



# Non- neonatal Tetanus

*Last updated: September 5, 2018*





## DISEASE AND VACCINE CHARACTERISTICS

Globally, approximately 13,500 tetanus cases were reported in 2016 through the WHO/UNICEF Joint Reporting Form, with 85% of cases occurring after the neonatal period (aged > 28 days), hereafter referred to as non-neonatal tetanus or non-NT. This number is likely an underestimate; true tetanus incidence is uncertain.

Tetanus is not transmitted from person to person. Tetanus occurs when wounds or injured tissues (such as from unclean deliveries, burns, surgeries, dental or ear infections, or jigger/chigger infestations), are contaminated with *Clostridium tetani* spores. In some cases, the site of entry is unknown or no longer visible when symptoms start. The median incubation period is seven days and usually ranges from 3 to 21 days. Characteristic features of tetanus are trismus (lockjaw, or inability to open the mouth), *risus sardonicus* (forced grin and raised eyebrows), and opisthotonus (backward arching of the spine). Generalized seizure-like spasms occur frequently in response to stimuli. Autonomic nervous system dysfunction (hypertension, abnormal pulse) and spasm of respiratory muscles and larynx can lead to respiratory failure. Among patients in the youngest and oldest age groups, the case-fatality rate approaches 100% without intensive care; with intensive care, the rate can be reduced to 10%–20%.

To protect against tetanus in all people, the WHO-recommended schedule for tetanus toxoid containing vaccines (TTCV) includes six doses: a three-dose

FIGURE  
1

Child with non-neonatal tetanus



Source: World Health Organization

primary infant series, and three booster doses given at ages 12–23 months, 4–7 years and 9–15 years (1). For booster doses, combination vaccines containing tetanus toxoid (TT) and diphtheria toxoid (DTP, TD, Td) are preferred for providing additional protection against diphtheria. In countries where maternal and neonatal tetanus (MNT) remains a public health concern, unvaccinated women of reproductive age need to receive up to five appropriately spaced TTCV doses (preferably Td) for lifetime protection.



## RATIONALE AND OBJECTIVES OF SURVEILLANCE

The need for improved tetanus surveillance is underscored by the absence of reliable global estimates of non-NT cases and deaths, including maternal tetanus (see Box 1). Since immunity from TTCV wanes over time and herd immunity does not play a role in protecting individuals from tetanus, every individual must be vaccinated with a complete TTCV series to prevent disease. If vaccination begins in infancy, six TTCV doses are required; if vaccination begins after the first year of life, five appropriately spaced doses of TTCV are sufficient. A key objective of surveillance

for non-NT is to monitor disease burden and changing epidemiology over time in order to assess the impact of vaccination and to identify gaps in the immunization programme. This information should be used to inform targeted strengthening of routine immunization services and optimize strategies and immunization schedules, including introduction and timing of booster doses. Another key objective is detecting and investigating unusual disease clusters. Finally, rapid detection of cases can help save lives and allow for proper treatment, including antitoxin, to begin.

## Maternal tetanus

Maternal tetanus is defined as tetanus occurring during pregnancy or within 6 weeks after pregnancy ends (with birth, miscarriage or abortion) and has the same risk factors and means of prevention as neonatal tetanus. For this reason, NT elimination (< 1 case per 1,000 live births) is considered a proxy for maternal tetanus elimination. Women of reproductive age are at risk of tetanus due to potential exposure to unhygienic practices during delivery and early termination of pregnancies, so special attention should be paid to investigating maternal cases and disease clusters to identify the underlying causes and implement appropriate remediation. If country programmes decide that maternal tetanus is of special priority, reports of maternal tetanus could be handled similar to reports of neonatal tetanus, including case investigation, rapid community assessments and public health response (see Neonatal Tetanus chapter). When feasible, serosurveys of tetanus immunity among women of reproductive age can be a complementary tool for monitoring MNT risk and guiding vaccination strategies (see Annex 2: Tetanus Serosurveys).



