



DIPHTHERIA-LAB DIAGNOSIS ,PREVENTION AND CONTROL



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LAB DIAGNOSIS

❑ The diagnosis of diphtheria is based on clinical signs and symptoms plus laboratory conformation.

1.Isolation of the corynebacterium diphtheriae

❑ Specimen :throat swab and a portion of pseudomembrane

❑ Direct smear

Gram stain : club shaped gram positive bacilli with chinese letter arrangement

Albert's stain : green bacilli with bluish black metamorphic granules

CULTURE MEDIA

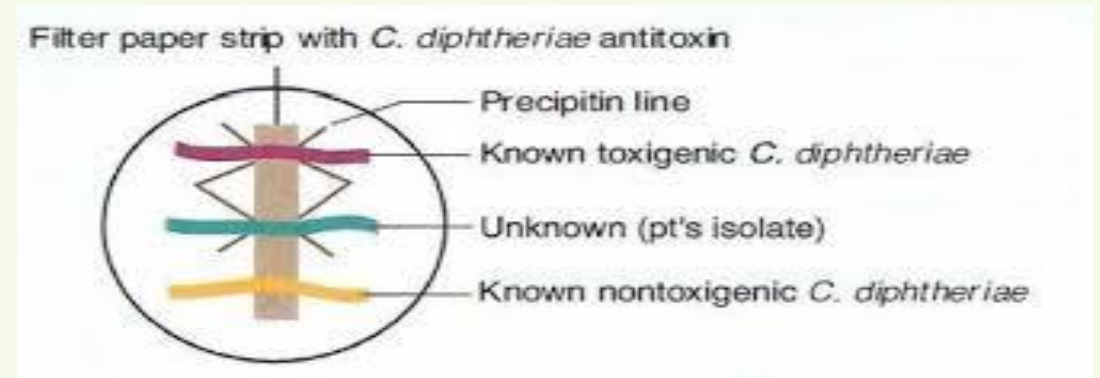
- ❑ ENRICHED MEDIUM : BLOOD AGAR, CHOCOLATE AGAR, Loeffler's serum slope
- ❑ Selective medium : on potassium tellurite agar, produce black colour colonies

IDENTIFICATION

- ❑ Biochemical test : sugar fermentation test using Hiss's serum sugar media
- ❑ Automated identification system : MALDI-TOF or VITEK

DIPHTHERIA TOXIN DEMONSTRATION

- ❑ In vivo test (guinea pig inoculation) : subcutaneous and intracutaneous tests.
- ❑ In vitro tests: Elek's gel precipitation test, detection of tox gene by PCR, detection of toxin by ELISA or ICT, cytotoxicity on cell lines.



CONTROL OF DIPHTHERIA

i) CASES AND CONTROL

a) Early detection :an active search for cases and carriers should start immediately among contacts;swabs should be taken from both the nose and throat and examined by culture method for diphtheria.

b) Isolation :

- ☐ it is done for at least 14 days or until proved free of infection
- ☐ At least 2 consecutive nose and throat swabs ,taken 24 hours apart,should be negative before terminating isolation.

c) Treatment

I) Cases

Diphtheria antitoxin should be given IM or IV

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Type of Diphtheria	Antitoxin Dose
Anterior nasal diphtheria	10,000 – 20,000 units
Tonsillar diphtheria	15,000 – 25,000 units
Pharyngeal / Laryngeal diphtheria	20,000 – 40,000 units
Nasopharyngeal diphtheria	40,000 – 60,000 units
Extensive disease (> 3 days) or Brawny Swelling of neck	80,000 – 1,20,000 units

