

ANTHRAX

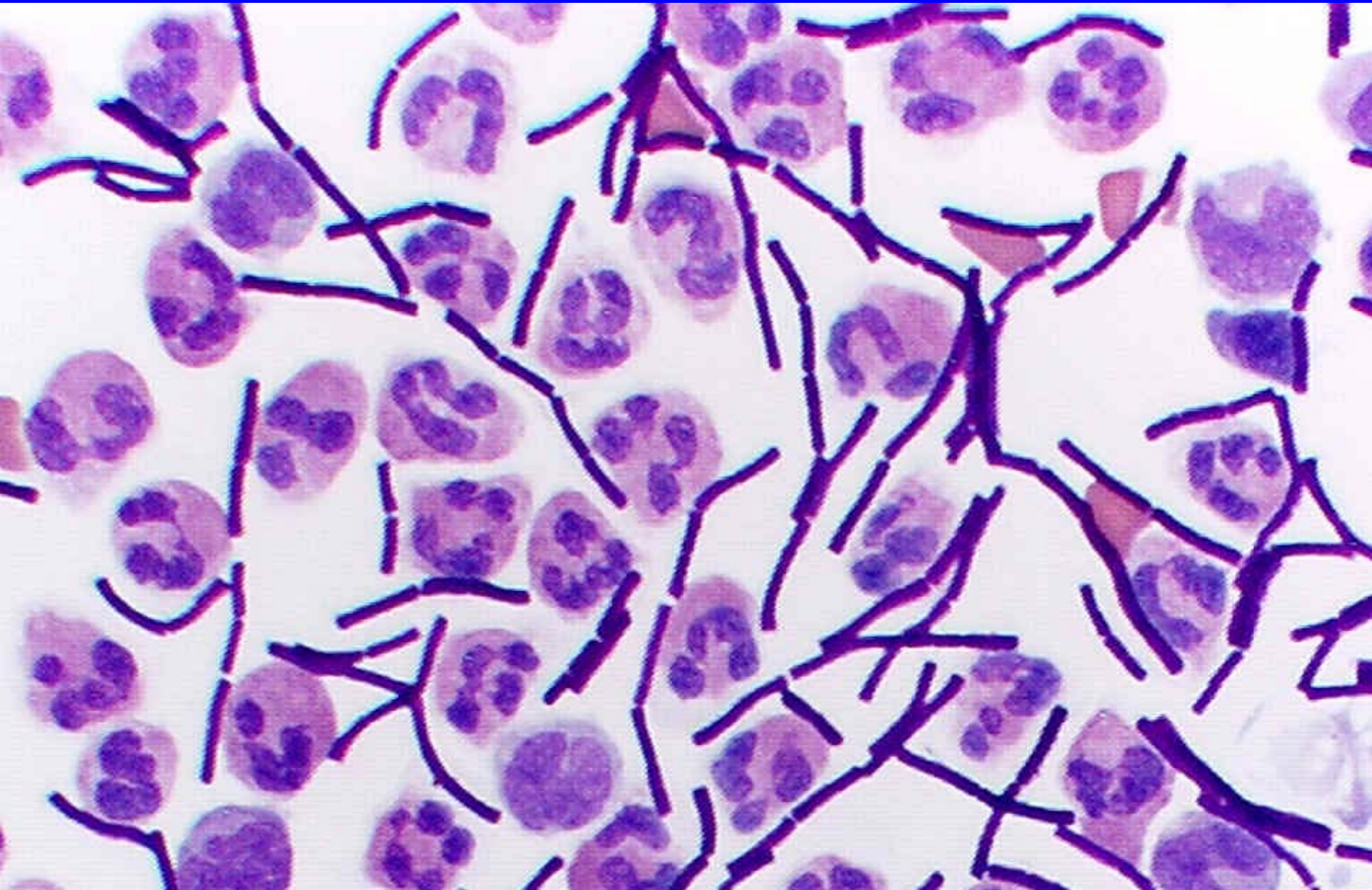
Bacillus anthracis

- Epidemiology
 - Occurs in humans naturally following contact with anthrax-infected animals (most commonly herbivores) or anthrax-contaminated animal products (e.g., hides, soil, bone meal)
 - Herbivores become infected by ingesting spores from soil
 - Animal vaccination programs have reduced animal mortality from anthrax
 - Anthrax spores continue to be found in soil samples worldwide; may last for decades

