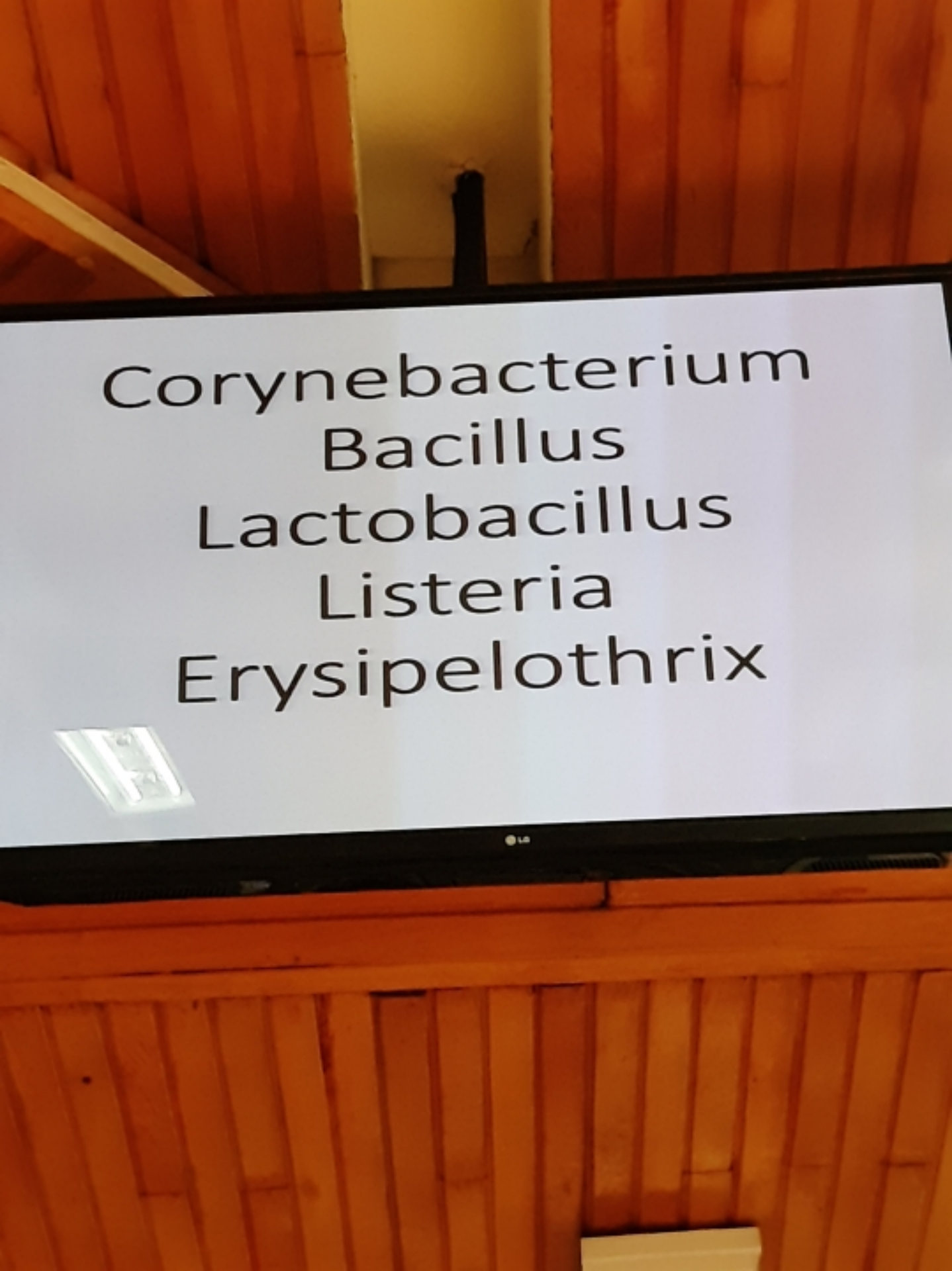

Corynebacterium
Bacillus
Lactobacillus
Listeria
Erysipelothrix

General characteristics

- Gram positive pleomorphic bacilli
- Have swollen or club-shaped ends
- Stain irregularly due to the structure of the cell wall
- An outer layer of **mycolic acids** is found which is **functionally** equivalent to the outer membrane of Gram-negative bacteria

