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ALDO MORO

CORSO DI IGIENE

Scuola
di
Medicina

Tetanus



Tetanus

- Etiology discovered in 1884 by Carle and Rattone
- Passive immunization used for treatment and prophylaxis during World War I
- Tetanus toxoid first widely used during World War II



Clostridium tetani

- Anaerobic gram-positive, spore-forming bacteria
- Spores found in soil, animal feces
- Two exotoxins produced with growth of bacteria
- Tetanospasmin estimated human lethal dose = 2.5 ng/kg





Tetanus Pathogenesis

- Spores enters in the body by **wounds**
- **Anaerobic** conditions allow germination of spores and production of **toxins**
- Toxin binds in central nervous system
- Interferes with neurotransmitter release to block inhibitor impulses
- Leads to unopposed muscle contraction and spasm



Tetanus Clinical Features

- Incubation period; 8 days (range, 3-21 days)
- Three clinical forms:
 - local (uncommon)
 - cephalic (rare)
 - generalized (most common)



Generalized Tetanus

Symptoms

- descending pattern of trismus (lockjaw)
- stiffness of the neck
- difficulty swallowing
- rigidity of abdominal muscles

Prognosis

- spasms continue for 3-4 weeks
- complete recovery may take months



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Trismus





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Stiffness of the neck





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Rigidity of abdominal





Neonatal Tetanus

- Generalized tetanus in newborn infant
- Infant born without protective passive immunity
- 58,000 neonates died in 2010 worldwide





Tetanus Complications

- Laryngospasm
- Fractures
- Hypertension and/or abnormal heart rhythm
- Nosocomial infections
- Pulmonary embolism
- Aspiration pneumonia
- Death



Diagnosis

- diagnosis is entirely clinical
- No bacterial cultures are needed
- Laboratory identification of the organism depends most importantly on the demonstration of toxin production in mice



Medical management

- All wounds should be cleaned
- Tetanus immune globulin (TIG)
- In case of tetanic spasms supportive therapy and maintenance of an adequate airway





Tetanus Wound Management

Vaccination history	Clean, minor wounds		All other wounds ¹	
	Tdap or Td ²	TIG	Tdap or Td ²	TIG
Unknown or fewer than 3 doses	Yes	No	Yes	Yes
3 or more doses	No ³	No	No ⁴	No

1- Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; avulsions; and wounds resulting from missiles, crushing, burns, and frostbite.

2- Tdap is preferred to Td for adults who have never received Tdap. Single antigen tetanus toxoid (TT) is no longer available in the United States.

3- Yes, if more than ten years since the last tetanus toxoid-containing vaccine dose.

4- Yes, if more than five years since the last tetanus toxoid-containing vaccine dose.