## TYPES OF SURVEILLANCE RECOMMENDED

### MINIMAL SURVEILLANCE

The minimal recommended standard for non-NT surveillance is nationwide, aggregate surveillance with routine reporting from inpatient facilities and investigation of any unusual disease clusters. Non-NT surveillance is population-based and includes all persons > 28 days of age. Laboratory confirmation is not an aspect of non-NT surveillance, as the basis of tetanus diagnosis is clinical rather than laboratory-based.

### ENHANCED SURVEILLANCE

Enhanced surveillance for non-NT consists of case-based surveillance to aid understanding the epidemiology of the disease and causes of infection and to allow monitoring of treatment practices and disease outcomes. Either nationwide or sentinel surveillance would be advised, depending on the burden of disease, health-seeking behaviours and resources available in the country (sentinel surveillance requires fewer resources).

### CASE DETECTION

- Establish a formal surveillance network of public and private inpatient facilities designated for non-NT reporting and sensitize surveillance focal points and key clinical staff (such as intensive care unit staff) to recognize and report non-NT cases per national guidelines.

- Report the aggregate number of inpatients with a final diagnosis of non-NT at designated reporting sites at a specified frequency (weekly or monthly), even if there are zero cases (referred to as “zero reporting”). Health facility reports should be regularly monitored and verified by surveillance staff. Unusually high numbers reported in a given month may represent a data entry error that needs to be corrected, or a disease cluster that needs investigation.
- For countries deciding to establish case-based surveillance for non-NT, public and private referral hospitals with intensive care capacity located in areas with high non-NT burden should be prioritized as sentinel sites to capture the majority of non-NT cases. Later, surveillance can be expanded to include additional sites that represent a larger extent of the population.

### LINKAGES TO OTHER SURVEILLANCE

Ideally, non-NT surveillance is linked with aggregate surveillance systems for other diseases through systems such as IDSR and EWARN. In some cases, HMIS reporting may be used for facility-based aggregate reporting of non-NT cases. Linkage to maternal death surveillance and response (MDSR) and other maternal child health post-partum surveillance systems may be relevant in some countries.



## CASE DEFINITIONS AND FINAL CLASSIFICATION

### SUSPECTED CASE DEFINITION FOR CASE FINDING

A suspected case is any person > 28 days of age with acute onset of at least one of the following: trismus (lockjaw), *risus sardonicus* (sustained spasm of the facial muscles) or generalized muscle spasms (contractions).

### FINAL CASE CLASSIFICATION

- **Confirmed:** A case meeting the suspect definition and clinically confirmed as tetanus by a physician/trained clinician.
- **Probable:** A case meeting the suspect case definition *without* clinical confirmation by a physician/trained clinician.
- **Discarded:** A case that has been investigated and does not satisfy the clinical criteria for confirmation or has an alternate diagnosis.

**Note:** The basis for case classification is entirely clinical and does not depend on laboratory confirmation. In low incidence settings, many clinicians may have never seen a tetanus case, making clinical diagnosis more challenging. During tetanus spasms, the patient is usually conscious, and the spasm is often brought on by stimuli such as light and sound, unlike other convulsions where the patient may be unconscious. Although tetanus diagnosis usually includes a history of injury or wound, tetanus may also occur in patients who are unable to recall a specific wound or injury. The most common differential diagnoses for tetanus are hypocalcemic tetany, drug-induced dystonias (from drugs such as phenothiazines), meningoencephalitis, strychnine poisoning and trismus due to dental infections.



## CASE INVESTIGATION

In countries conducting aggregate surveillance, information should be collected at designated health facilities from inpatient records for cases with a final diagnosis of non-NT, and reported to the next higher level based on national surveillance guidelines. No further investigation is needed except in the case of unusual disease clusters.

In countries conducting case-based surveillance, each suspected tetanus case should be investigated using a standard case investigation form, ideally within seven days of notification, to confirm the diagnosis

and determine the cause of infection. Send filled case investigation forms detailing the findings and actions taken or recommended to the next level and give written feedback to the reporting facility and community.

