from the bite of the flea in either environment. However, chances are greater in the urban setting

ولما يوصلو الrodents عالمدن ممكن بمرحلة معينة يصير عنا human to human transmission

- **Transmission can be (مهم):**

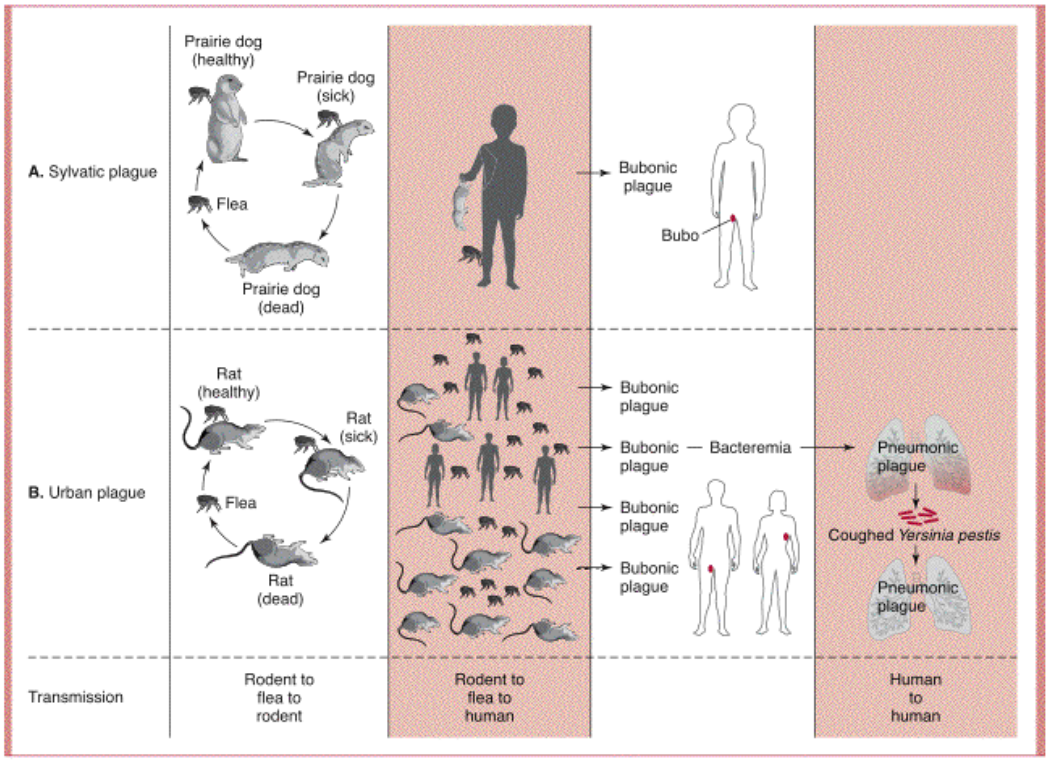
1. Flea to human infection: The bite of the flea is the first event in the development of a case of bubonic plague, which, even if serious enough to kill the patient, is not normally contagious to other humans

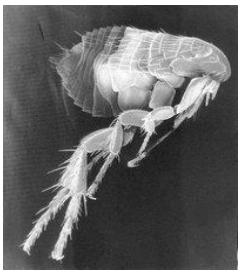
ال bubonic plague هو مرحلة معينة من المرض بكون فيها buboes (انتفاخ بال lymph nodes) بمنطقة ال groin

2. Human to human: Some patients with bubonic plague develop a secondary pneumonia by bacteremic spread to the lungs. This pneumonic plague is highly contagious person-to-person by the respiratory droplet route

ولما نحكي كيف بتنتقل للانسان من الكائنات هاي فبكون اما قرصة من الحشرة او عن عضة من الفار المصاب نفسه

The Epidemiology of Plague





Pathogenesis

- The plague cycle begins when a rat flea feeds on a rodent infected with *Y.pestis*. Bacteria are taken with the blood meal and multiply in the infected flea. Some virulence factors such as the fibrinolysin and phospholipase are produced

- Once injected past the skin barrier by the flea, *Y.pestis* produces a new set of virulence factors as it senses the change from the temperature and ionic environment of the new host

- The organisms eventually reach the regional lymph nodes, where they multiply rapidly and produce a hemorrhagic suppurative lymphadenitis known clinically as the bubo

