

03

Diphtheria

Introduced in 1930s (DT) and 1952/3 (DTP)

NOTIFIABLE

Introduction

Diphtheria is an acute infectious disease affecting the upper respiratory tract and occasionally the skin. It is caused by *Corynebacterium diphtheriae* or *C.ulcerans*. Effective protection against the disease is provided by active immunisation.

Since the introduction of vaccination against diphtheria, the disease and the organism have been virtually eliminated from Ireland. However, an immunisation rate of at least 85% must be maintained to protect the population against the possibility of a resurgence of the disease which could follow the introduction of cases or carriers of toxigenic strains from overseas.

Immunity decreases with age; approximately 65% of those over 30 years of age may be susceptible to diphtheria.

Approximately 5 secondary infections will result from each index case in a fully susceptible population.

Epidemiology

Humans are the only known reservoir of *Corynebacterium diphtheriae*. Transmission results primarily from close contact with a patient or carrier. Spread is by droplet infection, and on rare occasions through contact with articles soiled by contact with skin lesions of infected persons (fomites). The incubation period is usually 2-5 days, but occasionally can be longer. The disease is communicable for up to 4 weeks, but carriers may shed the organism for longer.

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There is little likelihood of acquiring natural immunity from sub-clinical infection. However, while no cases have been recently reported in Ireland, they have occurred in the UK, the former USSR states, India, China, and Bangladesh among other countries.

Effects of diphtheria

The disease is characterised by an inflammatory exudate which forms a greyish membrane in the upper respiratory tract resulting in nasopharyngitis and/or obstructive laryngotracheitis. There may also be moderate enlargement of cervical lymph nodes and oedema of the soft tissue of the neck. These local manifestations are associated with a low-grade fever and the gradual onset of generalised manifestations over 1-2 days. Cutaneous manifestations are less common.

A toxin is produced by diphtheria bacilli which affects particularly myocardial, nervous and adrenal tissues and may result in life-threatening complications including myocarditis and neurological problems such as vocal cord paralysis and ascending paralysis similar to the Guillain-Barré syndrome.

Milder infection, particularly in vaccinated persons, may cause tonsillitis or pharyngitis with toxin production.

The case-fatality rate ranges from 3-29%, and is highest in the young and the elderly.

Diphtheria toxoid

Diphtheria immunisation protects by stimulating the production of antitoxin which provides immunity to the effects of the toxin. After a primary series of 3 properly spaced doses in adults and 4 doses in infants, efficacy is estimated at over 97%.

Toxoid should be stored at 2-8°C.

Indications

Immunisation of infants and children under 10 years

Primary immunisation

Diphtheria toxoid is recommended for infants from 2 months of age. The primary immunisation course consists of 3 doses given I.M. at 2, 4 and 6 months of age. If a course is interrupted it may be resumed without the need to start again (see Chapter 2).

Booster immunisation

A booster dose is recommended at 4-5 years of age. Booster doses should be given at least 3 years from the last dose of the primary course unless there is a documented history of 5 doses of tetanus toxoid having been given or the child is over 10 years of age. This is because all diphtheria vaccines are combined with tetanus toxoid. A further booster using low-dose diphtheria toxoid (Tdap) is recommended 10 years later.

If pertussis vaccine is refused by parents, the only available diphtheria and tetanus vaccines are Td and Td/IPV, which contain insufficient tetanus and diphtheria toxoid for primary immunisation. They are not intended for use as part of the primary vaccine schedule, may not give a sufficient immune response if so used, and are not licensed for such use.

Dose and route of administration

For primary immunisation of children under 10 years the dose is 0.5 ml given by intramuscular injection into the deltoid region or the anterolateral thigh.

Immunisation of persons aged 10 years and over (unimmunised or partially immunised)**Primary immunisation**

A special low-dose diphtheria toxoid such as Td must be used because of the possibility of a serious local reaction in an individual who is already immune. Three doses should be given, by intramuscular injection.

Booster Immunisation

Low dose diphtheria toxoid must be used when the primary vaccination course has been delayed: the first booster should be given 5 years after the third dose and the second booster 10 years after that (see Chapter 2).

Change: "Three doses should be given, by intramuscular injection" is replaced with "the first booster should be given 5 years after the 3rd dose and the 2nd booster should be given 10 years after that." Update August 2010.

Contraindications

Anaphylactic reaction to a preceding dose or any of the constituents.

Precautions

Acute severe febrile illness, defer until recovery.

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HIV positivity

HIV positive individuals may be immunised against diphtheria in the absence of any contraindications.

Adverse reactions

Local: Transient local reactions (pain, palpable lump, and erythema) may occur. They are more frequent with subsequent doses. Sequelae are very rare.

General: Malaise, transient fever and headache may occasionally occur. Dyspnoea, urticaria, angioedema, anaphylaxis and neurological reactions are very rare. Anaphylaxis is extremely rare (0.6-3 per million doses).

Contacts of a diphtheria case or carriers of a toxigenic strain

Table 3.1 Recommendations for vaccination of contacts of diphtheria cases and carriers

Immune status	Age-group	Action
Immune (3 or more previous doses)	Under 10 years	One injection of diphtheria toxoid as DT or DTaP/IPV
	10 years and over	One injection of low dose diphtheria toxoid such as Td or Tdap
Non-immune (<3 previous doses)	Under 10 years	Three injections of DTaP/IPV diphtheria toxoid, DT or DTaP at monthly intervals*
	10 years and over	Three injections of Td or Tdap at monthly intervals*

* See Catch-up section, Chapter 2, for number of doses. These children may also need Hib and MenC vaccines.

Non-immunised contacts of a case of diphtheria should, in addition, be given a prophylactic course of Erythromycin, 20-30 mg/kg, 12 hourly for 7 days, max 1g per dose.

Bibliography

Bohike K et al (2003). Risk of anaphylaxis after vaccination of children and adolescents. *Pediatrics* 112: 815-820.

Canadian Immunisation Guide (2006), 7th ed. Health Canada.