Tetanus Epidemiology

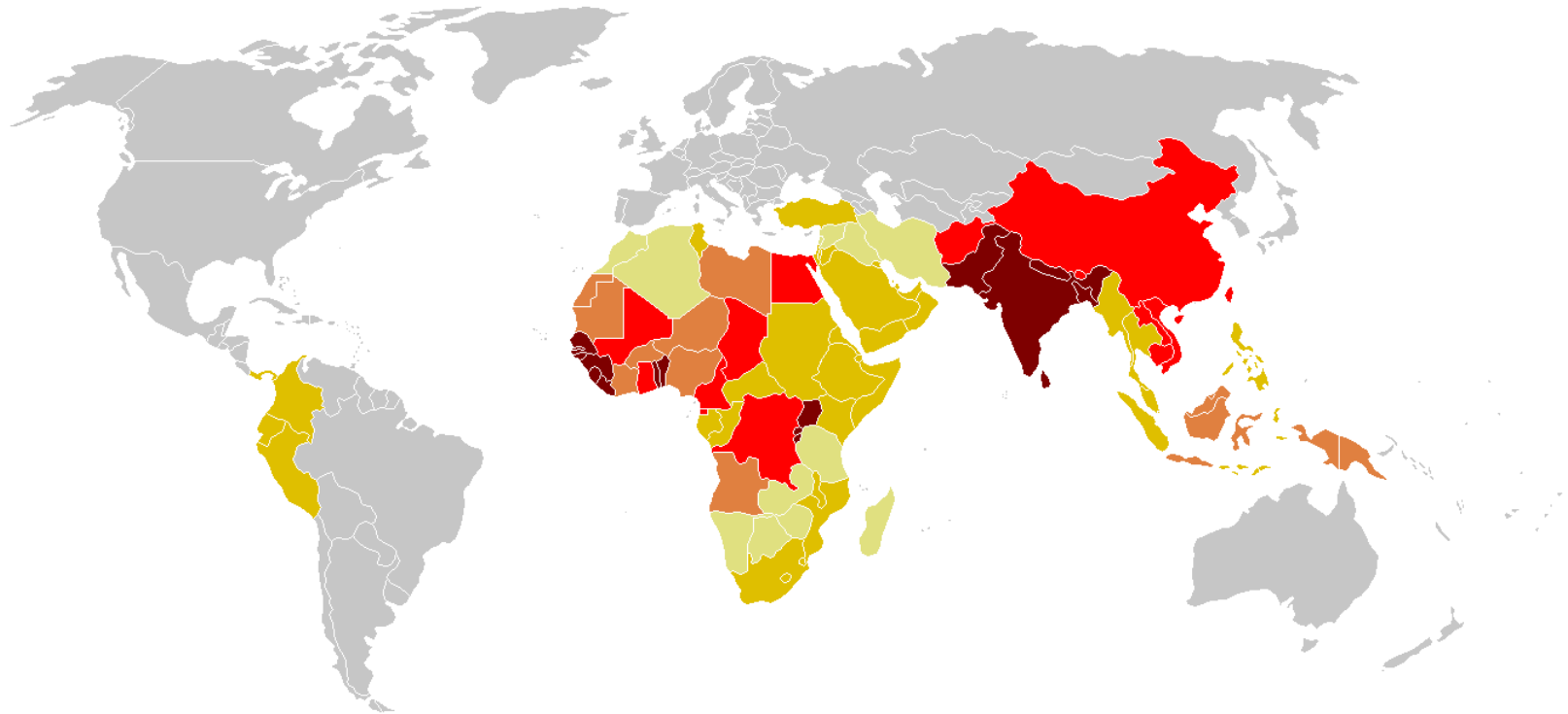
- **Reservoir:** soil and intestine of animals and humans
- **Transmission**
 - contaminated wounds
 - tissue injury
- **Temporal pattern:** peak in summer or wet season
- **Communicability:** not contagious



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Tetanus case reported worldwide 1990-2004