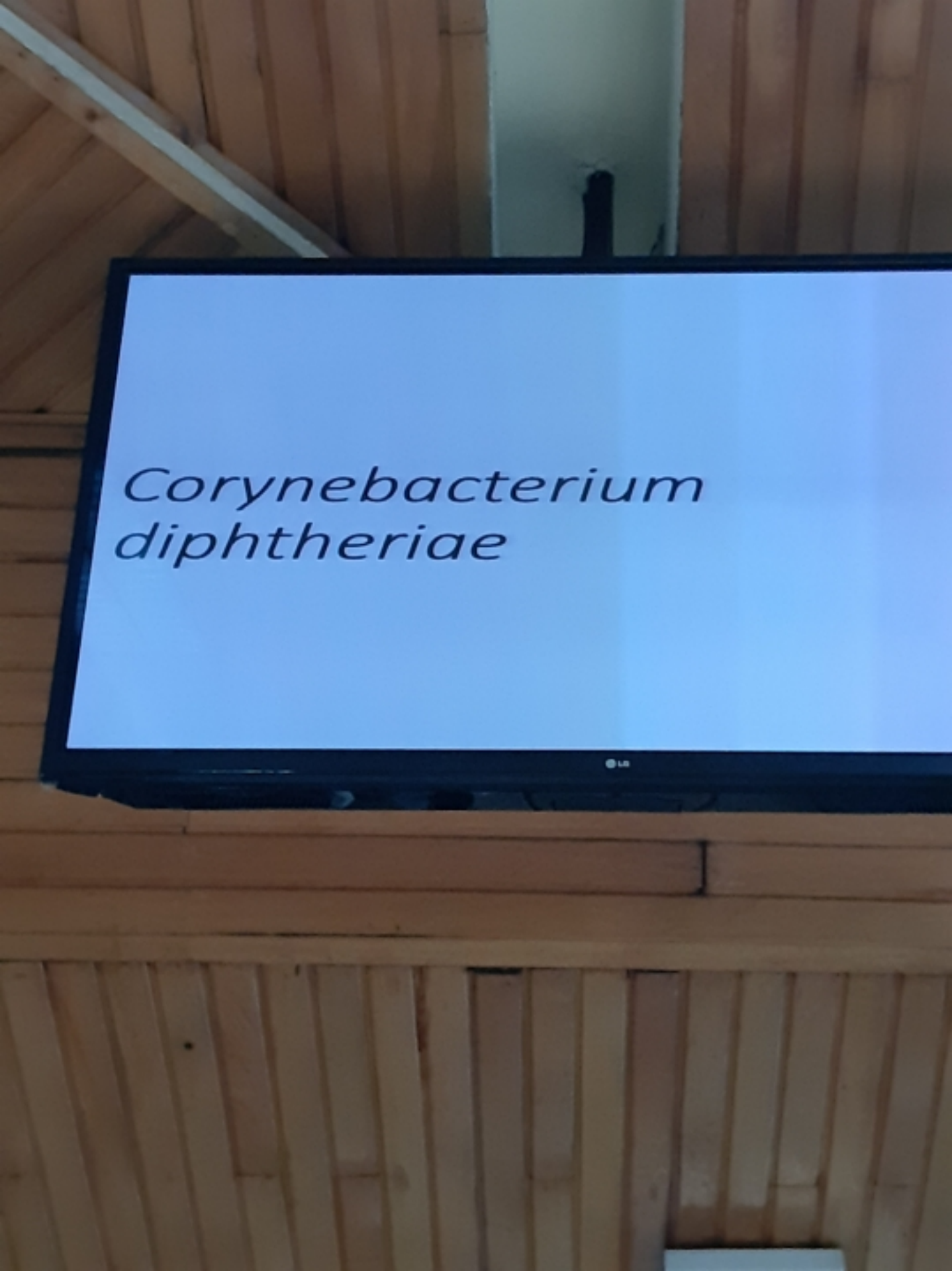
General characteristics

- Non-spore forming
- Non-motile
- Not capsulated

Classification

- Class: *Actinobacteria*
- Numerous species- >88 species

1. *Corynebacterium diphtheriae*
2. Diphtheroids/coryneform bacteria/non-diphtheriae corynebacteria
   - *C.striatum*
   - *C.pseudodiphtheriticum*
   - *C.propinquum*
   - *C.tuberculostearicum*