Tetanus immunoglobulin (TIG) or antitoxin tetanus serum (ATS) should be given immediately, even if investigation cannot be performed in a timely manner.



## SPECIMEN COLLECTION

No specimens are collected for non-NT cases, as there is no laboratory diagnosis.



## LABORATORY TESTING

Tetanus diagnosis is entirely based on clinical features and does not depend on laboratory confirmation.

*C. tetani* is recovered from microbiologic culture of wounds in only about 30% of cases, and the organism

is sometimes isolated from patients who do not have tetanus. As non-toxicogenic strains of *C. tetani* also exist, definitive laboratory diagnosis is not currently possible.



## DATA COLLECTION, REPORTING AND USE

### RECOMMENDED DATA ELEMENTS

#### ➤ Aggregate surveillance

- » Age group (optimal for tetanus epidemiology are 29 days–4 years, 5–14, 15–44, 45–64 and 65+ years, but can be aligned with needs of integrated surveillance system)
- » Sex
- » Month
- » Geographical area
- » Immunization status (if possible)

#### ➤ Case-based surveillance

- » Case notification
  - Name (if confidentiality is a concern the name can be omitted so long as a unique identifier exists)
  - Unique case identifier
  - Date of notification
  - Source of notification (health facility location, name of person)
  - Date of case investigation
- » Demographics
  - Sex
  - Date of birth (or age, if date of birth not available)
  - Race/Ethnicity (if relevant)
  - Migrant status
  - Educational status
  - Place of residence (village, district, and province)

#### » Clinical

- Date of onset
- Date of hospitalization
- Signs and symptoms (at minimum)
  - Trismus
  - Risus sardonicus
  - Muscle spasms

#### » Vaccination Status

- Number of tetanus vaccine doses (preferably by documentation, recall if not available)
- Dates of vaccine doses, especially last dose
- Receipt of tetanus conjugate vaccines (such as Hib, MenA, MenC, Pneumo, Typhoid depending on formulation)

#### » Risk factors

- Occupation
- History of wound or injury (including chigger/jigger infestation and intravenous drug use)
- History of surgery or medical procedure (for example, male circumcision)
- History of dental or ear infection
- Maternal tetanus
  - Current or recent pregnancies within the last 6 weeks
    - \* Number of antenatal care (ANC) visits during pregnancy
    - \* Pregnancy outcome (live birth/healthy child, live birth/NT case, still birth, miscarriage, or abortion)

- \* Information on birth/termination (date, location, who attended, clean surface/hands/tools)
  - Parity
- Application of unhygienic substances to wounds
- » Treatment
  - Tetanus immunoglobulin (TIG), antitoxin tetanus serum (ATS), intravenous immune globulin (IVIG) given
    - Date of administration
  - Antibiotics given (type)
    - Date of administration (starting date)
- » Outcome
  - Outcome (patient survived, died, unknown)
  - Final classification (confirmed, probable, discarded)
  - Date of discharge/death

## REPORTING REQUIREMENTS AND RECOMMENDATIONS

The number of non-NT cases should be reported separately from NT cases by designated reporting sites weekly, monthly or at another specified frequency, even if there are zero cases (zero reporting). Case investigation forms or electronic data from these forms should be forwarded to the national level.

For the purpose of case counts, tally only probable and confirmed inpatient cases for national reporting because

non-NT is managed on an inpatient basis. Including outpatients would likely result in overestimation because of problems like misdiagnosis, reporting errors from smaller facilities or double-counting of outpatients referred for inpatient admission.

Cases of non-NT should be reported annually to WHO-UNICEF and separately from NT, through the Joint Reporting Form (JRF). Reporting of tetanus is not required by the International Health Regulations (IHR).