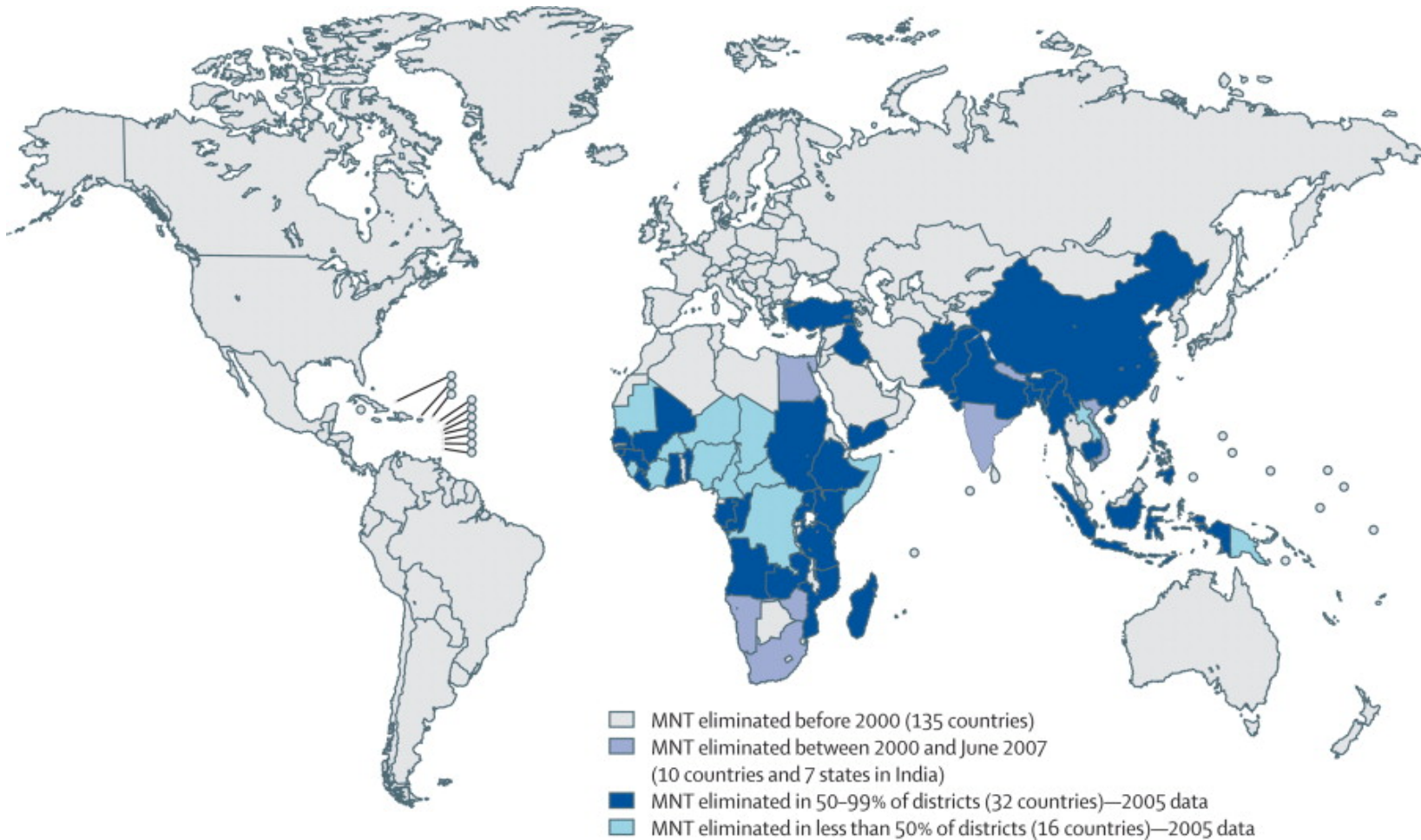




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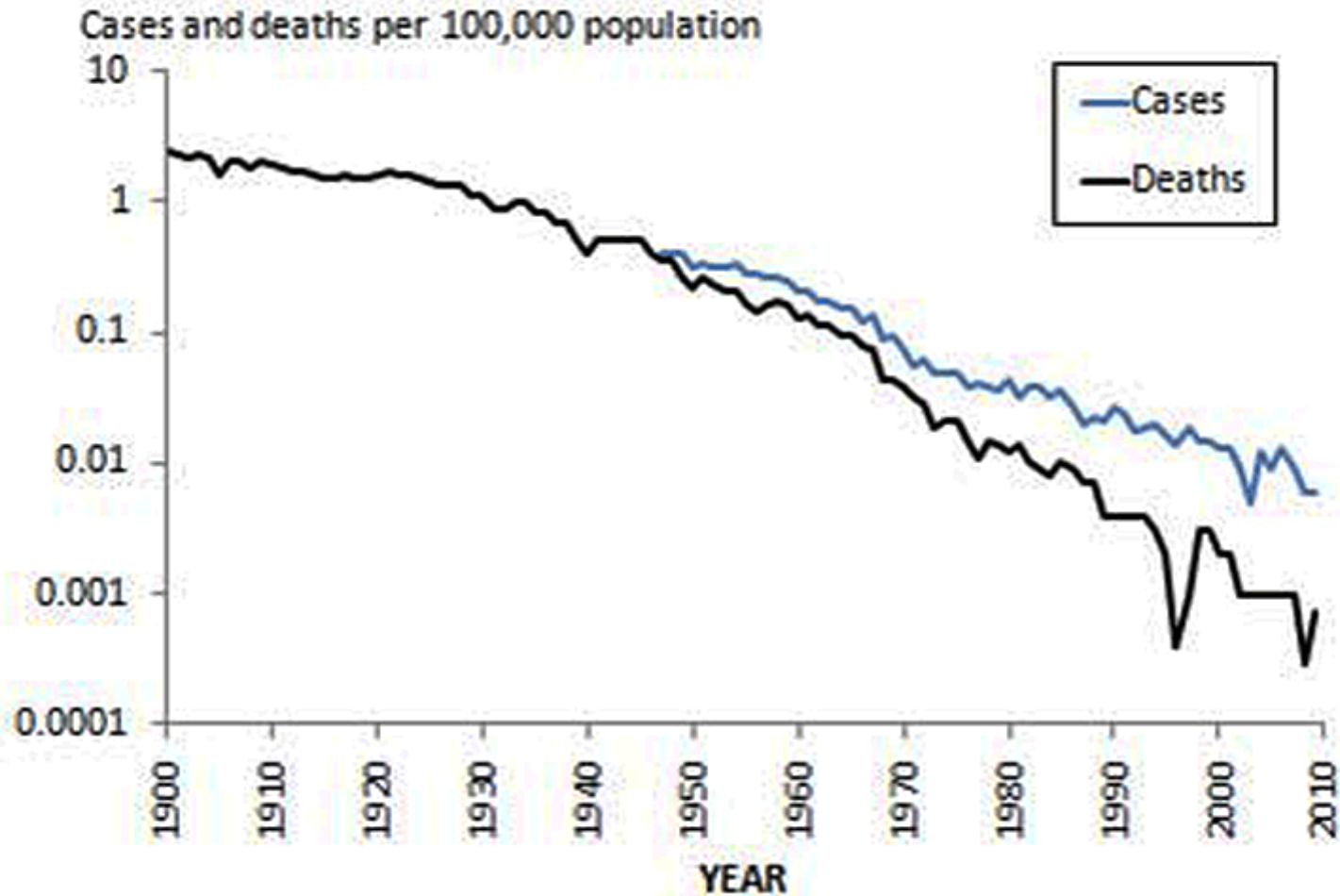
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Maternal and neonatal tetanus worldwide