Corynebacterium
diphtheriae

General characteristics

- Gram-positive pleomorphic bacilli
- Facultative anaerobe ;grows best under aerobic conditions
- Non-motile
- Non-capsulated
- Non-spore forming
- Decolourise very easily
- Have **granules** in the cytoplasm= **metachromatic/volutin granules**

General characteristics

- Metachromatic granules= **Babès-Ernst granules**. Represent accumulation of polymerised polyphosphates
- Take certain shapes
  - **Palisade** arrangement
  - Described as resembling **Chinese alphabet**
  - **Cuneiform** arrangement
- Relatively resistant to drying-may maintain viability for weeks in dust or on dry articles
- Susceptible to heat and regularly used detergents

Pathogenic properties

Disease production occurs through

1. Local invasion
2. Effects of virulence factors
   - Main virulence factors is the diphtheria toxin(exotoxin)

Diphtheria toxin

- Heat-stable polypeptide
- AB
- Not released by all strains
  - Toxigenic
  - Non-toxigenic
- Ability to produce toxin is acquired through **lysogeny**
- Toxigenic strains: 3 different strains
  1. Severe/gravis
  2. Mild/mitis
  3. Intermediate/intermedius

Clinical implications

1. Diphtheria
2. Wound infections
   - Infection through contamination and local invasion
   - Toxin production not observed

Diphtheria

- Acute febrile infectious disease-occurs in epidemics
- Mainly affects children
- Source of infection:
  - Nasal carrier
  - Patient
- Transmission
  - Secretions or droplets from URT

Diphtheria

- Initial clinical manifestations confined to the URT or oropharynx result from:
  1. Infection of the mucous membrane
  2. Local invasion of the mucosal surface tissue
  3. Toxin production at the site
  4. Inflammatory response

Clinical manifestations

- Fever
- Inflammation of the URT
- Results in a greyish membrane-like covering referred to as **pseudomembrane**
- Pseudomembrane=
  - products of acute inflammatory process e.g. exudate, WBCs and epithelial cells

Clinical manifestations

- Swelling around the neck due to oedema and enlarged cervical LN= **'Bull neck' appearance**
- Severe infections= DIB: pseudomembrane extends locally to the tonsils, pharynx, larynx and nasal passages

Complications

1. **Airway obstruction**–
   - extensive pseudomembrane or when dislodged during sample collection
2. **Haematogenous spread of the toxin**→internal organs
   a. Damage to the heart muscle
   b. Degeneration of peripheral nerves
   c. Damage to the adrenals

- *C. diphtheriae* does not invade deeply into tissues below the mucous membrane and **bloodstream invasion is not a feature** of the illness