## RECOMMENDED DATA ANALYSES

- Number of non-NT cases and incidence rates by month, year and geographical area
- Incidence rates by sex and age group (29 days–4 years, 5–14, 15–44, 45–64, and 65+ years)
- Trends in the sex ratio of non-NT cases over time
- Proportion of cases protected against tetanus (see Table 1)
- Proportion of cases by risk factor
- Proportion of cases receiving TIG/ATS/IVIG
- Case-fatality ratio (number of non-NT deaths / number of non-NT cases x 100)
- Proportion of maternal tetanus cases

As with other diseases, surveillance data should be triangulated with data from the immunization programme, such as coverage and historic vaccination schedules, to understand the entire picture of disease when formulating conclusions and new policies.

**TABLE 1** Expected duration of protection provided by valid tetanus toxoid containing vaccine (TTCV) doses

CUMULATIVE NO. OF TTCV DOSES IF VACCINATION BEGAN IN INFANCY	CUMULATIVE NO. OF TTCV DOSES IF VACCINATION BEGUN ≥1 YEAR OF AGE	MINIMUM INTERVAL BETWEEN DOSES TO BE CONSIDERED VALID	DURATION OF PROTECTION FROM RECEIPT OF LAST DOSE
TTCV1	TTCV1	--	None
TTCV2/TTCV3	TTCV2	4 weeks	3 years
TTCV4	TTCV3	6 months	5 years
TTCV5	TTCV4	1 year	10 years
TTCV6	TTCV5	1 year	20–30 years

*A “valid dose” is defined as a dose administered after the minimum time interval required between doses. TTCV doses received by adolescents and adults during childhood are only included if verified by reviewing written records such as infant or school vaccination records.*

#### USING DATA FOR DECISION-MAKING

- Monitor disease burden and impact of vaccination, including TTCV campaigns targeting women of reproductive age or wide-age range campaigns for both sexes with tetanus toxoid-conjugate vaccines such as MenA.
- Identify and investigate non-NT disease clusters to determine risk factors and appropriately design risk mitigation strategies such as provision of vaccine, improved hygiene practices.
- Identify gaps in the immunization programme (areas with low coverage, cold chain issues resulting in frozen TTCV, etc.) to inform targeted strengthening of routine immunization services or need for catch-up vaccination.
- Identify groups at higher risk for tetanus infection (women of reproductive age, school-age children, male adults, elderly) to inform changes in policy or strategy such as introduction of booster doses or optimization of schedule.
- Monitor maternal tetanus to strengthen MNTE strategies and reduce missed opportunities for vaccination such as ANC, sick visits and outreach.
- Periodically assess tetanus risk factors (occupation, road accidents, unclean deliveries/surgeries, migrant status, ethnicity) to appropriately design and implement messaging and interventions.
- Rapidly identify cases for appropriate case management, including provision of TIG/ATS/IVIG.
- Monitor surveillance reporting to identify areas that need targeted surveillance reviews or strengthening, where surveillance data appear unreliable.



## SURVEILLANCE PERFORMANCE INDICATORS

Non-NT surveillance can be evaluated through periodic national reviews approximately every five years, by integrating with other VPDs and including triangulation of aggregate and case-based NT reports as well as a review of facility records for missed cases. Targeted subnational reviews and data quality assessments can be conducted more frequently. As part of the quarterly EPI data review meetings, review of surveillance,

coverage and programme performance data at national and subnational level can help identify potential areas where surveillance gaps might exist or surveillance needs to be strengthened. Regular monitoring of surveillance indicators could help identify specific areas of the surveillance system and reporting network that should be targeted for improvement (Table 2).