Incidence of Tetanus, USA 1990-2010

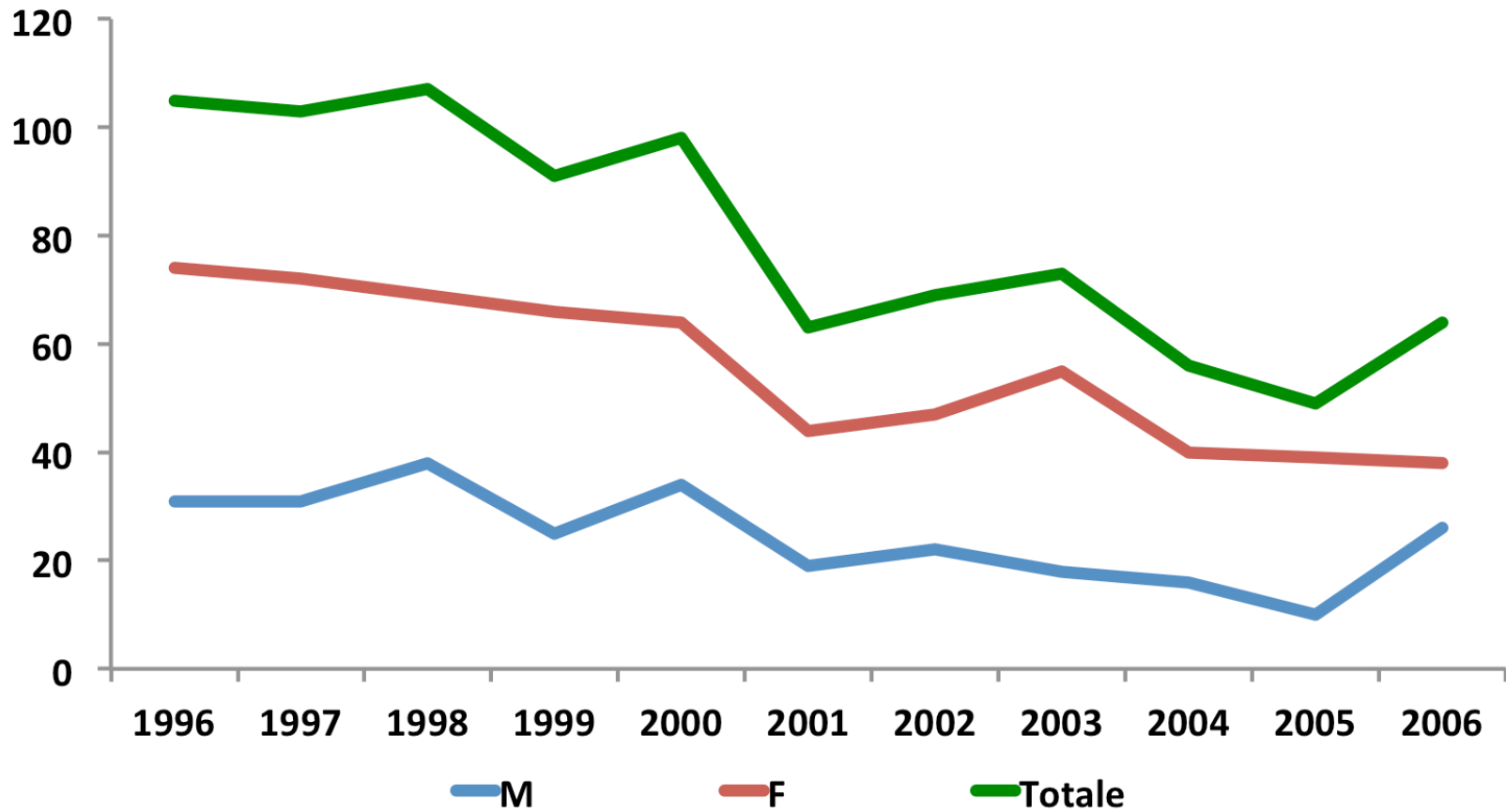




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