Bacillus anthracis

- Microbiology
 - Aerobic, non-motile, spore-forming, gram-positive bacillus
 - Spore size: approximately 1 - 100 microns
 - Grows readily on routine laboratory media at 37° C
 - Vegetative anthrax bacteria survive poorly outside host, but spores are hardy
 - Spores germinate in nutritive environment (blood/tissues of host)
 - Bacteria are virulent because of antiphagocytic capsule and 3 toxin components (protective antigen, lethal factor, edema factor) => hemorrhage, edema, necrosis

Bacillus anthracis – Gram Stain



Bacillus anthracis

- Potential for use as weapon
 - Has been weaponized
 - Today, at least 17 nations are thought to have biological weapons programs
 - 1979: accidental aerosolized release of anthrax spores from military microbiology facility in Sverdlovsk => estimated 79 cases of anthrax infection (approximately 68 died)
 - 1990's: Aum Shinrikyo terrorist group attempted release of aerosols of anthrax and botulism in Tokyo - failed to produce illness

Bacillus anthracis

- Forms of disease:
 - Cutaneous
 - most common form (but only 224 cases in U.S. between 1944-94)
 - Inhalational
 - 18 cases in US (2 lab-associated) in 20th century – last in 1978
 - Gastrointestinal
 - Meningeal (2° to septicemia)

INHALATIONAL ANTHRAX

1. Hemorrhagic mediastinitis
2. Malignant edema
3. Sepsis

with or
without

**Regional Hemorrhagic
LYMPHADENITIS**

Death

with

ANTHRAX SEPTICEMIA

Toxic

Nontoxic

Death

CUTANEOUS ANTHRAX

1. Necrotic lesion
2. Malignant edema

INTESTINAL ANTHRAX

1. Necrotic lesion with mucosal edema
2. Massive effusion

USAMRIID

Cutaneous Anthrax

- Route of infection
 - Direct cutaneous inoculation of spores into cuts, abrasions
- Incubation period: 1 – 7 days (range: 1 – 14)
- Clinical findings
 - Local edema (often pronounced) and erythema
 - Usually painless
 - Pruritic papule → vesicle → round ulcer → black eschar over 1-2 weeks
 - + / – painful regional lymphadenopathy or systemic symptoms (fever, malaise, HA)

Cutaneous Anthrax: Diagnosis

- Vesicular fluid or border of skin lesion:
 - Gram stain, culture and sensitivity
 - PCR
 - DFA
- Skin biopsy
 - Culture and PCR (fresh frozen)
 - Immunohistochemistry (formalin-fixed)
- Serology:
 - Acute- and convalescent-phase serum IgG (ELISA IgG antibody against protective antigen)

Cutaneous Anthrax: Diagnosis

- Thorough recent occupational history:
 - Employer –
 - high-profile person or organization?
 - postal Service?
 - Does patient handle mail? Work with automatic sorting machines?
 - Recent visit to high-risk site?
 - Exposure to suspicious mail, powder, or threat in past 1-2 weeks?
 - Pertinent history determined by epidemiology of outbreak

What is the role of nasal swabbing?

- Low positive and negative predictive values preclude use as diagnostic tool for the individual patient
- Used in epidemiologic investigation to identify exposure location
- Could be done if exposure to “blast” of powder to face or nose; \leq 1-2 days post-exposure, especially if powder is not available for testing, or testing of powder may be delayed

Cutaneous Anthrax: Clinical Course

- If untreated, may become systemic:
~ 5 – 20% case-fatality rate
- Treated: ~ 99 % survive
- “Malignant edema” variant – marked edema, induration, multiple bullae @ inoculation site, toxemia

Cutaneous Anthrax: Initial Empiric Therapy

- Adults:
 - ciprofloxacin 500 mg. po Q 12 H OR
 - doxycycline 100 mg po Q 12 H if sensitive
- Children:
 - ciprofloxacin 10-15 mg/kg po Q 12H OR
 - doxycycline if sensitive:
 - > 8 YRS and > 45 kg: 100 mg po BID
 - > 8 YRS and \leq 45 kg: 2.5 mg/kg po BID
 - \leq 8 YRS: 2.2 mg/kg po BID

In current outbreak, CDC recommends multi-drug intravenous regimens for severe cutaneous infections, extensive edema, head or neck involvement, or systemic signs

Cutaneous Anthrax: Therapy

- Isolates in current cases have cephalosporinase and possibly inducible beta-lactamase
- CDC advises *against* treating with a penicillin alone in current outbreak
- Adjust regimen based on susceptibility results

*Treatment recommendations may change:
consult with NYCDOH*

Cutaneous Anthrax: Therapy (cont.)