TABLE  
2

Performance indicators for non-NT surveillance

SURVEILLANCE ATTRIBUTE	INDICATOR	TARGET	HOW TO CALCULATE (NUMERATOR/DENOMINATOR)	COMMENTS
<b>COMPLETENESS OF REPORTING</b>	Percentage of designated reporting sites reporting non-NT data, even in the absence of cases (zero reporting)	≥ 90%	# designated sites reporting non-NT / # designated reporting sites for non-NT surveillance x 100 (for a given time period)	Designated reporting sites for non-NT surveillance might only include hospitals or referral hospitals, rather than all health facilities.
<b>TIMELINESS OF REPORTING</b>	Percentage of designated sites reporting non-NT data on time (zero reporting)	≥ 80%	# designated sites reporting non-NT on time / # designated reporting sites for non-NT surveillance x 100	At each level reports should be received on or before the requested date.
<b>COMPLETENESS OF INVESTIGATION</b> <i>(case-based surveillance only)</i>	Percentage of suspected non-NT cases that have been investigated (only among cases reported from health facilities included in case-based surveillance)	≥ 90%	# of non-NT case investigations / # of suspected non-NT cases reported x 100	If case-based database only includes data on case investigations performed, this indicator can be calculated as: # suspected cases in the case-based dataset / # suspected cases in the aggregate report x 100  This indicator will reflect the representativeness of case-based surveillance and efficiency of case investigations.
<b>TIMELINESS OF INVESTIGATION</b> <i>(case-based surveillance only)</i>	Percentage of all suspected non-NT cases investigated within 7 days of notification	≥ 80%	# suspected non-NT cases investigated within 7 days of notification / # suspected non-NT cases investigated x 100	



## CLINICAL CASE MANAGEMENT

Non-NT is a medical emergency requiring hospitalization and immediate treatment with TIG, drugs to control muscle spasm (preferred: benzodiazepines), wound care and antibiotics (preferred: metronidazole or penicillin G). A single intramuscular dose of human TIG is recommended as soon as possible to prevent further progression of the disease. If TIG is not available, equine-derived ATS can be given in a single intravenous dose after testing for hypersensitivity. Alternatively, IVIG may be used.

Supportive care should be provided; patients should be kept in a dark and quiet environment to reduce the risk of reflex spasms. If muscle spasms are occurring, it is critical to maintain a safe airway. If mechanical ventilation is not available, patients should be carefully monitored in order to minimize spasm and autonomic dysfunction while avoiding respiratory failure. Finally, before discharge, age-appropriate TTCV should be administered to prevent future disease.



## CONTACT TRACING AND MANAGEMENT

As tetanus is not contagious, no contact tracing is needed.



## SURVEILLANCE, INVESTIGATION AND RESPONSE IN OUTBREAK SETTINGS

### DEFINITION OF AN OUTBREAK

For non-NT, traditional communicable disease outbreaks do not occur because there is no person-to-person transmission, but cases may cluster together in time and space as a result of the same environmental exposure. A specific threshold has not been defined for the number of non-NT cases that should trigger investigation, but any substantial increase compared with previous reporting from the same area within a comparable timeframe should be investigated. A cluster of non-NT cases could include those occurring within the same geographic and time proximity, or multiple cases determined to be linked to the same source or event. Clusters of non-NT cases have been documented after natural disasters (earthquakes, tsunamis, typhoons), after male circumcision and from injection drug use.

### CHANGES TO SURVEILLANCE DURING AN OUTBREAK

Even in countries with aggregate surveillance, data should be regularly monitored to identify potential clusters of non-NT disease. Clusters should be followed up with investigation to determine if there is a common cause. If a cluster is identified, consider line listing of cases with a limited set of variables so that more detailed analysis of cases can be performed (by age, sex, vaccination status, risk factors, treatment, etc.). This information can be used to inform risk mitigation efforts, including provision of vaccine and promotion of improved hygiene practices, both for individuals and for healthcare settings.

### SPECIAL ASPECTS OF INVESTIGATION

If there is a non-NT cluster, it is important to identify environmental exposure risk factors (nosocomial, occupational, accident).



## SPECIAL CONSIDERATIONS FOR NON-NEONATAL TETANUS SURVEILLANCE

### SEROLOGICAL SURVEYS OR SEROSURVEILLANCE

Serological assessments of tetanus IgG antibody levels in a survey setting may be useful for evaluating protection against tetanus. Because immunity does not result from natural infection, tetanus seroprotection reflects population immunity from vaccination. However, the role of serological investigations should always be complementary to surveillance and other assessment methods, and the survey objective and outcomes should be well defined (see Annex 2: Tetanus Serosurveys).