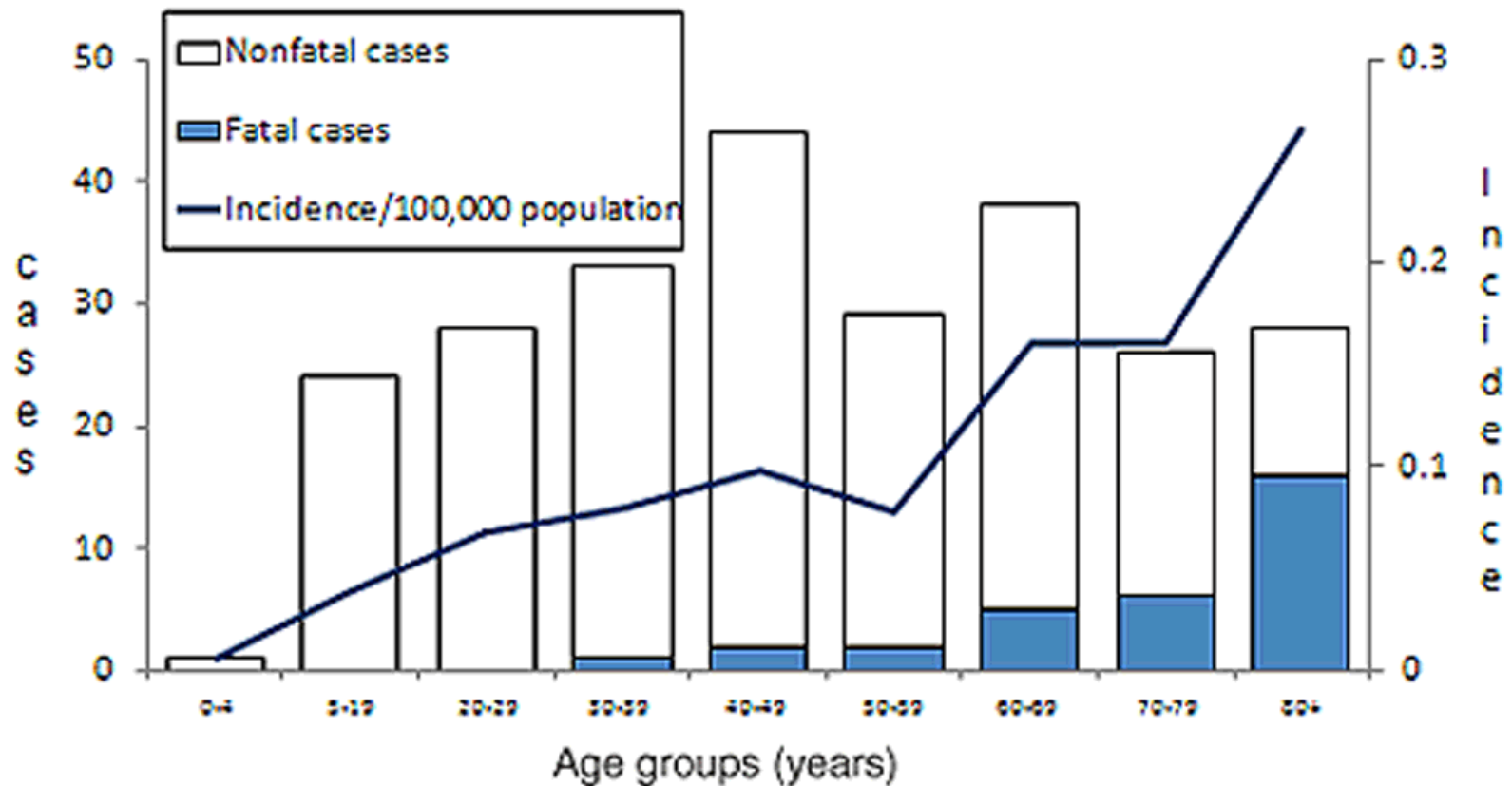
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Number of cases of Tetanus, Italy 1996-2006