المصطلح lymphadenitis معناته التهاب الLymph nodes ولما نقول hemorrhagic معناتو في نزيف وهذا بصير من ورا الfibrinolysin اللي عند البكتيريا و لما نقول suppurative يعني في infection, فهو عبارة عن التهاب دموي بكتيري بالعقد اللمفاوية وبالعادة الغدد المفاوية اللي بمنطقة الgroin هي الاكثر تأثُر (bubo) وهاي هي الcore pathology تاعت المرض

- Spread to the bloodstream quickly follows with toxicity due to lipopolysaccharide (LPS) endotoxin
- The bacteremia causes seeding of other organs, most notably the lungs, producing a necrotizing hemorrhagic pneumonia known as pneumonic plague

وهون ممكن يصير عنا person to person infection عن طريق الair droplets

Clinical Manifestations

- The incubation period for bubonic plague is 2 to 7 days after the flea bite
- **Onset is marked by** <u>fever and the painful bubo, usually in the groin or, less often, in the axilla</u>
- Without treatment, 50 to 75% of patients progress to bacteremia and die in Gram-negative septic shock within hours or days of development of the bubo
- About 5% of victims develop pneumonic plague with mucoid, then bloody sputum

Primary Pneumonic Plague

- Has a shorter incubation period (2 to 3 days)
- Begins with only <u>fever, malaise, and a feeling of tightness in the chest</u>

هسا بدنا نعرف معلومة انه اذا انتقلت من person to person ممكن مباشرة تصير pneumonic plague

- Cough, production of sputum, dyspnea, and cyanosis develop later in the course
- Death on the second or third day of illness is common, and there are no survivors without specific therapy
- <u>A terminal cyanosis seen with pneumonic plague is responsible for the term Black Death</u>

- Even today, plague pneumonia is almost always fatal if appropriate treatment is delayed more than a day from the onset

Diagnosis

تشخيصة مش سهل, ليش؟ لانه أي نعم موجود بس نادر حاليًا

الclinical picture تعتبر distinctive لما نحكي عن الbubo بس مش لما نحكي عن الpneumonia, ولما بدنا نفكر ب plague اصلا بنحتاج فحوصات ثانية بناءً على الclinical picture, قاعدين بنحكي عن حالة طاعون احنا مش اشي سهل ☺

ويطلب منك مباشر تبلغ لجنة الأوبئة أو الCDC اذا كنت بأمريكيا بانه عند حالة تشتبه اصابتها بالطاعون وبنعزل المريض عالسريع

- The appropriate specimens are bubo aspirate, blood, and sputum
- Aspirates from the bubo typically reveal Gram-negative bacilli
- An immunofluorescence technique is available in public health laboratories for immediate identification of smears or cultures
- *Y.pestis* is readily isolated on the media used for other members of the Enterobacteriaceae (blood agar, MacConkey agar), although growth may require more than 24 hours of incubation

Treatment

- Streptomycin is the treatment of choice for both bubonic and pneumonic plague. Tetracycline, chloramphenicol, and trimethoprim-sulfamethoxazole are alternatives
- Timely treatment reduces the mortality of bubonic plague below 10%. Of the 31 human cases of plague reported in the United States in 1984, 6 (19%) died

الدكتور ما ركز عليهم ولا قرأهم

Prevention

- Urban plague has been prevented by rat control and general public health measures such as use of insecticides

وهيك احنا قدرنا نتحكم بالurban cycle

- Sylvatic plague is virtually impossible to eliminate because of the size and dispersion of the multiple rodent reservoirs. Disease can be prevented by avoidance of sick or dead rodents and rabbits

وهذا اللي خلانا مستحيل نقضي على المرض بشكل كامل من العالم

- Eradication of fleas on domestic pets, which have been known to transport infected fleas from wild rodents to humans, is recommended in endemic areas

هاي الfleas اللي بتسبب المرض هي نوع من انواع البراغيث, فممكن تصيب الحيوانات المنزلية على شان هيك اللي عنده حيوان منزلي ضروري يدير باله من موضوع بالبراغيث

- The continued presence of fully virulent plague in its sylvatic cycle poses a risk of extension to the urban cycle and epidemic disease in the event of major disaster or social breakdown
- Chemoprophylaxis with tetracycline is recommended for those who have had close contact with pneumonic plague