- Duration of therapy:
 - 14 days – usual duration for treatment
- *CURRENT OUTBREAK:
AEROSOL EXPOSURE TO SPORES MAY
HAVE OCCURRED:*
 - Administer for *60 days* for *prevention* of *inhalational* anthrax (persistence of spores in lymph nodes seen in animal models for up to 60 days)

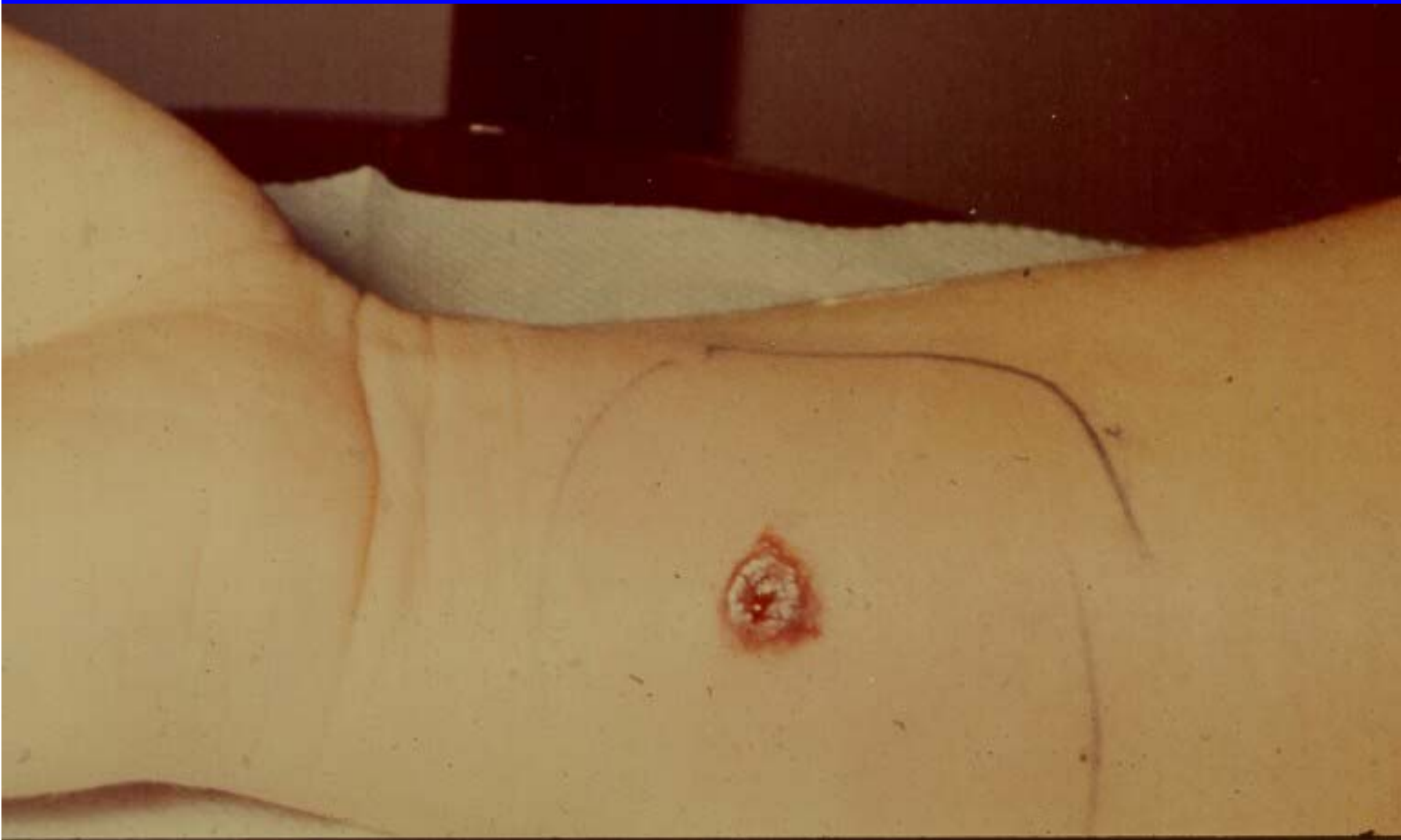