Incidence of Tetanus per age group, USA, 1990-2010





Tetanus toxoid

- Formalin-inactivated tetanus toxin
- Schedule
 - three or four doses plus booster
 - booster every 10 years
- Efficacy: approximately 100%
- Duration: approximately 10 years
- Should be administered with diphtheria toxoid as DTaP, DT, Td, or Tdap



Routine DTaP Primary Vaccination Schedule

Dose	USA	Italy
Primary 1	2 months	3 months
Primary 2	4 months	5-6 months
Primary 3	6 months	11-12 months
Primary 4	15-18 months	Not indicated
Booster 1	4-6 years	5-6 years
Booster 2	11-12 years	13-14 years
Periodical booster	Every ten years	Every ten years



Recommendation for Children Who Receive DT- USA

The number of doses of DT needed to complete the series depends on the child's age at the first dose:

- if first dose given at **younger than 12 months of age**, 4 doses are recommended
- if first dose given at 12 months or older, 3 doses complete the primary series



Routine Td Schedule Unvaccinated Persons 7 Years of Age or Older

Dose	Interval
Primary 1	----
Primary 2	4 weeks
Primary 3	6 to 12 months
Booster doses	Every 10 years

*ACIP recommends that one of these doses (preferably the first) be administered as Tdap



DTaP, DT, Td, and Tdap

Type	Diphtheria	Tetanus
DTaP, DT	6.7-25 Lf units	5-10 Lf units
Td, Tdap (adults)	2-2.5 Lf units	2-5 Lf units

Td and Tdap must be used for subjects aged >6 years



Diphtheria and Tetanus Toxoids Contraindications and Precautions

Controindicazione

- Severe allergic reaction to vaccine component or following a prior dose

Precautions

- Moderate or severe acute illness



Tetanus Toxoid Adverse Events

- Institute of Medicine favors a causal relationship:
 - **anaphylaxis**
- Institute of Medicine **rejects** a causal relationship:
 - **type 1 diabetes**
- Institute of Medicine finds **evidence inadequate** to support or reject a causal relationship
 - **peripheral neuropathy**
 - **Guillain-Barré syndrome (GBS)**



Diphtheria and Tetanus Toxoids

Adverse Reactions

- Local reactions (erythema, induration) are common
- Fever and systemic symptoms not common
- Exaggerated local reactions (Arthus-type) occasionally reported
- Brachial neuritis



Tetanus toxoid in Italian schedule

- Vaccination against tetanus is compulsory in Italy from **1962** for farmers, shepherds, breeders and other workers at high risk
- **Vaccination is also mandatory for athletes**
- Since 1968, vaccination is mandatory for all newborns



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