Laboratory investigations

1. Specimen
   - Throat, nasopharyngeal, skin swabs
2. Gram stain
3. Culture and isolation

Media

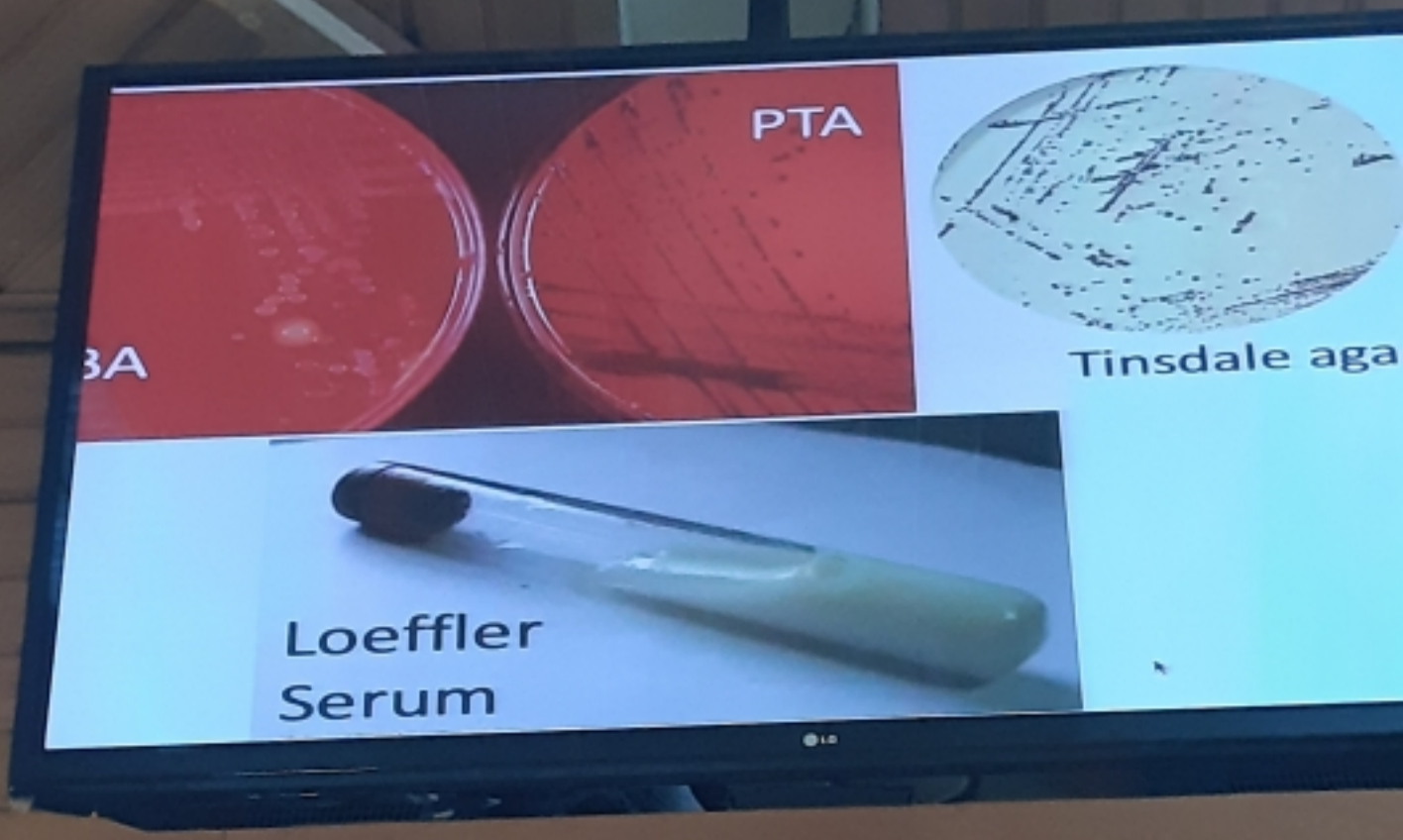
a. BA-

b. Selective media

i. Cystine tellurite blood agar/ Potassium tellurite BA
ii. Tinsdale medium
iii. Loeffler's serum agar

Laboratory investigations

- 20–40 ºC with an optimum of 35–37 ºC, 24–48 h
- Colony characteristics
  - greyish white colonies on **BA**
  - **PTA**- grey or grey-black colonies
  - **Tinsdale** medium- grey-black, raised and surrounded by a dark brown area
  - Loffler serum- for granule formation
- Volutin granules(metachromatic granules) presence demonstrated by **Albert's** or **Neisser's stain**


PTA
BA
Tinsdale aga
Loeffler
Serum

Laboratory investigations

- Biochemical tests
  - Oxidase negative
  - Urease negative
  - Catalase positive
  - Reduces nitrate to nitrite
  - Ferments glucose and maltose producing acid but not gas

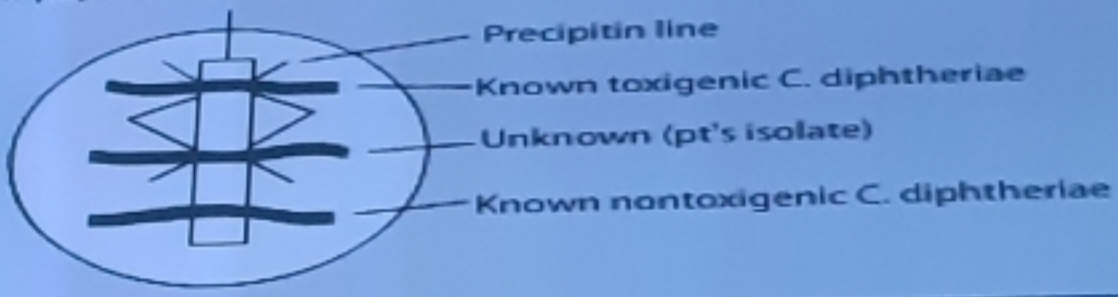
Laboratory investigations

Tests for toxin production

1. *In vitro* tests
   - **Elek's** gel precipitation test
   - Tissue culture test
2. *In vivo* tests
   - Subcutaneous test
   - Intradermal test
3. Molecular tests
   - *tox* gene