### IMMUNITY GAPS RESULTING FROM LACK OF BOOSTER DOSES

Investigations have documented immunity gaps and higher burden of disease in school-aged children and

adult men in countries not providing the WHO-recommended six TTCV doses to both sexes. All immunization programmes should review programme data and adjust routine immunization schedules to ensure tetanus protection over the life course (three primary doses in infancy and three booster doses in childhood/adolescence) (2).

### HUMANITARIAN EMERGENCIES

Non-NT should be considered for inclusion in surveillance systems set up during humanitarian emergencies because of the documented outbreaks after earthquakes and tsunamis (3).



## REFERENCES

### REFERENCES CITED

1. World Health Organization. *Tetanus vaccines: WHO Position Paper – February 2017*. *Wkly Epidemiol Rec.* 2017;92(6):53–76 (<http://apps.who.int/iris/bitstream/10665/254582/1/WER9206.pdf?ua=1>).
2. Dalal S, Samuelson J, Reed J, Yakubu A, Neube B, Baggaley R. *Tetanus disease and deaths in men reveal need for vaccination*. *Bull World Health Organ.* 2016;94:613–21 (<http://www.who.int/bulletin/volumes/94/8/15-166777/en/>).
3. World Health Organization. *Vaccination in acute humanitarian emergencies: a framework for decision making*. Geneva: World Health Organization; 2017 (<http://apps.who.int/iris/bitstream/10665/255575/1/WHO-IVB-17.03-eng.pdf>).

### ADDITIONAL REFERENCES

4. World Health Organization. *Current recommendations for treatment of tetanus during humanitarian emergencies: WHO technical note*. Geneva: World Health Organization; 2010 ([http://www.who.int/diseasecontrol\\_emergencies/who\\_hse\\_gar\\_dce\\_2010\\_en.pdf](http://www.who.int/diseasecontrol_emergencies/who_hse_gar_dce_2010_en.pdf)).
5. World Health Organization. *Maternal death surveillance and response: technical guidance information for action to prevent maternal death*. Geneva: World Health Organization; 2013 ([http://apps.who.int/iris/bitstream/10665/87340/1/9789241506083\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/87340/1/9789241506083_eng.pdf?ua=1)).
6. World Health Organization. *Report of the SAGE Working Group on maternal and neonatal tetanus elimination and broader tetanus prevention*. Geneva: World Health Organization; 2016 ([http://www.who.int/immunization/sage/meetings/2016/october/1\\_Report\\_of\\_the\\_SAGE\\_Working\\_Group\\_on\\_Maternal\\_and\\_Neonatal\\_Tetanus\\_27Sep2016.pdf](http://www.who.int/immunization/sage/meetings/2016/october/1_Report_of_the_SAGE_Working_Group_on_Maternal_and_Neonatal_Tetanus_27Sep2016.pdf)).
7. Scobie HM, Mao B, Buth S, Wannemuehler K, Sorenson C, Kannarath C, et al. *Tetanus immunity among women aged 15 to 39 years in Cambodia: a national population-based survey, 2012*. *Clin Vaccine Immunol.* 2016;23(7):546–54. doi: 10.1128/CVI.00052-16.
8. World Health Organization. *Tetanus toxoid vaccination and voluntary medical male circumcision [website]*. Geneva: World Health Organization; 2018 ([http://www.who.int/immunization/programmes\\_systems/interventions/TT\\_and\\_VMMC/en/](http://www.who.int/immunization/programmes_systems/interventions/TT_and_VMMC/en/)).
9. World Health Organization. *Vaccination in acute humanitarian emergencies: Implementation guide*. Geneva: World Health Organization; 2017 (<http://apps.who.int/iris/bitstream/10665/258719/1/WHO-IVB-17.13-eng.pdf>).
10. World Health Organization. *Meeting of the strategic advisory group of experts on immunization, October 2016 – conclusions and recommendations*. *Wkly Epidemiol Rec.* 2016;91(48):561–84 (<http://apps.who.int/iris/bitstream/10665/251810/1/WER9148.pdf?ua=1>).