Cutaneous Anthrax

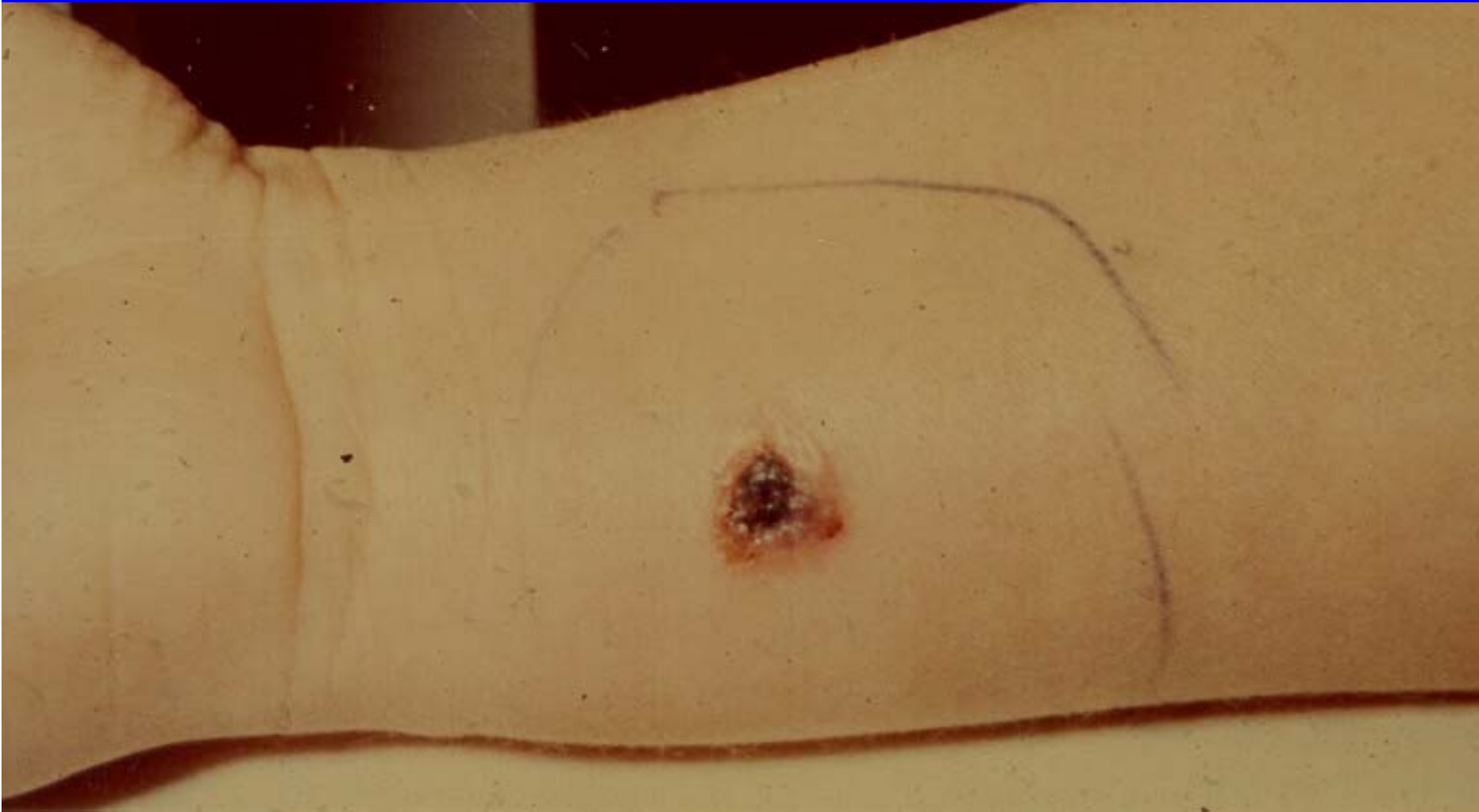
Cutaneous Anthrax – Day 4



Cutaneous Anthrax – Day 5



Cutaneous Anthrax – Day 7



Cutaneous Anthrax – Day 10



Cutaneous Anthrax – Painless Lesion



CUTANEOUS ANTHRAX



CUTANEOUS ANTHRAX



LOXOSCELISM - Painful from the Onset