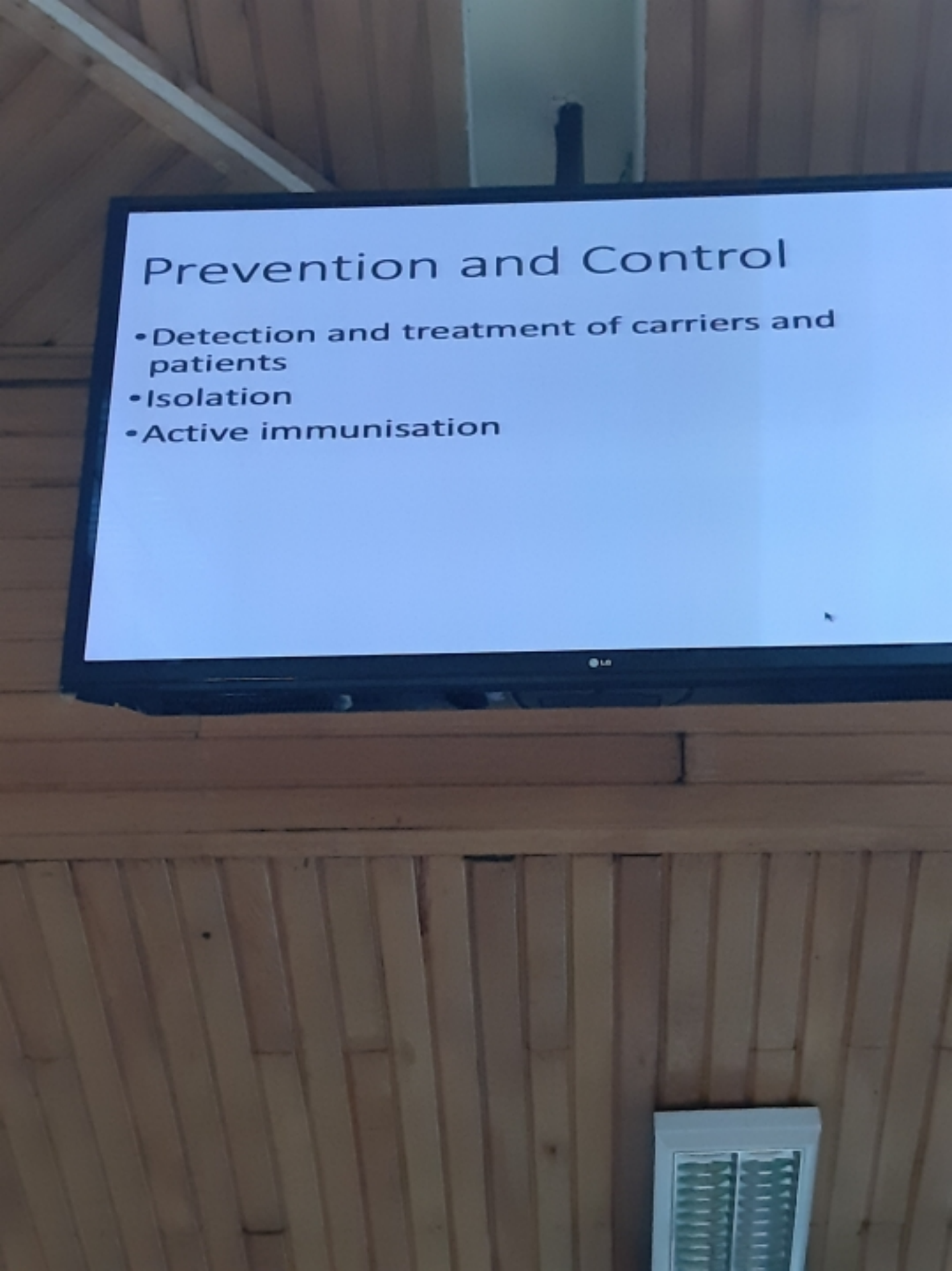
LEK test:

Filter paper strip with C. diphtheriae antitoxin



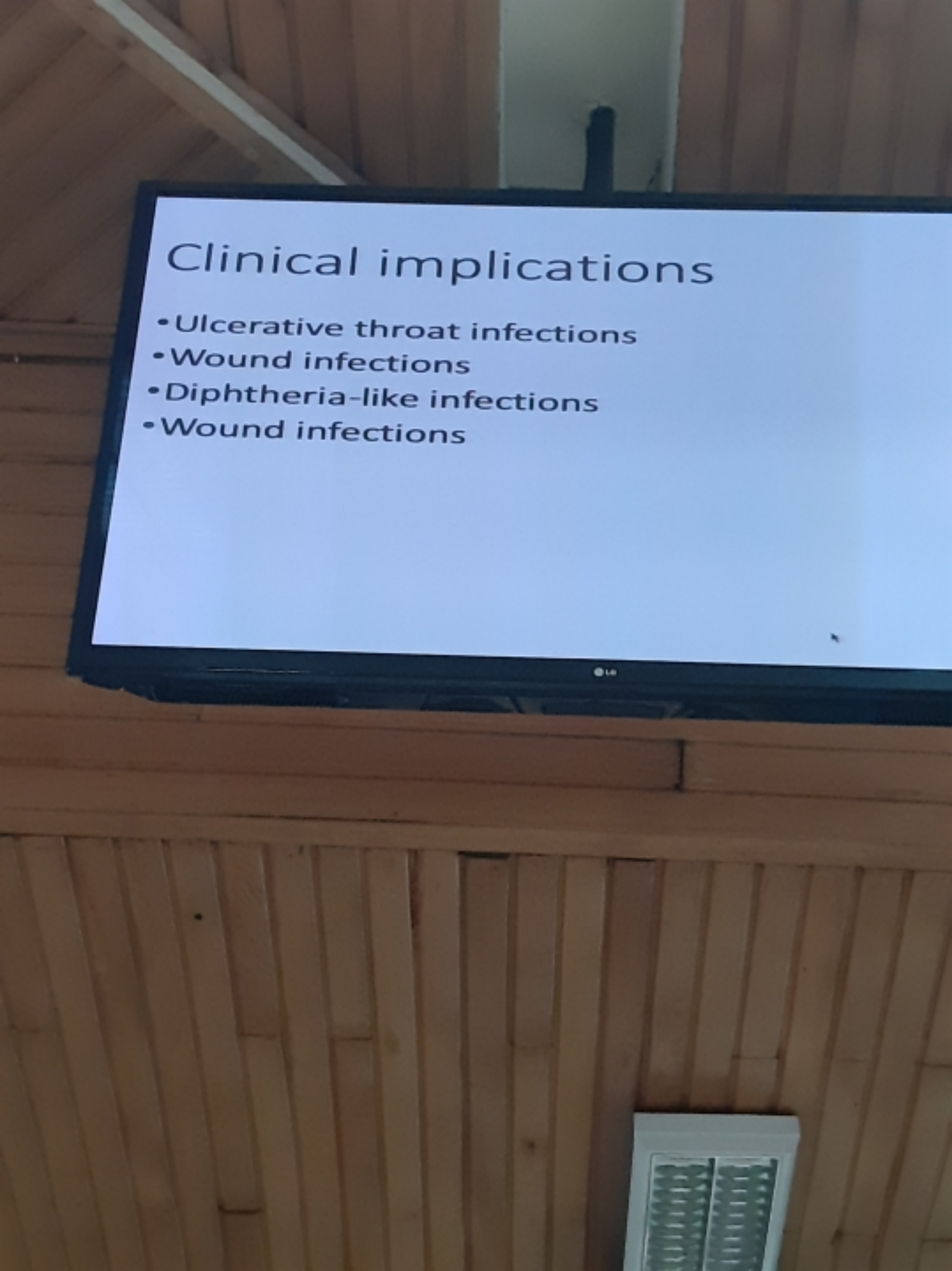
Treatment

- Anti-toxin- given immediately based on clinical manifestation
- Antimicrobials: Penicillin; Erythromycin


Prevention and Control
• Detection and treatment of carriers and patients
• Isolation
• Active immunisation

ther *Corynebacterium* bacteria

- Diphtheroids or non-diphtherial corynebacteria
- Commensals of skin, throat, conjuctiva
  - *C.ulcerans*
  - *C.bovis*
  - *C.haemolyticum*
  - *C.pyogenes*
  - *C.Xerosis*
  - *C.pseudotuberculosis*


Clinical implications
•Ulcerative throat infections
•Wound infections
•Diphtheria-like infections
•Wound infections