II) Carriers

Should be treated with 10 days course of oral erythromycin

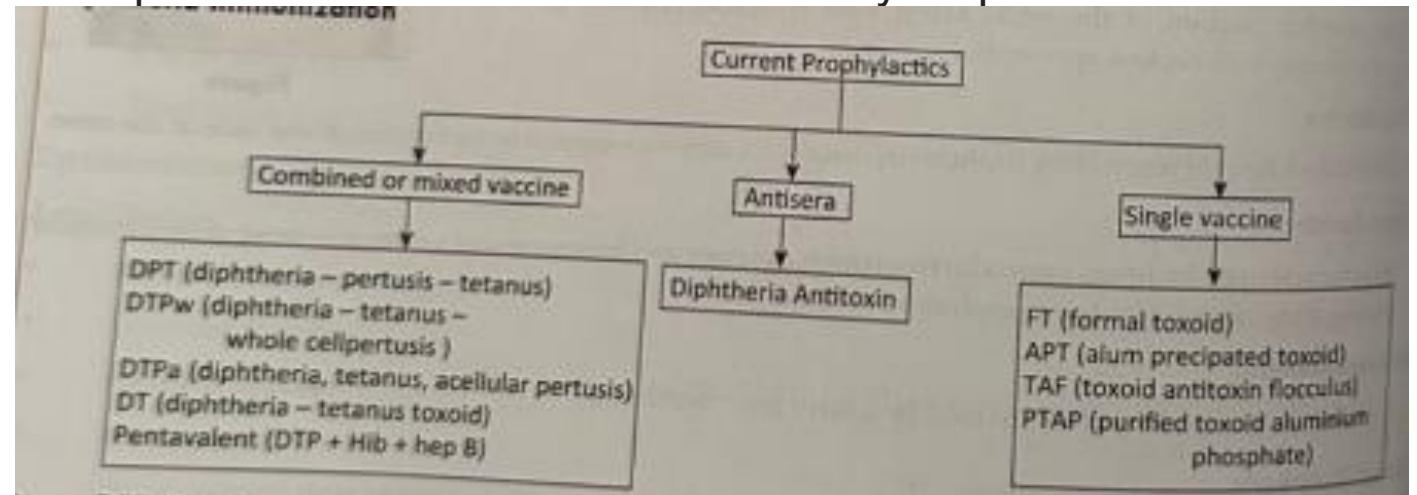
ii)Contacts

- ☐ If primary immunization received within previous 5 years
→ No further action needed
- ☐ If primary course received >5 years before
→ Only booster dose of diphtheria toxoid
- ☐ If non-immunized
→ Prophylactic penicillin or erythromycin + 1000–2000 units diphtheria toxoid + active immunization
- ☐ Contacts kept under medical surveillance and examined daily for at least one week



(iii) Community

- Only effective control method → Active immunization with diphtheria toxoid of all infants as early as possible



DIPHTHERIA IMMUNISATION



a. Combined or mixed vaccines

DPT (diphtheria-pertussis-tetanus vaccine)

DTPw (diphtheria, tetanus, whole-cell pertussis)

DTPa (diphtheria, tetanus, acellular pertussis)

DT (diphtheria-tetanus toxoid)

dT (diphtheria-tetanus, adult type)

Pentavalent (diphtheria, tetanus, pertussis, hepatitis B and Hib).

b. Single vaccines

FT (formal-toxoid)

APT (alum-precipitated toxoid)

PTAP (purified toxoid aluminium phosphate)

PTAH (purified toxoid aluminium hydroxide)

TAF (toxoid-antitoxin flocculus)

C. Antisera Diphtheria antitoxin.



I) COMBINED VACCINES

- **DPT vaccine**
 - Protects against 3 diseases simultaneously
 - Pertussis component enhances potency of diphtheria toxoid
 - Dose: 0.5 ml
 - Route: Intramuscular
 - Site: Anterolateral side of mid-thigh

SCHICK TEST

- Intradermal test of immunity status & hypersensitivity to diphtheria toxin
- Dose:
- 0.2 ml schick toxin in left forearm
- 0.2 ml heat-inactivated toxin in opposite arm

Observation		Reading	Interpretation
Test arm	Control arm		
No reaction	No reaction	Negative	Immune to diphtheria
Red flush	No reaction	Positive	Susceptible to diphtheria
Red flush fading by 4 th day	Red flush fading by 4 th day	Pseudopositive	Hypersensitivity
Red flush	Pseudopositive	Combined	Susceptibility & Hypersensitivity

(Red flush = Positive Reaction)

Schick test negative if ≥ 0.03 units antitoxin/ml serum

Now replaced by Haemagglutination test

Haemagglutination test : measurement of serum antitoxin level

AGE FOR IMMUNISATION

Dose	Age
DPT ₁	6 Weeks of age
DPT ₂	10 Weeks of age
DPT ₃	14 Weeks of age
DPT _{Booster}	16 - 24 months of age
DPT _{booster}	5 - 6 years of age

The current recommendation is to allow an interval of 4 week between the 3 doses

What you need to know about the Tdap vaccine



→ What is Tdap?

Tdap stands for 3 bacterial infections:

Tetanus:

Tetanus (lockjaw) is a painful condition that causes your muscles to become stiff, especially around your neck and jaw. It can lead to:

- Trouble opening your mouth
- Trouble breathing and swallowing
- Death



Diphtheria:

Diphtheria causes thick mucus in the back of your throat. This can lead to:

- Trouble breathing
- Heart failure
- Paralysis (being unable to move all or part of your body)
- Death



Acellular Pertussis:

Pertussis (whooping cough) causes violent coughing that makes it hard to breathe, eat, or drink. It can lead to:

- | | |
|--------------------------------------|--|
| In teens and adults: | In babies and young children: |
| • Weight loss | • Pneumonia (lung infection) |
| • Bladder control problems | • Seizures (violent and automatic muscle movement) |
| • Fainting | • Brain damage |
| • Rib fractures from severe coughing | • Death |



Storage

Store in refrigerator at 2–8 °C

Reactions

Common → Fever & mild local reactions

Severe → Neurological complications such as

Encephalitis / encephalopathy

Prolonged convulsions

Infantile spasm

Reye's syndrome

Contraindications

Severe hypersensitivity to previous dose

Progressive neurological disease

PENTAVALENT VACCINE



- Protects from 5 life-threatening diseases-
diphtheria, pertussis, tetanus, hepatitis B and Hib
- It Reduces number of pricks to a child.
- Dose: 0.5 ml
- Route: IM (anterolateral mid-thigh)
- Schedule: 6th, 10th, 14th week
- Temperature: 2–8 °C
- Age limit for delayed immunisation :upto 1year

SINGLE VACCINES

- ☐ Single vaccines (e.g., FT, PTAP, APT, PTAH) are less frequently used.
- ☐ They are all good immunizing agents.
- ☐ APT is hardly used because it is prone to give rise to serious reactions.
- ☐ Each dose of these antigens generally contains 25 Loeffler (Lf)units of diphtheria toxoid.

C.ANTISERA

- ☐ Diphtheria antitoxin prepared in horse serum is still the mainstay of passive prophylaxis and also for treatment of diphtheria.
- ☐ Protection against diphtheria toxin is quantitative phenomenon, so that a serum antitoxin titre that protect against a small dose of toxin may not protect against a large dose.



Thank
you